FINAL DAMAGE ASSESSMENT AND RESTORATION PLAN FOR THE JULY 2007 JET A FUEL DISCHARGE INTO TURKEY CREEK IN WALKER COUNTY, TEXAS

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PREPARED BY:

Texas Commission on Environmental Quality

Texas General Land Office

Texas Parks and Wildlife Department

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

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NOTE TO READER:

This Final Damage Assessment and Restoration Plan (DARP) is intended to inform members of the public and to solicit their comments on the Texas Natural Resource Trustees' assessment of the natural resource injuries and service losses described herein and the restoration actions which the Trustees propose to implement in order to compensate the public for those injuries and losses. The Trustees received one request for a copy of the DARP and one person submitted comments on the DARP. Since the commenter on the Draft DARP supported the Trustee findings that the restoration alternative in Angelina County is appropriate, the Trustees have determined to proceed with the finalization of this document and implementation of the selected restoration alternative without additional public comment. Concerns expressed by the commenter will be, to the maximum extent possible, addressed within the framework of the implementation of the selected restoration action.

EXECUTIVE SUMMARY:

On July 14, 2007, a 5-foot split occurred in a 28-inch transmission line belonging to Explorer Pipeline, resulting in an unauthorized discharge of Jet A fuel just east of the City of Huntsville, in Walker County, Texas. Approximately 6,568 barrels (275,860 gallons) of Jet A fuel were discharged onto land and into Turkey Creek and adjacent riparian habitat. Jet A fuel was observed at the discharge point and extended about 4.5 miles downstream within Turkey Creek. Fish and wildlife kills, tree mortality, and impacts to terrestrial habitat were observed at the spill site.

Initial response activities included building earthen berms within Turkey Creek, excavating the pipeline, and recovering free product from Turkey Creek with vacuum trucks. Heavy equipment was used to excavate and remove the damaged section of line and provide access to Turkey Creek. Banks of Turkey Creek were washed to remove residual Jet A fuel and material was consolidated into central areas to facilitate collection of the free product. Response actions removed a large portion of the Jet A fuel from Turkey Creek within 8 days of the release. Monitoring and maintenance activities continued through August 2008.

The Texas Commission on Environmental Quality, the Texas General Land Office, the Texas Parks and Wildlife Department (TPWD), and the Department of the Interior represented by the United Sates Fish and Wildlife Service, as designated Natural Resources Trustees, are responsible under state and/or federal law to assess injuries and seek compensation for natural resources injured or services lost as the result of discharges of oil. The Trustees determined that the discharge of Jet A fuel in conjunction with response actions undertaken by Explorer Pipeline, injured or potentially injured natural resources and that restoration of these resources and the associated lost ecological services should be pursued. Natural resources or their services impacted as a result of the spill and spill response included riparian and upland

wooded habitats, pasture, and aquatic habitat of Turkey Creek. Biota impacted by the spill included fish, birds, other wildlife species, and benthic communities.

Explorer Pipeline, as the designated responsible party, entered into a Memorandum of Agreement with the Trustees to perform a cooperative restoration-based assessment to address potential or actual natural resource injuries and lost services resulting from the spill. The Trustees and Explorer Pipeline jointly performed site investigations on August 20, 2007 and May 28, 2008, to assess lost natural resource services resulting from the discharge and the associated response actions. Results from site investigations and Habitat Equivalency Analysis were used to determine the scale of restoration necessary to compensate for injuries to natural resource services.

In accordance with the Oil Pollution Act of 1990 regulations, the Trustees evaluated a reasonable range of restoration alternatives to compensate for injuries to natural resources and lost services. After examining restoration alternatives and potential restoration sites, the Trustees have identified the acquisition and preservation of existing high quality habitat located along 3.28 miles of the Angelina Riverfront to be incorporated as part of the TPWD Alazan Bayou Wildlife Management Area as the restoration alternative selected for implementation. The Trustees have received public input on the Draft DARP and have determined that the most appropriate compensation for injuries associated with the spill is the use of Natural Resources Damages recovered for the spill as matching funds to preserve a 486-acre tract in Angelina County.

