

DRAFT

RESTORATION PLAN/ENVIRONMENTAL ASSESSMENT

FOR FORMER KERR-MCGEE

CHEMICAL CORPORATION WOOD-TREATING FACILITY (TRONOX LLC),

TEXARKANA, BOWIE COUNTY, TEXAS

OCTOBER 2018

PREPARED BY THE:

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

TEXAS GENERAL LAND OFFICE

TEXAS PARKS AND WILDLIFE DEPARTMENT

AND

UNITED STATES FISH AND WILDLIFE SERVICE

EXECUTIVE SUMMARY

This Draft Restoration Plan/Environmental Assessment (RP/EA) was developed by the Texas Commission on Environmental Quality (TCEQ), Texas Parks and Wildlife Department (TPWD), Texas General Land Office (GLO), and the United States Fish and Wildlife Service (USFWS) acting on behalf of the United States Department of the Interior (DOI) (collectively, the Trustees) for public review and comment. The purpose of this Draft RP/EA is to describe how the Trustees propose to use recovered funds to restore natural resources injured, lost, or destroyed due to releases of hazardous substances at or from the former Kerr-McGee Chemical Corporation (Kerr-McGee) wood-treating facility in Texarkana, Bowie County, Texas (the Facility). The Trustees have recovered approximately \$21.3 million in natural resource damages.

The Facility was built in 1905 and operated under various companies, including Kerr-McGee, until operations ceased in 2003. On May 20, 2008, the Trustees and Tronox LLC (Tronox), the property owner, entered into a memorandum of agreement to perform a cooperative assessment under the Natural Resource Damage Assessment (NRDA) regulations to address potential natural resource damages liability for releases of hazardous substances at or from the Facility. After Tronox declared bankruptcy in 2009 and the Bankruptcy Court approved a Consent Decree and settlement agreement, the natural resource damage assessment became a direct Trustee effort. The Trustees determined, as part of the bankruptcy claim, that there had been injury to freshwater aquatic benthic habitat at three perennial streams at or downstream of the Facility: Days Creek, Howard Creek, and Waggoner Creek. In addition, there was potential injury to riparian and bottomland hardwood habitats adjacent to Days and Howard creeks.

In this Draft RP/EA, the Trustees propose to restore those natural resources injured due to releases at or from the Facility by: 1) acquiring tracts associated with Caddo Lake, the Neches River, and Talbot Prairie; 2) restoring and enhancing bottomland hardwoods within the Mineola Nature Preserve in Wood County; and 3) constructing wetlands, preserving forested habitat, and stabilizing, restoring, and enhancing freshwater streams in the Texarkana area. In this Draft RP/EA, the Trustees propose the preferred restoration alternatives listed below. The Trustees would implement these actions pursuant to the terms of the settlement of natural resource damage claims for the Facility. The Trustees may elect to utilize remaining restoration funds from the NRDA settlement, as well as interest earned on these recoveries, to supplement the currently proposed restoration alternatives, increasing the size of the NRDA-funded conservation, and to pay for the Trustees' administrative costs to develop and implement the alternatives.

Summary of Proposed Action

Preferred Restoration Alternatives	Alternative Cost
Alternative 3: Caddo Lake Habitat Acquisition Project	\$5,900,000
Alternative 4: Days Creek Enhancement and Restoration Projects for Cowhorn, Days, Howard, Swampoodle, and Waggoner creeks	\$9,800,000
Alternative 7: Mineola Nature Preserve Projects	\$500,000
Alternative 8: Neches River Bottomland Forest Conservation	\$2,200,000
Alternative 10: Talbot Prairie and Forest Land Acquisition	\$1,000,000
Total Proposed Restoration:	\$19,400,000

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ACRONYMS AND ABBREVIATIONS

Acronym/Abbreviations	Definition
AR	Administrative Record
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
C.F.R.	Code of Federal Regulations
COC	Chemical of Concern
DOI	United States Department of the Interior
EA	Environmental Assessment
EIS	Environmental Impact Statement
ESA	Endangered Species Act
The Facility	Former Kerr McGee Chemical Corporation wood treating facility in Bowie County, Texas
FONSI	Finding of No Significant Impact
GLO	Texas General Land Office
H&H	Hydrology and Hydraulic
Kerr-McGee	Kerr-McGee Chemical Corporation
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act of 1966
NOAA	National Oceanic and Atmospheric Administration
NPAT	Native Prairies Association of Texas
NRDA	Natural Resource Damage Assessment
NWR	National Wildlife Refuge
PAH	Polycyclic Aromatic Hydrocarbons
PCP	Pentachlorophenol
RCRA	Resource Conservation and Recovery Act
RP/EA	Restoration Plan/Environmental Assessment
TCEQ	Texas Commission on Environmental Quality
TCF	The Conservation Fund
TexReg	Texas Register
TNC	The Nature Conservancy
TPWD	Texas Parks and Wildlife Department

Tronox	Tronox LLC
the Trustees	TCEQ, TPWD, GLO, and USFWS
TWC	Texas Water Commission (predecessor agency to the TCEQ)
U.S.C.	United States Code
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
WMA	Wildlife Management Area

1.0 INTRODUCTION

This Draft Restoration Plan/Environmental Assessment (Draft RP/EA) was developed by the Texas Commission on Environmental Quality (TCEQ), Texas Parks and Wildlife Department (TPWD), Texas General Land Office (GLO), and the United States Fish and Wildlife Service (USFWS) acting on behalf of the United States Department of the Interior (DOI) (collectively, the Trustees). This Draft RP/EA describes how the Trustees propose to use recovered funds to address natural resources (including associated ecological services) that were injured, lost, or destroyed due to releases of hazardous substances at or from the former Kerr-McGee Chemical Corporation (Kerr-McGee) wood-treating facility in Texarkana, Bowie County, Texas (the Facility).

The Facility property included approximately 500 acres of upland and bottomland hardwoods, including the floodplains of Days, Howard, and Waggoner creeks (see Figure 1-1). The Facility was built in 1905 and operated under various companies before being acquired and operated by Kerr-McGee in 1969. Operations at the Facility included treating railroad ties and other railroad timber products with a creosote-based preservative. The creosote was released to the surface soil and subsequently leached to groundwater. It traveled off-site into the nearby creeks by overland flow and the discharge of groundwater from seeps. Treating operations at the Facility ceased in 2003, and the production Facility was decommissioned in 2004. In 2005, Kerr-McGee transferred ownership of the Facility to Tronox LLC (Tronox). On June 23, 2006, Anadarko Petroleum Corporation acquired what remained of Kerr-McGee.

In 2008, the Trustees began an assessment to identify whether natural resources were injured by the releases of creosote and other hazardous substances at or from the Facility. Through this assessment, the Trustees determined that the releases caused injury to freshwater aquatic and benthic habitats at three perennial streams at or downstream of the Facility: Days Creek, Howard Creek, and Waggoner Creek (Figure 1-1). In addition, there was potential injury to riparian and bottomland hardwood habitats adjacent to Days and Howard creeks.

While the Trustees were conducting the damage assessment, Tronox declared bankruptcy. In 2009, the Trustees filed a claim for natural resource damages with the Bankruptcy Court. Pursuant to the settlement agreements approved by the Bankruptcy Court, the Trustees received nearly \$21.3 million to compensate the public for natural resources injured at the Facility. The Trustees have prepared this Draft RP/EA to describe how the recovered funds will be used to restore, replace, or acquire the equivalent of the natural resources injured, and to provide the public with an opportunity to comment on these proposed actions.

This Draft RP/EA presents the range of alternatives that the Trustees considered and identifies the preferred alternatives which the Trustees believe will restore natural resources injured by the releases of hazardous substances at or from the Facility. The proposed preferred restoration alternatives are all located within northeast and east Texas and would be implemented by the Trustees in conjunction with local partners.

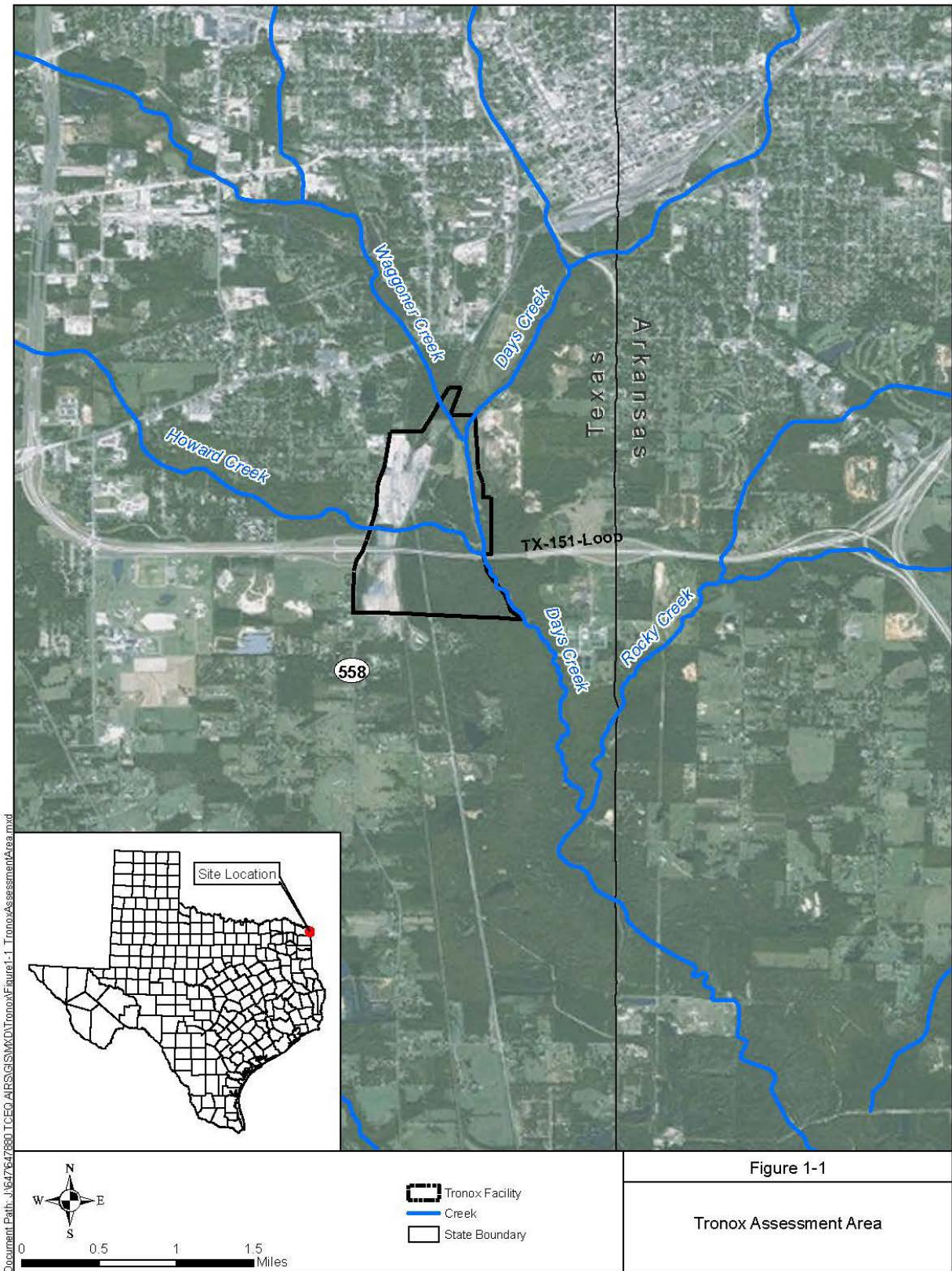


Figure 1-1 Tronox Assessment Area

1.1 Authority

This Draft RP/EA was prepared jointly by the Trustees pursuant to their respective authorities and responsibilities as natural resource trustees under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. §§ 9601 *et seq.*, and other applicable federal and state laws. Relevant regulations include Subpart G of the National Oil and Hazardous Substances Pollution Contingency Plan (40 C.F.R. §§ 300.600 through 300.615), and DOI's regulations at 43 C.F.R. Part 11, which provide guidance for the NRDA process under CERCLA. In addition, the Texas Water Code provides for recovery of costs to determine impacts on the environment of a spill or discharge and to restore land and aquatic resources held in trust or owned by the State (Tex. Water Code § 26.265).

In addition to addressing the remediation of contaminated sites, CERCLA establishes liability for the injury to, destruction of, or loss of natural resources caused by releases of hazardous substances. Damages recovered for these losses must be used to restore, replace, or acquire the equivalent of the injured natural resources and services, in accordance with a restoration plan developed by the designated natural resource trustees.

Pursuant to 43 C.F.R § 11.23(e), to determine whether to proceed with an assessment, the Trustees must establish that 1) a release of hazardous substance occurred; 2) natural resources for which the Trustees may assert trusteeship under CERCLA have been or are likely to have been adversely affected by the release; 3) the quantity and concentration of the released hazardous substance is sufficient to potentially cause injury to those natural resources; 4) data sufficient to pursue an assessment are readily available or likely to be obtained at reasonable cost; and 5) response actions, if any, carried out or planned do not or will not sufficiently remedy the injury to natural resources without further action.

Pursuant to their respective authorities and responsibilities as natural resource trustees under CERCLA, the Trustees determined that releases of hazardous substances at or from the Facility resulted in injuries or potential injuries to natural resources under their jurisdiction. The Trustees undertook this restoration planning effort to restore those natural resources and services injured as a result of releases at or from the Facility. Restoration activities are intended to restore or replace habitats, species, and services to their baseline condition and to compensate the public for the time natural resources are injured until they recover to baseline conditions.

1.2 NEPA Compliance

Actions undertaken by the federal Trustees to restore natural resources or services under CERCLA and other federal laws are subject to the National Environmental Policy Act (NEPA), 42 U.S.C. §§ 4321 *et seq.*, and the regulations guiding its implementation at 40 C.F.R. Parts 1500 - 1508. NEPA requires federal agencies to consider the potential environmental impacts of proposed federal actions. It provides a mandate and framework for federal agencies to determine if proposed actions will have significant environmental effects and related social and economic effects. According to the regulations at 40 C.F.R. § 1508.9, an environmental assessment (EA) is a concise public document designed to (1) help determine whether to prepare an environmental impact statement (EIS) or a finding of no significant impact (FONSI), (2) aid an agency's compliance with NEPA when the agency determines no EIS is necessary, and (3) facilitate preparation of an EIS when one is necessary. If a federal agency determines through an EA that

a proposed action will not significantly impact the quality of the human environment, the agency will issue a FONSI to satisfy NEPA requirements. In the case of this Draft RP/EA, if the federal Trustee determines that a FONSI is appropriate, it will issue one concurrent with the Trustees' issuance of a Final RP/EA describing the selected restoration action(s).

USFWS is the lead federal Trustee for preparing this Draft RP/EA pursuant to NEPA. The state Trustee agencies (TCEQ, TPWD, and GLO) are acting as cooperating agencies for the purposes of compliance with NEPA in the development of this Draft RP/EA. This Draft RP/EA describes the purpose and need for restoration actions; provides opportunity for public comment; summarizes the current environmental setting; identifies alternative actions; and determine their applicability and potential impact of the restoration actions on the quality of the physical, biological, and cultural environment.

1.3 Purpose and Need for the Proposed Action

The purpose of this Draft RP/EA is to identify and analyze the reasonable range of alternatives that the Trustees have developed to address natural resource injuries. The proposed actions are needed to restore those natural resources and services lost to the public as a result of the releases of hazardous substances at or from the Facility, and to compensate the public for the loss of those services pending restoration. The Trustees developed the restoration alternatives based on criteria evaluated in this Draft RP/EA and input received from the public.

1.4 Compliance with Other Authorities

In addition to CERCLA and NEPA, other legal requirements may apply to NRDA planning or implementation. These may include:

- Endangered Species Act (16 U.S.C. §§ 1531 *et seq.*),
- National Historic Preservation Act (16 U.S.C. §§ 470 *et seq.*),
- Federal Water Pollution Control Act (Clean Water Act, 33 U.S.C. §§ 1251 *et seq.*),
- Fish and Wildlife Coordination Act (16 U.S.C. §§ 661 *et seq.*),
- Migratory Bird Treaty Act (16 U.S.C. §§ 703-712), and
- Bald and Golden Eagle Protection Act (16 U.S.C. §§ 668-668c).

The Trustees will ensure compliance with authorities, consultations, and permitting applicable to the preferred restoration alternatives prior to implementation.

In addition to compliance with these statutes and regulations, the Trustees will consider relevant environmental or economic programs or plans that are ongoing or planned in or near the affected environment, and they will ensure that restoration projects neither impede nor duplicate such programs or plans. By coordinating restoration projects identified in this Draft RP/EA with other relevant restoration programs and plans, the Trustees will enhance the overall effort to restore and improve the environment and resources affected by the releases of hazardous substances at or from the Facility.

1.5 Public Participation

Public participation and review is an integral part of the restoration planning process. CERCLA and NEPA provide a mandate and a framework for the Trustees to inform and involve the public in their environmental analysis and decision-making processes. The Trustees have integrated both the CERCLA and NEPA processes in this Draft RP/EA.

On March 11, 2016, the Trustees issued a request in the *Texas Register* (41 TexReg 2008) for project ideas in counties in northeast and east Texas that would restore, rehabilitate, or conserve forested riparian, bottomland hardwoods, aquatic, and/or wetland habitats. In response to the request for scopes of work, the Trustees received 12 project ideas, which are identified in Section 3.2 of this Draft RP/EA. In November 2016, the Trustees requested additional information from the entities that submitted projects. The Trustees used this information to develop a reasonable range of alternatives that could restore those resources injured as a result of the releases of hazardous substances at or from the Facility.

The Trustees prepared this Draft RP/EA to provide the public with information on:

- the environmental setting that was impacted by releases at or from the Facility;
- the restoration alternatives considered to compensate for those injuries;
- the screening process used to identify the proposed restoration alternatives; the rationale for the preferred restoration alternatives; and
- the analysis of potential environmental impacts associated with the various restoration alternatives.

Accordingly, the purpose of this document is to seek input on (1) restoration actions proposed in this restoration plan under CERCLA, and (2) the analysis of environmental impacts associated with the restoration alternatives under NEPA.

The public is encouraged to review and comment on this Draft RP/EA. A copy of the RP/EA is available for download from the U.S. Department of the Interior's (DOI) Natural Resource Damage Assessment and Restoration Program case map and document library here:

https://www.cerc.usgs.gov/orda_docs/CaseDetails?ID=1064

Following public notice, the Draft RP/EA will be available to the public for a 30-day comment period. The deadline for submitting written comments on the document is specified in the public notice published in the Texas Register. Comments must be postmarked no later than 30 days after the start of the comment period. Comments on the Draft RP/EA can be submitted during the comment period to Mr. Mike Cave by email at michael.cave@tceq.texas.gov or at the address provided below.

Texas Commission on Environmental Quality
MC-136, P.O. Box 13087
Austin, TX 78711-3087

After the close of the public comment period, the Trustees will consider all comments received, within the comment period, and will revise the Draft RP/EA as appropriate. A summary of comments received and the Trustees' responses (where applicable) will be included in the Final RP/EA.

1.6 Administrative Record

The Trustees maintain records documenting the information considered and actions they have taken during this NRDA process. These records comprise the Trustees' administrative record (AR) supporting this Draft RP/EA. Documents germane to the development of this Draft RP/EA are included in the AR. The AR is available for public review and may be requested by contacting Mr. Mike Cave by email at michael.cave@tceq.texas.gov or at the address provided below.

Texas Commission on Environmental Quality
MC-136, P.O. Box 13087
Austin, TX 78711-3087

Arrangements must be made in advance to review or obtain copies of the AR. Access to and copying of the AR is subject to all applicable laws and policies including, but not limited to, laws and policies relating to copying fees and the reproduction or use of any copyrighted material.

2.0 OVERVIEW AND BACKGROUND

The restoration alternatives proposed in this Draft RP/EA are intended to restore those natural resources injured, lost, or destroyed due to releases of hazardous substances at and downstream of the Facility in Texarkana, Bowie County, Texas. This includes the loss of the services associated with injuries to benthic freshwater habitats and associated potential injuries to adjacent riparian, bottomland hardwood and wetland habitats.

This chapter describes the Facility and its operational history, the environment impacted by the Facility, and summarizes the response actions undertaken to address contamination released at or from the Facility. This chapter also details and summarizes the bankruptcy and NRDA settlement.

2.1 Overview of the Facility Site

The former wood-treating Facility is located at 2513 Buchanan Road in Texarkana, Bowie County, Texas (Figure 1-1). The Facility was built in 1905 and operated under various companies before being acquired and operated by Kerr-McGee in 1969. Wood-treating operations at the Facility ceased in late 2003, and the production Facility was decommissioned in 2004. In 2005, Kerr-McGee transferred its chemical business, including the Facility, to Tronox. On June 23, 2006, Anadarko Petroleum Corporation acquired what remained of Kerr-McGee.

The Facility property includes approximately 500 acres of upland and bottomland hardwoods and floodplains of Days, Howard, and Waggoner creeks. The properties north, south, and east of the Facility are mostly undeveloped. Residential dwellings are located west and northwest of the Facility. Liberty-Eylau Independent School District's C. K. Bender Elementary School is located on Buchanan Road immediately northwest of the Facility. Recent development in the general area has included new highways, subdivisions, and a prison system facility.

Figure 1-1 shows Days, Waggoner, and Howard creeks in relation to the Facility. Days Creek flows through the eastern-most portion of the Facility. Waggoner Creek enters the northern portion of the Facility from the northwest and flows for approximately 0.25 miles through the Facility to Days Creek. Howard Creek enters the Facility west of State Route 558 (i.e. Buchanan Road) and flows for 0.75 miles roughly parallel to State Loop Highway 151 bisecting the Facility. Stands of hardwood can be found along the creeks and within the undeveloped portions of the Facility. Image 1 shows the confluence of Days and Howard creeks. After exiting the Facility property, Days Creek flows to the south into Arkansas before joining the Sulphur River (downstream of Lake Wright Patman) about 10 miles south of the Facility. Approximately 362 acres of the property (78%) lies within the 100-year floodplain; however, the areas inundated during flood events drain rapidly as Days Creek recedes from flood stage.



Image 1 Confluence of Days Creek and Howard Creek (July 2017)

The past operations area of the Facility consisted of a drip pad, treated and untreated wood storage areas, wood-treating cylinders, chemical storage tanks, and wastewater lagoons. Facility products included railroad timbers treated with creosote-based preservatives. The wood-treating process used at the Facility included a drying phase which, as an industry standard, used an aqueous solution containing 0.25% sodium fluoride and 1.75% arsenic trioxide. The chemicals used in the preservation process included creosote, which contained polycyclic aromatic hydrocarbons (PAHs) and 2% pentachlorophenol (PCP). The Facility discontinued use of PCP in the wood preservation process in 1984.

During the wood-treating process, four pressure vessels were used to dry the wood by live steam or boultonizing, followed by pressure creosote impregnation. Wastes produced from this process included equipment washdown water, boiler blowdown, and discharges from various pumps and equipment seals. Before 1989, wastewaters generated by the wood-treatment process were treated in American Petroleum Institute oil-water separators prior to being discharged through a series of six surface impoundments that provided treatment and retention. Prior to construction of the six surface impoundments, wastewaters were allowed to flow into natural depressions located just east of the impoundments.

2.2 Impacted Environment

This section briefly describes the physical and biological environments of the area potentially affected by the releases at or from the Facility.

2.2.1 The Physical Environment

The Facility is located in the headwaters of the Red River and Sulphur River watersheds. The bottomland floodplain ecosystem directly impacted by activities at the Facility is described further in the sections below. Three creeks were identified as impacted by releases from the Facility: Days Creek, Howard Creek, and Waggoner Creek. In addition, the adjacent deciduous and riparian deciduous forests transported materials released from the Facility to the creek channels through surface water runoff or groundwater discharge and were also potentially impacted by releases.

Days, Howard, and Waggoner creeks are perennial streams with riffle/run habitat, pools ranging from 1 to greater than 6 feet deep, and shallow, low-energy depositional areas (See Figure 1-1 and Image 1).

2.2.1.1 Days Creek

Days Creek flows through the eastern most portion of the Facility, from the Facility's northern- to southern-most boundaries. Originally, Days Creek flowed closer to the Facility's operational area, and the lower reach of Howard Creek was part of Days Creek. However, Days Creek was diverted to its present location in the 1940s. The top bank width of Days Creek, adjacent to the Facility, ranges from 60 to 120 feet including primary flow channels, sandbars, and secondary high-water flow channels. Banks are generally incised, ranging from 6 to 12 feet in height. During normal flow regimes, water channel depths range from only a few inches in riffle areas to 1 to 4 feet in the deeper pools. Days Creek sediments consist of cobbles, pebbles, gravels, and coarse sands in riffle zones and higher energy flow areas. The Days Creek sand bars within this reach consist of gravels, coarse to very fine sands, and sandy to silty clays, with organic material in the lower energy flow areas (Trustee site investigations, AquAeTer & Kerr-McGee 1994, Exponent 1999a). Image 2 shows Days Creek adjacent to the Facility.



Image 2 Days Creek (July 2017)

2.2.1.2 Howard Creek

Howard Creek enters the Facility from just west of Buchanan Road and flows for 0.75 miles roughly parallel to State Loop Highway 151 in the southern portion of the Facility property. The Howard Creek sediments range from cobble, pebble, gravel, and coarse-grained sands in the upper reaches at the western property line to gravel and fine-grained sands from mid-reach on the Facility property to its confluence with Days Creek. The top bank width of Howard Creek ranges from 10 to 40 or more feet. Approximate normal flow water depths range from less than 1 foot over most of the reach through the Facility to 3 to 4 feet at the confluence of Days and Howard creeks. Bank heights range from 4 to 6 feet where Howard Creek enters the Facility to 6 to 8 feet at its confluence with Days Creek (Trustee site investigations, AquAeTer & Kerr-McGee 1994, Exponent 1999a). Image 3 shows Howard Creek adjacent to the Facility.



Image 3 Howard Creek (July 2017)

2.2.1.3 Waggoner Creek

Waggoner Creek enters the northern portion of the Facility from the northwest and flows for approximately 0.25 miles through the Facility to Days Creek. The Waggoner creek-top bank width averages approximately 70 feet. The channel includes primary channels, sandbars, and secondary high-water flow channels. Banks are incised with bank height ranging from 10 to 12 feet. Approximate normal flow water width ranges from 5 to 10 feet with water depths ranging from less than 1 foot to 3 feet. Creek sediments consist of cobble, pebble, gravel, and coarse-grained sands in high-energy flow areas and silty

to sandy clays in low-energy flow and shallow pooled areas (Trustee site investigations, AquAeTer & Kerr-McGee 1994, Exponent 1999a). Image 4 shows the confluence of Waggoner Creek and Days Creek near the Facility.



Image 4 Confluence of Days Creek (right) and Waggoner Creek (left) (July 2017)

2.2.2 The Biological Environment

The forested areas adjacent to Waggoner, Howard, and Days creeks in the vicinity of the Facility have been identified as deciduous and riparian deciduous forest. This section includes descriptions of these habitats and associated species of the impacted environment.

Deciduous Forest: The deciduous forest classification is used for areas in which the tree canopy is comprised of deciduous species. Two subdivisions have been recognized based on differences in canopy species composition and location: 1) upland deciduous forest in slightly more elevated areas and 2) bottomland forest where flooding occurs seasonally. On the slightly more elevated surfaces, sweet gum, water oak, and American elm dominate the tree canopy. In areas of slightly lower elevation and/or closer to stream and pond edges, the tree canopy is comprised of black willow, plains cottonwood, green ash, and American elm. Other common species found in this second subdivision include Chinese and common privet, greenbriar, wild grapes, mimosa trees, Chinese tallow, box elder, pecan, black walnut, trumpet flower, and other vines.

Riparian Deciduous Forest: The riparian deciduous forest classification is found along Howard and Waggoner creeks at the Facility and Days Creek at and below the Facility. The dominant tree canopy species along the creeks are river birch, sycamore, and plains cottonwood. Other tree species include

white mulberry, box elder, green ash, American elm, water oak, and winged elm. Under-story species include Chinese and common privet, stinging nettle, inland sea oats, salt pennywort, widow's tears, green briar, poison ivy and poison oak, wild grape, and buttonbush. The invasive species Chinese tallow was noted along Days Creek in 2017.

Flora and Fauna: The terrestrial habitat on and adjacent to the Facility and the combined creeks support numerous bird species. Bird species are represented by predators (e.g., Coopers hawk and the great horned owl), cavity nesters (e.g., red-bellied woodpeckers and Carolina chickadee), wading birds (e.g., snowy egrets and great blue herons), and seed eaters (e.g., northern cardinal). Most bird species observed occupy the forest habitats and edge habitats between the forest and the grasslands. In addition, the aquatic habitats in the creeks provide stopover habitat for other migratory avian species.

Reptiles have been observed throughout the three creeks. Turtle species found in the area were the red-eared slider, common musk turtle, and river cooter turtle. Common snapping turtles are also suspected to inhabit the area. Three-toed box turtles and pallid spiny softshell turtles have also been observed in the upper reaches of Waggoner Creek and Days Creek. Alligators have also been reported in the area (Exponent 1999a).