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1 INTRODUCTION AND INCIDENT SUMMARY

This Final Damage Assessment and Restoration Plan (DARP) has been prepared by the Texas Natural Resource Trustees to address natural resources and services injured or lost as a result of the discharge of an estimated 6,568 barrels (275,860 gallons) of Jet A aviation turbine fuel (Jet A fuel) into the waters and adjacent riparian habitat of Turkey Creek leading to Lake Livingston and Trinity River in Walker County, Texas. The Texas Commission on Environmental Quality (TCEQ), the state's designated response agency for this discharge and the United Sates Environmental Protection Agency (EPA) designated Explorer Pipeline as the responsible party (RP) for the July 14, 2007 spill. The TCEQ, the Texas General Land Office (GLO), the Texas Parks and Wildlife Department (TPWD), and the Department of the Interior (DOI) represented by the United Sates Fish and Wildlife Service (USFWS) (Trustees), as designated Natural Resources Trustees, are responsible under state and/or federal law to assess, recover, and seek compensation for natural resources injured and/or services lost as the result of unauthorized discharges of oil and or release of hazardous substances to the environment.

This Final DARP is intended to inform members of the public on the Trustees' assessment of the natural resource injuries and service losses described herein and the restoration actions that will be undertaken to compensate the public for those injuries and losses. Public input received by the Trustees during the public comment period will be considered prior to finalizing this DARP and a summary of the comments and the Trustees' responses thereto will be included in the Final DARP. The Trustees received one request for a copy of the DARP and one person submitted comments on the DARP. Since the commenter on the Draft DARP supported the Trustee findings that the restoration alternative in Angelina County is appropriate, the Trustees have determined to proceed with the finalization of this document and implementation of the selected restoration alternative without additional public comment. Concerns expressed by the commenter will be, to the maximum extent possible, addressed within the framework of the implementation of the selected restoration action. Details of the comments submitted are provided in Section 1.3.6.

1.1 Overview of the Incident

On July 14, 2007, a 5-foot split occurred in a 28-inch transmission line belonging to Explorer Pipeline, resulting in an unauthorized discharge of Jet A fuel (Incident) just east of the City of Huntsville, in Walker County, Texas (Figure 1). Approximately 6,568 barrels (275,860 gallons) of Jet A fuel were discharged onto land and into Turkey Creek and adjacent riparian habitat. Jet A fuel was observed at the discharge point and extended about 4.5 miles downstream within

Turkey Creek. Fish and wildlife kills, tree mortality, and impacts to terrestrial habitat were observed at the spill site.