Frogs and toads were observed and heard in and around the three creeks and the Facility property. Their distribution is widespread over the surrounding area. Species such as the leopard frog, the chorus frog, and the red-spotted toad have been observed in the upper reaches of Waggoner Creek and are suspected further downstream in Days and Howard creeks (Exponent 1999b).

Scat and tracks at the Facility indicate the area is utilized by deer, eastern cottontail rabbits, and raccoons. These appeared to be common terrestrial mammals in the area. Slides and wildlife trails along the banks of the three creeks indicate the presence of wild pigs. The eastern gray squirrel has been spotted on the Facility property and adjacent properties. No mammal surveys have been conducted, but evidence such as burrows and tracks indicate mice, voles, raccoons, and deer are common in the Facility and riparian areas.

The in-stream environment of the combined creeks provide habitat for benthic invertebrates. The aquatic species present include, but are not limited to, golden shiner, red shiner, blackspot shiner, bullhead minnow, western mosquito-fish, redbfin shiner, warmouth, longear sunfish, green sunfish, bluegill, spotted sunfish, largemouth bass, grass pickerel, yellow bullhead, and gar. Additionally, benthic resources such as mollusks, crustaceans, and various families and species of insects occupy vegetated and open water areas (AquAeTer & Kerr-McGee 1994, Exponent 1999a and 1999b). Image 5 shows a fish bed in Howard Creek. These beds were common in all three creeks adjacent to the Facility in July 2017.



Image 5 Fish Bed in Howard Creek (July 2017)

Two community studies were conducted in the Days Creek watershed in conjunction with sediment sampling in 1994 and 2004 (Crowe 1995, Cook & Buttram 2006). Crowe (1995) concluded, based on fish and benthic macroinvertebrate data, that the aquatic life use in the Days Creek watershed was impaired when compared to the least-impacted reference sites within the area. Cook & Buttram (2006) found that species tolerant of adverse conditions were well represented and only one intolerant species (a darter) was collected.

2.2.3 Threatened and Endangered Species

The Endangered Species Act (ESA) of 1973 (16 U.S.C. §§ 1531 *et seq.*) requires federal agencies to conserve endangered and threatened species and to conserve the ecosystems upon which these species depend. As part of describing the biological environment of the affected area, the Trustees considered the known distribution and potential occurrence of protected species for Bowie County. The creeks provide aquatic habitat and water resources to threatened and endangered species that may be present or may historically have been present in the area, such as the alligator snapping turtle.

The potential occurrence of federally-or state-listed species in the vicinity of the Facility is summarized in Table 2-1. The species listed were obtained from the most recent Bowie County list developed and maintained by the TPWD (2017) and the USFWS Environmental Conservation Online System (ECOS). Table 2-1 provides a brief evaluation of the likely presence or absence of the species at the Facility.

Table 2-1 Federal and State Threatened and Endangered Species – Bowie County

Common Name	Status ¹		Potentially Present in Facility Habitats ²		Comments
	Federal	State	Forest	Creeks	
Reptiles					
Alligator snapping turtle	--	T	No	Yes	Creeks could provide sufficient habitat, especially in lower reaches with deeper depths
Northern scarlet snake	--	T	Yes	No	Found in mixed hardwood scrub on sandy soils, semi-fossorial
Timber rattlesnake	--	T	Yes	Yes	Riparian area and heavily vegetated floodplains provide good habitat
Fishes					
Blackside darter	--	T	No	Yes	Sulfur River basin. Prefers clear, gravelly streams with pools and some current
Creek chubsucker	--	T	No	Yes	Found in small rivers and creeks of various types
Birds					
Bachman's sparrow	--	T	Yes	No	Found in open pine woods with scattered brushes and grassy understory
Interior least tern	LE	E	No	Yes	Nests along braided streams and rivers and manmade structures
Piping plover	LT	T	PM	PM	Rare migrant only, Facility is not within designated critical habitat
Red Knot	LT		PM	PM	Ground foragers, pecking to obtain some surface foods in the wintering and migratory feeding grounds.
Wood stork	--	T	Yes	Yes	Forages in prairie ponds, flooded pastures or fields, ditches
Mammals					
Rafinesque's big-eared bat	--	T	Yes	Yes	Roosts in cavity trees of bottomland hardwoods

1. **Listing status under the federal Endangered Species Act and/or Texas rules:** LE, LT = Federally Listed Endangered/Threatened; C = Federal Candidate for Listing, formerly Category 1 Candidate; DL= Federally Delisted; E, T = State Listed Endangered/Threatened. The species are listed based on TPWD's Bowie County Annotated County List of Rare Species, Last Revision 5/4/2017. USFWS Environmental Conservation Online System (ECOS) for the Facility area was also consulted – no critical habitats in the area, Least tern could be present.

2. Habitats available to wildlife are broadly divided into the forest, which includes bottomland hardwood forest and deciduous forest, and the riparian habitats associated with the creeks. Known or potential occurrences in the respective habitats of representatives of particular species are indicated as: "No" = absent or highly unlikely; "Yes" = present or highly likely to be present; and "PM" = potential migrant (i.e., if present, likely to be very occasional).

2.3 Summary of Facility Response Actions

The hazardous waste generated at the Facility was held in six surface impoundments located west of Waggoner Creek. Bottom sediment and sludge generated from the treatment of wastewater during wood preserving processes that use creosote and/or PCP are listed as hazardous wastes, classified as K001 under the Resource Conservation and Recovery Act (RCRA) hazardous waste rules in 40 C.F.R. § 261.32.

During an assessment completed in 1985, the Texas Water Commission (TWC), now TCEQ, identified the presence of creosote in the upper aquifer and discharge of the constituents to Waggoner Creek. On September 30, 1986, the TWC issued Solid Waste Registration No. SWR-31002 to Kerr-McGee for the Facility. On March 31, 1987, the TWC issued Compliance Plan No. CP-50076 (Compliance Plan) in conjunction with Hazardous Waste Permit No. HW-50076. In accordance with the Compliance Plan's corrective measures, Kerr-McGee began groundwater monitoring, groundwater corrective action, and dense non-aqueous phase liquid recovery at the Facility. Voluntary corrective measures for groundwater remediation were implemented at the Facility from 1988 to approximately 1993. These corrective measures included subsurface barriers and a groundwater pump-and-treat system to remove creosote and other hazardous substances from the groundwater. In addition to complying with the performance standards of the Compliance Plan, Kerr-McGee was required to comply with the requirements of the Hazard Waste Permit No. HW-50076, which includes responding to newly identified releases of hazardous substances. The six surface impoundments were closed as required by the closure plan in the Hazardous Waste Permit during 1988 and 1989. The groundwater pump-and-treat system, sampling, and remedial investigations continued at the Facility until 2009, when Tronox filed for bankruptcy.

Currently, the Facility is owned and managed by the Greenfield Environmental Multistate Trust LLC (Greenfield). Greenfield, in its representative capacity as trustee of the Multistate Environmental Response Trust (the Multistate Trust), assumed responsibility for the Facility pursuant to the Consent Decree and Environmental Settlement Agreement approved by the United States Bankruptcy Court (New York) on February 14, 2011. The Multistate Trust was established by the Consent Decree and Environmental Settlement Agreement, and is responsible for implementing all environmental actions at the Facility including the groundwater pump-and-treat system. Other required environmental actions include the characterization and cleanup of the Facility and all post-closure care obligations.

2.4 Summary of Resource Injury

The Trustees conducted an assessment to identify the nature and extent of natural resource injuries attributable to releases of hazardous substances at or from the Facility, to quantify the resulting natural resource and ecological service losses, and to provide the technical basis for determining the need for, type of, and amount of restoration appropriate to compensate the public for those losses.

The assessment process is guided by NRDA regulations issued under CERCLA and found at 43 C.F.R. Part 11. A number of factors are considered in identifying and quantifying natural resource injuries, including, but not limited to:

- Hazardous chemicals of concern (COCs);
- Specific natural resources and ecological services of concern;

- Evidence indicating exposure, pathway and injury;
- Mechanism(s) by which injury to natural resources of concern would occur;
- Type, degree, spatial and temporal extent of injury; and
- Type(s) of restoration that would be appropriate and feasible for use as compensation.

As part of the assessment, the Trustees must determine if an injury (a measurable adverse change resulting either directly or indirectly from exposure to a release of a hazardous substance) occurred. There must be a release of hazardous substance and a pathway that caused natural resources to be exposed to the hazardous substance. A “pathway” is defined as the route or medium (e.g., water or soil) through which hazardous substances are transported from the source of contamination to the natural resource of concern (43 C.F.R. § 11.14(dd)). The Trustees concluded that processing activities, surface water runoff from the Facility, and groundwater discharges were the transport pathways to the affected habitats of Days, Howard, and Waggoner creeks. The COCs transported from the Facility via these pathways included PAHs, PCP, and arsenic.

Sediment data have been collected from Days, Howard, and Waggoner creeks by several entities, including the Department of Water Resources, the Trustees, Kerr-McGee and their contractors, the TCEQ (including its predecessor agencies), and Tronox and their contractors. All studies conducted identified elevated levels of PAHs within the creeks that consistently exceeded established ecotoxicological thresholds. The sediment data also identified concentrations of arsenic and PCP high enough to cause injury in portions of Days and Howard creeks. These studies identified the Facility as the most significant contributor of PAH and arsenic to these water bodies adjacent to and downstream of the Facility. The Trustees determined that releases of creosote and other hazardous substances at or from the Facility injured benthic freshwater habitats in Days, Howard, and Waggoner creeks and potentially injured adjacent riparian and bottomland hardwood habitats. More information about the Trustees’ injury determination can be found in the 2009 Natural Resources Damage Assessment Claim (TPWD et al., 2009).

2.5 Summary of Settlement

On May 20, 2008, Tronox and the Trustees entered into a memorandum of agreement to perform a cooperative restoration-based assessment to address potential natural resource damage liability for releases of hazardous substances at or from the Facility. However, on January 12, 2009, Tronox, Inc.¹ filed for protection under Chapter 11 of the Bankruptcy Code in the United States Bankruptcy Court for the Southern District of New York (*In re Tronox Incorporated, et. al.*, Case No. 09-10156). In light of the bankruptcy filing and short timeline to file a proof of claim, the federal and state Trustees developed a

¹ Tronox, Inc. was formed as a holding company to hold the limited liability company membership interests in Tronox Worldwide LLC, the parent company of Tronox LLC.

joint claim for natural resource damages which they filed with the Bankruptcy Court. Subsequently, the State filed a separate claim for natural resource damages and past assessment costs.

On January 26, 2011, the Bankruptcy Court approved a Consent Decree and Settlement Agreement (Order Granting the U.S. Motion to Approve the Consent Decree and Environmental Settlement Agreement, Case No. 09-10156), the details of which were published for public comment in the Texas Register (35 TexReg 10777, December 3, 2010). On November 10, 2014 the United States District Court, Southern District of New York, approved the Settlement Agreement in the fraudulent conveyance lawsuit (*In re Tronox Incorporated, Tronox Incorporated, et. al., v. Anadarko Petroleum Corporation, et. al.*, Case No. 1:14-cv-05495-KBF) filed against Kerr-McGee and its parent company, Anadarko Petroleum Company. As part of these two settlements, the Trustees received \$21,292,395.06 for natural resource damages: \$7,336,099.60 for the State of Texas Trustees natural resource damage claim, and \$13,956,295.46 for the joint State of Texas Trustees and DOI natural resource damage claim. The State of Texas Trustees funds and the joint State of Texas Trustees and DOI funds have been held in respective jointly managed interest-bearing accounts within the Texas Treasury Safekeeping Trust Company and the DOI Natural Resource Damage Assessment and Restoration Fund, pending their use for restoration projects to restore the natural resources injured by releases of hazardous substances from the Facility.

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3.0 RESTORATION SCOPING AND SCREENING PROCESS

The Trustees preferentially seek to restore injured natural resources in kind (e.g., create new wetlands to compensate for lost wetland function) and in the geographical vicinity affected, while working to maximize ecosystem benefit and provide cost-effective restoration as a whole. However, in-kind restoration is not always possible or feasible or may not otherwise fit the restoration selection criteria, and in those instances, enhancement or acquisition of alternative resources that provide similar ecological benefits may be appropriate. Increased benefits and improved cost-effectiveness may often be obtained by addressing several injured resources and/or services or classes of injury with a single restoration project.

The Trustees approached restoration planning with the view that the injured resources and associated services lost are part of an integrated ecological system including northeast and east Texas watersheds, and that the South Central Plains ecoregion (see Image 6) represents the relevant geographical area for appropriate restoration actions. Further, the Trustees determined that forested riparian, bottomland hardwoods, aquatic, and/or wetland habitats would provide natural resources or services equivalent to the aquatic and benthic communities of Days, Waggoner and Howard creeks, which are the primary injury associated with the release of hazardous substances from the Facility. This approach ensures that the benefits of restoration actions are related, or have an appropriate nexus, to the resource injuries and service losses due to releases of hazardous substances at or from the Facility.

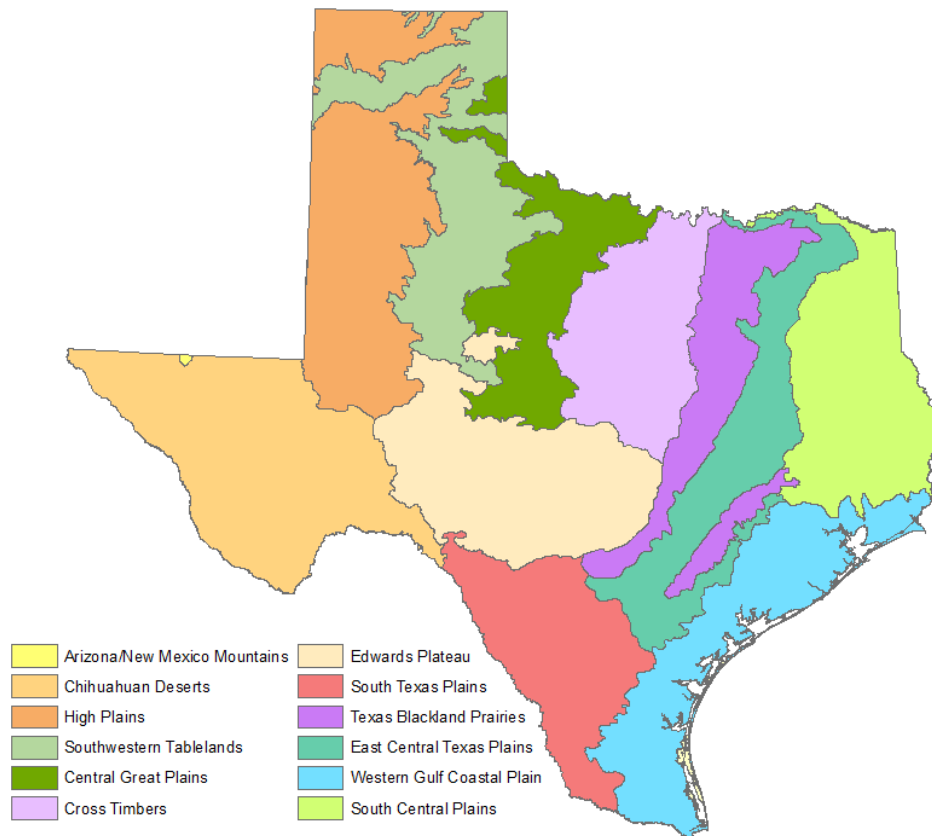


Image 6 Ecoregions of Texas

In accordance with the NRDA regulations, the Trustees identified and evaluated a reasonable range of alternatives capable of restoring ecological services comparable to those lost due to injury to natural resources from releases at the Facility. The alternatives identified and evaluated in this Draft RP/EA are also consistent with NEPA's requirement that the Trustees analyze the environmental consequences of the proposed action, including the environmental consequences of alternatives to the proposed action, as well as a no action alternative. This chapter describes the process through which the Trustees evaluated the 13 restoration alternatives proposed in this Draft RP/EA.

3.1 Affected Area

This section describes the environment of the area(s) to be affected by any proposed alternatives being considered, with emphasis commensurate with the importance of the impact on those resources (40 C.F.R. §1502.15).

The South Central Plains ecoregion, locally termed the "piney woods," is the western edge of the southern coniferous forest belt (Griffith *et al.*, 2007). Once blanketed by a mix of pine and hardwood forests, much of the region is now in loblolly and shortleaf pine plantations. Soils are mostly acidic sands and sandy loams. Covering parts of Louisiana, Arkansas, northeast Texas, east Texas, and Oklahoma, only about one sixth of the region is in cropland, primarily within the Red River floodplain, while about two thirds of the region is in forests and woodland. Lumber, pulpwood, oil, and gas production are major economic activities for this ecoregion. Distinct sub-regions within the South Central Plain ecoregion include the Tertiary Uplands, the Floodplain and Low Terraces, and the Flatwood sub-regions.

The Tertiary Upland sub-region of the South Central Plains can generally be characterized as gently to moderately sloping, covering a large area in northeast Texas, east Texas, southern Arkansas, and northern Louisiana. Numerous small streams dissect the landscape, and the region contains a large diversity of habitats and species. The natural vegetation has been altered by multiple timber harvests and commercial pine plantation activities. Many areas of the ecoregion are replanted to loblolly pine for timber production or are in improved pasture. Lumber and pulpwood production, livestock grazing, and poultry production are typical land uses. Oil and gas production activities are also widespread.

The Floodplains and Low Terraces of the South Central Plains ecoregion comprise the western margin of the southern bottomland hardwood communities that extend along the Gulf and Atlantic coastal plains from Texas to Virginia. Within the South Central Plains, this area is generally delineated by a distinct vegetation change into bottomland oaks (*Quercus* spp.) and gum (*Nyssa* spp.) forest. In Texas, the region includes sections of the Sulphur River, Big Cypress Bayou, Sabine River, Angelina River, Neches River, and Trinity River. Active, meandering alluvial river channels are dynamic systems, with erosion and deposition reworking the topography of levees, ridges, and swales. Overbank flooding, subsurface groundwater, and local precipitation recharges water levels in backswamps, pools, sloughs, oxbows, and depressions of this floodplain region. Wetness and flooding present severe limitations for agriculture. A few of the higher terraces may have some pasture, but most of the region has deciduous forest land cover. Silviculture activities range from selective tree removal to clearcutting to, in some areas, replacement with pine monoculture. Reservoirs have inundated large areas of this habitat and altered downstream hydrology. The bottomland forests provide important wildlife habitat with a high diversity of species. One estimate

of east Texas bottomlands fauna listed 119 fish, 36 amphibian, 59 reptile, 279 bird, and 48 mammal species (Wilkinson *et al.*, 1987).

Mostly flat to gently sloping, the Flatwoods of the South Central Plains ecoregion occurs on Pleistocene sediments in southeast Texas and southwest Louisiana. Some flatwood landscapes are characterized by pimple mounds, small hillocks that are abundant across the flats. This region is warmer, wetter, flatter, less dissected, and lower in elevation than the other sub-regions. Almost all of the Big Thicket National Preserve is within this sub-region. The area has a long history of modification, particularly by the lumber, railroad, and oil and gas industries that contributed to boom and bust cycles of development and occupancy (Gunter 1993). Historically, longleaf pine flatwoods and rare wetland savannas with bluestem grasses and other herbaceous species in understory dominated this region. A high diversity of plant and animal species can also be found here (Griffith *et al.*, 2007).

Specific information on the affected environment and environmental consequences for each alternative is provided in subsequent discussions in Sections 4.2 and 4.3.

3.2 Restoration Evaluation Criteria

The Trustees' first step in developing restoration alternatives was to identify the criteria by which they would evaluate potential restoration actions. Consistent with the factors listed in the NRDA regulations (43 C.F.R. § 11.82(d)), the Trustees identified the following criteria for use in evaluating restoration alternatives:

Criterion #1: Alternative provides direct ecological benefits to forested riparian, bottomland hardwoods, aquatic, and/or wetland habitats in the identified geographic area: The primary goal of any restoration alternative is to provide a level and quality of resources and services comparable to those lost due to the assessed injuries. To determine if a proposed restoration alternative meets the goal of this criterion, the Trustees considered factors such as the potential relative productivity of the habitat to be restored and whether the habitat is being created or enhanced. Proximity to the injury, the quality and type of habitat, and whether the restoration provides benefits to more than one resource are considered. At a minimum, restoration alternatives considered in this Draft RP/EA had to provide ecological benefits to forested riparian, bottomland hardwoods, aquatic, and/or wetland habitats in the identified geographic area.

Criterion #2: Technical feasibility: Technical feasibility means that the technology and management skills necessary to implement a restoration alternative are well known and that each element of the plan has a reasonable chance of successful completion in an acceptable period of time. In evaluating the restoration alternatives in this Draft RP/EA, the Trustees considered whether the restoration alternative would be adequately protected for the long term, as well as any potential difficulties in implementation, including acquisition of state and federal permits. The Trustees also considered if the alternative is self-sustaining and if long-term maintenance of project features will likely be necessary and feasible.

Criterion #3: Cost effectiveness: The benefits provided by an alternative relative to its cost are an important factor in evaluating restoration alternatives. Cost effective or cost effectiveness

means that when two or more activities provide the same or a similar level of benefits, the least costly activity will be selected. Factors that can affect the costs of implementing the restoration alternatives were considered and include project management costs, costs of personnel, overhead, project location, timing, complexity of construction and access to the restoration site (e.g., with heavy equipment), acquisition of necessary land, scale of the project, and the potential liability from project construction. The timeline to complete all project activities and availability of match funding was also considered by the Trustees.

Criterion #4: Reasonable probability of success: Restoration alternatives must have a reasonable probability of being successfully implemented. The Trustees evaluated if project success depended on factors outside of the project implementor's control. The Trustees considered the capacity and previous successes of project proponents and project teams, including if management measures are likely to be maintained after project completion. Project roles and responsibilities for all project partners must be clearly defined. A commitment for future action and management, including financial support from partners, must be identified.

Criterion #5: Measurable results: Restoration alternatives must identify and quantify measures of success for project components during the implementation and describe how those measures relate back to project goals and objectives to restore injuries to natural resources resulting from releases at or from the Facility. Project components should provide measurable success criteria and monitoring methodology and address corrective action strategies to ensure achievement of the project objectives.

Criterion #6: Avoids collateral injury to natural resources: Restoration alternatives should not result in additional losses of natural resources and should minimize the potential to affect surrounding resources during implementation. Restoration alternatives less likely to adversely impact surrounding resources are generally viewed more favorably. Compatibility of a restoration alternative with the surrounding land use and potential conflicts with endangered species are also considered.

Criterion #7: Effect of each alternative on public health and safety, and compatibility with the remediation process: Restoration alternatives that would negatively affect public health, public safety, or remedial actions were not considered by the Trustees.

Criterion #8: Consistency with federal, state, or local laws, regulations, or policies: Restoration alternatives that are inconsistent with laws, regulations, or policies were not considered by the Trustees.

Criterion #9: Alternative is not already required by existing laws, regulations, permits, settlements, or enforcement orders, including anticipated requirements such as mitigation requirements or draft permits unrelated to the project scope of work: Restoration alternatives already required as part of other regulatory or enforcement actions are not appropriate and were not considered by the Trustees.

3.3 Solicitation of Project Ideas from the Public

After developing the restoration evaluation criteria, the Trustees released a public request for project ideas on March 11, 2016 to involve the public early in this process. In response, the Trustees received 12 project proposals from a variety of interested parties. The Trustees reviewed the submitted project ideas and requested additional information from the proponents. Brief descriptions of the 12 project ideas submitted in response to the Trustees' March 11, 2016, request are provided below. Figure 3-1 shows the project locations in relation to the Tronox Facility.

Big Thicket Acquisition and Conservation: This project idea involved acquisition and protection of about 1,200 acres of bottomland hardwood forest. Upon acquisition, the property would transfer to the United States National Park Service to be incorporated into the Big Thicket National Preserve. The property is east of Lumberton in Hardin County. The project proponent estimated the total project cost to be \$2,400,000.

Bottomland Hardwood Restoration and Chinese Tallow Eradication: This project idea involved removal and treatment of Chinese tallow, an invasive species, and planting of native hardwood species in the Stephen F. Austin Experimental Forest within the Angelina National Forest and in the Alazan Bayou Wildlife Management Area (WMA). Habitat improvement activities would be implemented throughout 4,000 acres of conservation lands in Nacogdoches County. The project proponent estimated the total project cost to be \$1,700,000.

Caddo Lake Habitat Acquisition Project: This project idea involved the protection through fee title acquisition or conservation easement of land in two tiers of acquisition: Tier 1) approximately 3,900 acres at an estimated cost of \$7,200,000 and Tier 2) approximately 1,000 acres at an estimated cost of \$2,300,000. The properties are adjacent to the Caddo Lake WMA and Caddo Lake National Wildlife Refuge (NWR), effectively increasing the contiguous size of conserved lands. Properties include a variety of wetland and upland ecosystems. The properties are located within Marion and Harrison counties. The project proponent estimated the total project cost to be approximately \$9,500,000.

Days Creek Watershed Comprehensive Aquatic Ecosystem Restoration: This project idea consisted of 22 project components located in Bowie County adjacent to, upstream of, and immediately downstream of the Facility, and involved the construction and/or restoration of about 350 acres within the Days Creek watershed, including approximately 100 acres of freshwater wetlands, 100 acres of riparian habitat, and 100 acres of open water aquatic habitat. The project proponent estimated the total project cost to be \$20,000,000.

Longview Arboretum and Nature Center: This project idea involved funding the Phase 1 construction of a public park in Gregg County. The proposal includes the development of a nature center, gardens, and associated infrastructure. The project is part of a Master Plan for the property. The project proponent estimated the total project cost of Phase I development to be approximately \$1,100,000.

Mineola Nature Preserve: This project idea involved the restoration and enhancement of bottomland hardwoods within the 2,911-acre Mineola Nature Preserve in Wood County. Restoration activities include plantings, hydrological work to improve drainage to restore natural hydrology, and mechanical land

clearing (i.e. mulching/grinding activities) to remove large woody debris caused by flooding. The project proponent estimated the total project cost to be \$500,000.

Neches River Bottomland Forest Conservation: This project idea involved the acquisition and protection of approximately 6,900 acres of land, including approximately 5,900 acres of riparian bottomland hardwood forest along the Neches River in Anderson, Cherokee, Trinity Counties. The acquisition would expand the network of protected tracts associated with the Davy Crockett National Forest and Neches River NWR. The project proponent estimated the total project cost to be approximately \$13,600,000.

Sulphur Springs Wastewater Treatment Plant Wetlands Habitat: This project idea involved the construction of at least 100 acres of wetlands for water quality enhancement and the purchase of an additional 100 acres of wetlands around Lake Sulphur Springs in Hopkins County for preservation and recreational use. The created wetlands would be intended for water quality enhancement. The project proponent estimated the total project cost to be approximately \$6,000,000.

Talbot Prairie and Forest Land Acquisition: This project idea involved the acquisition and protection of at least 370 acres of land, including 140 acres of endemic *Silveanus dropseed* prairie and 230 acres of hardwood forest, 75% of which is seasonally flooded. The property is located southwest of New Boston in Bowie County. The project proponent estimated the total project cost to be approximately \$1,000,000.

Tonkawa Sandhills Land Acquisition Project: This project idea involved the acquisition of at least 4,900 acres for preservation and restoration in the Tonkawa Sandhills of Rusk and Nacogdoches Counties. The area includes riparian and bottomland hardwood forest, natural springs, and hydric bogs as features of the sandhill ecosystem. The project proponent estimated the total project cost to be \$10,000,000.

T&J Hunting Properties #1 – Caddo Creek Bottom: This project idea involved the purchase of a conservation easement, to be held in perpetuity, for at least 111 acres of bottomland hardwoods in Panola County. Land would remain in original ownership, with hunting, fishing, and hiking rights reserved. The project proponent estimated the total project cost to be \$1,300,000 for the purchase of development rights.

T&J Hunting Properties #2 – Sabine River Frontage: This project idea involved the purchase of a conservation easement, to be held in perpetuity, for at least 30 acres of bottomland hardwoods in Panola County on the Sabine River. Land would remain in original ownership, with hunting, fishing, and hiking rights reserved. The project proponent estimated the total project cost to be \$500,000.