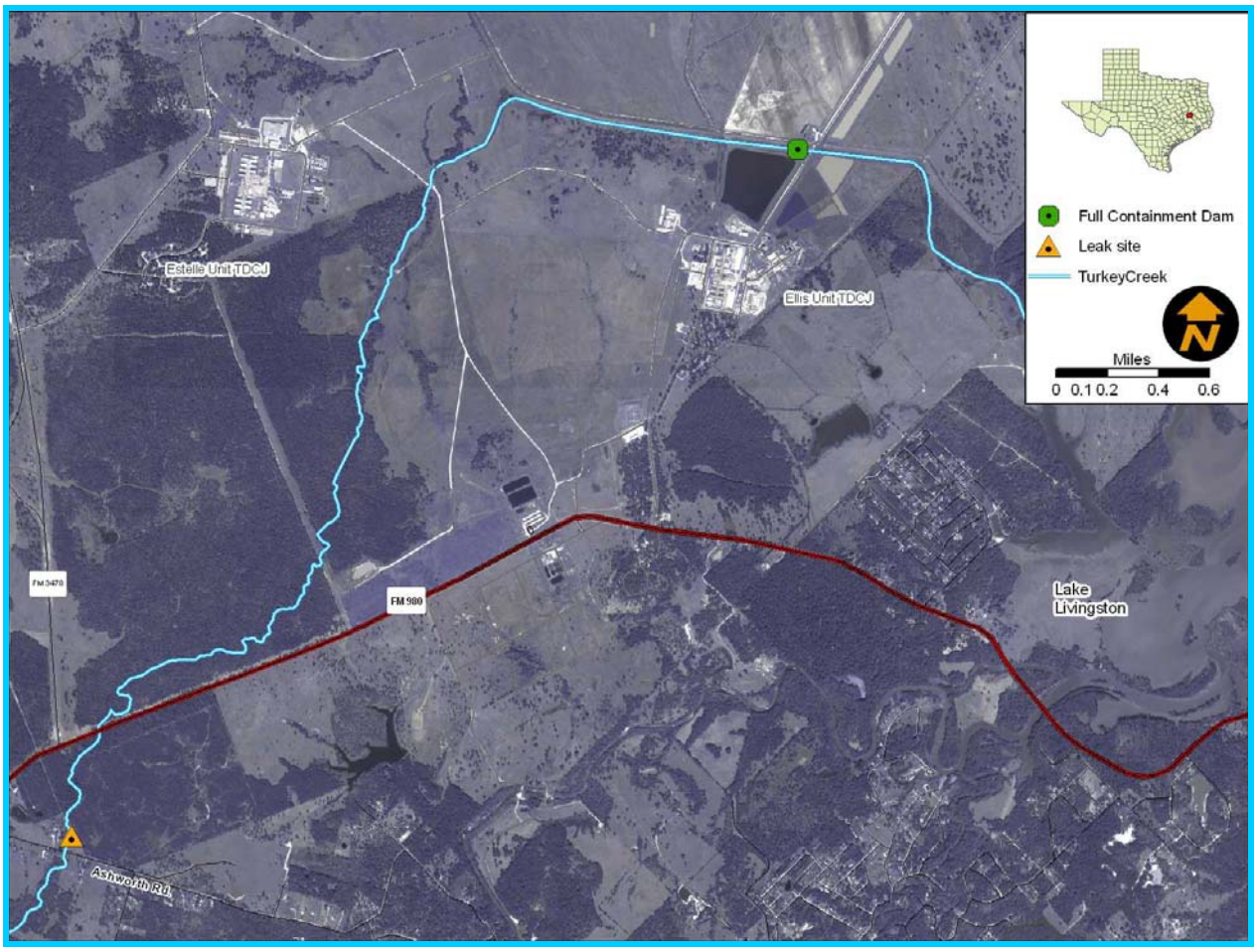

Figure 1. Spill site.

Initial response activities included building earthen berms within Turkey Creek, excavating the pipeline, and recovering free product from Turkey Creek with vacuum trucks (Figure 2). Response actions included the use of heavy equipment to excavate and remove the damaged section of line, as well as, provide access to Turkey Creek. During secondary response activities, the responders washed the banks of Turkey Creek to remove residual Jet A fuel and consolidated the product into central areas to facilitate collection of the free product. Response actions removed a large portion of the Jet A fuel from Turkey Creek within 8 days of the release. Monitoring and maintenance activities continued through August 2008.