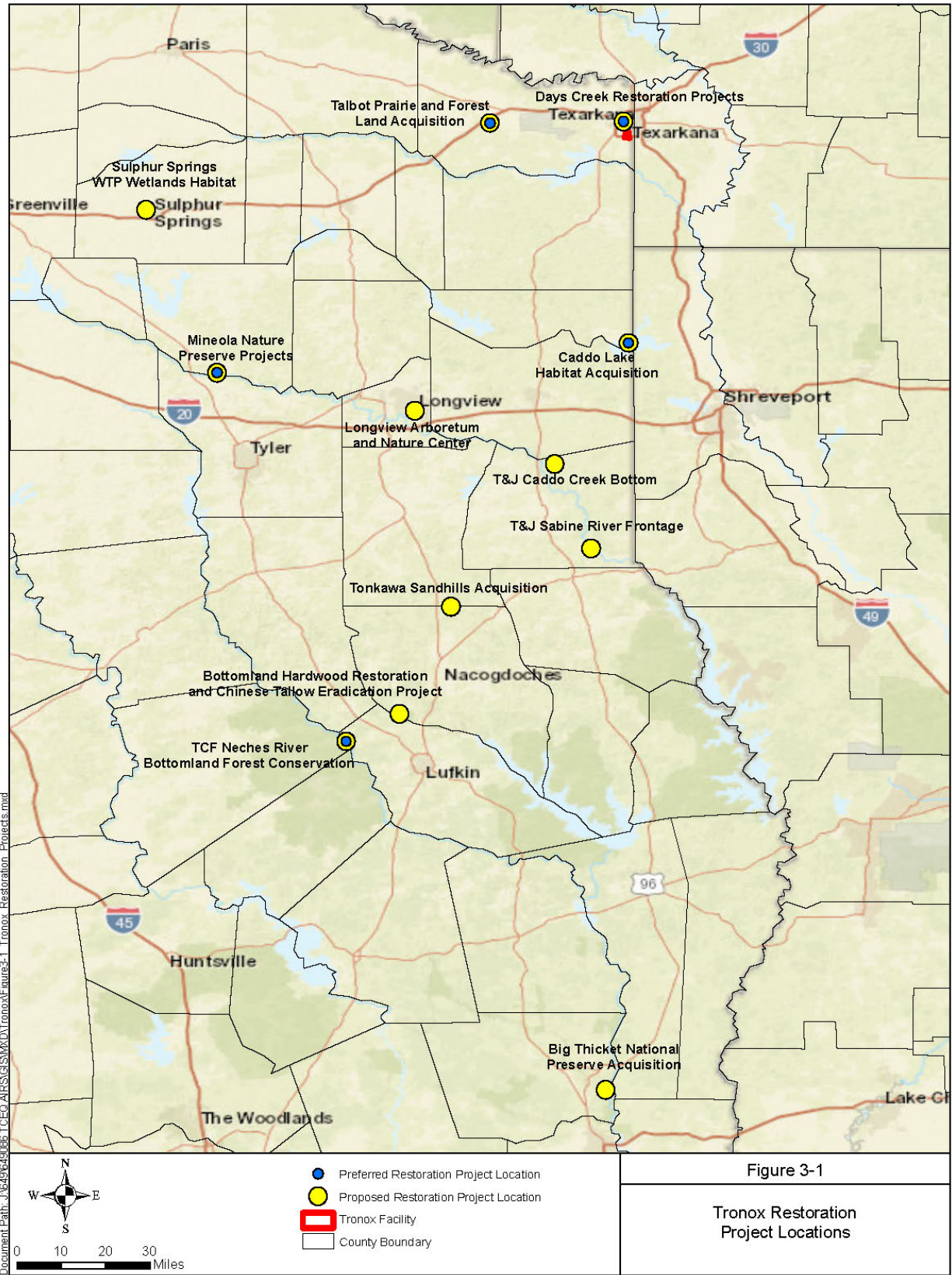


Figure 3-1 Tronox Restoration Project Locations

3.4 Development of Restoration Alternatives

After reviewing the submitted project ideas, the Trustees developed a suite of restoration alternatives to evaluate. The Trustees considered restoration actions that would provide natural resources and/or services of the equivalent type, quality, and comparable value as those impacted. Throughout this process, the Trustees emphasized projects that benefited the areas and natural resources directly affected by the historical releases of hazardous substances at or from the Facility in Texarkana, Texas. The Trustees also recognized that the affected natural resources are part of a larger ecological system comprising the freshwater, riparian, and bottomland hardwood habitats of east and northeast Texas. Under this approach, the Trustees are better able to compensate for natural resource injuries while also considering the multiple ecological benefits of restoration within the larger area.

The Trustees sought to strike a balance between restoration alternatives that would impact natural resources affected by releases at or from the Facility and restoration alternatives that could provide major ecological benefits to the South Central Plains ecoregion. The Trustees also weighed cost effectiveness with the amount and quality of ecological services each project provided when developing restoration alternatives. In some instances, the Trustees combined the elements of related projects into one restoration alternative for consideration. For example, the Trustees combined two similar easement acquisition properties into the T&J Hunting Properties alternative. In other instances, the Trustees separated out individual components of a project idea to develop multiple restoration alternatives. For example, the proposed Days Creek Watershed Comprehensive Aquatic Ecosystem Restoration project idea included 22 different project components. The Trustees grouped individual components into two alternatives: (1) components that would provide for the preservation and enhancement of forested riparian habitats as well as the naturalization and stabilization of urban stream channels which directly feed into the area of injury, and (2) components related to urban restoration, isolated wetland habitats and enhancement projects.

The Trustees developed 12 distinct restoration alternatives for evaluation, in addition to a “no action” alternative as required by 43 C.F.R. § 11.82(c)(2) and NEPA:

- Alternative 1: Big Thicket Acquisition and Conservation
- Alternative 2: Bottomland Hardwood Restoration and Chinese Tallow Eradication
- Alternative 3: Caddo Lake Habitat Acquisition
- Alternative 4: Days Creek – Enhancement and Restoration
- Alternative 5: Days Creek – Urban Wetland Restoration and Enhancement
- Alternative 6: Longview Arboretum and Nature Park
- Alternative 7: Mineola Nature Preserve – Restoration and Enhancement
- Alternative 8: Neches River Bottomland Forest Acquisition
- Alternative 9: Sulphur Springs Wastewater Treatment Plant Wetlands Habitat
- Alternative 10: Talbot Prairie and Forest Land Acquisition
- Alternative 11: Tonkawa Sandhills Land Acquisition
- Alternative 12: T&J Hunting Properties

- Alternative 13: No Action

Each Alternative is described below.

3.4.1 Alternative 1: Big Thicket Acquisition and Conservation

This alternative involves acquisition and protection of up to 1,200 acres of bottomland hardwood forest previously utilized as industrial forest land from a timber company, a willing seller. Upon acquisition, the property would transfer to the United States National Park Service to be incorporated into the Big Thicket National Preserve (BTNP).

The BTNP's unique natural features and species diversity have earned it designation as an International Biosphere Reserve and Globally Important Bird Area. Acquiring and permanently protecting the property would improve water quality, prevent fragmentation, reduce the effects of flooding, and conserve bottomland hardwoods, important wildlife habitat and habitat corridors. Over 1,320 species of trees, shrubs, vines, and grasses; 60 mammal species; 86 reptile and amphibian species; 34 species of freshwater mussel; 1,800 invertebrate species; 97 fish species; and 300 bird species have been identified within the BTNP. The targeted acquisition property contains habitat for the red-cockaded woodpecker and the Texas trailing phlox, two federally-listed species.

The BTNP is composed of 9 land units and 6 narrow water corridors, totaling approximately 110,000 acres separated by miles of privately held lands. The discontinuous nature of the BTNP makes its resources more vulnerable to negative effects from adjacent development and logging activities that fragment the natural landscape. The 2005 National Parks Conservation Association's "State of the Parks Report" rated the overall condition of natural resources at the BTNP as "fair" due to habitat fragmentation resulting from residential, commercial, industrial, and road development in the region.

The property is located east of Lumberton and north of Village Creek State Park in Hardin County near the confluence of Village Creek and the Neches River and adjacent to the Lower Neches River Corridor Unit of the BTNP (Figure 3-2). The property, which contains bottomland hardwood, wetlands, and parts of an inlet/island on the Neches River, would bridge the gap between Village Creek and the Neches River.

The estimated total cost of Alternative 1 is \$2,400,000.

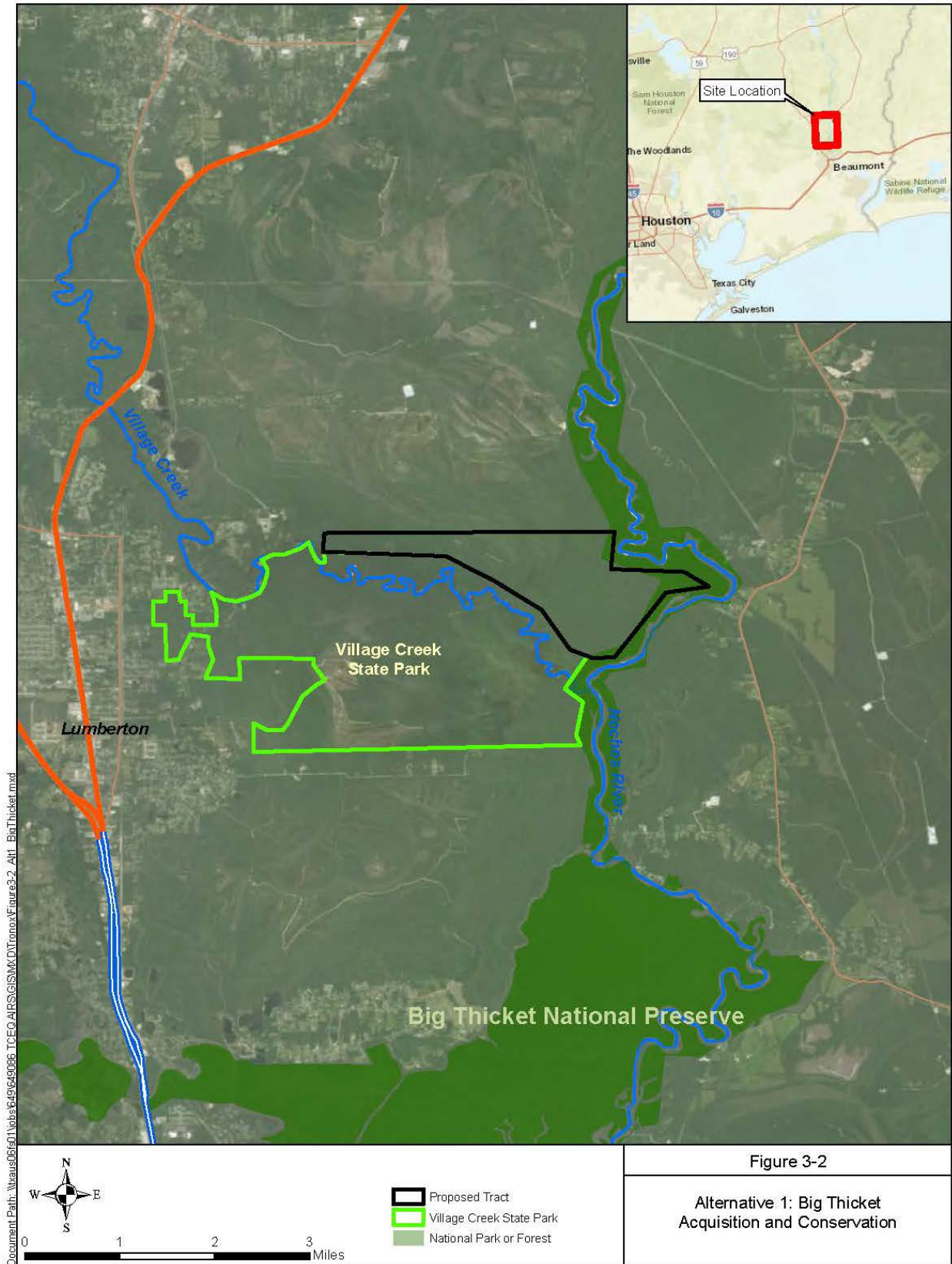


Figure 3-2 Alternative 1: Big Thicket Acquisition and Conservation

3.4.2 Alternative 2: Bottomland Hardwood Restoration and Chinese Tallow Eradication

This alternative involves treatment of Chinese tallow, an invasive species, and planting of hardwood species in Nacogdoches County within the Stephen F. Austin Experimental Forest, part of the Angelina National Forest. The area is bordered to the east by the Alazan Bayou WMA. The Alazan Bayou WMA also has a large bottomland/floodplain hardwood component and has a severe Chinese tallow infestation. Habitat improvement activities would be implemented throughout 4,000 acres of conservation lands along the Bayou Loco/Bonaldo Creek/Upper Angelina River watershed. The treatment area would include 1,800 acres in the Stephen F. Austin Experimental Forest and 2,200 acres in the Alazan Bayou WMA. The treatment area is also seasonally flooded, and improvements would support the long-term sustainability of important habitat and natural systems.

The Trustees expect the project would take at least 5 years to complete but could take longer in order to completely ensure the seedbank is devoid of Chinese tallow seeds and a sufficient number of hardwood species become established in the affected area. Because the area is seasonally flooded, Chinese tallow treatments would generally occur in late summer or early fall before seed maturity. Hardwood planting would occur during the dormant season.

Activities would include pesticide application to remove/reduce infestations of Chinese tallow, collection and propagation of acorns from suitable hardwood species, hardwood planting in suitable sites, and monitoring of success. Figure 3-3 shows the location of Alternative 2.

The estimated total cost of Alternative 2 is \$1,700,000.

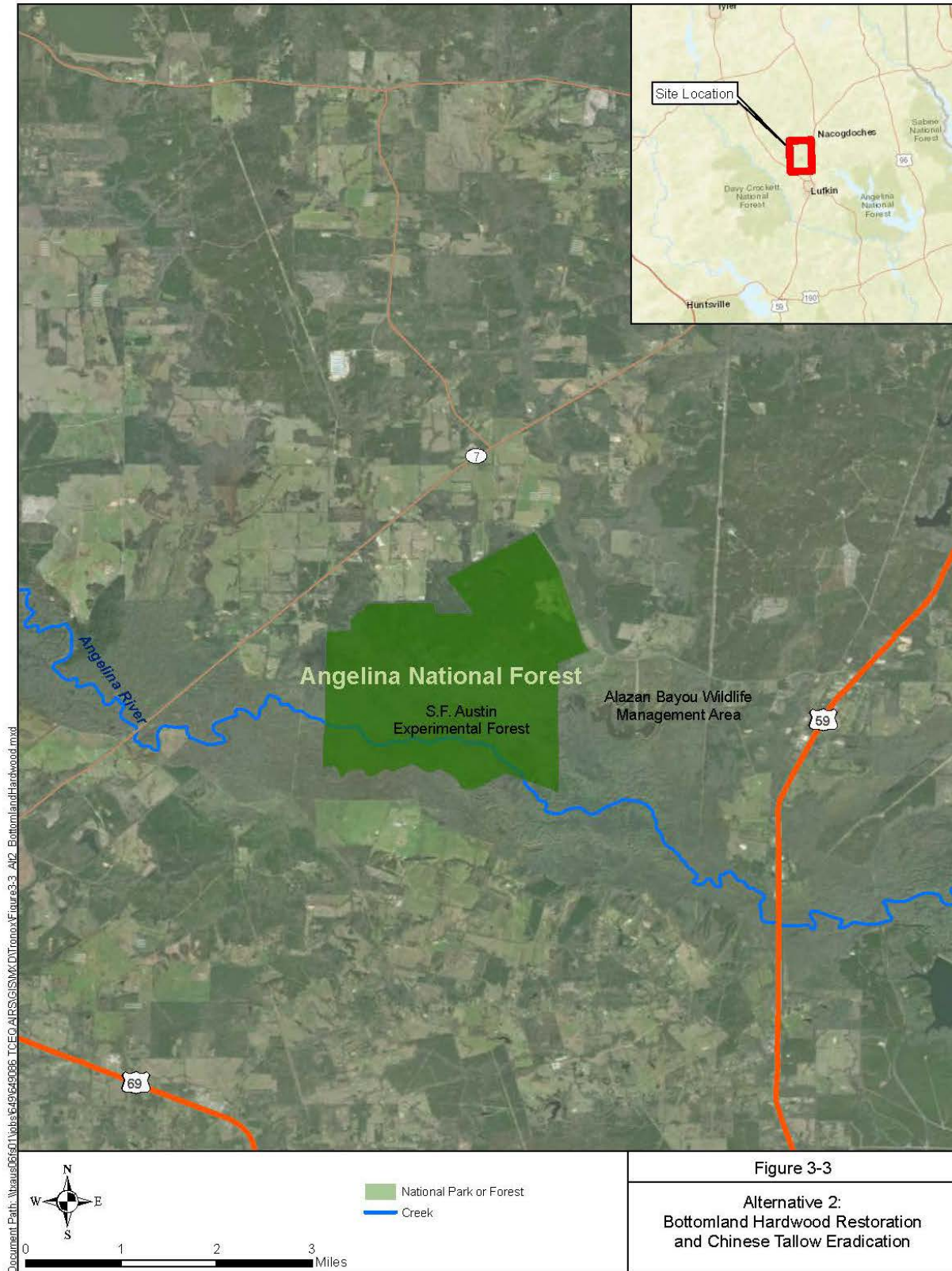


Figure 3-3 Alternative 2: Bottomland Hardwood Restoration and Chinese Tallow Eradication

3.4.3 Alternative 3: Caddo Lake Habitat Acquisition

From the approximately 4,900 acres recommended by the project proponent, the Trustees developed Alternative 3 to include the acquisition and protection of approximately 3,500 acres of swamp, slough, and headwaters habitat to better connect the landscape into either the Caddo Lake WMA or Caddo Lake State Park. Figure 3-4 shows the land acquisition area in relation to Caddo Lake State Park, the Caddo Lake NWR, and the Caddo Lake WMA.

The Caddo Lake system includes Caddo Lake, the only natural freshwater lake in Texas, and its upstream network of bayous, sloughs, and forested wetlands. Caddo Lake is a highly productive ecosystem and serves as a vibrant recreational fishery and habitat for waterfowl and other wildlife. Much of Caddo Lake's backwater system is already managed for conservation purposes as the Caddo Lake State Park, Caddo Lake WMR, and the Caddo Lake NWR, for a combined acreage of approximately 18,100 acres of protected land. Despite these efforts, these protected areas are fragmented, and threats posed by invasive species and development persist. There is a critical need to acquire and preserve a contiguous headwater ecosystem for Caddo Lake.

Several protected species are known to be present in the Caddo Lake system and are likely found within the properties proposed for acquisition: wood storks, bald eagles, paddlefish, Rafinesque's big-eared bat, alligator snapping turtles, northern scarlet snake, timber rattlesnake, southern hickorynut mussel, Louisiana pigtoe mussel, and the plant species earth-fruit. The targeted properties also contain habitat for earth fruit (*Geocarpon minimum*) and the Neches River rose-mallow (*Hibiscus dasycalyx*), two federally-listed species. Many of these species are also present in the Facility area (see Table 3-1) in Bowie County, presenting an opportunity to positively influence the populations of protected species that may have been impacted at the Facility.

The estimated total cost of Alternative 3 is \$5,900,000.

3.4.4 Alternative 4: Days Creek Enhancement and Restoration

The Trustees developed Alternative 4 by combining various components of the Days Creek Watershed Comprehensive Aquatic Ecosystem Restoration project idea into an alternative that would preserve and enhance approximately 200 acres of forested riparian habitats and restore and stabilize about 6 miles of urban creek channels. This alternative would restore and enhance the urban ecosystem upstream of and near the Facility. Figure 3-5 shows the project components and their geographic extent in relation to the City of Texarkana and the Facility.

This alternative includes restoration, creek channel stabilization, and preservation of riparian and bottomland habitats along Cowhorn, Days, Howard, Swampoodle, and Waggoner creeks in Texarkana. Most of the Upper and Middle Days Creek sub-watershed in Texarkana is urbanized. Creek channels have been streamlined, canopy cover reduced or eliminated, and urban development borders the creeks throughout the watershed. Much of the shoreline has been planted and maintained with turfgrass. The following are descriptions of individual project components proposed by the City of Texarkana that the Trustees incorporated into this alternative.

Cowhorn Creek Enhancement - This combination of project components would result in restoration of Cowhorn Creek from its headwaters near Richmond Road to below its confluence with Waggoner Creek. Figure 3-5 shows the extent of restoration planned along Cowhorn Creek in relation to the City of Texarkana and the Facility. In general, Cowhorn Creek is an urban channel with eroding banks. The channel is incised with no connection to active floodplains and lacks a riparian corridor.

- Project Component 1: Naturalization of approximately 2,600 linear feet of creek channel along Cowhorn Creek near the Convention Center. Additional actions include planting and expansion of bottomland hardwood habitats along this reach. Estimated project costs are \$300,000.
- Project Component 2: Stabilization of approximately 11,000 linear feet of eroding banks with bioengineering and approximately 9,200 linear feet of native planting along Cowhorn Creek. Bioengineering includes the use of riprap made of natural materials (e.g., brushwood, vegetation, and brush layers) to stabilize the banks as an alternative to lining the banks with concrete. Project component costs are estimated to be \$550,000.
- Project Component 3: Restoration of the natural alignment, stabilization, and enhancement of approximately 3,000 linear feet along Cowhorn Creek near Texarkana Community College and Berkey Park Road. This component also includes the preservation of an estimated 2.5 acres of forested habitat adjacent to this reach, and the creation of approximately 6 acres of wetlands through the restoration of the meandering creek channel. Project component costs are estimated to be \$1,350,000.

Days Creek Enhancement - These two project components would preserve and enhance wetlands along Days Creek (see Figure 3-5).

- Project Component 4: Preservation in perpetuity of approximately 32 acres of wet forested habitat and enhancement of approximately 36 acres of wet forested habitat east of the Facility and Days Creek. This land is currently owned by the City and consists of high quality deciduous hardwoods. Project component costs are estimated to be \$40,000.

- Project Component 5: Preservation by third-party conservation easement in perpetuity of approximately 100 acres of high quality forested riparian habitat along Days Creek, south of the Texas Viaduct. Project component costs are estimated to be \$110,000.

Howard Creek Enhancement - Figure 3-5 shows the extent of restoration planned along Howard Creek in relation to the City of Texarkana and the Facility.

- Project Component 6: Restoration and enhancement of approximately 2,000 linear feet along Howard Creek and the construction of approximately 23 acres of wetlands adjacent to Howard Creek between Flower Acre Road and Bender Road. Currently, the channel is in marginal to poor condition and has been widened and deepened to convey urban stormwater runoff. There is no connection to an active floodplain and the channel lacks riparian cover. The top of the bank is mowed grass, predominantly common Bermuda. Project component costs are estimated to be \$1,000,000.

Swampoodle Creek Enhancement - These project components would result in restoration of Swampoodle Creek from its headwaters near Ferguson Park to its confluence with Days Creek. Figure 3-5 shows the extent of restoration planned along Swampoodle Creek in relation to the City of Texarkana and the Facility.

- Project Component 7: Construction of approximately 2.85 acres of wetlands and removal of concrete liner along a tributary of Swampoodle Creek at Ferguson Park. The existing concrete-lined channel is 10 feet wide, approximately 2.5 to 3.0 feet deep, and 2,000 linear feet in length with no natural banks or creek beds. Mowed grass is the predominate ground cover and the creek segment through Ferguson Park is in a severe channel condition. The channel is incised and excavated with no natural access to an active floodplain. Aquatic habitat and riparian and bottomland hardwood are not present. The channel receives direct, untreated runoff from a nearby parking lot. In this project component, wetlands would be created by allowing surface water to meander and sheet flow through parts of the landscape using bioswales. Project component costs are estimated to be \$3,700,000.
- Project Component 8: Naturalization and stabilization of approximately 11,000 linear feet of creek channel on Swampoodle Creek between Spring Lake Park and Days Creek. Swampoodle Creek flows directly into Days Creek north of the Facility. Currently, habitat conditions are highly degraded. A portion of the channel has concrete-lined banks and bed. The unlined channel is unstable with eroding banks. There is no aquatic habitat, no riparian corridor, or adjacent wetland habitat. The City of Texarkana would perform hydrology and hydraulic (H&H) modeling to determine the most effective methodology for channel stabilization. Potential actions under this project component include 1) removal of concrete lining, where applicable, 2) restoration of natural bed and bank conditions, 3) naturalization of channel alignment, and 4) an increase of areas with native plantings. Project component costs are estimated to be \$1,700,000.
- Project Component 9: Restoration of the natural alignment of approximately 1,700 linear feet of Swampoodle Creek. Currently, the channel is concrete lined with no access to an active floodplain. There is little to no aquatic habitat or riparian corridor. The bottomland hardwoods cleared from

the project site would be restored. This project component would remove the concrete lining, recreate the natural meander, and restore forested riparian habitat along this segment. Project component costs are estimated to be \$650,000.

Waggoner Creek Enhancement - Figure 3-5 shows the extent of restoration planned along Waggoner Creek in relation to the City of Texarkana and the Facility.

- Project Component 10: Creek channel and riparian habitat restoration of approximately 2,000 linear feet along Waggoner Creek east of Interstate 369. Moderate to good aquatic habitat conditions currently exist in this stretch of Waggoner Creek. Where banks are eroding, live staking, live fascines, and brush layers may be incorporated. In cleared areas that are currently a mix of grass and deciduous bottomland forest, the habitat would be restored to a more native state. Project component costs are estimated to be \$400,000.

The estimated total cost of Alternative 4 is \$9,800,000.

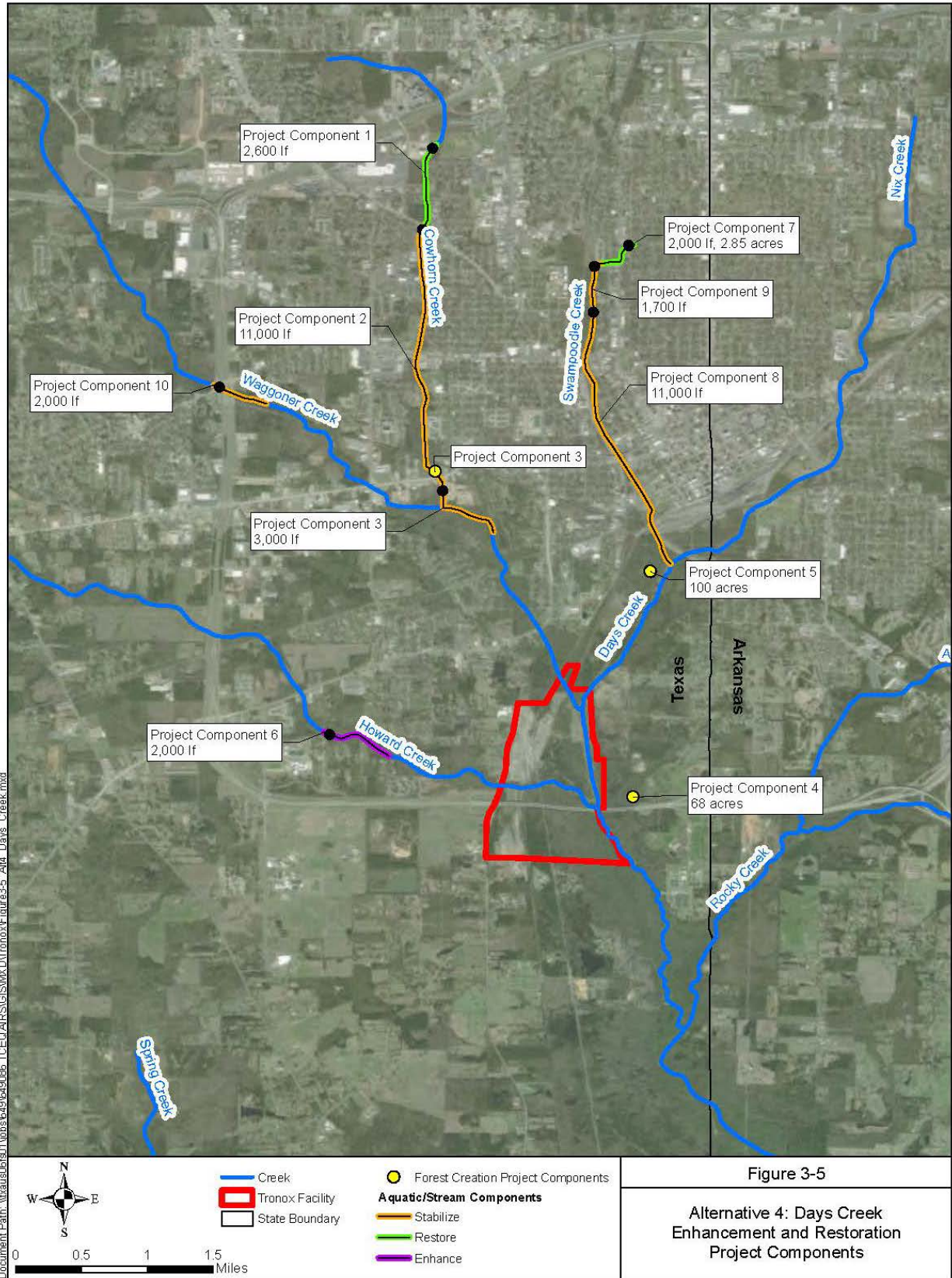


Figure 3-5 Alternative 4: Days Creek Enhancement and Restoration Project Components

3.4.5 Alternative 5: Days Creek – Urban Wetland Restoration and Enhancement

The Trustees developed Alternative 5 by combining various components of the Days Creek Watershed Comprehensive Aquatic Ecosystem Restoration project idea into an alternative focused on urban wetland restoration. This alternative includes urban wetland restoration and enhancement projects in and around the City of Texarkana within Days Creek, Swampoodle Creek, and Spring Lake Park. Many of the project components are located in upland mowed areas with limited or minimal aquatic habitat. Restoring and enhancing these areas to include wetlands, riparian cover, and bottomland trees would serve to manage or enhance surface water quality, create or enhance aquatic habitat, and provide educational and aesthetic benefits to Texarkana residents. Figure 3-6 shows the project components of Alternative 5 and their geographic extent in relation to the City of Texarkana and the Facility. The following are descriptions of individual project components proposed by the City of Texarkana that the Trustees incorporated into this alternative.