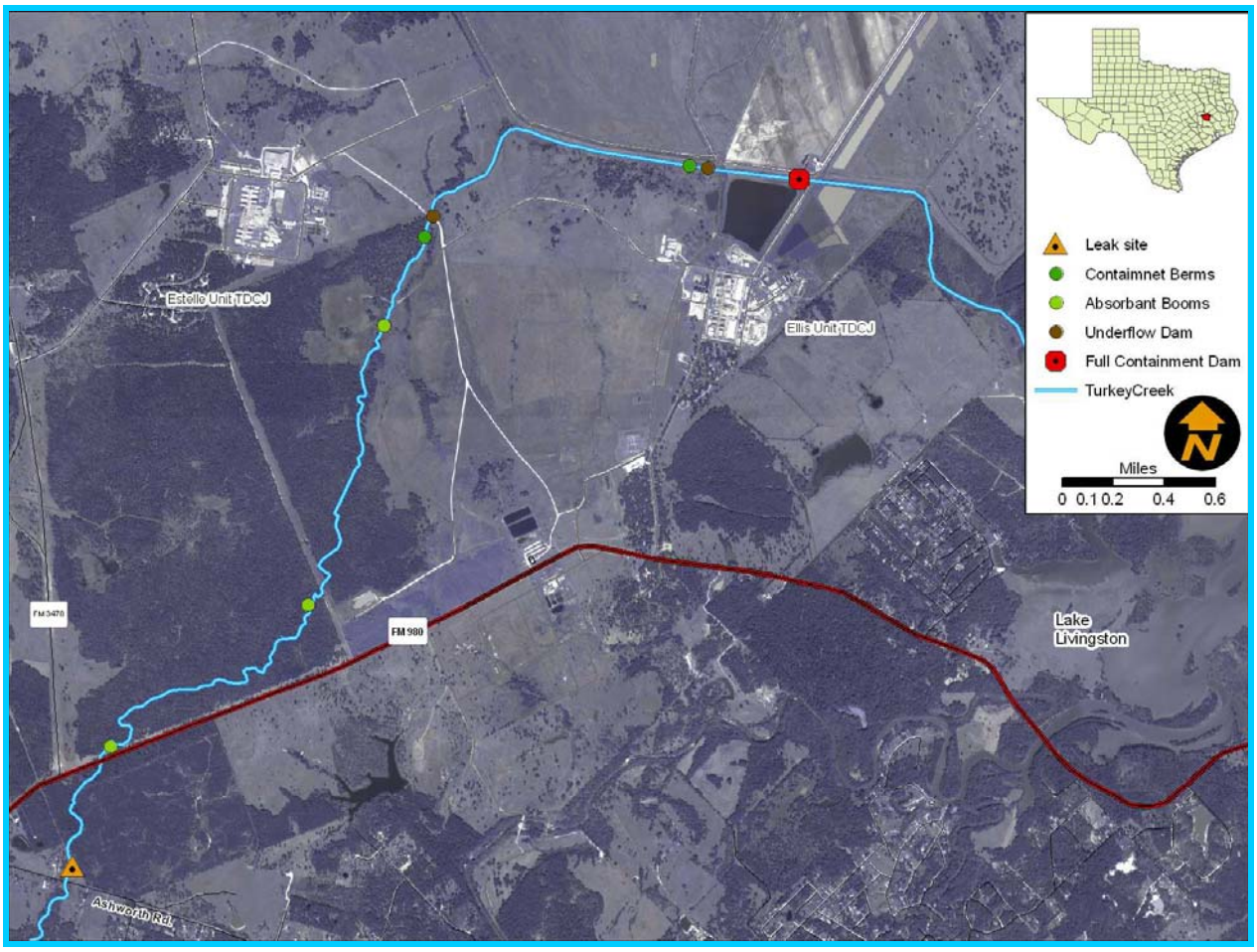

Figure 2. Location of spill response activities.

The response actions did not contemplate or provide for the restoration of injuries to natural resources. Based upon site visits, personal observations, and sediment data, the Trustees determined actual or potential injuries to natural resources and services occurred. Therefore, restoration planning is necessary since injuries have resulted from the Incident.

1.2 Natural Resources Injuries

Restoration planning is needed to evaluate the magnitude of actual and potential injuries to natural resources and natural resource services and to use that information to determine the need for, and scale of, restoration actions. Natural resource services are the ecological and public services that natural resources provide, such as foraging and nesting habitat for bird populations, structural and ecological habitat for aquatic invertebrates, or fishing, hiking, swimming, nature photography, or similar recreational or educational services. Restoration planning provides the link between the injury and the restoration and has two basic components: injury assessment and restoration selection.

The goal of injury assessment is to determine the nature and extent of injuries to natural resources and services, thereby providing a factual basis for evaluating the need for, type of, and scale of restoration actions. Consistent with the Oil Pollution Act of 1990 (OPA, 33 U.S.C. §2701 et seq.), the goal of the restoration actions presented in this DARP is to make the environment and the public whole for injuries to, or lost use of, natural resources and services resulting from the Incident. This will be accomplished through the restoration, rehabilitation, replacement, or acquisition, collectively referred to as restoration, of equivalent natural resources and services. The specific goals for this action are to restore the following natural resources affected by the spill: riparian and upland wooded habitat, pasture, and aquatic habitat. Biota impacted by the spill include fish, birds, other wildlife species, and benthic communities.