Days Creek Watershed Enhancement – These project components would enhance the Days Creek watershed by increasing wetlands and wooded habitat in the watershed.

- Project Component 1: Create approximately 18 to 20 acres of freshwater wetlands between Days Creek and the City's wastewater treatment plant in cleared open upland areas consisting predominantly of mowed grass. Estimated costs are \$1,200,000.
- Project Component 2: Stabilize approximately 4,000 linear feet downstream of the Facility and create a series of treatment wetlands near the City's mulch operation and wastewater treatment plant. Estimated project costs are \$2,000,000.
- Project Component 3: Create approximately 1.2 acres of wet woods within Karrh Park. Currently the location is open mowed grass. Estimated project costs are \$15,000.
- Project Component 4: Restore and enhance approximately 1.6 acres of wooded habitat between Liberty Lane and C.K. Bender Elementary School. The area is cleared and previously supported wet woods. Currently the location is open mowed grass. Estimated project costs are \$115,000.
- Project Component 5: Create approximately 12 acres of wooded wetlands along C.K. Bender Elementary School property. The location is flat open upland with routinely mowed grass on the eastern half. Common Bermuda grass is the prevalent plant species. The western half of the site is less frequently mowed and has an unpaved road that leads to debris piles and a soil borrow pit. Approximately seven trees are scattered in the center of the site, including oak and elm species. Currently, this location lacks any aquatic areas, i.e., open water or wetlands. Since there are no native habitats in the proposed 12-acre wetland area, native aquatic and forest habitat would increase 100%. Layout of the wetland and associated forested areas would avoid impacts to the existing trees in the center of the site. Restoration of hardwoods would serve to reduce forest fragmentation in the vicinity and enhance aquatic habitat conditions for local wildlife. Estimated project costs are \$1,550,000.
- Project Component 6: Restore approximately 2 acres of wet woods around an existing pond and stream channel within Karrh Park. The area is currently open mowed upland consisting of common Bermuda grass. This location lacks any aquatic areas. Estimated project costs are \$220,000.

- Project Component 7: Work with a private landowner along an approximate 310 linear-foot segment of an unnamed stream channel to establish a conservation easement and restore approximately 0.5 acres of riparian habitat before the stream flows into Days Creek. The area is currently a drainage swale with minimal aquatic habitat. The channel is a shallow swale which functions to convey water from the west to the east where it flows under railroad tracks. The culvert under the railroad does not function well, and water ponds on the west side of the railroad tracks. Various small woody shrubs are scattered along the channel. No earthmoving activity is proposed, only planting. Restoration of the riparian cover and bottomland trees in the ponded area would serve to reconnect a broader tree canopy cover in the area and potentially enhance water quality. A project cost was not provided.

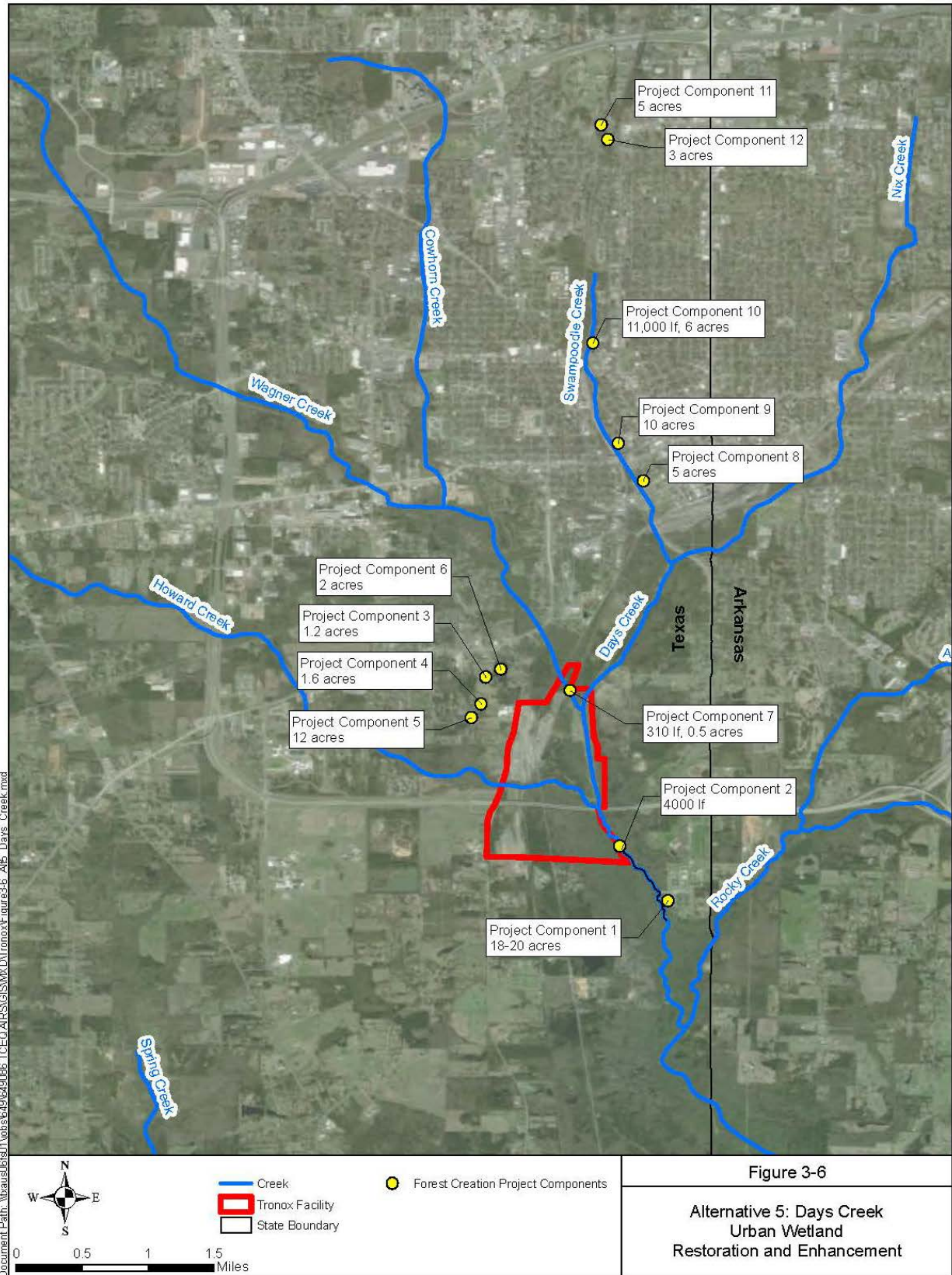
Swampoodle Creek Enhancement – These three project components would increase wetlands along Swampoodle Creek. Swampoodle Creek is sandwiched between railroad tracks on the west and residential developments and downtown Texarkana to the east. Swampoodle Creek within the Sulphur River basin has been identified as having water quality issues including fecal coliforms and ammonia nitrogen. Portions of the Swampoodle Creek channel are highly rectified, concrete lined, or severely eroding. Development of wetlands associated with Swampoodle Creek could potentially increase water quality and act as a buffer with large volumes of urban surface water runoff minimizing erosion. Figure 3-6 shows the location of these project components.

- Project Component 8: Create approximately 5 acres of wetland between Martin Luther King Boulevard and West 4th Street. This area is cleared and previously supported wet woods, but the area is currently open mowed grass. Estimated project costs are \$300,000.
- Project Component 9: Create approximately 10 acres of wetland along Swampoodle between College Drive and West 4th Street. This area is cleared and previously supported wet woods, but the area is currently open mowed grass. Estimated project costs are \$600,000.
- Project Component 10: Restore approximately 6 acres of riparian habitat along 11,000 linear feet of Swampoodle between College Drive and West 4th Street. Estimated project costs are \$60,000.

Spring Lake Enhancement – These two project components would increase the amount of wetlands in Spring Lake Park. Swampoodle Creek begins as discharge from Spring Lake via a drainage pipe under Spring Lake Park Road to a natural channel that flows through an approximately 1,140 linear foot segment with a heavy native riparian and bottomland hardwood tree canopy cover. Development of wetlands around Spring Lake would enhance the water quality of Spring Lake and potentially into Swampoodle Creek. Figure 3-6 shows the location of these project components.

- Project Component 11: Create approximately 5 acres of wetlands along Spring Lake in Spring Lake Park. Currently, Spring Lake is mostly devoid of a wetland fringe. Bank conditions are eroding. This project area is currently open mowed grass. Estimated project costs are \$300,000.
- Project Component 12: Construct approximately 3 acres of wetlands and approximately 300 feet of boardwalk at Spring Lake Park. Estimated project costs are \$240,000.

The estimated total cost of Alternative 5 is \$6,600,000.



3.4.6 Alternative 6: Longview Arboretum and Nature Park

This alternative would fund the construction of Phase 1 of a public park as part of the Master Plan for the Longview Arboretum and Nature Center. The proposal includes the development of a nature center, gardens, and associated infrastructure. The City of Longview set aside approximately 28 acres of land adjacent to Grace Creek, a tributary of the Sabine River, and in 2012 designated the land as a public park. The land is bordered on the west by the Maude Cobb Convention and Activity Complex, on the south by State Highway 31, on the east by Grace Creek, and on the north by Cotton Street. Figure 3-7 shows the location of this alternative.

The mission of the Longview Arboretum is to enhance the quality of life by educating the greater community about the recreational, educational, and ecological resources of the region. While small portions of the property, particularly on the west side, are designated for higher intensity uses (e.g., formal gardens, learning notes, and the Nature Center), the greatest portion of the property is being conserved to demonstrate the significant biodiversity of the area. This project fully supports the City of Longview's Comprehensive Plan that was completed in 2015. Among the goals identified by the community and adopted by the City Council is: "Enhance Longview's natural beauty and preserve its natural resources."

As part of this alternative, the City would pass a resolution designating the 28 acres as natural open space in perpetuity. Per the Master Plan, "the property is uniquely representative of the South Central Plains Ecoregion with a mixture of hardwood and pine forest communities as well as riparian and open space biodiversity."

The estimated total cost of Alternative 6 is \$1,100,000 to assist with Phase 1 development. The funding would address costs for water lines and faucets, bridges, the maintenance facility, development of the lawn area and irrigation, restrooms and utilities, pond creations and creek improvements, restoration and management, contractual fees, permitting, and contingency. Costs include shaping and reconstructing habitat impacted by earlier construction and controlling run-off entering the site from adjacent properties; managing drainage and erosion; and plantings of native grasses, trees, and plants to provide migratory bird habitat. Water features would include waterfalls to increase oxygen levels and bridges for access and connectivity. Non-native and invasive species would be removed from the property.



Figure 3-7 Alternative 6: Longview Arboretum and Nature Park

3.4.7 Alternative 7: Mineola Nature Preserve – Restoration and Enhancement

This alternative includes the following restoration and rehabilitation activities: 1) plant hardwood trees and prevent the establishment of invasive species, 2) perform hydrological work to improve drainage so that the natural flow of water is not restricted, and 3) mechanically clear land (i.e. mulching/grinding activities) to remove large woody debris piles in the southeast portion of the Mineola Nature Preserve (Preserve) to improve hydrology in bottomland hardwood and riparian habitats.

The Preserve includes approximately 2,911 acres adjacent to the Sabine River in close proximity to the Little Sandy NWR and the Old Sabine Bottom WMA. Figure 3-8 shows the Preserve. The Preserve lies within the Sabine River Corridor, a state- and locally-designated natural area, and comprises various habitat types including upland maintained pasture, upland mixed hardwood, pine habitat, emergent/marsh wetland habitat, open water features, riparian habitat, and hardwood bottomland. Riparian and hardwood bottomland habitats make up the majority of the habitat type due to the location of the Preserve within the floodplain of the Sabine River.

During the 1980s, the USFWS identified the Preserve and several adjacent tracts of land as having biologically important bottomland hardwoods that should be preserved and protected. Because of the diversity of habitat types, wildlife, including various species of waterfowl and other birds, are abundant. Protected species potentially found in the Preserve include species similar to those potentially found at the Facility (interior least tern, Bachman's sparrow, piping plover, fish such as the blackside darter and creek chubsucker, freshwater mussels such as the Texas pigtoe, and reptiles such as the timber rattlesnake). Improvements in the Preserve would increase habitat quality and thereby benefit several species, including protected species.

The estimated total cost of Alternative 7 is \$500,000, which includes site preparation, purchase of seedlings, maintenance and monitoring, and construction activities.

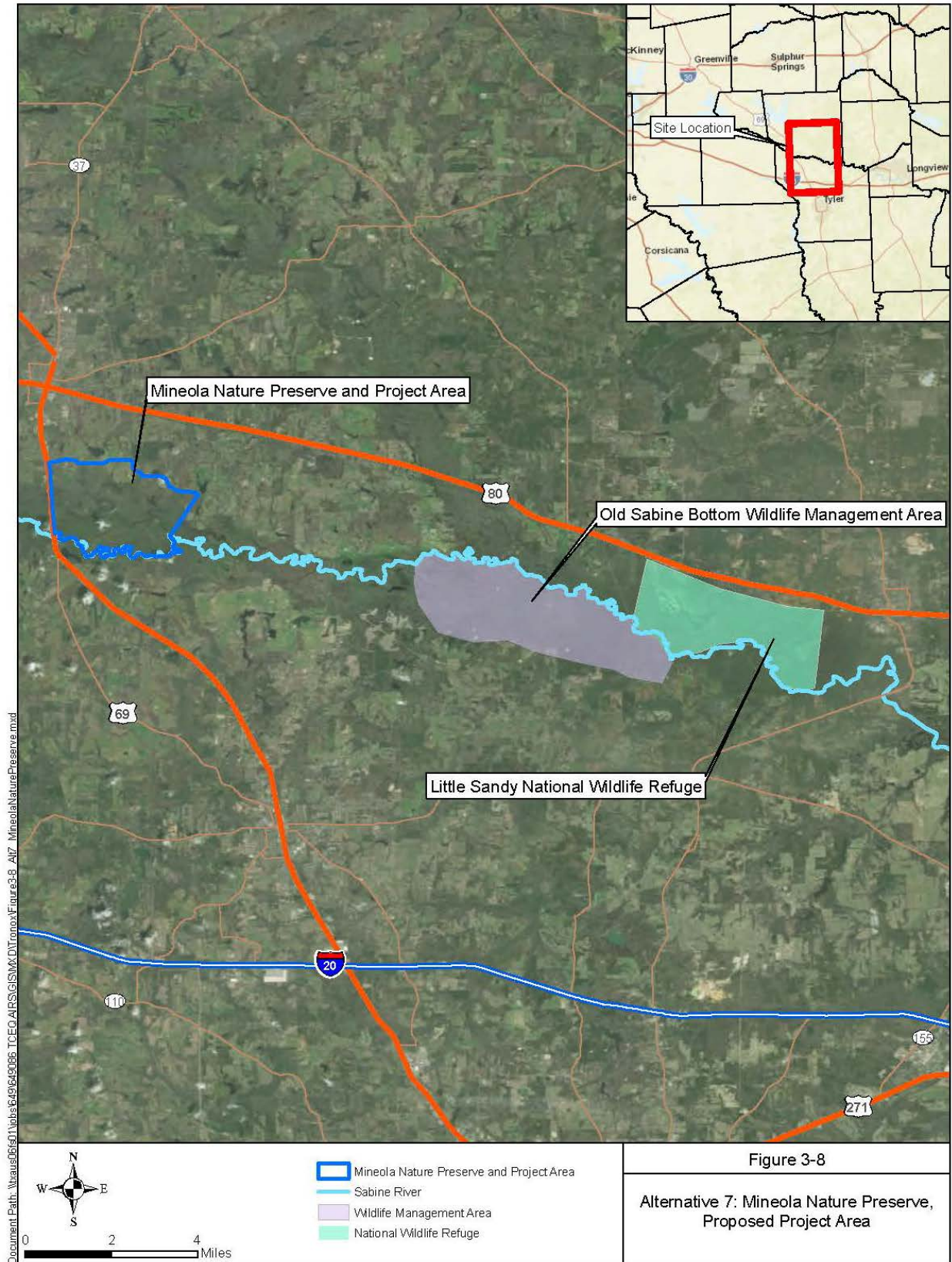


Figure 3-8 Alternative 7: Mineola Nature Preserve

3.4.8 Alternative 8: Neches River Bottomland Forest Acquisition

This alternative involves the acquisition and protection of approximately 1,100 acres of land, including riparian bottomland hardwood forest along the Neches River. The Neches River system contains large contiguous blocks of high conservation value bottomland hardwood forest in east Texas. Acquisition of the proposed properties would expand the network of protected tracts associated with the Neches River NWR and conserve, in perpetuity, a significant habitat corridor along the Neches River. Figure 3-9 shows the proposed land acquisition areas in relation to the Neches River NWR. The original project scope of work proposed acquisition within the Davy Crockett National Forest; however, the Trustees did not include this additional acreage in Alternative 8 because acquisition of this property would require an Act of Congress.

The properties consist of Neches River frontage, expanses of river bottom habitat, as well as swamps and sloughs. This acquisition would provide habitat for freshwater sediment benthic invertebrate communities and would protect the variability and productivity of the overall Neches River system. Other ecosystem benefits of this project include the preservation of habitat for 12 state-threatened species, including the Artic peregrine falcon, wood stork, American shallow-tailed kite, bald eagle, paddlefish, Rafinesque's big-eared bat, alligator snapping turtle, timber rattlesnake, and 4 freshwater mussel species.

The river bottom forests provide critical habitat for the federally-threatened Louisiana black bear which has been reported in Anderson County along the Neches River bottoms and play a key role in sustaining the Central Flyway waterfowl population. The site also contains habitat for the red-cockaded woodpecker, Neches River rose-mallow, and earth fruit, all federally-listed species. According to the USFWS' East Texas/Oklahoma Emphasis Area Work Plan for the Neches River Watershed, the Neches River watershed is a hotspot of biodiversity in the Pineywoods of east Texas. Forty-three percent of all bird species documented in Texas (including 44 birds of conservation concern) are found along the Neches River. The Neches river bottom is known to support over 20 plant communities, 45 species of mammals, 54 species of reptiles and amphibians, and 116 species of fish, and numerous invertebrates.

The estimated total cost of Alternative 8 is \$2,200,000.

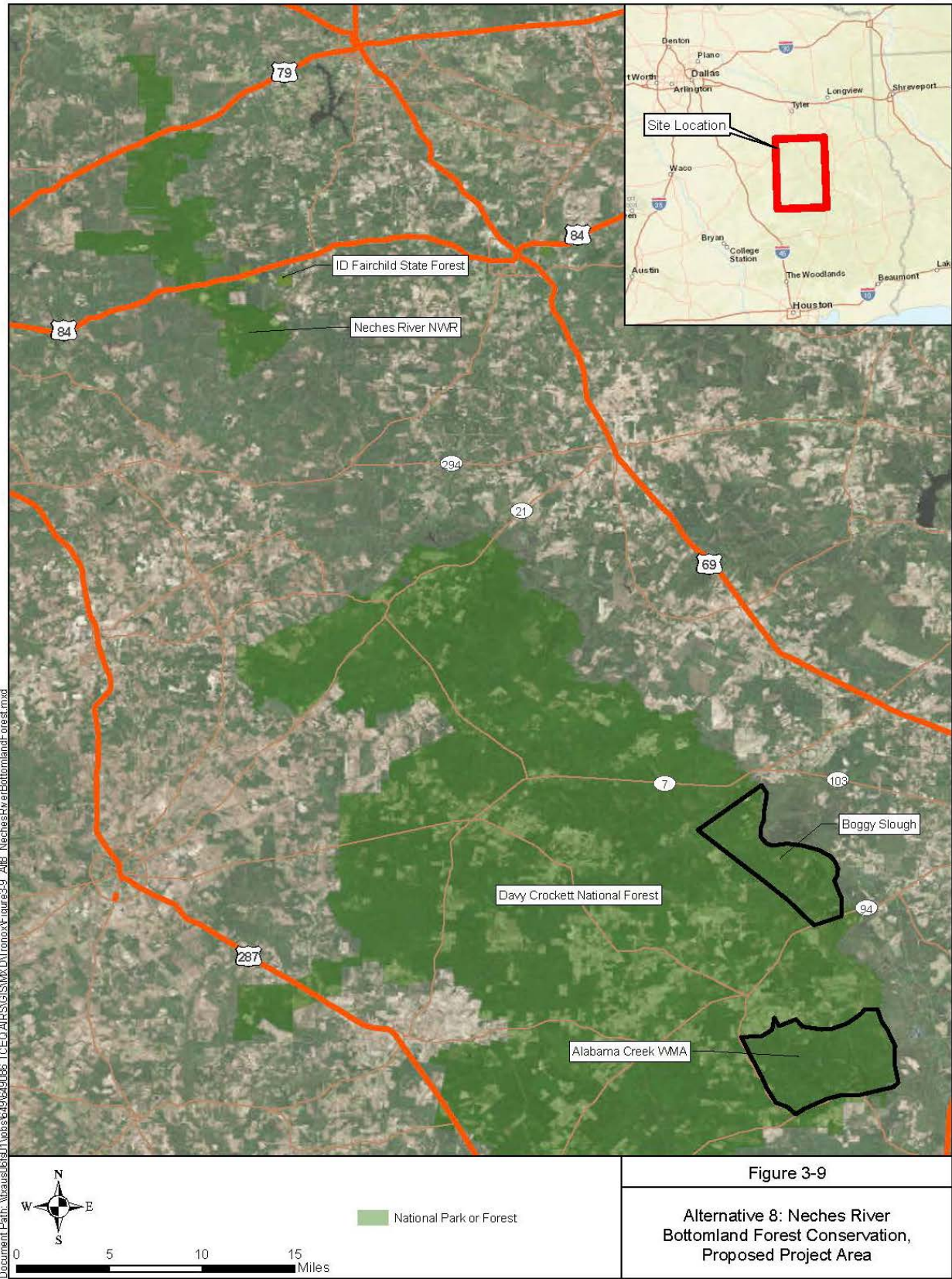


Figure 3-9 Alternative 8: Neches River Bottomland Forest Conservation

3.4.9 Alternative 9: Sulphur Springs Wastewater Treatment Plant Wetlands Habitat

This alternative would involve working with the City of Sulphur Springs to convert 100 acres of grass meadow to wetlands and to purchase an additional 100 acres of wetlands around Lake Sulphur Springs for preservation and recreational use. The process would consist of transferring water from the existing wastewater treatment plant to the constructed wetlands. The wetlands habitat would provide a natural filtration system for approximately 3 million gallons of reclaimed water every day. After the water cycles through the wetlands area, it would gravity flow to a stream to Lake Sulphur Springs. The additional water supply to Lake Sulphur Springs would enhance the lake by keeping the lake water level consistent year-round. In addition, water quality in the lake would be enhanced due to the wetlands filtration and the constant water movement from the stream. The created wetlands are intended for water quality enhancement, and in order for them to function properly, infrastructure would have to be provided, such as large pipes and a pump system. The pump system and pipes are necessary to supply approximately 3 million gallons of water per day to the constructed wetlands. After the completion of the wetlands, recreational facilities such as boardwalks, wildlife viewing stations and interpretive signage can be constructed to benefit the local community and others.

In addition to converting approximately 100 acres to wetlands habitat, the City is committed to purchasing an additional 100 acres of existing low land and wetlands areas around Lake Sulphur Springs to serve as preserved habitat for wildlife. Portions of the site would also be developed for recreational opportunities. Figure 3-10 shows the alternative area.

The overall scope of the project is to acquire approximately 100 acres of existing low land and wetlands areas around Lake Sulphur Springs, construct approximately 100 acres of wetlands habitat to enhance the surrounding environment and enhance the water quality and provide additional recreational opportunities to the local community.

The estimated total cost of Alternative 9 is \$6,000,000, which includes the purchase of land, the construction of the wetlands habitat, recreational amenities, and all the utilities necessary to get reclaimed water from the wastewater treatment plant to the wetlands area.

3.4.10 Alternative 10: Talbot Prairie and Forest Land Acquisition

This alternative involves the acquisition and protection of approximately 366 acres of land including 136 acres of endemic *Silveus'* dropseed prairie and 230 acres of hardwood forest, 75% of which is seasonally flooded (see Images 7 and 8). Northeast Texas, including Bowie County, is a transition zone between several ecological regions including the Texas Blackland Prairie, Post Oak Savanna, and Pineywoods regions of Texas and adjacent states. The area supports species and plant communities which are not found elsewhere in Texas. Less than 2% remains of what was once 10 million acres of native tallgrass prairie and calcareous woodland. Functional ecosystems in the region are fragmented, as most of the region has been converted to cropland or urban areas or invaded by non-native forage species. Native tallgrass prairies, which occur in a few northeast Texas counties from Texarkana to Bonham, are among the few recognized vegetation types unique to the state and are considered globally endangered.

Unlike tallgrass prairies elsewhere in Texas, which are dominated by little bluestem grass and Indiangrass, *Silveus'* dropseed prairies are dominated by a different suite of native grasses including *Silveus'* dropseed and longspike tridens with a large variety of colorful wildflowers. "Wet-prairies" are seasonally flooded areas within open grasslands that contain high botanical diversity. Such prairies usually occur as isolated inclusions within calcareous forests or woodlands, forming a mosaic of habitats unique to the South Central Plains ecoregion. Most wet prairies have been converted to farmland or rangeland, permanently destroying their native diversity. These sites are among the state's least conserved natural communities and have long been recognized as important for conservation. Several tracts of land in western Bowie County owned by the Talbot family contain *Silveus'* dropseed prairie, wet prairie, and hardwood forest.

Figure 3-11 shows the general location of the project. If acquired, the 136 acres of open prairie would be the largest example of *Silveus'* dropseed prairie in conservation ownership. At least 40% of the prairie area is seasonally inundated "wet prairie" which is characterized by hydrophilic species, especially sedges and rushes. The property contains a number of plant communities correlating with slight topographic gradients, ranging from upland and seasonally flooded prairie to hardwood forest with "pimple mounds" and swale wetlands. A preliminary botanical survey identified 316 plant species, including scarlet paintbrush, a wildflower not previously recorded in Texas. More species are expected to be identified as the property is inventoried further. Sheet flow over the property feeds numerous drainages to a creek which drains south to Anderson Creek, a relatively intact hydrologic system and a tributary of the Sulphur River.

The estimated total cost of Alternative 10 is \$1,000,000.



Image 7 Hardwood Forest with Drainages and Seasonally Flooded Flatwood Ponds

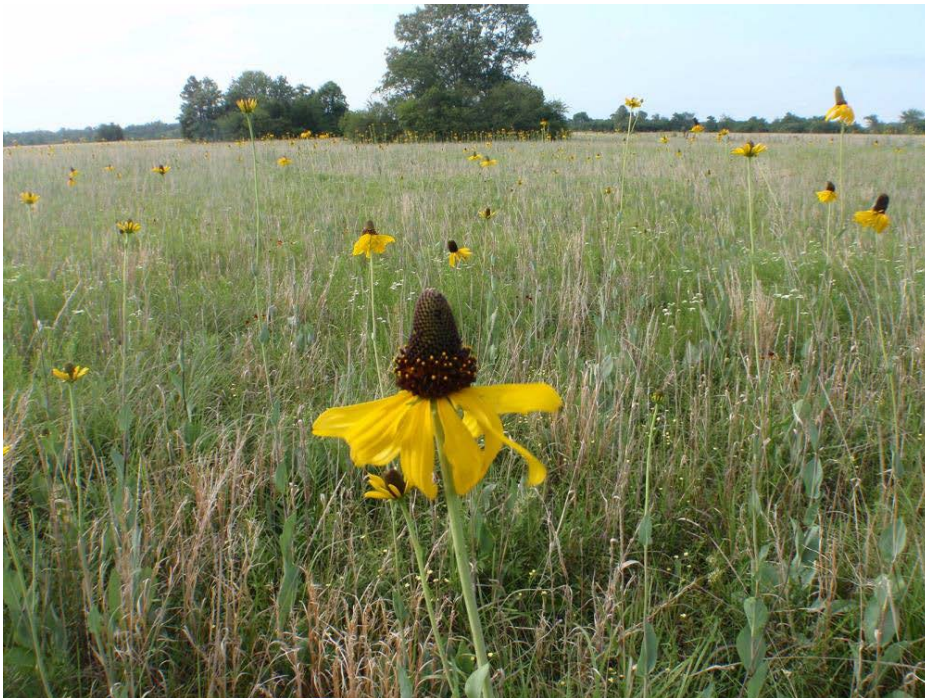


Image 8 Silveus' Dropseed Prairie, one of Texas' Rarest Plant Communities

3.4.11 Alternative 11: Tonkawa Sandhills Land Acquisition

This alternative includes the acquisition of approximately 4,900 acres in the Tonkawa Sandhills of Rusk and Nacogdoches Counties. Figure 3-12 shows the location of this alternative. The area includes riparian and bottomland hardwood forest, natural springs, and hydric bogs as features of the sandhill ecosystem. The Tonkawa Sandhills is a unique area of large natural springs and spring-fed creeks which recharge out of deep sandhills. These deep sands also serve as part of the recharge zone for the Carrizo-Wilcox Aquifer.

The property to be acquired contains the headwaters of five separate stream drainages which flow into the Attoyac River and Naconiche Creek. The largest springs impact the water quality in the recently completed reservoir, Lake Naconiche, located 2 miles downstream of the property. The property contains extensive intact riparian and bottomland hardwood forest and hydric bogs or acid “baygalls,” globally imperiled plant associations which are not well represented in existing parks and natural areas. Rare plants known to inhabit the property include Nixon’s hawthorn, a recently described species first discovered on the property, as well as Texas trillium, Murray penstemon, Carrizo leatherflower, barbed rattlesnake-root, Mohlenbrock’s sedge, grass-of-parnassus, and prairie fameflower. The site contains habitat for the red-cockaded woodpecker and the Neches River rose-mallow, two federally-listed species.

The Tonkawa Sandhills area is a combination of bottomland hardwood forest, wetlands, and adjacent uplands. These areas support native shortleaf pine-oak savannas, a vanishing ecosystem which is important habitat for migratory songbirds such as Bachman’s sparrow and game species including northern bobwhite and wild turkey.

The 4,900 acres would be placed into a conservation easement held by the Nature Conservancy (TNC) to ensure the long-term protection of the property. A restoration and management plan governing public access, riparian wetland protection, and habitat restoration activities would be developed.

The estimated total cost of Alternative 11 is \$10,000,000.

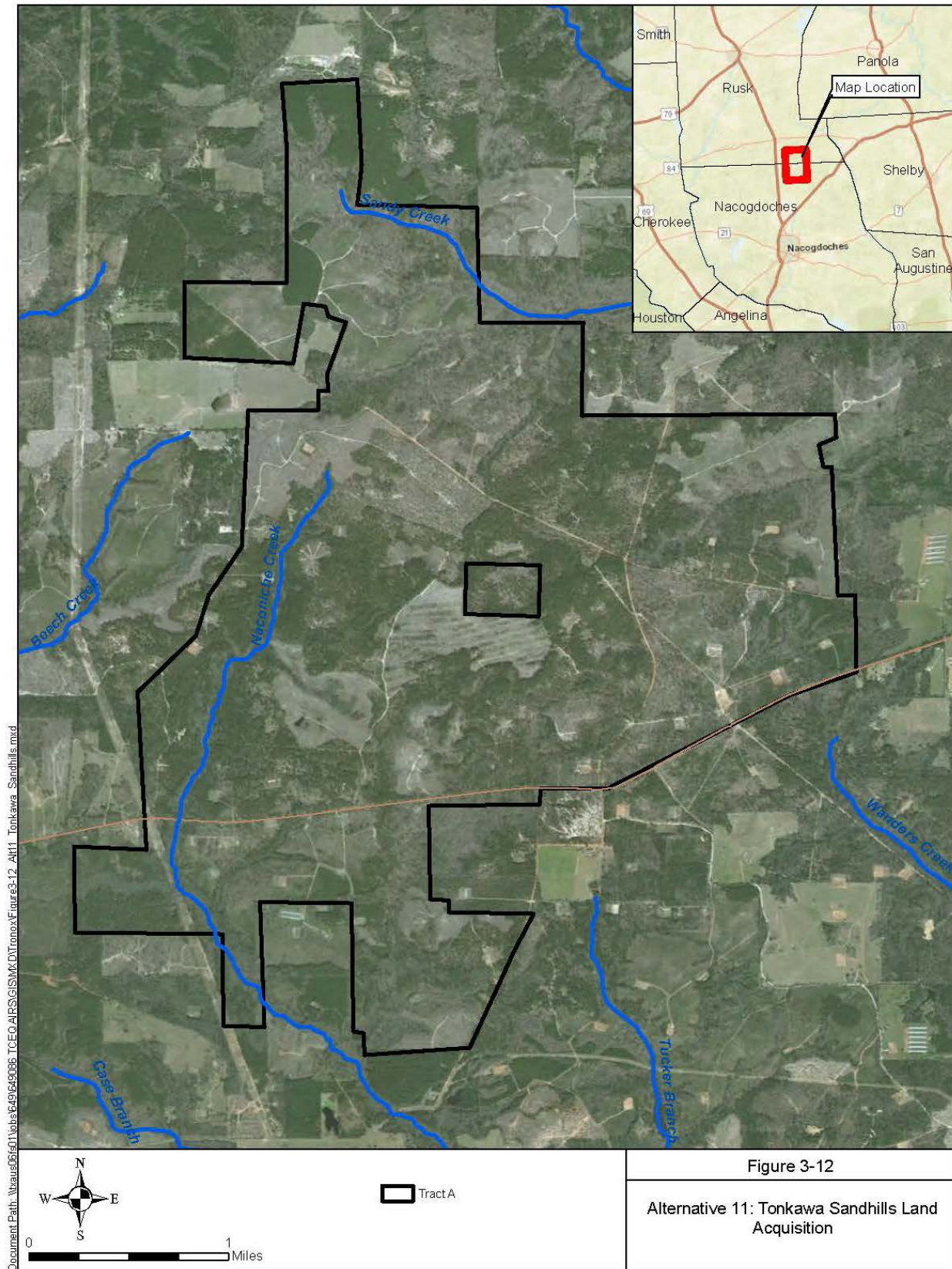


Figure 3-12 Alternative 11: Tonkawa Sandhills Land Acquisition

3.4.12 Alternative 12: T&J Hunting Properties

This alternative involves the purchase of two separate properties: 1) 111 acres of bottomland hardwoods in Panola County and 2) 30 acres of wetlands and bottomland hardwoods along the Sabine River. Due to the similarity of the scopes of work, both from T&J Hunt Club, the Trustees combined two related project ideas to generate this alternative. Figure 3-13 shows the locations of the two properties.

Both tracts are composed of deciduous forested wetlands and frequently flooded bottomland hardwoods forming a riparian forest ecosystem that supports a variety of South Central Plains ecoregion wildlife and bird habitat. Numerous old growth trees such as bald cypress, water oaks, willow oaks, overcup oaks, green ash, hackberry, and American elm are found on the properties, as well as numerous woody shrubs, vines, native grasses, and forb species. Large mast-producing trees provide shelter and resting sites for numerous species and a large food resource during the fall. Smaller soft mast-producing trees and shrubs also provide a food resource as well. New woody growth provides winter browse for white-tailed deer.

The habitat diversity on the two tracts supports a variety of wildlife species including white-tailed deer, coyotes, bobcats, fox, squirrel, and numerous bird species including bald eagles. There are numerous reptiles and amphibians also found on the property. Habitat potentially supports the alligator snapping turtle and timber rattle snake, both state-listed species, and *Geocarpon* (*Geocarpon minimum*) a federally-listed plant species.

Historically managed for timber production as a hunting club, the tracts would be owned by the T&J Hunt Club. Under this alternative, the properties would be placed under conservation easements and managed for wildlife diversity and limited recreational hunting and fishing.

The estimated total cost of Alternative 12 is \$1,800,000, which includes \$1,300,000 for the 111-acre site and \$500,000 for the 30-acre site.

3.4.13 Alternative 13: No Action

Both 43 C.F.R. § 11.82(c)(2) and NEPA require consideration of a “No Action” alternative. Under the “No Action” alternative, the Trustees would take no action to restore, rehabilitate, replace, or acquire natural resources or services equivalent to those lost due to hazardous substance releases at or from the Facility or the remedial actions taken to prevent further or future harm.

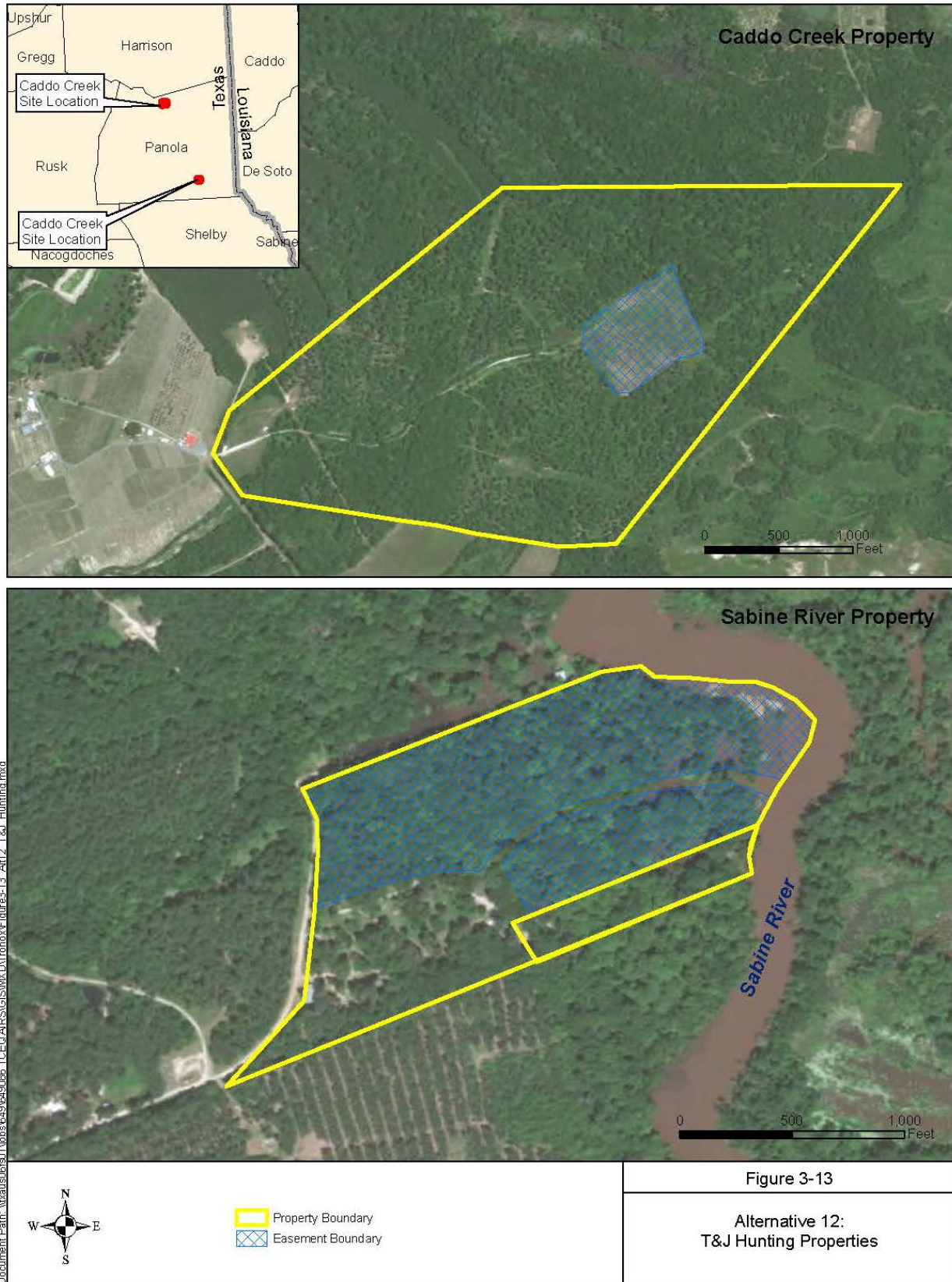


Figure 3-13 Alternative 12: T&J Hunting Properties

4.0 EVALUATION OF RESTORATION ALTERNATIVES

This chapter describes the Trustees' evaluation and analysis of the 13 alternatives listed in Section 3.3 and 3.4. The Trustees have integrated the CERCLA and NEPA evaluation processes in this Draft RP/EA. To most efficiently present the CERCLA and NEPA evaluations of the various restoration alternatives, the Trustees divided the alternatives into two groups. The first group, presented in Section 4.1, contains the CERCLA evaluations of the habitat acquisition alternatives. The second group, presented in Section 4.2, contains the CERCLA and NEPA evaluations of the habitat enhancement and construction alternatives.

As described in Section 3.2, consistent with the restoration factors listed in the CERCLA NRDA regulations, the Trustees considered the following criteria in evaluating the restoration alternatives: (1) Direct ecological benefits; (2) Technical feasibility; (3) Cost effectiveness; (4) Reasonable probability of success; (5) Measurable results; (6) Avoids collateral injury to natural resources; (7) Effect of each alternative on public health and safety, and compatibility with the remediation process; (8) Consistency with laws, regulations or policies; and (9) Alternative is not already required by existing laws, regulations, permits, or enforcement orders. All 12 restoration action alternatives met Criterion 8 and Criterion 9, and as such, those criteria are not further discussed for each specific alternative. For each alternative in the reasonable range of alternatives, the remaining seven CERCLA criteria are evaluated independently and a determination is made regarding how well the alternative meets that element. The Trustees used this evaluation in combination with Trustee priorities, the amount of funding available, and consideration of the relevant conservation landscape within the South Central Plains ecoregion to identify a suite of preferred restoration alternatives.

Under NEPA, federal agencies must consider environmental effects of their actions, including impacts on social, cultural, and economic resources, as well as natural resources. An agency's NEPA evaluation may take the form of a categorical exclusion, an environmental assessment (EA), or an environmental impact statement (EIS). A categorical exclusion is a category of actions that an agency has determined does not individually or cumulatively have a significant effect on the human environment. When determining whether a categorical exclusion applies for a proposed activity, a Federal agency must ensure that the proposed action fits within the category of actions described in the categorical exclusion. The agency must then consider the specific circumstances associated with each proposed activity to ensure no extraordinary circumstances are present that might give rise to significant environmental effects. The EA determines whether or not a federal action has the potential to cause significant environmental effects.

The habitat acquisition alternatives are anticipated to qualify for a categorical exclusion. All necessary NEPA analyses of the habitat acquisition alternatives will be completed before finalizing the RP/EA.

The Trustees have prepared a NEPA analysis, in the form of an Environmental Assessment (EA), for the habitat enhancement and construction alternatives in Section 4.2. Detailed information on the affected environment is presented in Section 3.1. The Trustees' evaluation under NEPA of the potential environmental impacts in terms of both context, duration, and intensity informed the Trustees' analysis and decision-making process under CERCLA. For the proposed actions identified in this Draft RP/EA, the appropriate context for considering potential significance of the actions is local, as opposed to national or worldwide. Duration refers to whether the impacts are short- or long-term, and intensity refers to the

severity of impact as well as whether the impact is beneficial or adverse. The NEPA analysis of the habitat enhancement and construction alternatives is based on alternative-specific preliminary design concepts rather than detailed plans. There are alternatives that will involve planning, engineering, design, permitting, and budget development to arrive at a shovel-ready alternative. Any steps prior to construction are not expected to reduce the anticipated benefits of the alternative or affect the analyses conducted for NEPA.

Two of the CERCLA evaluation criteria, “(6) Avoids collateral injury to natural resources” and “(7) Effect of each alternative on public health and safety, and compatibility with the remediation process” are related to effects that are evaluated as part of the EA for the habitat enhancement and construction alternatives; therefore, the degree to which each of these alternatives meets these two criteria is described in the NEPA evaluation discussions. All of the habitat acquisition alternatives met criteria 6 and 7. The acquisition of a property would ensure its biological integrity and simply acquiring the property would not be expected to result in collateral injury or any type of effect on public health and safety, or compatibility with a given remediation process. As such, criteria 6 and 7 are not specifically discussed for each of the habitat acquisition alternatives.

If the Trustees conclude that the actions associated with the preferred habitat enhancement and construction alternatives will not lead to significant adverse impacts to the environment, the federal Trustee will issue a finding of no significant impact (FONSI) concurrent with the Final RP/EA. If significant impacts are anticipated, the Trustees will proceed with an EIS to determine the extent of adverse impacts and outline a plan for using best management practices to mitigate those impacts.

4.1 Habitat Acquisition Alternatives

Six of the 13 alternatives considered in this Draft RP/EA include land acquisition as their major restoration action. These six alternatives may be eligible for a NEPA categorical exclusion and are therefore grouped together in this section to allow the Trustees to more efficiently evaluate the alternatives. Discussion of the Trustees CERCLA evaluation for each of the land acquisition alternatives follows.

Summary of Land Acquisition Alternatives

Alternative Name	County
Alternative 1: Big Thicket Acquisition and Conservation	Hardin
Alternative 3: Caddo Lake Habitat Acquisition	Marion, Harrison
Alternative 8: Neches River Bottomland Forest Acquisition	Houston, Angelina, Trinity, Anderson
Alternative 10: Talbot Prairie and Forest Land Acquisition	Bowie
Alternative 11: Tonkawa Sandhills Land Acquisition	Rusk, Nacogdoches
Alternative 12: T&J Hunting Properties	Panola

4.1.1 Alternative 1: Big Thicket Acquisition and Conservation

This alternative involves acquisition and protection of up to 1,200 acres of bottomland hardwood forest previously utilized as industrial forest land by a timber company, a willing seller. Upon acquisition, the property would transfer to the United States National Park Service to be incorporated as contiguous to the Big Thicket National Preserve (BTNP). The Trustees evaluated this alternative based on the following criteria.

- *Criterion #1-Direct Ecological Benefits:* This alternative would provide benefits to bottomland hardwood forest; however, the subject properties and adjacent properties have been logged for pine and hardwoods and some pipeline infrastructure remains on the properties. American Forest Management, a for-profit tree management business, manages the property adjacent to the northern boundary of the 1,200 acres. Adjacent preserve property will remain in a natural state in perpetuity. The Trustees determined that the site has lower ecological value due to past and present operations on the property and the long distance from the Facility, weakens the correlation to the injury for benthic invertebrates. In addition, the use of timber sales to generate funds for restoration actions may not align with the goals of the Trustees.
- *Criterion #2-Technical Feasibility:* Preservation of the donated property in perpetuity through inclusion in the BTNP would require an Act of Congress. The lengthy timeline reduces the technical feasibility of this alternative. The Trustees also considered the current state of the property, including its use as industrial forest land for over 100 years, the presence of pipelines and supporting infrastructure, as well the presence of Chinese Tallow and feral hogs, as part of this evaluation. Except for the already conserved BTNP property, timber businesses own the subject and adjacent properties, so it is likely that at least the adjacent property will be logged eventually, reducing the value of the subject tract unless the adjacent property was also preserved. The technical feasibility was considered to be low because of the extended time frame for the conveyance process to be completed, the actions required to restore the landscape to historical species, and the active timber management activities that will continue to occur adjacent to the alternative.
- *Criterion #3-Cost Effectiveness:* The total alternative cost is estimated to be \$2,400,000 or approximately \$2,000 per acre. This cost includes acquisition, appraisal, title review, closing costs, and environmental studies. Based on previous Trustee experience a range of \$1,000 to \$3,500 per acre is considered reasonable for acquisition of rural acreage in east Texas. These comparative costs are influenced by proximity to urban areas, quality of habitat, and the size of the tract. According to the Texas Lands Trends Report (2016), *“Rural land values vary by location, land use, property size, and other characteristics. Changes in land value were closely tied to distance from major metropolitan growth areas. The average land value, for example, within the top 25 fastest growing counties was \$5,266 per acre in 2012, compared to the state-wide average of \$1,573 per acre.”* The inclusion of the appraisal, environmental studies and closing costs within the \$2,000 per acre cost make this project cost effective.

- *Criterion #4-Reasonable Probability of Success:* Given the current condition of the property, the timeframe required to acquire the property, and the potential for logging at or near the property, the Trustees considered this alternative to have a low probability of success.
- *Criterion #5-Measurable Results:* The measures of success are primarily the acquisition of the property, finalization of the conservation easement, inclusion in the BTNP, and preservation of the property in perpetuity. As with Criterion #2, based on the length of time required for the acquisition and conveyance of the property to the BTNP, the Trustees determined this to have a low probability for timely measurable results.

4.1.2 Alternative 3: Caddo Lake Habitat Acquisition

This alternative involves the acquisition of approximately 3,500 acres within the Caddo Lake system. The acquired habitat would be swamp, slough, and headwaters, with the intention to better connect the landscape into either the Caddo Lake WMA or the Caddo Lake State Park. The Trustees evaluated this alternative based on the following criteria.

- *Criterion #1-Direct Ecological Benefits:* This acquisition would benefit and protect habitat for freshwater benthic invertebrate communities, bottomland hardwood, and the overall freshwater system. Other ecosystem benefits include the preservation and maintenance of natural hydrology, reducing the spread of invasive species, reducing nutrient loads, and the introduction and proliferation of sensitive and threatened fishes. This alternative provides natural resources or services equivalent to the injury to freshwater benthic invertebrate communities in Days, Waggoner, and Howard creeks.
- *Criterion #2-Technical Feasibility:* The technical feasibility depends on the long-term protection of the tract(s). Conservation of the acquired tracts will be reflected in the greater Caddo Lake system, and benefits to water quality, wildlife populations, and habitat patterns could be observed at the landscape scale.
- *Criterion #3-Cost Effectiveness:* There are multiple tracts of land that make up the 3,500 acres within this alternative. There is uncertainty as to which tracts can be purchased until property owners have been contacted; however, the estimated costs range from \$1,000 to \$4,400 per acre for the various tracts. Costs include the appraisal, title review, survey, environmental assessment, staff time and land acquisition. Based on previous Trustee experience, a range of \$1,000 to \$3,500 per acre is considered reasonable for acquisition of bottomland acreage in east Texas. Only one of the proposed tracts estimated costs above the range. The most expensive tract in the proposal, (\$4,400 per acre) is open water and bottomland forest, would protect a mile of riverbank of Big Cypress Bayou adjacent to Caddo Lake State Park. Because of the exceptional quality of the habitat and proximity to the Caddo Lake State Park, \$4,400 per acre is still considered to be cost effective. The other tracks are priced within the commonly found range of costs that the Trustee consider to be acceptable. The inclusion of necessary activities outside of the acquisition in the estimated costs make Alternative 3 cost effective. Depending on the specific tracts, the acquisition process may include purchase of fee title to be held by TPWD or USFWS, and/or conservation easements to be held by the Nature Conservancy (TNC). All acquisitions will be managed for

conservation in perpetuity. The purchase price of the land would be based on a recent appraisal to ensure it is purchased at current market value.

- *Criterion #4-Reasonable Probability of Success:* There is a high probability of success for this alternative based on the past partnerships of the managing entities and stability of the Caddo Lake system. The proponents of this alternative, the TPWD and TNC, have demonstrated successful implementation of similar projects, such as the acquisition of Palo Pinto Mountains State Park, Goose Island State Park, and Powderhorn Ranch, and therefore, this alternative is considered to have a high probability of success by the Trustees.
- *Criterion #5-Measurable Results:* The measure of success is the acquisition of the property, finalization of the conservation easement, and preservation of the property in perpetuity. The Trustees determined the project meets this criterion.

4.1.3 Alternative 8: Neches River Bottomland Forest Acquisition

This alternative involves the acquisition and protection of approximately 1,100 acres of land, including riparian bottomland hardwood forest along the Neches River. The Trustees evaluated this alternative based on the following criteria.

- *Criterion #1-Direct Ecological Benefits:* The properties in this alternative contain riparian areas that become inundated similarly to riparian areas adjacent to Days, Howard, and Waggoner creeks. This alternative provides natural resources or services equivalent to the injury to freshwater benthic invertebrate communities in Days, Waggoner, and Howard creeks and any impacts to the riparian corridor along the creeks. Additionally, this alternative will help ensure that the wetlands of the Neches River continue to provide high quality habitat, clean water, flood retention, recreation, and drinking water to communities upstream and downstream.
- *Criterion #2-Technical Feasibility:* The technical feasibility depends on the long-term protection of the tract(s). For this alternative, the Trustees would protect tracts within the Neches River NWR through fee title acquisition. Upon acquisition, the property would be donated to USFWS. This alternative is expected to take 24 months to complete and all acquisitions would be managed for conservation in perpetuity. The Trustees determined the project meets this criterion.
- *Criterion #3-Cost Effectiveness:* Approximately 1,100 acres in the Neches River NWR have been identified as potential targets for acquisition. There is uncertainty as to which tracts can be purchased until negotiations with property owners have been completed; however, the estimated cost per acre is approximately \$1,500 to \$2,100 per acre. Costs include the appraisal, title review, survey, environmental assessment, staff time and land acquisition. Based on previous Trustee experience, a range of \$1,000 to \$3,500 per acre is considered reasonable for acquisition of bottomland acreage in east Texas. For example, the recent Trustee-led acquisition of 612 acres in the Neches River NWR cost \$1,825 per acre. The estimated costs for Alternative 8 are within this range. The purchase price of the land would be based on a recent appraisal to ensure it is purchased at current market value.

- *Criterion #4-Reasonable Probability of Success:* The Conservation Fund (TCF), along with their proposal partner, the USFWS, have demonstrated successful implementation of similar projects. In the last 10 years, TCF has secured over \$60 million in public and private dollars to conserve bottomland forests bordering the length of the Neches River. This alternative has a high probability of success based on past performance by TCF and the past partnerships of the managing entities and stability of the Neches River NWR.
- *Criterion #5-Measurable Results:* The measure of success is primarily the acquisition of the property in perpetuity, finalization of the conservation easement, and the conservation and preservation of the property in perpetuity. The Trustees determined the project meets this criterion.

4.1.4 Alternative 10: Talbot Prairie and Forest Land Acquisition

This alternative involves the acquisition and protection of approximately 366 acres of land including 136 acres of endemic *Silveus'* dropseed prairie and 230 acres of hardwood forest, 75 percent of which is seasonally flooded. The Trustees evaluated this alternative based on the following criteria.

- *Criterion #1-Direct Ecological Benefits:* The property is the highest quality native prairie remnant in the vicinity and possibly in Bowie County. This proposed alternative provides ecological services equivalent to the injury, in that benthic invertebrate communities within the wetlands and within the drainage areas would be preserved and protected. The protection of the 366 acres would reduce urban runoff and improve water quality in the area. This alternative provides ecological benefits to riparian, bottomland hardwoods, aquatic, and wetland habitats within 25 miles of the Facility and within the same river basin and county as the Facility. Additionally, this alternative will add to the representation of *Silveus'* dropseed prairie and calcareous hardwood forest in conservation ownership.
- *Criterion #2-Technical Feasibility:* This alternative is considered technically feasible. In 2012, TNC successfully assisted the Native Prairies Association of Texas (NPAT) with acquiring a nearby preserve and currently enforces a deed restriction on that property.
- *Criterion #3-Cost Effectiveness:* Total costs are estimated to be \$1,000,000 or approximately \$2,700 per acre. The costs include the appraisal, title policy, survey, environmental assessment, land acquisition, and an endowment to TNC to support monitoring of the conservation easement. Based on previous Trustee experience, a range of \$1,500 to \$3,200 per acre is considered reasonable for acquisition of wet prairie habitat acreage. The estimated costs for this alternative are within this range. The Trustees consider this alternative to be cost effective based on a comparison to similar projects and the inclusion of administrative costs and the endowment to TNC. The purchase price of the land would be based on a recent appraisal to ensure property is purchased at current market value.
- *Criterion #4-Reasonable Probability of Success:* For this property, the NPAT, a Texas-based land trust, would purchase and manage the property. TNC would accept a conservation easement on the property. NPAT and TNC would jointly create and submit to the Trustees a land management

plan with the goal of maintaining the optimal diversity of plant and animal species. This alternative has a high probability of success based on the past partnerships of the managing entities.

- *Criterion #5-Measurable Results:* The measurable results are directly associated with the successful acquisition of the property, finalization of the conservation easement, and the conservation and preservation of the property in perpetuity. A land management plan would be submitted to the Trustees to further define the measures of success. The Trustees determined the project meets this criterion.

4.1.5 Alternative 11: Tonkawa Sandhills Land Acquisition

This alternative includes the acquisition of 4,900 acres for preservation in the Tonkawa Sandhills of Rusk and Nacogdoches counties. The Trustees evaluated this alternative based on the following criteria.

- *Criterion #1-Direct Ecological Benefits:* The acquisition area includes riparian and bottomland hardwood forest, natural springs, sandhills, and hydric bogs as features of the sandhill ecosystem. The property contains approximately 2,880 acres of planted pine stands composed predominantly of loblolly pine, which naturally occurs in more mesic communities, and slash pine, which is non-native in east Texas. Previous land use including oil and gas development and road and utility crossings have impacted streams and riparian corridors. Almost all the upland areas would require restoration (70% of the total alternative area). Upland habitat on the property has been severely degraded, predominately through soil organic matter depletion from site preparation practices, farming activities, and the replacement of native shortleaf pine with loblolly and slash pine. This proposed alternative would provide similar ecological services directly comparable to the injury, in the bottomland hardwoods and benthic communities within the wet portions of the property, however, due to the degraded nature of the upland communities, the Trustees determine ecological benefits to be moderate as a whole.
- *Criterion #2-Technical Feasibility:* The acquisition of this property is technically feasible. The amount of restoration required on both the riparian and upland areas, as well as current and future oil and gas operations on the property, are of concern to the Trustees with regard to the technical feasibility of this project. In addition, an inholding near the center of the property is owned by a private individual for recreational hunting and timber production.
- *Criterion #3-Cost Effectiveness:* The estimated total cost of this alternative is \$10,000,000 or approximately \$2,000 per acre. The cost includes the appraisal, survey, Phase I environmental report, title policy, closing costs, and an endowment for the conservation easement. The cost of acquisition of the acreage is reasonable as compared to other similar projects, especially since the costs include implementation costs and an endowment. The purchase price of the land would be based on a recent appraisal to ensure it is purchased at current market value.
- *Criterion #4-Reasonable Probability of Success:* The 4,900 acres would be placed into a conservation easement with TNC to ensure the long-term protection of the property. The acquisition and execution of the conservation easement are highly probable given past partnerships with the managing entities. Once acquired, a restoration and management plan

governing public access, riparian wetland protection, and habitat restoration activities would be developed. The Trustees consider this alternative to have a mixed probability of long-term success based on current and past land use.