1.3 Natural Resource Trustees and Authority

This DARP has been prepared jointly by the TCEQ, GLO, TPWD, and USFWS. Each of these agencies is a designated Natural Resource Trustee pursuant to the OPA (33 U.S.C. §2706), and the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR §§300.600 and 300.605), for natural resources injured by the Incident. As a designated Trustee, each agency is authorized to act on behalf of the public under state and/or federal law to assess and recover natural resource damages and to plan and implement actions to restore natural resources and resource services injured or lost as the result of a discharge of oil. Applicable laws and regulations regarding natural resources damage assessment and restoration planning include:

- OPA of 1990 (33 U.S.C. §2701 et seq.)
- Natural Resource Damage Assessment Regulations under OPA (15 CFR Part 990)
- National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR Part 300, Subpart G)
- National Environmental Policy Act (NEPA, 42 U.S.C. §4321 et seq.)

1.3.1 Overview of OPA Requirements

OPA establishes a liability regime for oil spills that injure or are likely to injure natural resources and/or the services that those resources provide to the ecosystem or humans. Federal and state agencies and Indian tribes act as Trustees on behalf of the public to assess the injuries, scale restoration to compensate for those injuries and implement restoration. Section l006(e)(1) of OPA (33 U.S.C. §2706(e)(1)) requires the President, acting through the Under Secretary of Commerce for NOAA, to promulgate regulations for the assessment of natural resource damages resulting from a discharge or substantial threat of a discharge of oil. Assessments are intended to provide the basis for restoring, replacing, rehabilitating, and acquiring the equivalent

of injured natural resources and services. The process emphasizes both public involvement and participation by the responsible party or parties.

Under OPA (33 U.S.C. §2706(d)), Trustees can recover:

1) the cost of restoring, rehabilitating, replacing, or acquiring the equivalent of the damaged natural resources ("primary restoration");

2) the diminution in value of those injured natural resources pending restoration ("compensatory restoration"); and

3) the reasonable assessment costs.

Incident, oil, and natural resources are defined under OPA (33 U.S.C. §2701):

- Incident means "any occurrence or series of occurrences having the same origin, involving one or more vessels, facilities, or any combination thereof, resulting in the discharge or substantial threat of discharge of oil."

- Oil means "oil of any kind or in any form, including petroleum, fuel oil, sludge, oil refuse, and oil mixed with wastes other than dredged spoil, but does not include any substance which is specifically listed or designated as a hazardous substance under Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. 9601)."

- Natural resources are "land, fish, wildlife, biota, air, water, groundwater, drinking water supplies, and other such resources belonging to, managed by, held in trust by, appertaining to, or otherwise controlled by the United States, any State or local government or Indian tribe."

1.3.2 Natural Resource Damage Assessment Regulations under OPA

As described in the OPA regulations, a NRDA consists of three phases: (1) Preassessment, (2) Restoration Planning, and (3) Restoration Implementation. Based on early available information collected during the preassessment phase, the Trustees make a preliminary determination as to whether natural resources and/or services have been injured and/or are likely to be injured by the release. Through coordination with response agencies (e.g., for this case the EPA, and TCEQ On-Scene Coordinator), the Trustees next determine whether the oil spill response actions will eliminate the injury or the threat of injury to natural resources. If injuries are expected to continue and feasible restoration alternatives exist to address such injuries, the Trustees may proceed with the restoration planning phase. Restoration planning also may be necessary if injuries are not expected to endure but are nevertheless suspected to have resulted in interim losses of natural resources and/or services from the date of the incident until the date of recovery.

Before initiating a natural resource damage assessment (NRDA), the Trustees must determine that (15 CFR §990.41):

- an incident has occurred;
- the incident is not from a public vessel;
- the incident is not from an onshore facility subject to the Trans-Alaska Pipeline Authority Act;
- the incident is not permitted under federal, state, or local law; and
- public trust natural resources and/or services may have been injured as a result of the incident.

Injury is defined in the regulations as “an observable or measurable adverse change in a natural resource or impairment of a natural resource service” (15 CFR §990.30).

The purpose of the restoration planning phase is to evaluate the potential injuries to natural resources and services and use that information to determine the need for and scale of associated restoration actions. This phase provides the link between injury and restoration and has two basic components: (1) injury assessment, and (2) restoration selection. The goal of injury assessment is to determine the nature and extent of injuries to natural resources and services, thus providing a factual basis for evaluating the need for, type of, and scale of restoration actions. As the injury assessment is being completed, the Trustees develop a plan for restoring the injured natural resources and services.