- *Criterion #5-Measurable Results:* The measurable results are directly associated with the successful acquisition of the property and finalization of the conservation easement, and the conservation and preservation of the property in perpetuity which the Trustees determined to be feasible.

4.1.6 Alternative 12: T&J Hunting Properties

This alternative involves the purchase of two separate properties: 1) 111 acres of bottomland hardwoods in Panola County and 2) 30 acres of wetlands and bottomland hardwoods along the Sabine River.

- *Criterion #1-Direct Ecological Benefits:* The acquisition of these properties would provide ecological services (e.g., benthic invertebrate services) consistent with the injury. Both tracts are composed of deciduous forested wetlands and frequently flooded bottomland hardwoods forming a riparian forest ecosystem that supports a variety of east Texas wildlife and bird habitats. However, the proposed properties are small (111 acres and 30 acres), isolated, and not contiguous with other preserved properties in the region, thereby reducing their overall benefit.
- *Criterion #2-Technical Feasibility:* The floodplain perpetuity easements would be held by the United States Corps of Engineers or the United States Department of Agriculture. Based on previous experience, the Trustees are concerned that easements held by these entities would have requirements that do not align with Trustee restoration goals. Historically managed for timber production as a hunting club, the tracts would be owned by the T&J Hunt Club. Under this alternative, the properties would be placed under conservation easements and managed for wildlife diversity and limited recreational hunting and fishing. The technical feasibility of this alternative is low because the perpetuity requirement for the easement(s) and future land use associated with the property may not align with Trustee restoration goals.
- *Criterion #3-Cost Effectiveness:* The estimated total cost of this alternative is \$1,800,000: \$1,300,000 for the 111-acre site (approximately \$12,000 per acre) and \$500,000 for the 30-acre site (approximately \$16,500 per acre). Based on previous Trustee experience a range of \$1,000 to \$3,500 per acre is considered reasonable for acquisition of acreage in east Texas. These comparative costs are influenced by proximity to urban areas, quality of habitat, and the size of the tract. The estimated costs, as presented, do not include costs for appraisal, environmental studies and closing costs, reducing cost effectiveness. Based on the comparative costs for acquisition, this alternative is not cost effective.
- *Criterion #4-Reasonable Probability of Success:* Although conservation easements on the properties could likely be obtained, the probability of success for this alternative is low because of Trustee concerns with the conservation easement requirements and restrictions, and the prohibitive cost for small parcels that are discontinuous with currently preserved acreage.

- *Criterion #5-Measurable Results:* The measurable results are directly associated with the successful acquisition of the properties, finalization of the conservation easement, and management in perpetuity. As with Criterion #2, based on past experience with floodplain perpetuity easements and the requirements of the entities that would hold them, the Trustees determined the project did not meet this criterion.

4.2 Habitat Enhancement and Construction Alternatives

The remaining seven alternatives considered in this Draft RP/EA focus on habitat enhancement and construction. Since these projects are not eligible for a NEPA categorical exclusion, this section assesses the CERCLA evaluation of each alternative as well as the environmental consequences analysis pursuant to NEPA.

Summary of Habitat and Construction Alternatives

Alternative Name	County
Alternative 2: Bottomland Hardwood Restoration and Chinese Tallow Eradication	Nacogdoches
Alternative 4: Days Creek Enhancement and Restoration	Bowie
Alternative 5: Days Creek Urban Wetland Restoration and Enhancement	Bowie
Alternative 6: Longview Arboretum and Nature Park	Gregg
Alternative 7: Mineola Nature Preserve Restoration and Enhancement	Wood
Alternative 9: Sulphur Springs Wastewater Treatment Plant Wetlands Habitat	Hopkins

4.2.1 Alternative 2: Bottomland Hardwood Restoration and Chinese Tallow Eradication

This alternative involves treatment of Chinese tallow, an invasive species, and planting of hardwood species. This alternative is located in Nacogdoches County within the Stephen F. Austin Experimental Forest which is part of the Angelina National Forest. The treatment area would be 1,800 acres in the Stephen F. Austin Experimental Forest and 2,200 acres in the Alazan Bayou WMA. The treatment area is infested with Chinese tallow and is seasonally flooded. Improvements would help the long-term sustainability of important habitat and natural systems.

4.2.1.1 CERCLA Evaluation

- *Criterion #1-Direct Ecological Benefits:* The removal of Chinese tallow and improvement of Texas bottomland/floodplain would increase the biological diversity and therefore would ultimately benefit riparian and benthic invertebrate health in the bottomland hardwood habitat; however, the benefits may not be realized for 5 years or more. Any restoration and rehabilitation of

bottomland and floodplain communities will ultimately benefit the benthic invertebrate communities and water quality consistent with Trustee goals for this project.

- *Criterion #2-Technical Feasibility:* The methods used in the eradication of Chinese Tallow are established, and the Trustees determined that this project is technically feasible. However, the project proponent expects this alternative could take at least 5 years to complete. Additional time may be needed to ensure the seedbank is devoid of Chinese tallow seeds and a sufficient number of hardwood species become established in the affected area. The Trustees are also concerned with the technical feasibility involved in restoring an area infested with an invasive species and returning it to native hardwood bottomland for perpetuity. It is difficult to predict success based on the scale and objective of the eradication phase and restoration phase. Chinese tallow can be difficult to control because it will regrow from the roots and from seeds, requiring chemical control using systemic herbicides.
- *Criterion #3-Cost Effectiveness:* Total alternative cost is estimated to be approximately \$1,700,000 or approximately \$425 per acre. This cost includes: 1) \$700,000 for cutting stumps, 2) \$700,000 for herbicide foliar spraying, 3) \$100,000 for hardwood planting using USFS supplied plants, 4) \$100,000 for hardwood planting from seedlings, and 5) \$100,000 for monitoring over 5 years.

The costs for stump cutting and herbicide foliar spray are estimated to be \$175 per acre, each. Published costs for mowing or other mechanical manipulations depends on labor, fuel, and machinery costs. Herbicide applications using broadcast application methods range from \$80 to \$120 per acre. The estimated project costs are slightly more expensive than published values, but a direct comparison is difficult without additional breakdown of assumptions used to develop the project costs (e.g., equipment rental, fuel, labor, and herbicide costs).

Estimated costs for planting hardwood seedling (bare root) is \$200,000 or \$50 per acre. This assumes that the USFS will supply the plant material. Costs for planting hardwoods are influenced by planting rates, labor rates, and costs for any necessary supporting materials such as tree shelters or geotextile mats. Published costs per acre for planting of trees range from \$350 to \$550. Because of the support from the USFS, the planting of hardwoods in this alternative is estimated to be \$50 per acre and is considered cost effective.

Monitoring is assumed to occur over a 5-year period at \$25 per acre for a total estimated cost of \$100,000. Information is not provided on the activities to be conducted during monitoring, nor are there costs included or discussed to address corrective actions if eradication efforts are not sufficiently effective or if the survival rate of the planted hardwoods is unacceptably low.

- *Criterion #4-Reasonable Probability of Success:* The Trustees are concerned with the long-term success involved in restoring an area infested with an invasive species and returning it to native hardwood bottomland in perpetuity. The Alazan Bayou WMA and the USFS already have established Chinese tallow treatment programs and would continue treatments after project activities have concluded. A project partner, the Southern Research Station, can provide expertise in identifying priority areas most suitable for planting hardwoods and monitoring hardwood survival rates. The National Wild Turkey Federation's liaison to the USFWS has proven experience

with bottomland hardwood restoration and would assist with project oversight by providing guidance on project implementation and aiding in measuring project success. The project proponents did not respond to requests for more information on the project, calling into question the probability of success. The Trustees determined the project did not meet this criterion.

- *Criterion #5-Measurable Results:* A work plan with milestones and clear measures of success would be developed with the Trustees. Tasks include Chinese tallow treatment, hardwood planting, and monitoring. Monitoring beyond the 5-year predicted life of the alternative may be required along with re-planting of hardwoods if sufficient success is not achieved. This project will require long-term monitoring and maintenance, as well as agreement on decision points between multiple stakeholders. The Trustees determined that clear performance measures will be difficult to establish and evaluate.

4.2.1.2 NEPA Evaluation

Environmental and Socio-Economic Impacts Evaluation

The removal and eventual eradication of Chinese tallow (*Triadica sebifera*, formerly known as *Sapium sebiferum*) within the Stephen F. Austin Experimental Forest and Alazan Bayou WMA would benefit the bottomland hardwood ecosystem of the Angelina National Forest in Nacogdoches County. Chinese tallow represents a significant invasive species problem in many areas of Texas and across the South. The species adversely affects the diversity of native plants by invading and eventually dominating habitats including marshes, coastal prairies, river bottoms, and upland forests, as well as disturbed sites and abandoned agricultural fields. Chinese tallow prefers wet soils but is very adaptable. The species has become a serious problem on private and federal lands, such as the Big Thicket National Preserve and national forests in Texas. Chinese tallow can transform areas into a single-species forest. The rapid forestation of Chinese tallow has contributed significantly to the degradation of wetlands along the Gulf Coast. Chinese tallow may alter soil chemistry, allowing the species to self-perpetuate once established.

Eradication coupled with plantings of native hardwood species within the 4,000 acres of affected area is, in part, proposed using herbicide application techniques. Herbicides can be effective but are temporary control measures requiring repeated treatments. Based on the scale and objective of restoration, it is difficult to predict and guarantee success. Chinese tallow can be difficult to control because the trees will regrow from the roots and from seeds, requiring chemical control using systemic herbicides. No negative socio-economic effects would be anticipated as a result of this alternative. As with the other proposed alternatives, restoration of bottomland hardwoods would positively impact riparian ecosystems, indirectly benefiting recreation, education opportunities, and local economies. A cost-benefit analysis of this alternative is difficult to evaluate due to the low certainty of total alternative costs and probability of success.

Physical, Biological, and Cultural Impacts Evaluation

Air Quality, Noise, Traffic, Energy: This alternative is located in a low-population rural setting. The increased presence of heavy equipment has little potential to disturb local residents. Any noise, traffic, or air quality impacts would be temporary. Minimal equipment use would be expected to implement this

alternative; therefore, no air quality, noise, traffic, or energy impacts would be anticipated as a result of this alternative.

Water Quality, Geology: Over the long term, the reestablishment of native hardwood species displaced by Chinese tallow would help improve local water quality, increase local species diversity, and increase resilience to erosion and nutrient loading during high precipitation events.

Contaminants, Public Health and Safety: Restoration activities are not expected to have any impacts on public health and safety. The introduction and use of herbicides, when properly applied, would not negatively impact human or ecological health; however, the risk of contamination is difficult to evaluate without a detailed proposal on type and rate of herbicide application. Prior to implementation, the Trustees would coordinate and consult with applicable county, state, and federal regulatory authorities to properly evaluate and minimize environmental impacts from herbicide application in terrestrial and aquatic habitats.

Biological Environment: The combined effort of Chinese tallow destruction and native tree plantings would substantially improve vegetative diversity, and eventually faunal diversity within the riparian wetlands of the Bayou Loco, Bonaldo Creek, and Upper Angelina River watersheds. Invasive species eradication and native species reestablishment can take years, with an initially slow improvement to local ecologies. Ultimately, the construction, enhancement, and preservation of riparian wetland services achieved through the proposed alternative restoration activities would positively impact wildlife, invertebrate, and wetland plant communities.

Endangered Species: Several state-and federally-listed species may be present in the alternative area. The site contains habitat for the following federally-listed species: red-cockaded woodpecker (*Picoides borealis*), Louisiana pine snake (*Pituophis ruthveni*), and the Neches River rose-mallow (*Hibiscus dasycalyx*). The proposed actions may result in limited exposure to herbicide; however, impacts are avoidable when applying best management practices in concert with conducting endangered species surveys and employing monitors. The eradication of Chinese tallow and planting of native species would likely benefit threatened and endangered species and their designated critical habitats over time.

Prior to project implementation, the Trustees would coordinate and complete consultation with USFWS to address any potential impacts to protected species in accordance with Section 7 of the ESA. The Trustees, in consultation with USFWS, would incorporate and implement conservation measures recommended during consultation in final project design and implementation to avoid or minimize impacts to protected species and critical habitats.

Environmental Justice: This alternative would not have the potential to negatively or disproportionately affect minority or low-income populations in the alternative area, including economically, socially, or in terms of conditions affecting their health. Stephen F. Austin Experimental Forest and Alazan Bayou WMA are already managed for conservation purposes. The proposed activities would help restore an environment that is of benefit to all citizens.

Recreation: The restoration of communities at the Alazan Bayou WMA could enhance the current level of recreation. Removal of invasive species should improve habitat for multiple species of plants and animals

which would likely improve recreational opportunities such as hunting, fishing, hiking, and wildlife viewing.

Cultural Resources: There are no known historic sites or significant cultural, scientific, or historic resources in the area that would be affected by the proposed restoration actions. If this alternative is selected, a complete review of the site under section 106 of the National Historic Preservation Act of 1966 (NHPA) would be completed prior to any construction activities being implemented, with consideration of measures to avoid, minimize, or mitigate any adverse effects on any cultural resources located within the site area. This alternative would be implemented in accordance with all applicable laws and regulations applicable to the protection of cultural and historic resources.

4.2.2 Alternative 4: Days Creek Enhancement and Restoration

This alternative combines various components of the Days Creek Watershed Comprehensive Aquatic Ecosystem Restoration project idea into an alternative that would preserve and enhance approximately 200 acres of forested riparian habitats and restore and stabilize about 6 miles of urban creek channels.

4.2.2.1 CERCLA Evaluation

- *Criterion #1-Direct Ecological Benefits:* These actions would directly compensate for habitat value lost at and adjacent to the Facility within the same watershed through the reestablishment of natural stream meanders, creation of wetland ecosystem services, and the preservation of existing habitats. The selected components that comprise Alternative 4 align with the Trustees' objective to compensate for injuries to freshwater benthic and riparian habitats in the South Central Plains ecoregion through the preservation, restoration, and creation of analogous habitat. Because these alternative components are located in Bowie County and in the same watershed and river basins (Red River and Sulphur River) as the injury, any enhancements to water quality in the area would benefit any protected species in the watershed and river basin impacted by the injury.
- *Criterion #2-Technical Feasibility:* Alternative 4 is technically feasible given the participation of engineers, hydrologists, and city planners in the planning process with oversight by the Trustees. This alternative is restoration and enhancement of existing stream corridors but also includes some development of wetlands and wet forest adjacent to the existing water ways. Because the wetlands and forested habitats are not isolated, there is a high likelihood that they will be viable and self-sustaining for the long term. The proposed activities are commonly completed and highly effective.
- *Criterion #3-Cost Effectiveness:* The Trustees estimate the total cost of this alternative to be \$9,800,000. These components utilize mostly City of Texarkana property and there are no costs for land purchase. Typical urban stream restoration costs range between \$500 and \$1,200 per foot and are generally more expensive than stop gap measures such as detention ponds to manage nitrogen loads from stormwater at \$30-\$120 per foot or placement of rip-rap to armor streambanks at \$0 to \$120 per foot. The long-term benefits of urban stream restoration are primarily water quality improvements and infrastructure protection. Other benefits include

educational, ethical, and community benefits that arise from restoring a naturalized environment within an urban setting, as well as enhancing aquatic and riparian ecosystems along streams with improved water quality (Kenney et al., 2012).

Cost estimations for wetland restoration in urban areas are complex given the many human and natural constraints and can vary widely. The most expensive cost factors tend to be the design accommodations (for example, access, clearing, grading, placement of weirs, pumps or other controls, and excavations or earthwork) that must be made for co-existing or adjacent land uses and infrastructure. Estimates of restoration of seasonal wetlands and creeks range from \$9,000 to \$40,000 per acre (Steere, 2000). Zentner et al (2003) also describes the costs for constructed wetlands from seasonal or wet meadows. These costs include grading and contouring to manage and encourage the water input but assume that water is readily available and is easily manipulated. Plantings are usually required because naturally dominant native plants do not readily invade the restored basin. Costs for plants and planting vary widely depending on type of plants, planting method, density of plants and the potential replanting of areas if unsuccessful. Costs for 1 acre of wetland restoration in a seasonal or wet meadow range from \$12,000 to \$42,000 (Zentner et al., 2003).

Riparian woodlands consist of a channel, an overstory of trees and shrubs and an understory of native herbs. Restoration or reforestation of the riparian corridor is dependent on multiple factors. Planting for the riparian woodland is complex because of the range of plant sizes and types and the potential need for irrigation. Bair (2000) estimates that costs range from \$4,000 to \$8,000 per mile with an average of \$5,000 a river mile or \$110 per acre and was developed assuming planting hard woods and shrubs with conventional hand crews and heavy equipment (Bair, 2000). Zentner et al. (2003) estimates that typical riparian woodland restoration costs are approximately \$40,000 per acre, but these costs are comprehensive and include surface grading, a diverse and highly dense planting strategy, irrigation and mowing or herbicide application to eliminate weeds (Zentner, et al., 2003).

Costs for bank stabilization range from \$46,000 to \$222,000 per mile with a mean of \$86,000 per mile (Bair, 2000). Factors that influence the costs include:

1. Project size – Larger projects tend to have a lower cost per mile. Planning, design, and permitting requirements on small bank stabilization projects (<3000 feet) can quickly drive up the cost per mile. Large scale projects (1 to 9 miles) can absorb or reduce the implementation to fixed cost ratio and are more efficient.
2. Treatment intensity – Treatment intensity varies from site to site. For example, 200 feet of bank at one site may be treated with a single log jam or linear rock structures (e.g., bank barbs), while another site with 200 feet of unstable bank may require a series of barbs and floodplain contouring to stabilize.
3. Stream size – Planning, design, regulatory coordination, and treatment intensity typically increase with stream size and are inversely proportional to stream order.
4. Access – Access to the site usually dictates the equipment type and labor intensity. Clearing of debris or construction of temporary roads may be necessary. If larger

equipment is required, then the scope and dimensions of the physical access may be greater than if smaller equipment is sufficient.

5. Other factors include material, equipment, and labor availability and the length of time for the project.

Each component in this alternative is considered cost effective for the amount of creek restoration that will be gained. A breakdown of the costs per alternative component is listed below.

- This combination of alternative components (1, 2 and 3) would result in restoration of Cowhorn Creek upstream of the Facility. Approximately 16,600 linear feet, 2.5 acres of forested habitat, and six acres of wetland along Cowhorn Creek would be restored for \$2,200,000. Component 1 is naturalization of 2,600 linear feet of the Cowhorn Creek channel in the downtown area for \$300,000. Component 2 is stabilization of approximately 11,000 linear feet of eroding streambanks and native plantings along 9,200 linear feet for \$550,000. Component 3 is naturalizing the alignment, stabilizing and enhancing approximately 3,000 linear feet along Cowhorn Creek for \$1,350,000. Approximately 6 acres of wetlands will be constructed, and 2.5 acres of forested habitat will be preserved. At an assumed cost of \$42,000 per acre, the wetland construction and preservation would cost \$357,000 leaving \$1,843,000 or approximately \$111 per linear foot for stream restoration if funding were solely applied to stream restoration. The components (1, 2 and 3) estimated costs are well below the typical stream restoration published costs.
- Two alternative components (4 and 5) would preserve and enhance approximately 168 acres of wet forested habitat along Days Creek. Component 4 is preservation of 32 acres of wet forested habitat and enhancement of an additional 36 acres for \$40,000. Planned enhancements include litter pickup, understory seeding with native shade tolerant species mix to increase the biodiversity. Component 5 is preservation of 100 acres of forested riparian habitat for \$110,000. The City of Texarkana currently owns these properties and costs will address enhancements for 36 acres and administrative costs for preservation of 132 acres. Total costs for these components are estimated to be \$150,000 or approximately \$900 per acre. The components (4 and 5) estimated costs are in line with the published estimates for simple acquisition of acreage of at least \$1,000 per acre.
- Alternative component 6 is restoration and enhancement of approximately 2,000 linear feet along Howard Creek and the construction of approximately 23 acres of wetlands. This component costs are estimated to be \$1,000,000. At \$12,000 to \$42,000 per acre of constructed wetland cost, the total cost of construction of the 23 acres of wetland could range from \$276,000 to \$966,000 leaving anywhere from \$714,000 to \$24,000 for restoration and enhancement of 2,000 linear feet of Howard Creek. This component is considered cost effective because there are no property acquisition costs; however, the costs between the wetlands construction and stream restoration will have to be balanced appropriately so that all of the ecological goals are achieved.

- Alternative components 7, 8, and 9 would restore and enhance Swampoodle Creek at a total cost of \$6,050,000. Component 7 is construction of 2.85 acres of wetlands, removal of 665 linear feet of concrete lining in the stream channel and naturalization of the stream through Ferguson Park. The cost of component 7 is \$3,700,000 and includes the costs for removal of 1,100 to 1,700 linear feet of concrete downstream into the area represented in component 9. The cost of component 9 is \$650,000 and includes channel naturalizing/excavation, re-grading and planting. Component 8 is stabilization of 11,000 linear feet along Swampoodle Creek before it enters Days Creek north of the Facility at a cost of \$1,700,000. The 2.85-acre wetland would be constructed on the existing channel and therefore the water source is readily available. At an assumed cost of \$42,000 per acre, the wetland construction would cost \$120,000 leaving approximately \$5,930,000 or approximately \$400 per linear foot for stream restoration if funding were all applied to stream restoration. The components (7, 8 and 9) estimated costs are well below the typical stream restoration and wetland restoration comparison costs.
- Alternative component 10 is restoration of approximately 2,000 linear feet along Waggoner Creek with costs estimated to be \$400,000 or \$200 per linear foot. The component 10 estimated costs are well below the typical stream restoration published costs of \$500 to \$1,200.
- *Criterion #4-Reasonable Probability of Success:* The probability of success is considered high by the Trustees. The City of Texarkana is committed to the long-term success of this alternative as evidenced by more efficient management of storm water in the city. The properties are all owned by the City of Texarkana, so there are no land purchase that are required. The various components are located along existing urban streams and creeks that run through the City of Texarkana and south of the city. Because the proposed wetland restoration projects are located adjacent to existing streams, the maintenance of the wetlands should be less challenging than if the proposed components were upland fields located away from a perennial water source. Engineers will have to understand how to maintain consistent water flow in the creeks and wetlands as well as providing for urban flood controls. The wetlands can be used as a buffer for water management during times of heavy rains but must also be maintained as wet during dry times.
- *Criterion #5-Measurable Results:* Planning documents (e.g., engineering designs) will be developed but readily available standards and methodologies to measure performance and construction completion are common practice in the industry. The measures of success can be further defined with the Trustees during the planning process. A long-term management and monitoring plan would be developed with the Trustees to ensure that the wetlands were maintained properly, and any re-planting occurred in a timely manner.

4.2.2.2 NEPA Evaluation

Environmental and Socio-Economic Impacts Evaluation

The environmental and socio-economic impacts of the described restoration actions in this alternative are largely beneficial. This proposed stream channel restoration stabilizes the stream banks through native

plantings, bioengineering, and recreating the natural plan alignments. This alternative would improve water quality, reduce erosion and nutrient loading from adjacent urban land use, improve benthic and forage fish habitats, and naturalize hydrologic regimes. Similar benefits are anticipated with the creation of emergent and forested riparian wetlands along the waterways. Preservation of large tracts of deciduous and bottomland forest will ensure the continued presence of high quality refuge habitat for wildlife. The actions associated with this alternative could potentially affect noise levels and the pursuit of recreational activities in the vicinity of the alternative area. However, these effects will be minor and short-term and are not expected to influence long-term use of the area by the public. Beyond the short-term effects mentioned above, the area is expected to foster and enhance the ecological value and continued public use of the affected portion of the area through the improvements to the environment. Increases in productivity should improve species abundance and diversity at the site and enhance public use of the area, especially for environmental education and bird watching. Hydrologic improvements are expected to reduce flooding and erosion concerns. Implementation of this alternative would have a positive effect on the local economy and its citizens, given its proximity to the population center. Considering the setting and information available, the Trustees do not believe there is any meaningful uncertainty as to potential effects or unknown risks to the environment associated with implementing the proposed actions.

Physical, Biological, and Cultural Impacts Evaluation

Air Quality, Noise, Energy, Traffic: This alternative is located in a populated area with residential land use. Minor short-term adverse impacts to noise, traffic, and air quality may result from the construction and enhancement of wetlands. Exhaust emissions, construction traffic and noise, and energy consumption from construction equipment may result, but these impacts would be minimal and only occur during the construction phase of the alternative. Air contaminants would be quickly dissipated by prevailing winds. There would be no long-term negative impacts.

Water Quality and Geology: In the short term, during the period of construction, earth-moving activities will increase turbidity in the area resulting in moderate adverse impacts. Over the longer term, the selected restoration action will re-establish, enhance, and increase the acreage of freshwater wetlands and help improve local water quality via filtration of larger volumes of water through better management of rainfall runoff. Cowhorn, Days, Swampoodle, and Waggoner creeks are all on the TCEQ Concerns List for organics and/or impaired habitat and microbenthic communities (TCEQ, 2015). The restoration actions will improve these known water quality issues, directly addressing habitat and species concerns recognized by the State in these waterbodies.

Freshwater wetland and stream restoration would improve riparian habitat function but would not displace or diminish unique geographic areas. No unique or rare habitat would be destroyed due to alternative implementation. Stream restoration activities will facilitate a natural flux of sediment in and out of floodplains. The return of more natural hydrologic regimes would reduce the “flashiness” of stream hydrology responsible for flash flooding and extreme erosion.

Contaminants, Public Health and Safety: Restoration activities are not expected to have any impacts on public health and safety. The risk of spills from construction equipment should be acknowledged but can

be minimized using secondary containments and other preventative measures. Likewise, sediment runoff from clearing and construction activities is possible; however, silt fences and other measures can be implemented to prevent erosion.

Biological Environment: During the active restoration phase of this alternative, potential short-term and localized impacts include increased noise levels from vehicle traffic and use of large equipment. Increases in turbidity during construction are also possible. Work in stream channels will utilize proper sediment and erosion control measures. These effects will be minor and short-term and are not expected to influence long-term use of the area by wildlife. The Trustees do not believe that the proposed alternative would have a net adverse effect on vegetation and wildlife. There is currently limited wetland vegetation at the sites of proposed alternative construction. Any wildlife that may be present in the area during restoration activities are likely mobile and would move during construction activity. There is adequate habitat adjacent to the area to provide sufficient space for refuge during operations. Ultimately, the wildlife, invertebrate, and wetland plant communities would be positively impacted by the construction, enhancement, and preservation of riparian wetland services that would be achieved through the proposed alternative restoration activities.

Endangered Species: As noted in Section 2.2.3, several state- and federally-listed species may be present in Bowie County; however, the proposed actions are not likely to adversely affect threatened or endangered species or their designated critical habitats. The area is heavily urbanized and does not provide habitat to threatened and endangered species. Some listed species, such as the bald eagle, may benefit from the restoration alternatives. Prior to project implementation, the Trustees would coordinate and complete consultation with USFWS on this alternative regarding any potential impacts to protected species in accordance with section 7 of the ESA. The Trustees, in consultation with USFWS, would incorporate and implement conservation measures recommended during consultation in final project design and implementation to avoid or minimize impacts to protected species and critical habitats.

Environmental Justice: The proposed alternative does not have the potential to negatively or disproportionately affect minority or low-income populations in the City of Texarkana, either economically, socially, or in terms of conditions affecting their health. In particular, Cowhorn Creek enhancement components are located in a low-income housing area of Texarkana and would directly benefit an economically disadvantaged population. The alternative outlines plans which would include an H&H study to avoid unintentional flooding as a result of construction or final disposition of stream hydrology. The proposed activities would help restore an environment that is of benefit to all citizens.

Recreation: The noise and increased turbidity of surface waters resulting from earth-moving activities during alternative construction are expected to discourage and decrease recreational activities in the vicinity of the site during construction. Any such effect will be limited to the short time period of construction and should be minor. Over the longer term, the selected restoration action will increase the quality, quantity, and productivity of natural areas. The unique urban setting of these alternatives provides an opportunity to increase educational and recreational values of existing natural resources in the City. The restored riparian habitat in Days Creek will support many recreational activities (e.g., bird watching), and the improvement in site conditions will enhance opportunities for, and quality of, a variety of recreational uses.

Cultural Resources: There are no known historic sites or significant cultural, scientific, or historic resources in the area that would be affected by the proposed restoration actions. If this alternative is selected, a complete review of the site under section 106 of the NHPA would be completed prior to any construction activities being implemented, with consideration of measures to avoid, minimize, or mitigate any adverse effects on any cultural resources located within the site area. This alternative would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources.

4.2.3 Alternative 5: Days Creek – Urban Wetland Restoration and Enhancement

The Trustees developed Alternative 5 by combining various components of the Days Creek Watershed Comprehensive Aquatic Ecosystem Restoration project idea into an alternative focused on urban wetland restoration. This alternative includes approximately 66 acres of urban wetland restoration and enhancement of approximately 15,000 linear feet of creek stabilization, development, or restoration in and around the City of Texarkana within the Days Creek and Swampoodle Creek watersheds and Spring Lake Park.