During the restoration planning phase, the Trustees must:

- identify a reasonable range of restoration alternatives,
- evaluate and select the preferred alternative(s),
- develop a Restoration Plan presenting the alternative(s) to the public,
- solicit public comment on the Restoration Plan, and
- incorporate comments into a Final Restoration Plan.

1.3.3 National Oil and Hazardous Substances Pollution Contingency Plan

The National Oil and Hazardous Substances Pollution Contingency Plan, more commonly called the National Contingency Plan (NCP), is the federal government's blueprint for responding to both oil spills and hazardous substance releases. The NCP is the result of the federal government’s efforts to develop a national response capability and promote overall coordination

among the hierarchy of responders and contingency plans. Federal agencies are designated as Natural Resource Trustees according to the regulations in 40 CFR Part 300, Subpart G.

1.3.4 National Environmental Policy Act Compliance

NEPA requires an assessment of any federal action that may impact the environment. NEPA applies to restoration actions undertaken by federal Trustees, except where a categorical exclusion or other exception to NEPA applies. Restoration of natural resources under OPA which involves Federal Trustee agencies must comply with the National Environmental Policy Act (42 U.S.C. §4321 et seq.) and the Council on Environmental Quality (CEQ) regulations implementing NEPA at 40 CFR Part 1500. The process outlined in OPA for NRDA selection of restoration alternatives is substantially similar to NEPA and therefore is in compliance with NEPA and the CEQ regulations. This Final DARP summarizes the current environmental setting, describes the purpose and need for action, identifies alternative actions, assesses their applicability and environmental consequences, and summarizes Trustee actions taken to facilitate opportunities for public participation in the decision-making process. Based on the previous information the Trustees determined that as proposed, the selected restoration alternative meets the criteria for Categorical Exclusion from further environmental assessment or environmental impact statement evaluation as provided by the DOI Revised NEPA Implementation Procedures (DOI 1996).

1.3.5 Coordination and Settlement with the Responsible Party

Federal regulations direct the Trustees to invite the RP to participate in the damage assessment and restoration process. Although the RP may contribute to the process in many ways, final authority to make determinations regarding injury and restoration rests solely with the Trustees.

On June 27, 2008, Explorer Pipeline entered into a Memorandum of Agreement with the Trustees to perform a cooperative restoration-based assessment to address potential or actual natural resource injuries and lost services at the site. The Trustees and Explorer Pipeline jointly performed site investigations on August 20, 2007 and May 28, 2008, to assess injured natural resources and lost services resulting from the discharge and the associated response actions. During the assessment phase the types of resources, acreage and habitat types affected by the spill were quantified. Appropriate scientific methodologies were used to determine the nature and extent of natural resource injuries.

1.3.6 Public Participation

Public review of the Draft DARP is an integral component of the restoration planning process. Through the public review process, the Trustees seek public comment on the methods used to define and quantify natural resource injuries and service losses and the proposal to restore injured natural resources or replace lost resource services. This Final DARP provides the public with current information about the nature and extent of the natural resource injuries identified and restoration alternatives evaluated. A Draft DARP that provided information about the

natural resource injuries and service losses identified and the restoration alternatives evaluated was prepared and made available for review and comment by the public.

Following a public notice, the Draft DARP was available to the public for a 30-day comment period. Public notices were placed in both the January 30, 2009 Texas Register and the Sunday, February 1, 2009 Huntsville Item. The deadline for submitting written comments on the Draft DARP concluded on Tuesday, March 3, 2009. The Trustees received one request for the plan and one comment was submitted. The comment submitted expressed three concerns regarding the identified preferred restoration alterative: 1) the location of the property is outside of Walker County and therefore the county would not see direct benefits; 2) ensuring the property will be managed for strict conservation in perpetuity; 3) ensuring the property could not be leased or mined for the purpose of extracting minerals below the surface. A major goal of OPA is to make the environment and public whole for injury to or loss of natural resources and services as a result of a discharge or substantial threat of a discharge of oil. The Trustees consider several factors when evaluating restoration alternatives including the proximity of the restoration alterative to the area injured (e.g., same watershed) and the extent to which the restoration alternative restores similar types of natural resources that were injured (e.g., same ecoregion). While public use is taken into consideration, political boundaries are not. Restrictive covenants will be included in the property deed to run with the land and ensure conservation of the property into perpetuity as well as management by TPWD as a Wildlife Management Area. TPWD shall ensure that the holder of any existing third party mineral rights complies with all applicable statutes and regulations and with all conditions of any applicable easement, lease, right-of-way, surface use agreement, or similar document, including any requirement to restore any adversely affected area to its pre-existing condition.

Since the commenter on the Draft DARP supported the Trustee findings that the restoration alternative in Angelina County is appropriate, the Trustees have determined to proceed with the finalization of this document and implementation of the selected restoration alternative without additional public comment. Concerns expressed by the commenter will be, to the maximum extent possible, addressed within the framework of the implementation of the selected restoration action.

2 AFFECTED ENVIRONMENT

This section describes the toxicity profile of the material spilled, the description of injured resources and services, as well as federal and state endangered and/or threatened species potentially affected by the Jet A fuel spill. The description of these resources focuses primarily on the natural resources and services that are relevant to the discussion of injuries and restoration projects presented in this document.

2.1 Jet A Toxicity Profile

The product discharged from Explorer Pipeline's transmission lines was Jet A fuel, a kerosene-type fuel used in aviation turbine engines regulated under OPA. Jet A, which is mainly used in

the United States, must have a freeze point (the temperature at which wax crystals disappear in a laboratory test) of -40 ºC or below and does not normally contain a static dissipator additive. The classification “jet fuel” is applied to fuels meeting the required properties for use in jet engines and aviation turbine engines. In general, jet fuels are highly refined kerosene products, blended from low sulfur or desulfured kerosene and various light distillates generated from hydro-cracking partially refined petroleum feed-stocks. The end product must meet critical specifications, including a very low freezing point or pour point, smoke point and aromatic hydrocarbon content, generally less than 20 percent (Irwin et al. 1997).

In terms of refining crude oil, Jet A is a middle distillate, a classification of products that also includes kerosene, aviation fuels, diesel fuels and fuel oil #1 and #2. These fuels contain paraffins (alkanes), cycloparaffins (cycloalkanes), aromatics and olefins from approximately C9 to C20. Aromatic compounds of concern include alkylbenzenes, toluene, napthalenes, and polycyclic aromatic hydrocarbons (PAHs). Compositions range from avgas and JP-4, which are similar to gasoline, to Jet A and JP-8, which are kerosene-based fuels. Jet A is approximately 99.8% kerosene by weight and usually has a benzene percentage below 0.02% (Irwin et al. 1997).

As intermediate products, jet fuels have a combination of (mostly) lighter, less persistent and more mobile compounds as well as (some) heavier, more persistent and less mobile compounds. These two different groups are associated with two distinctly different patterns of fate/pathway concerns:

1. The relatively lighter, more volatile, mobile, and water soluble compounds in Jet A will tend to fairly quickly evaporate into the atmosphere or migrate to groundwater. Benzenes, toluene, and xylenes (all common components of jet fuels) have high volatility. When exposed to oxygen and sunlight, most of these compounds will tend to break down relatively quickly. However, in groundwater, many of these compounds tend to be more persistent than in surface water, and readily partition on an equilibria basis back and forth between water and solids (soil and sediment) media.

2. The compounds in jet fuel which will tend to be somewhat more persistent and more bound to solids particles will include the PAHs, alkyl PAHs, and alkyl benzenes. Higher concentrations of heavier PAHs will tend to be in adjacent contaminated soils rather than groundwater (Irwin et al. 1997).

Since Jet A is a kerosene-based fuel oil, it is of intermediate volatility and will evaporate if conditions allow. Having a boiling point range between that of gasoline and diesel, Jet A will evaporate faster than diesel but slower than gasoline. Spilling Jet A in an open water environment would allow maximum spreading. Jet A would be expected to persist on the water surface for only a single day with the majority of the fuel lost to evaporation. If the spill is on land or into a confined waterway such as a small pond or stream, the rate of evaporation would be significantly less and enhanced dissolution would be observed in underlying waters. If there is turbulent mixing such as rapids or water passing over a weir, dispersion would be increased.