4.2.3.1 CERCLA Evaluation

- *Criterion #1-Direct Ecological Benefits:* The creation and enhancement of urban wetlands, wet woods, and riparian habitat, and the stabilization/restoration of urban stream channels would improve water quality and other ecological services associated with aquatic habitats. This alternative is generally located upstream of the Facility, and the creation of enhanced ecosystem services (improved water quality and management of urban runoff) would directly benefit the portions of Days and Waggoner creeks that flow adjacent to the Facility. However, a lack of continuity between the alternative components (i.e., they are disconnected geographically) could lower the ecological benefits from the project. For example, a 5-acre isolated wetland in an urban setting provides some level of ecological value but is not as productive and provides less ecological value than wetlands that are part of a connected system such as a larger wetland or creek. The Trustees concluded that there are direct ecological benefits, but they are limited due to the lack of connectivity between the restoration areas and the potential future surrounding urban encroachment.
- *Criterion #2-Technical Feasibility:* The Trustees have concerns about the technical feasibility for this alternative. The majority of the project components included in this alternative are urban, isolated wetlands not constructed in naturally wet areas and therefore unlikely to be self-sustaining.
- *Criterion #3-Cost Effectiveness:* Costs for wetlands developed vary widely depending on if the project site is currently a perennial wetland, seasonal wetland, or wet meadow. The costs per acre for the creation of wetlands from mowed, upland lots in an urban environment is higher than the acquisition, restoration, and preservation of existing wet areas or freshwater wetlands. As described in Section 4.2.2, the costs for constructed wetlands from seasonal or wet meadows range from \$9,000 to \$42,000 per acre, and the costs for bank stabilization range average \$86,000 per mile.

The Trustees estimate the total cost of Alternative 5 to be \$6,600,000. Individual component costs are described below².

- Component 1: Create approximately 18 to 20 acres of freshwater wetlands. Estimated costs are \$1,200,000 or approximately \$60,000 per acre. The wetlands will be located between Days Creek and the City's wastewater treatment plant in cleared open areas that are currently uplands consisting predominantly of mowed grass. Published costs for constructed wetlands from seasonal or wet meadows range from \$9,000 to \$42,000 per acre. This component cost is greater than the higher end of the range, but the area prior to wetlands construction is not considered a seasonal or wet meadow, but an upland mowed field and therefore costs are expected to be higher. Development of wetlands from upland non-wet areas most likely include excavation, earth moving, plantings, and some method to maintain the water in the area. Given the comparable costs, this component cost is reasonable.
- Component 2: Stabilize approximately 4,000 linear feet downstream of the Facility and create a series of treatment wetlands near the City's mulch operation and wastewater treatment plant. Estimated component costs are \$2,000,000. Assuming the total acreage of the wetlands will be 30 acres, the cost is approximately \$1,260,000 (assuming \$42,000 per acre), and the remaining \$740,000 could be applied to stream stabilization (approximately \$185 per linear foot). This component cost as compared to published values is cost effective, but sufficient detail on the scope of the stabilization or the current nature of the areas slated to become wetlands (i.e., how wet the areas are currently) is not well understood.
- Component 3: Create 1.2 acres of wet woods within Karrh Park. Estimated alternative costs are \$15,000 or approximately \$12,500 per acre. As compared to published costs for development of wet woods, this component is reasonable.
- Component 4: Restore and enhance 1.6 acres of wooded habitat. Estimated alternative costs are \$115,000 or approximately \$72,000 per acre. Zentner et al. (2003) estimates that typical riparian woodland restoration costs are approximately \$40,000 per acre. Comparative wetland construction costs are reported to be \$42,000. Based on these comparisons, the restoration and enhancement of 1.6 acres of wooded habitat is not cost effective.

² A cost was not estimated for component 7. This component involves working with a private landowner along an approximate 310-linear-foot segment of an unnamed stream channel, establishing a conservation easement, and restoring approximately 0.5 acres of riparian habitat.

- Component 5: Create 12 acres of wooded wetlands along C.K. Bender Elementary School property. Estimated alternative costs are \$1,550,000 or approximately \$129,000 per acre. Comparative wetland construction costs are reported to be \$42,000. Based on this comparison, the creation of 12 acres of wooded wetlands is not cost effective.
- Component 6: Restore approximately 2 acres of wet woods around an existing pond and stream channel within Karrh Park. Estimated alternative costs are \$220,000 or \$110,000 per acre. Comparative wetland construction costs are reported to be \$42,000. Based on this comparison, the creation of 2 acres of wet woods is not cost effective.
- Component 8: Create approximately 5 acres of wetland between Martin Luther King Boulevard and West 4th Street. Estimated alternative costs are \$300,000 or \$60,000 per acre. Comparative wetland construction costs are reported to be \$42,000. Based on this comparison, the creation of 5 acres of wetlands is not cost effective.
- Component 9: Create approximately 10 acres of wetland along Swampoodle between College Drive and West 4th Street. Estimated alternative costs are \$600,000 or approximately \$60,000 per acre. Comparative wetland construction costs are reported to be \$42,000. Based on this comparison, the creation of 10 acres of wetlands is not cost effective.
- Component 10: Restore approximately 6 acres of riparian habitat along 11,000 linear feet of Swampoodle between College Drive and West 4th Street. Estimated alternative costs are \$60,000 or approximately \$10,000 per acre. Planting for the riparian woodland is complex because of the range of plant sizes and types and the potential need for irrigation. Bair (2000) estimates that costs range from \$4,000 to \$8,000 per mile with an average of \$5,000 a river mile or \$110 per acre assuming conventional hand crews and heavy equipment are used for planting hard woods and shrubs. Zentner et al. (2003) estimates that typical riparian woodland restoration costs are approximately \$40,000 per acre, but these costs are comprehensive and include surface grading, a diverse and highly dense planting strategy, irrigation, and mowing or herbicide application to eliminate weeds. Because this component is to occur within the urban area of College Drive and West 4th street, it is assumed that significant earth moving, planting, and management of water would be required. Based on these assumptions and the comparative cost analysis, component 10 is reasonably cost effective.
- Component 11: Create approximately 5 acres of wetlands along Spring Lake in Spring Lake Park. Estimated alternative costs are \$300,000 or approximately \$60,000 per acre. Comparative wetland construction costs are reported to be \$42,000. Based on this comparison, the creation of 5 acres of wetlands is not cost effective.
- Component 12: Construct approximately 3 acres of wetlands and approximately 300 feet of boardwalk at Spring Lake Park. Estimated alternative costs are \$240,000 or approximately \$80,000 per acre. Comparative wetland construction costs are reported to

be \$42,000. Based on this comparison, the creation of 3 acres of wetlands is not cost effective.

- *Criterion #4-Reasonable Probability of Success:* The Trustees consider this alternative to have a reasonable probability of success. The commitment by the City of Texarkana is key to the success of this alternative.
- *Criterion #5-Measurable Results:* For the majority of these alternative components, the primary measure of success is the creation of the wetlands. A long-term management plan would be developed with the Trustees to ensure that the wetlands were maintained properly, and any re-planting occurred in a timely manner. Various planning documents (e.g., engineering designs) would be developed. The measures of success and monitoring can be further defined with the Trustees during the planning process.

4.2.3.2 NEPA Evaluation

Environmental and Socio-Economic Impacts Evaluation

The environmental impacts of Alternative 5 are largely beneficial; however, those benefits were deemed relatively small compared to the larger stream rehabilitation and preservation projects preferred by the Trustees. The creation of small, isolated wetlands in an urban setting can provide environmental benefits through improvements in water quality, aesthetics, and localized flood control. These areas can be susceptible to invasive species and eutrophication, making them expensive to maintain. There are small socio-economic benefits to the alternative components (e.g., added educational and recreational value to school grounds).

Physical, Biological, and Cultural Impacts Evaluation

Air Quality, Noise, Energy, Traffic: This alternative is located in a populated area with residential land use. Minor short-term adverse noise, traffic, and air quality impacts may result from the construction and enhancement of wetlands. Exhaust emissions, construction traffic and noise, and energy consumption from construction equipment may result, but these impacts would be minimal and only occur during the construction phase of the alternative. Air contaminants would be quickly dissipated by prevailing winds. There would be no long-term negative impacts.

Water Quality and Geology: In the short term, during the period of construction, earth-moving activities would increase turbidity in the area. After construction, regrading, and planting is completed, water quality would significantly improve. Over the longer term, the wetland construction and use would improve local water quality up to the capacity of the wetlands to treat flow-through surface water. Stream restoration activities will facilitate a natural flux of sediment in and out of floodplains. The return of more natural hydrologic regimes reduces the “flashiness” of stream hydrology responsible for flash flooding and extreme erosion. However, the small size and location of the projects included in this alternative limits the potential for water quality improvement.

Contaminants, Public Health and Safety: Wetland construction activities are not expected to have any negative impacts on public health and safety. The risk of spills from construction equipment should be

acknowledged but can be minimized using secondary containments and other preventative measures. Likewise, sediment runoff from clearing and construction activities is possible; however, silt fences and other measures can be implemented to prevent erosion.

Biological Environment: Minor long-term ecological benefits may be recognized by the construction and enhancement of small, isolated urban wetlands. Those benefits come at the price of considerable maintenance costs, litter cleaning, invasive plant treatment, and possible eutrophication concerns. Some bird and wildlife species may utilize these wetlands for foraging and nesting; however, more sensitive species may avoid these areas or be unsuccessful in living and breeding in them.

Endangered Species: The proposed actions are not likely to adversely affect threatened or endangered species or their designated critical habitats. The site is heavily urbanized and does not currently provide habitat to threatened and endangered species. Prior to project implementation, the Trustees would coordinate and complete consultation with USFWS on this alternative regarding any potential impacts to protected species in accordance with section 7 of the ESA. The Trustees, in consultation with USFWS, would incorporate and implement conservation measures recommended during consultation in final project design and implementation to avoid or minimize impacts to protected species and critical habitats.

Environmental Justice: The proposed alternative does not have the potential to negatively or disproportionately affect minority or low-income populations in the City of Texarkana, either economically, socially, or in terms of conditions affecting their health. Components of this alternative are generally not located in demographically-disadvantaged neighborhoods. The proposed activities may improve environmental conditions to the benefit of all citizens.

Recreation: There are components that would directly benefit the public by improving or creating recreational opportunities (e.g., creation of a boardwalk, wetland creation in a city park). None of the alternative components would negatively influence the availability and quality of recreation within the City of Texarkana.

Cultural Resources: There are no known historic sites or significant cultural, scientific, or historic resources in the area that would be affected by the proposed restoration actions. Prior to project implementation, the Trustees would coordinate and complete consultation with USFWS on this alternative regarding any potential impacts to protected species in accordance with section 7 of the ESA. The Trustees, in consultation with USFWS, would incorporate and implement conservation measures recommended during consultation in final project design and implementation to avoid or minimize impacts to protected species and critical habitats. If this alternative is selected, a complete review of the site under section 106 of the NHPA would be completed prior to any construction activities being implemented, with consideration of measures to avoid, minimize, or mitigate any adverse effects on any cultural resources located within the site area. This alternative would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources.

4.2.4 Alternative 6: Longview Arboretum and Nature Park

This alternative would fund the construction of Phase 1 of a public park as part of the Master Plan for the Longview Arboretum and Nature Center. The proposal includes the development of a nature center, gardens, and associated infrastructure.

4.2.4.1 CERCLA Evaluation

- *Criterion #1-Direct Ecological Benefits:* Once completed, the Longview Arboretum and Nature Park would improve water quality and mitigate the effects of stormwater. Restoration for pine woodlands, bottomland hardwood, and riparian areas is planned within the 28-acre park. Due to the scale of the restoration of bottomland hardwoods and riparian areas, as well as potential future development of the surrounding area, the Trustees concluded that direct ecological benefits are small in comparison to other alternatives proposed in this Draft RP/EA.
- *Criterion #2-Technical Feasibility:* The Longview Arboretum and Nature Park will be situated within a 28-acre area and will require significant construction and management. The long-term technical feasibility was determined to be low by the Trustees.
- *Criterion #3-Cost Effectiveness:* The estimated total cost of this alternative is \$1,100,000. The funding would primarily address infrastructure costs for waterlines and faucets, bridges, maintenance facility, development of lawn area and irrigation, restrooms and utilities, pond creation and creek improvements, restoration and management, contractual fees, permitting, and contingency. Although this alternative does include development of aquatic and wetland habitat, funds will largely be applied to the infrastructure placement. Given the limited amount of ecological benefits to forested riparian, bottomland hardwoods, aquatic, and/or wetland habitats, this alternative is not considered cost effective.
- *Criterion #4-Reasonable Probability of Success:* This alternative has a reasonably high probability of success as an arboretum and park in an urban setting. The City of Longview has completed significant planning and investigation as is shown in the Master Plan documentation, though the availability of future funds needed to complete the project is unknown.
- *Criterion #5-Measurable Results:* The Phase I infrastructure development would provide minimal measurable result that align with the Trustees' goal to restore, replace, or acquire the equivalent of the injured natural resources.

4.2.4.2 NEPA Evaluation

Environmental and Socio-Economic Impacts Evaluation

The installation of the Longview Arboretum and Nature Park would provide some environmental benefits to the larger urban environment through the creation of new green spaces, increased coverage of native flora, and possible a wildlife refuge. A detailed environmental impacts evaluation of this alternative is difficult to ascertain due to the limited ecological objectives of the alternative and the divergence of alignment from offsetting damages associated with losses of ecological services at the Facility. The majority of benefits are associated with socio-economic effects of the alternative. Considerable outdoor recreational opportunities would be created constructing the alternative.

Physical, Biological, and Cultural Impacts Evaluation

Air Quality, Noise, Energy, Traffic: The site of the arboretum and park is located in a populated residential area. Minor short-term adverse impacts may result from the development of the arboretum and park.

Exhaust emissions, construction traffic and noise, and energy consumption from this equipment may result, but these impacts would be minimal and only occur during the construction phase of the alternative. Air contaminants would be quickly dissipated by prevailing winds. There would be no long-term negative impacts.

Water Quality and Geology: After construction, regrading, and planting are completed, water quality may improve in Grace Creek through reduced erosion, nutrient loads, and runoff. These improvements would be contingent upon management of fertilization application, water drainage, water storage, and landscaping associated with the final design.

Contaminants, Public Health and Safety: The alternative should not result in any contaminants released into the environment. The risk of spills from construction equipment should be acknowledged but can be minimized using secondary containments and other preventative measures. Likewise, sediment runoff from clearing and construction activities is possible; however, silt fences and other measures can be implemented to prevent erosion.

Biological Environment: The construction of an arboretum and park in the City of Longview may provide nesting sites for local fauna; however, benefits to the biological environment are anticipated to be minimal. Urban green spaces are common through the City already. The arboretum and park are planned to be managed for recreation and educational uses, minimizing the opportunity for in-kind compensation of ecosystem services lost at the Facility.

Endangered Species: The proposed actions are not likely to adversely affect threatened or endangered species or their designated critical habitats. The site is urbanized and does not currently provide critical habitat to threatened and endangered species. Some listed migratory waterfowl and wading birds, including piping plover (*Charadrius melodus*), least tern (*Sterna antillarum*), and red knot (*Calidris canutus rufa*), may benefit from the construction of the alternative.

Prior to project implementation, the Trustees would coordinate and complete consultation with USFWS on this alternative regarding any potential impacts to protected species in accordance with section 7 of the ESA. The Trustees, in consultation with USFWS, would incorporate and implement conservation measures recommended during consultation in final project design and implementation to avoid or minimize impacts to protected species and critical habitats.

Environmental Justice: Adjacent land use to the proposed alternative is limited to commercial development. The proposed alternative impacts, positive and negative, would be realized throughout the City of Longview for all its residents. The proposed alternative does not have the potential to negatively or disproportionately affect minority or low-income populations in the City of Longview, either economically, socially, or in terms of conditions affecting their health. The proposed activities should improve access to green spaces and educational opportunities of benefit to all citizens.

Recreation: The alternative would substantially improve recreational opportunity (e.g., hiking, birding) in the City of Longview. The alternative has a unique design that would inspire and educate residents and visitors.

Cultural Resources: There are no known historic sites or significant cultural, scientific, or historic resources in the area that would be affected by the proposed actions. If this alternative is selected, a complete review of the site under section 106 of the NHPA would be completed prior to any construction activities being implemented, with consideration of measures to avoid, minimize, or mitigate any adverse effects on any cultural resources located within the site area. This alternative would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources.

4.2.5 Alternative 7: Mineola Nature Preserve – Restoration and Enhancement

This alternative includes the following restoration and rehabilitation activities: 1) plant hardwood trees and prevent the establishment of invasive species, 2) perform hydrological work to improve drainage so that the natural flow of water is not restricted, and 3) mechanically clear land (e.g., mulching/grinding activities) to remove large woody debris piles in the southeast portion of the Mineola Nature Preserve (Preserve) to improve hydrology.

4.2.5.1 CERCLA Evaluation

- *Criterion #1-Direct Ecological Benefits:* This alternative provides direct ecological benefits to forested riparian, bottomland hardwoods, aquatic and wetland habitats in the geographic area identified by the Trustees. These restored habitats are equivalent to the injury to freshwater benthic invertebrate communities in Days, Waggoner, and Howard creeks in that they enhance freshwater flow and riparian and bottomland hardwood diversity and health. Because of the enhancements to the Preserve, aquatic habitat and surface water flow would be improved, providing habitat for benthic invertebrate communities. In addition, the Preserve provides connectivity along the Sabine River due to its proximity to the Little Sandy National Wildlife Refuge and the Old Sabine Bottom Wildlife Management Area.
- *Criterion #2-Technical Feasibility:* The Preserve is owned and maintained by the City of Mineola as part of a comprehensive development plan to protect wildlife and habitat. The active management of the Preserve by the City has led to a good understanding of where the actions described in this alternative will be most effective for the long term. All the activities proposed would be technically feasible.
- *Criterion #3-Cost Effectiveness:* Total estimated cost for this alternative is \$500,000. The planting of hardwood trees is estimated to cost \$150,000 and includes site preparation, purchase and planting of seedlings, herbicide application, and annual maintenance and monitoring for 5 years. Published costs for planting of trees range from \$350 to \$550 per acre. Only a portion of the 2,911-acre Preserve will be planted. The cost of \$150,000 for this alternative would allow approximately 300 acres to be replanted with hardwoods.

Hydrological improvements are estimated to cost between \$125,000 and \$175,000. The alternative would occur over 2 years followed by annual monitoring for 5 years. Costs for mowing or other mechanical manipulations depends on labor, fuel, and machinery costs. Hydrological improvements might include placement of culverts or other structures to enhance the natural

flow of water. The cost of \$175,000 for this alternative would include surveying, engineering designs, heavy equipment, and labor.

Debris removal would be achieved by purchasing mulching/grinding equipment, which is estimated to be \$150,000 with an additional \$50,000 for a part-time operator. Equipment for management of dead trees and debris ranges from \$20,000 for a trailer chipper/shredder pulled behind a standard pickup truck to \$200,000 for a tub grinder that can demolish large tree trunks. More expensive models up to \$600,000 are available that can turn 45-inch diameter trees into mulch. The estimate of \$150,000 for this alternative would allow for purchase of a reasonable sized commercial shredder.

- *Criterion #4-Reasonable Probability of Success:* The TPWD and the City of Mineola have already demonstrated a successful working relationship with the initial development of the Preserve in 2002. The City of Mineola and the TPWD have a Texas Recreation and Parks Account Agreement which requires the City of Mineola to obtain prior authorization from the TPWD before performing certain types of activities at the Preserve. This alternative was given a high probability of success by the Trustees.
- *Criterion #5-Measurable Results:* Potential measures of success include 1) successful planting and growth of native hardwoods, 2) measured improvement in water flow and water quality, and 3) removal of debris. These measures require considerable development through an implementation and monitoring plan.

4.2.5.2 NEPA Evaluation

Environmental and Socio-Economic Impacts Evaluation

The environmental and socio-economic impacts of the described restoration action for the Mineola Nature Preserve are entirely beneficial. This alternative entails the restoration and enhancement of areas already under conservation through planting, improvements to surface water drainage, and removal of excess large wood debris. Given the setting and information available, the Trustees do not believe there is any meaningful uncertainty as to potential effects or unknown risks to the environment associated with implementing the selected actions. The proposed actions will provide direct ecological benefits to the various wetland habitats within the Preserve and to the overall aquatic ecosystem. Additionally, the proposed alternative would also provide improved habitat for various wildlife species.

The Preserve supports visitor access for hiking, biking, birding, wildlife viewing, horseback riding, fishing, camping, and education and event opportunities. Clearing, construction, and earth-moving activities associated with restoration and enhancement of Preserve lands will affect noise levels and the pursuit of recreational activities in the nearby area. However, these effects will be short-term and are not expected to influence long-term use of the area by the public. Beyond the short-term effects mentioned above, the proposed restoration work is expected to enhance the ecological value and foster continued public use of the affected portion of the Preserve through the improvements to the environment. Increases in productivity should improve species abundance and diversity and enhance public use of the area, especially for environmental education, recreational fishing, and bird watching. Implementation of this

proposed alternative could positively affect the local economy and its citizens through increased visitation to the Preserve.

Physical, Biological, and Cultural Impacts Evaluation

Air Quality, Noise, Energy, Traffic: The Preserve is not located in a populated area; however, minor short-term adverse impacts may result from the proposed construction activities. Exhaust emissions, construction traffic, and noise may periodically and temporarily disturb wildlife in the immediate vicinity of the site, or cause movement of wildlife away from the Preserve. Similarly, recreating humans may avoid this area due to noise during construction, but as with wildlife, these impacts would only occur during the construction phase of the alternative, with minimal impacts, and air contaminants should be quickly dissipated by prevailing winds. There would be no long-term negative impacts.

Water Quality and Geology: In the short term, earth-moving activities during the period of construction may increase turbidity in adjacent surface waters to some degree. Best management practices (e.g., containment berms, erosion control) should be employed to minimize the extent, duration, and intensity of water quality impacts during construction. After construction is completed, the sediments should generally be stable as the material removed from the artificial uplands has already de-watered. Over the longer term, the selected restoration action will re-establish, enhance, and increase productivity by removal of excess large woody debris, restoration of natural hydrology, and new plant growth, and help improve local water quality.

Contaminants, Public Health and Safety: Restoration activities are not expected to have any impacts on public health and safety. The restoration alternative would not present any unique physical hazards to humans. The risk of spills from construction equipment should be acknowledged but can be minimized using secondary containments and other preventative measures. Likewise, sediment runoff from clearing and construction activities is possible; however, silt fences and other measures can be implemented to prevent erosion.

Biological Environment: The Preserve has a relatively high diversity of ecological communities for its overall size. Communities present include open water, emergent marshes, wetland scrub, forested bottomland hardwoods, riparian wetlands, improved pastureland, and upland hardwood/pine habitat. Waterfowl and bird species utilizing the Preserve are diverse and abundant.

During the active restoration phase of this proposed alternative, short-term and localized impacts including increased noise levels from vehicle traffic and use of large equipment could occur. Impacts to water quality within and near the proposed alternative site during construction are also possible. These effects will be minor and short-term and are not expected to influence long-term use of the area by wildlife such as wintering ducks, shore birds, or wading birds. Mobile fish and invertebrates would probably not be affected, since these would most likely leave the area and return after completion of construction activities. The Trustees do not believe that the proposed alternative would have a net adverse effect on vegetation and wildlife. Any wildlife that may be present in the area during restoration activities are likely mobile and would move during construction activity. There is adequate habitat adjacent to the area to have sufficient opportunity for refuge during operations. Ultimately, the wildlife,

invertebrate, and wetland plant communities would be positively impacted by the enhancement of wetland services that would be achieved through the proposed alternative restoration activities.

Endangered Species: As noted in Section 2.2.3, several state- and federally-listed species may be present. A TPWD assessment of potential threatened and endangered species was provided by the project proponent. Potential species include bald eagle, creek chubsucker, paddlefish, alligator snapping turtle, Louisiana pine snake, northern scarlet snake, and timber rattlesnake. A query of federally-listed species habitat on USFWS resource list database did not return any listed species likely to use the on-site habitat. The proposed action is not likely to adversely affect threatened or endangered species or their designated critical habitats. Some listed species, such as the bald eagle and alligator snapping turtle, can be temporarily relocated during construction, if deemed necessary, but would ultimately benefit from the restoration. If necessary, the Trustees would coordinate and complete consultation with USFWS on this alternative regarding potential impacts to protected species in accordance with section 7 of the ESA prior to project implementation. Surveys would be completed and, if protected species were present, conservation measures recommended during consultation would be incorporated in final project design and implementation to avoid or minimize impacts to protected species and critical habitats.

Environmental Justice: The proposed alternative does not have the potential to negatively or disproportionately affect minority or low-income populations in the Mineola area, including economically, socially, or in terms of conditions affecting their health. The proposed restoration alternative has no unique attributes or characteristics in regard to the mission or activities currently imposed at the Preserve. The proposed activities would help restore an environment that is of benefit to all citizens.

Recreation: The restoration of biological communities at the Preserve could enhance the current level of recreation.

Cultural Resources: There are no known historic sites or significant cultural, scientific, or historic resources in the area that would be affected by the proposed restoration actions. If this alternative is selected, a complete review of the site under section 106 of the NHPA would be completed prior to any construction activities being implemented, with consideration of measures to avoid, minimize, or mitigate any adverse effects on any cultural resources located within the site area. This alternative would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources.

4.2.6 Alternative 9: Sulphur Springs Wastewater Treatment Plant Wetlands Habitat

This alternative involves working with the City of Sulphur Springs to convert 100 acres of grass meadow to wetlands and purchase an additional 100 acres of wetlands around Lake Sulphur Springs for preservation and recreational use. The process would include transferring water from the existing wastewater treatment plant to the constructed wetlands.

4.2.6.1 CERCLA Evaluation

- *Criterion #1-Direct Ecological Benefits:* The alternative does provide enhancement of benthic and freshwater habitats through the construction and acquisition of wetlands. Isolated constructed

wetland habitats provide unique ecological benefits, but they may not be equivalent to the service losses associated with the Facility.

- *Criterion #2-Technical Feasibility:* The initial design documentation demonstrates that the alternative is technically feasible; however, the technical feasibility of developing and maintaining a constructed wetland using pipes and pumps to provide water does not result in a self-sustaining wetland in perpetuity.
- *Criterion #3-Cost Effectiveness:* The total cost of this alternative, \$6,000,000, includes the purchase of land, construction of 100 acres of wetlands, preservation of another 100 acres of existing wetlands, recreational amenities, and all the utilities necessary to get reclaimed water from the wastewater treatment plant to the wetlands area. This is a cost of approximately \$30,000 per acre, though this cost does not distinguish between construction and preservation. Costs for wetland construction can typically cost \$42,000 per acre. Given this comparison, the construction of 100 acres of wetlands and preservation of another 100 acres would be below typical cost and therefore considered acceptable. The greatest costs associated with this project (\$3.4 million) appear to be related to the construction of the water conveyance pipeline systems which run over long distances at the project site. The development of infrastructure piping, and their associated cost, does not align with the Trustees' restoration goals (restoration of riparian and benthic invertebrate habitat).
- *Criterion #4-Reasonable Probability of Success:* The Trustees determined the project has a reasonable probability of success; however, although the acquisition and maintenance of existing wetlands is likely to provide cumulative benefit, the long-term success of developing and maintaining a constructed wetland using pipes and pumps to provide water is a concern to the Trustees. The constructed wetlands are isolated and not contiguous with larger tracts of preserved wetland habitat.
- *Criterion #5-Measurable Results:* Potential measurable results for this alternative would be the successful development of constructed wetlands and maintenance of constructed and acquired wetlands; however, considerable planning and development are required. The infrastructure development would provide minimal measurable results that align with the Trustees' goal to restore, replace, or acquire the equivalent of the injured natural resources.

4.2.6.2 NEPA Evaluation

Environmental and Socio-Economic Impacts Evaluation

The construction of 100 acres of wetland habitat associated with the existing wastewater treatment plant would provide entirely positive benefits to the City of Sulphur Springs. The wetlands would accept water from the treatment plant to provide tertiary treatment of plant effluent. The additional supply of water from the constructed wetlands to Lake Sulphur Springs would supplement water supplies and improve water quality downstream via natural wetland filtration mechanisms. Additional benefits include the creation of ecological habitat, recreational opportunities, and educational assets. It is unclear as to the specific type of wetland habitat that would be created, but most flow-through wetlands designed for

water treatment are emergent marshes due to the superior water quality treatment services they provide. These habitats provide unique ecological benefits but may not be equivalent to the services lost associated with the Facility.

Socio-economic effects would be largely positive. Improvements to downstream water quality would make the use of Lake Sulphur Springs as drinking water source more feasible. The cost-benefit balance of such an alternative is difficult to ascertain due to the uncertainty of future water use; however, recreational and ecological uses are already established and would largely benefit from the alternative.

Physical, Biological, and Cultural Impacts Evaluation

Air Quality, Noise, Energy, Traffic: The proposed site for creation of the wetland habitat is located near a residential area of the City of Sulphur Springs. Minor short-term adverse impacts may result from the construction of wetlands and installation of pumps and pipes. Exhaust emissions, construction traffic and noise, and energy consumption from construction equipment may result, but these impacts would be minimal and only occur during the construction phase of the alternative. Air contaminants would be quickly dissipated by prevailing winds. There would be no long-term negative impacts.

Water Quality and Geology: In the short term, earth-moving activities during the period of construction will increase turbidity in the area resulting in a moderate adverse impact. After construction, regrading, and planting are completed, water quality will significantly improve. Over the longer term, the selected wetland construction and use will improve local water quality via filtration of larger volumes of water as better management of rainfall runoff will be in place. Significant water quality benefits would be achieved through additional removal of nitrogen and phosphorus loads to the lake. The alternative would not result in any geological or soil effects.

Contaminants, Public Health and Safety: Wetland construction activities are not expected to have any negative impacts on public health and safety. The risk of spills from construction equipment should be acknowledged but can be minimized using secondary containments and other preventative measures. Likewise, sediment runoff from clearing and construction activities is possible; however, silt fences and other measures can be implemented to prevent erosion. The reduction of nutrient loads into downstream waters reduces the risk of detrimental algal and bacterial blooms, which can cause significant harm to human health.

Biological Environment: The construction of the 100-acre wetland may provide forage and nesting sites for local and migratory fauna. The City of Sulphur Springs anticipates acquiring an additional 100 acres of existing wetlands around the Lake of Sulphur Springs. This combined approach would increase the quality of habitat the lake provides to wildlife. Constructed wetlands, especially those used for water quality treatment, may be susceptible to encroachment of invasive plant species. Considerable effort may be required to maintain native plant community structure. If the alternative is implemented successfully, wildlife, invertebrate, fish, and wetland plant communities would be positively impacted by the additional wetland services achieved through the proposed alternative.

Endangered Species: The proposed actions are not likely to adversely affect threatened or endangered species or their designated critical habitats. The site is heavily urbanized and do not currently provide critical habitat to threatened and endangered species. Some listed migratory waterfowl and wading birds

(e.g. piping plover, red knot, and least tern) may benefit from the creation of wetlands at Lake Sulphur Springs. If necessary, the Trustees would coordinate and complete consultation with USFWS on this alternative regarding potential impacts to protected species in accordance with section 7 of the ESA prior to project implementation. Surveys would be completed and, if protected species were present, conservation measures recommended during consultation would be incorporated in final project design and implementation to avoid or minimize impacts to protected species and critical habitats.

Environmental Justice: The proposed alternative impacts, positive and negative, would be realized throughout the City of Sulphur Springs by all residents. The proposed alternative does not have the potential to negatively or disproportionately affect minority or low-income populations in the City of Sulphur Springs, including economically, socially, or in terms of conditions affecting their health. The proposed activities should improve environmental conditions that are of benefit to all citizens.

Recreation: Proper alternative design and preventative measures should minimize the noise and potential for increased turbidity of surface waters arising from earth-moving activities during alternative construction. Over the longer term, the proposed wetland construction will increase the quality of recreational value at Lake Sulphur Springs. The unique urban setting of this alternative provides an opportunity to increase educational and recreational values of existing natural resources in the City. Improved water quality and expansion of wetland habitat would enhance opportunities for, and quality of, a variety of recreational uses.

Cultural Resources: There are no known historic sites or significant cultural, scientific, or historic resources in the area that would be affected by the proposed restoration actions. If this alternative is selected, a complete review of the site under section 106 of the NHPA would be completed prior to any construction activities being implemented, with consideration of measures to avoid, minimize, or mitigate any adverse effects on any cultural resources located within the site area. This alternative would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources.

4.2.7 Alternative 13: No Action

Under the “No Action” alternative, the Trustees would take no action to restore, rehabilitate, replace, or acquire natural resources or services equivalent to those lost due to hazardous substance releases at or from the Facility or remedial actions taken to prevent further or future harm.

4.2.7.1 CERCLA Evaluation

The Trustees’ injury assessment indicated that benthic resources were injured due to hazardous substances released from the Facility. Response actions have not yet been determined for this Facility, but they may not fully allow the injured resource to recover and would not compensate the public for the resource services lost over time due to the injuries. Natural resources will likely take decades to return to baseline ecological conditions. The Trustees believe there are feasible and appropriate opportunities within the northeast and east Texas watersheds to restore, replace, or provide services equivalent to those lost due to the release of hazardous substances and subsequent benthic, riparian, and bottomland hardwood injury (see 2.3 and 2.4). Under the “No Action” alternative, restoration actions needed to make the environment and

public whole for its losses would not occur. The no-action alternative would not provide the conditions necessary for recovery of the injured riparian ecosystem in a comprehensive, timely manner. With no action, key natural resources and services might not ever return or be replaced. If the proposed alternatives are not implemented, an opportunity would be lost to preserve the habitats specifically injured by actions at the Facility. Additionally, the public would not be compensated for the loss of ecosystem services associated with the Facility. This is inconsistent with the goals of the natural resource damage provisions of CERCLA. The Trustees determined that the “No Action” alternative should be rejected on this basis.

The Trustees evaluated the potential for restoration actions associated with both the proposed and the No Action alternative to impact the following: the physical environment (air and noise pollution, water quality, geological and energy resources, contaminants), the biological environment (fisheries, vegetation, wildlife and endangered species), the cultural and human use environment (environmental justice, recreation, traffic, and cultural resources), and the potential for cumulative impacts. Remedial actions proposed for or undertaken at the Facility are of a nature that precludes natural recovery under this option.

4.2.7.2 NEPA Evaluation

Environmental and Socio-Economic Impacts Evaluation

Under this alternative, no direct action would be taken to compensate for injured natural resources; instead, the natural processes for recovery of the injured natural resources would be allowed to occur at the Facility. The principal advantages of this approach are the ease of implementation and cost-effectiveness. This approach relies on the capacity of the ecosystem to “self-heal.” While some natural recovery of the injured natural resources in the riparian communities associated with and downstream from the Facility will likely occur over time, compensation for loss of ecological services would not be provided under the No Action recovery alternative. Losses were suffered in the aquatic stream benthos and forested riparian wetlands, and technically feasible, cost-effective alternatives exist to compensate for these losses. Therefore, the No Action alternative is not proposed as a preferred restoration alternative.

Physical, Biological, and Cultural Impacts Evaluation

Air Quality, Noise, Energy, Traffic: There would be no negative impacts to air quality, noise, energy, or traffic from the No Action alternative.

Water Quality and Geology: Under the No Action alternative, surface water quality and streambank stability benefits anticipated in Days Creek due to the proposed restoration actions would not occur. Under the No Action alternative there would be no compensation of additional freshwater wetlands in the area.

Contaminants, Public Health and Safety: The No Action alternative would not change current conditions or create a new potential for the release of contaminants affecting public health and safety.

Environmental Justice: By taking no action, there would be no enhanced benefits to the public from improvements to water quality in the area. The lack of meaningful recovery would contribute negatively to the economic and social well-being of all citizens.

Recreation: The No Action alternative would not implement the proposed actions and therefore would not result in any increased opportunities for recreational use.

Cultural Resources: The No Action alternative would have no effect on cultural resources in the area.

4.3 Cumulative Impacts

The combined proposed preservation and restoration actions outlined in this Draft RP/EA are expected to result in cumulative landscape-level benefits across east and northeast Texas bottomland hardwood and riparian ecosystems. The direct effects of the potential alternatives are local; however, the nature of watersheds is such that both benefits and impacts to one area can affect the system on a regional scale. While the alternative actions would not result in any change in the larger current pattern of boat traffic, economic activity, or land use, the creation and protection of habitat for benthos and fish species may contribute to an improved fishery. Naturalization of stream channels and the creation and preservation of floodplain in the Days Creek watershed will improve flood protection in a growing urban area. The addition of wetland acreage in the Days Creek watershed and enhancement activities at the Mineola Nature Preserve has the direct potential to improve water quality. The preservation of wildlife habitat in the proposed acquisition actions supplements existing habitat in the region, expanding and connecting critical habitat and increasing the resiliency of bird and mammal populations that utilize the network of wetlands and wildlife corridors of the greater ecosystem. The construction of the arboretum and park in the City of Longview could have cumulative economic impacts by benefitting local business and improving the quality of life through aesthetics and recreational opportunities; however, those cumulative impacts would only indirectly benefit the benthos and instream aquatic habitats injured by the release of hazardous substances at or from the facility.

Overall, no significant adverse cumulative impacts are anticipated from the proposed actions. A net cumulative beneficial impact may result from synergy with past, current, and future restoration activities.

In this Draft RP/EA, the proposed restoration actions to compensate for environmental damages associated with the Facility were considered in light of multiple planning efforts and opportunities in the region. These alternatives build upon prior and anticipated conservation activities implemented by the Trustees and their partners. Further, the actions selected are intended to compensate the public (i.e., make the public and the environment whole) for resources injuries caused by the release of hazardous substances into the watershed.

5.0 PREFERRED RESTORATION ALTERNATIVES SUMMARY

The Trustees considered each alternative individually and comparatively to identify the alternatives that best provide direct ecological benefits to forested riparian, bottomland hardwoods, aquatic, and/or wetland habitats cost effectively and with the highest probability of success in perpetuity. All the alternatives were ecologically equivalent to the injury (i.e., providing some kind of bottomland or aquatic benefit), and several of the alternatives added large amounts of acreage to existing preserved habitat areas (e.g., Caddo Lake Habitat Acquisition, Mineola Nature Preserve or Neches River Acquisition). The Trustees chose five preferred alternatives: Alternative 3: Caddo Lake Habitat Acquisition, Alternative 4: Days Creek, Alternative 7: Mineola Nature Preserve, Alternative 8: Neches River Bottomland Forest Acquisition, and Alternative 10: Talbot Prairie and Forest Land Acquisition. Two of the preferred alternatives (Alternative 7: Mineola Nature Preserve and Alternative 10: Talbot Prairie and Forest Land Acquisition) would be funded at the requested amount. The Trustees propose funding portions of Alternative 3: Caddo Lake Habitat Acquisition, Alternative 4: Days Creek, and Alternative 8: Neches River Bottomland Forest Acquisition that align with the Trustee restoration goals. Figure 5-1 summarizes the results of the CERCLA evaluation for the first seven criteria.

5.1 Individual Alternative Summaries

A summary of the assessment and the conclusions of the Trustees for each of the alternatives is presented below.

5.1.1 Alternative 1: Big Thicket Acquisition and Conservation

This alternative involves acquisition and protection of up to 1,200 acres of bottomland hardwood forest previously utilized as industrial forest land from a timber company, a willing seller. Upon acquisition, the project would transfer the property to the United States National Park Service to be incorporated as contiguous to the Big Thicket National Preserve (BTNP).

This alternative would provide benefits to bottomland hardwood forest; however, since the subject properties and adjacent properties have been logged for pine and hardwoods, and some pipeline infrastructure remains on the properties, the Trustees determined that the site has lower ecological value than other options considered. Preservation of the donated property in perpetuity through inclusion in the BTNP would require an Act of Congress. The associated lengthy timeline reduces the technical feasibility of this alternative. Although the cost of acquisition of the acreage is considered reasonable, the use of timber sales to generate funds for restoration actions may not align with the goals of the Trustees. The probability for success was considered to be low because of the extended time frame required for the conveyance process to be completed, the actions required to restore the landscape to historical

species, and the active timber management activities that will continue to occur adjacent to the subject properties. The Trustees did not choose Alternative 1 as a preferred alternative.

5.1.2 Alternative 2: Bottomland Hardwood Restoration and Chinese Tallow Eradication

This alternative involves treatment of Chinese tallow and planting of bottomland hardwood species. The treatment area would comprise 1,800 acres in the Stephen F. Austin Experimental Forest and 2,200 acres in the Alazan Bayou WMA. The treatment area is infested with Chinese tallow but is also seasonally flooded, and improvements would help the long-term sustainability of important habitat and natural systems.

The removal of Chinese tallow and improvement of Texas bottomland/floodplain would increase the biological diversity and ultimately benefit riparian and benthic invertebrate health in the bottomland hardwood habitat. The Trustees expect the alternative could take at least 5 years to complete but could take longer to completely ensure that the seedbank is devoid of Chinese tallow seeds and a sufficient number of hardwood species become established in the affected area. Total alternative cost is estimated to be \$1,700,000 or approximately \$425 per acre. This cost includes: 1) \$700,000 for cutting stumps, 2) \$700,000 for herbicide foliar spraying, 3) \$100,000 for hardwood planting using USFS supplied plants, 4) \$100,000 for hardwood planting from seedlings, and 5) \$100,000 for monitoring over 5 years. Although these costs appear to be reasonable and cost effective given relevant comparisons, costs do not include contingency costs if the eradication or hardwood planting is not successful. Instead, the project relies on existing programs within the Alazan WMA and USFS to continue herbicide treatments. The measures of success do not include hardwood success rates, invasive eradication rates, or actions to address insufficient success. The Trustees did not choose Alternative 2 as a preferred alternative.

5.1.3 Alternative 3: Caddo Lake Habitat Acquisition

This alternative involves the acquisition of approximately 3,500 acres within the Caddo Lake system. The acquired habitat would be swamp, slough, and headwaters, with the intention to better connect the landscape into either the Caddo Lake Wildlife Management Area or the Caddo Lake State Park.

This alternative will protect habitat for freshwater benthic invertebrate communities and the overall freshwater system. Alternative 3 is directly applicable to the injury to freshwater benthic invertebrate communities in Days, Waggoner, and Howard creeks. There are several tracts available for acquisition within Alternative 3, and the estimated costs range from \$1,000 to \$4,400. When these costs are compared to previous acquisitions by the Trustees, all the tracts would be considered cost effective because of the exceptional habitat quality and the increased congruency with other preserved properties. The inclusion of necessary activities outside of the acquisition in the estimated costs increases the cost effectiveness of Alternative 3. There is also a high probability of success for this alternative based on the

past partnerships of the managing entities and stability of the Caddo Lake system. The Trustees chose Alternative 3 as a preferred alternative.

5.1.4 Alternative 4: Days Creek – Enhancement and Restoration

This alternative was developed by combining various components of the Days Creek Watershed Comprehensive Aquatic Ecosystem Restoration project idea into an alternative that would preserve and enhance approximately 200 acres of forested riparian habitats and restore and stabilize about 6 miles of urban creek channels.

This alternative entails restoration and enhancement of existing stream corridors but also includes some development of wetlands and wet forest adjacent to the existing waterways. Because the wetlands and forested habitats are not isolated, there is a high likelihood that they will be viable and self-sustaining for the long term. The proposed activities are commonly completed in the industry and highly effective. These actions would directly compensate for habitat value lost at the Facility within the same watershed through the reestablishment of natural stream meanders, creation of wetland ecosystem services, and the preservation of existing habitats. The components that comprise Alternative 4 align with the Trustees' objective to compensate for injuries to freshwater benthic and riparian habitats in the South Central Plains ecoregion through the preservation, restoration, and creation of analogous habitat. The Trustees estimate the total cost of this alternative to be \$9,800,000. These components utilize mostly City of Texarkana property and include no costs for land purchase. The costs estimated for the individual components are well within or below comparison costs. The probability of success is considered high by the Trustees. Engineers will have to understand how to maintain consistent water flow in the creeks and wetlands as well as providing for urban flood controls. Planning documents (e.g., engineering designs) will be developed, but readily available standards and methodologies to measure performance and construction completion are common practice in the industry. The Trustees chose Alternative 4 as a preferred alternative.

5.1.5 Alternative 5: Days Creek – Urban Wetland Restoration and Enhancement

The Trustees developed Alternative 5 by combining various components of the Days Creek Watershed Comprehensive Aquatic Ecosystem Restoration project idea into an alternative focused on urban wetland restoration. This alternative includes urban wetland restoration and enhancement in and around the City of Texarkana within the Days Creek and Swampoodle Creek watersheds and Spring Lake Park.

The development of urban wetlands, wet woods, riparian habitat and stabilization/restoration of urban stream channels would adequately compensate for habitat lost at the Facility by improving water quality and benthic invertebrate habitat within the same watershed as the injury. However, there is a lack of continuity between the alternative components (i.e., they are disconnected geographically and are small amounts of acreage). For example, a 2- or 6-acre isolated wetland in an urban setting, although providing some level of ecological value, would be more productive and provide more ecological value if it was connected or part of a larger wetland or creek. The isolated and urban nature of these components not constructed in naturally wet areas and are unlikely to be self-sustaining. Overall, this alternative is not considered cost effective for the amount of stabilization, restoration, and wetland development proposed. Development of wetlands from upland non-wet areas most likely include excavation, earth

moving, plantings, and some method to maintain the water in the area. Some of the individual components propose reasonable costs, but many of them are significantly greater than comparative costs. The Trustees did not choose Alternative 5 as a preferred alternative.

5.1.6 Alternative 6: Longview Arboretum and Nature Park

This alternative would partially fund the construction of a public park as part of the Master Plan for the Longview Arboretum and Nature Center. The proposal includes the development of a nature center, gardens, and associated infrastructure.

The Longview Arboretum and Nature Park will be situated within a 28-acre area and will require significant construction and management. Once completed, the arboretum and park would improve water quality and potentially mitigate the effects of stormwater. The estimated total cost of Alternative 6 is \$1,100,000. Although this alternative includes development of aquatic and wetland habitat, funds will largely be applied to the infrastructure placement. Given the limited amount of direct ecological benefits to forested riparian, bottomland hardwoods, aquatic, and/or wetland habitats, Alternative 6 is not considered cost effective. This alternative has a reasonably high probability of success as an arboretum and park in an urban setting. Significant planning and investigation has already occurred as is shown in the Master Plan documentation. Ultimately, this alternative does not align with the Trustees' goal to restore, replace, or acquire the equivalent of the injured natural resources. The Trustees did not choose Alternative 6 as a preferred alternative.

5.1.7 Alternative 7: Mineola Nature Preserve – Restoration and Enhancement

This alternative includes the following restoration and rehabilitation activities: 1) plant hardwood trees and prevent the establishment of invasive species, 2) improve drainage so that the natural flow of water is not restricted, and 3) mechanically clear land to remove large woody debris piles in the southeast portion of the Mineola Nature Preserve (Preserve) to improve hydrology.

This alternative provides direct ecological benefits to forested riparian, bottomland hardwoods, aquatic and wetland habitats that are directly comparable to the injury to freshwater benthic invertebrate communities in Days, Waggoner, and Howard creeks. Because of the enhancements to the Preserve, aquatic habitat and surface water flow would be improved, providing habitat for benthic invertebrate communities. The Preserve is owned and maintained by the City of Mineola as part of a comprehensive development plan to protect wildlife and habitat. The active management of the Preserve by the City has led to a good understanding of where the actions described in this alternative will be most effective for the long term. All of the activities proposed would be technically feasible. The alternative is considered cost effective. Total estimated costs for this alternative is \$500,000 and will include hardwood planting in specific areas, drainage improvements and purchase of shredding equipment to be used in the long-term. The TPWD and the City of Mineola have already demonstrated a successful working relationship with the

initial development of the Preserve in 2002. This alternative was given a high probability of success by the Trustees. The Trustees chose Alternative 7 as a preferred alternative.

5.1.8 Alternative 8: Neches River Bottomland Forest Acquisition

This alternative involves the acquisition and protection of up to approximately 1,100 acres of land, including riparian bottomland hardwood forest along the Neches River.

The properties contain river frontage with riparian areas that become inundated similarly to the site of the injury. Based on past performance by TCF, this alternative is considered to have a reasonable probability of success by the Trustees. There is uncertainty as to which tracts can be purchased until negotiations with property owners have been completed; however, the estimated cost per acre is approximately \$1,500 to \$2,100 per acre. Costs include the appraisal, title review, survey, environmental assessment, staff time and land acquisition. Based on previous Trustee experience, a range of \$1,000 to \$3,500 per acre is considered reasonable for acquisition of bottomland acreage in east Texas. This alternative is expected to take 24 months to complete and all acquisitions would be managed for conservation in perpetuity. There are no restoration activities projected for this alternative. There is a high probability of success for this alternative based on past partnerships with the managing entities and stability of the Neches River NWR. The Trustees chose Alternative 8 as a preferred alternative.

5.1.9 Alternative 9: Sulphur Springs Wastewater Treatment Plant Wetlands Habitat

This alternative involves converting 100 acres of grass meadow to wetlands and the purchase of an additional 100 acres of wetlands around Lake Sulphur Springs for preservation and recreational use. The process would include transferring water from the existing wastewater treatment plant to the constructed wetlands.

The initial design documentation demonstrates that the alternative is technically feasible. However, developing and maintaining a constructed wetland using pipes and pumps to provide water does not result in a self-sustaining wetland in perpetuity. The total cost of this alternative is \$6,000,000 and includes the purchase of land, construction of 100 acres of wetlands, preservation of another 100 acres of existing wetlands, recreational amenities, and all utilities necessary to move reclaimed water from the wastewater treatment plant to the wetlands area. The development of infrastructure piping does not align with the Trustees' restoration goals (restoration, replacement, or preservation of the equivalent of the injured natural resources); therefore, this alternative is not considered cost effective. The constructed wetlands are isolated and not contiguous with larger tracts of preserved wetland habitat. The Trustees did not choose Alternative 9 as a preferred alternative.

5.1.10 Alternative 10: Talbot Prairie and Forest Land Acquisition

This alternative involves the acquisition and protection of approximately 366 acres of land, including 136 acres of endemic *Silveus'* dropseed prairie and 230 acres of hardwood forest, 75 percent of which is seasonally flooded. The property is the highest quality native prairie remnant in the vicinity and possibly in Bowie County. The Native Prairies Association of Texas (NPAT), a Texas-based land trust, would purchase and manage the property. TNC would accept a conservation easement on the property. The NPAT and TNC

would jointly create and submit to the Trustees a land management plan with the goal of maintaining the optimal diversity of plant and animal species.

This alternative provides ecological services directly comparable to the injury within 25 miles of the Facility. Additionally, this alternative will add to the representation of Silveus' dropseed prairie and calcareous hardwood forest in conservation ownership. This alternative is considered to have a reasonable probability of success because of the past successful working relationship between TNC and the NPAT. Total alternative costs are estimated to be \$1,000,000 or approximately \$2,700 per acre. This alternative is considered cost effective by the Trustees based on a comparison to similar projects, the inclusion of administrative costs and the endowment to TNC. The Trustees chose Alternative 10 as a preferred alternative.

5.1.11 Alternative 11: Tonkawa Sandhills Land Acquisition

This alternative includes the acquisition of 4,900 acres for preservation and restoration in the Tonkawa Sandhills of Rusk and Nacogdoches counties.

The acquisition area includes riparian and bottomland hardwood forest, natural springs, and hydric bogs as features of the sandhill ecosystem. This proposed alternative would provide ecological services directly comparable to the injury, in that bottomland hardwoods and benthic invertebrate communities within the wetter areas and drainages would be preserved and protected. The riparian and wetland portions on 6 to 20 acres are in need of restoration. Almost all the upland shortleaf pine-hardwood ecosystem areas need restoration (70% of the total alternative area).

The amount of restoration required is of concern to the Trustees. Current and future oil and gas operations on the property are also a concern for long-term restoration planning and meeting Trustee restoration goals. The Trustees estimate the total cost of this alternative to be \$10,000,000 or approximately \$2,000 per acre. Although the cost of acquisition of the acreage is reasonable as compared to other similar projects, especially since the costs include implementation costs and an endowment, the dependency on the generation of revenue for restoration activities is a concern. The Trustees consider this alternative to have a mixed probability of long-term success. The Trustees did not choose Alternative 11 as a preferred alternative.

5.1.12 Alternative 12: T&J Hunting Properties

This alternative involves the purchase of two separate properties: 1) 111 acres of bottomland hardwoods in Panola County and 2) 30 acres of wetlands and bottomland hardwoods along the Sabine River.

The acquisition of these properties would provide ecological services (e.g., benthic invertebrate services) in line with the injury; however, the proposed properties are small (111 acres and 30 acres), isolated, and not contiguous with other preserved properties in the region, thereby reducing their overall benefit. The floodplain perpetuity easements would be held by the United States Corps of Engineers or the United States Department of Agriculture. Based on experience, the Trustees are concerned that easements held by these entities would have easement requirements that do not align with Trustee restoration goals. Historically managed for timber production and used as a hunting club, the tracts would be owned by the

T&J Hunt Club. Under this alternative, the properties would be placed under conservation easements and managed for wildlife diversity and limited recreational hunting and fishing. The technical feasibility of this alternative is low because the perpetuity requirement for the easement(s), as well as the continued use for recreational hunting and fishing, do not align with Trustee restoration goals.

The estimated total cost of Alternative 12 is \$1,800,000: \$1,300,000 for the 111-acre site (approximately \$12,000 per acre) and \$500,000 for the 30-acre site (approximately \$16,500 per acre). Based on previous Trustee experience a range of \$1,000 - \$3,500 per acre is considered reasonable for acquisition of acreage in east Texas. Based on the comparative costs for acquisition, this alternative is not cost effective. Although conservation easements on the properties could likely be obtained, the probability of success for this alternative is low because of Trustee concerns with the conservation easement requirements and restrictions, and the prohibitive cost for small parcels that are discontinuous with currently preserved acreage. The Trustees did not choose Alternative 12 as a preferred alternative.

5.1.13 Alternative 13: No Action

Under the “No Action” alternative, restoration actions needed to make the environment and public whole for its losses would not occur. The Trustees did not choose Alternative 13 as a preferred alternative because of the settlement being in place and the availability of acceptable alternatives.

	Criterion # 1: Direct ecological benefits to bottomland and aquatic habitats in the identified geographic area	Criterion # 2: Technical feasibility	Criterion # 3: Cost effectiveness	Criterion # 4: Reasonable probability of success	Criterion # 5: Measurable results	Criterion # 6: Avoids collateral injury to natural resources	Criterion # 7: Effect on public health and safety, and compatibility with the remediation process
Alternative 1: Big Thicket Acquisition and Conservation			✓			✓	✓
Alternative 2: Bottomland Hardwood Restoration and Chinese Tallow Eradication	✓	✓	✓			✓	✓
Alternative 3: Caddo Lake Habitat Acquisition	✓	✓	✓	✓	✓	✓	✓
Alternative 4: Days Creek – Enhancement and Restoration	✓	✓	✓	✓	✓	✓	✓
Alternative 5: Days Creek – Urban Wetland Restoration and Enhancement	✓			✓	✓	✓	✓
Alternative 6: Longview Arboretum and Nature Park				✓			✓
Alternative 7: Mineola Nature Preserve – Restoration and Enhancement	✓	✓	✓	✓		✓	✓
Alternative 8: Neches River Bottomland Forest Acquisition	✓	✓	✓	✓	✓	✓	✓
Alternative 9: Sulphur Springs Wastewater Treatment Plant Wetlands Habitat	✓	✓		✓		✓	✓
Alternative 10: Talbot Prairie and Forest Land Acquisition	✓	✓	✓	✓	✓	✓	✓
Alternative 11: Tonkawa Sandhills Land Acquisition	✓	✓	✓		✓	✓	✓
Alternative 12: T&J Hunting Properties	✓					✓	✓
Alternative 13: No Action		✓	✓			✓	

Figure 5-1 CERCLA Criteria Summary

Note: CERCLA Criteria 8 (Consistency with federal, state, or local laws, regulations, or policies) and 9 (Alternative is not already required by existing laws, regulations, permits, settlements, or enforcement orders, including anticipated requirements such as mitigation requirements or draft permits unrelated to the project scope of work) were found to have been met by all of the alternatives and therefore are not presented in the figure above.

5.2 Preferred Restoration Alternatives

The Trustees are proposing to spend \$19.2 million to implement the five preferred restoration alternatives. In some cases, the description and analysis of the alternatives is based on alternative-specific preliminary design concepts rather than detailed plans. There are proposed preferred alternatives that will require the Trustees to develop a budget, plan, engineer, design, and permit before the alternative becomes a shovel-ready alternative. Any time required in preparation for construction is not expected to reduce the anticipated benefits of the alternative or affect the analyses conducted for NEPA. The Trustees may elect to utilize remaining restoration funds from the NRDA settlement, as well as interest earned on these recoveries, to pay for the Trustees' administrative costs to develop and implement the alternatives and to potentially supplement the funding for currently proposed restoration alternatives. Table 5-1 summarizes the proposed preferred restoration alternatives, the estimated costs, the funding allocated by the Trustees, and acres to be restored and or preserved.

Table 5-1 Summary of Proposed Preferred Restoration Alternatives

Preferred Alternative	Allocated Funds^a	Size and Type of Alternative
Alternative 3: Caddo Lake Habitat Acquisition	\$5,900,000	Acquisition of approximately 3,500 acres
Alternative 4: Days Creek Enhancement and Restoration	\$9,800,000	Restore approximately 6 miles of creek and preserve approximately 200 acres of wetlands
Alternative 7: Mineola Nature Preserve – Restoration and Enhancement	\$500,000	Restoration and enhancement within the 2,911-acre preserve
Alternative 8: Neches River Bottomland Forest Conservation	\$2,200,000	Acquisition of approximately 1,100 acres
Alternative 10: Talbot Prairie and Forest Land Acquisition	\$1,000,000	Acquisition of an estimated 370 acres

a – Total allocated funds are approximately 91% of funds available to the Trustees. Administrative and Trustee oversight costs will be covered by the remaining 9%.

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