If the fuel penetrates into organic debris and sediment/soils, the product can be expected to persist for months to years depending on the concentration and specific environmental conditions (Irwin et al. 1997, Environmental Canada 1994).

The toxicological effects of Jet A may also be evaluated through its constituents, such as PAHs, and other semi-volatile and volatile components (Irwin et al. 1997). In general, jet fuels are moderately volatile and soluble and possess a moderate to highly acute toxicity to biota. Product-specific toxicity is related to the type and concentration of aromatic compounds.

Short-term hazards to biota by the lighter, more volatile and water soluble compounds (such as benzene compounds and toluene) in Jet A include potential acute toxicity to aquatic life in the water column (especially in relatively confined areas) as well as potential inhalation hazards. Impacts to birds, mammals, or other biota which come into direct contact with spilled product represent another potential short-term hazard. Human uses of natural resources may also be affected by spills of Jet A, and include recreational, fisheries, industrial, potable groundwater supply, and irrigational uses of impacted waters (Irwin et al. 1997).

Long-term, chronic effects to biota are also associated with PAHs, alkyl PAHs and alkyl benzene (such as xylene constituents of jet fuel). Although PAHs (particularly heavy PAHs) do not make up a large percentage of jet fuels by weight, there are some PAHs in jet fuels, including naphthalene and alkyl naphthalenes. Some of the PAHs in this product may be absorbed by plants and have a harmful effect. Due to their relative persistence, PAHs (and particularly the alky PAHs), can contribute to the potential for various chronic effects of jet fuels in contaminated soils, sediments and groundwater. In studies of bio-degradation of the water soluble fraction of Jet A, it was determined that the higher molecular weight PAHs tended to be the last to degrade and that bio-genetically produced metabolites may be causing biological impacts and system perturbations after many of the original hydrocarbons had degraded (Irwin et al. 1997). Many of the PAHs found in Jet A exhibit phytotoxicity and may display greatly enhanced toxicity in sunlight or other UV source than elsewhere (Irwin et al. 1997).

Acute toxicity is rarely reported in fish or wildlife as a result of exposure to low levels of a single PAH compound. PAHs in general are more frequently associated with chronic risks. These risks are often the result of exposure to complex mixtures of aromatics (such as PAHs, alkyl PAHs, benzenes and alkyl benzenes), rather than exposure to low levels of a single compound. Jet A is an example of such a complex mixture (Irwin et al. 1997).

2.2 Description of Injured Resources and Services

To facilitate the identification and quantification of actual or potential injuries at the site, the Trustees divided the impacted area into aquatic, woodland and pasture habitats. This section provides a general description of the habitats that have been impacted or potentially impacted by the Incident. Descriptions of these habitats and their associated flora and fauna were taken from field notes and reports concerning the site.

2.3 Biological Resources

The area in which the spill occurred can be classified as the Pineywoods ecoregion of Texas. The East Texas Pineywoods are characterized by rolling hills of pine and oak and rich hardwood bottomlands renewed frequently by long-term flooding. These woodlands are dominated by loblolly and shortleaf pines. Oak, ash, hickory, gum, and cottonwood species are common along the major river drainages such as the Trinity.

Approximately 4.5 miles of Turkey Creek was potentially or actually impacted by the spill (Figure 3). During the initial spill investigations dead fish were observed in Turkey Creek just downstream of the location where the jet fuel initially entered the creek. The fuel also sprayed a nearby residence and impacted some small oak trees, large pine trees, and grass in the area. The pipeline break occurred in a small, about 2-3 acre, pasture. Some sheening from the fuel was observed a few feet upstream of the Ashworth Road crossing as discharged product appeared to have back-flowed upstream due to the lack of flow coming downstream. Numbers and species of fish killed were estimated during the first 3 days of the investigation (Appendix A). During this time very heavy rainfall far upstream in the watershed caused a significant rise on the Trinity River. These flood waters impacted tributaries in the area, including Turkey Creek, and appeared to encroach on the final containment dam at the furthest downstream point of the spill site. Although there was sheening down to the last underflow dam, it appeared that most of the free product was captured upstream of the first underflow dam and main recovery point.

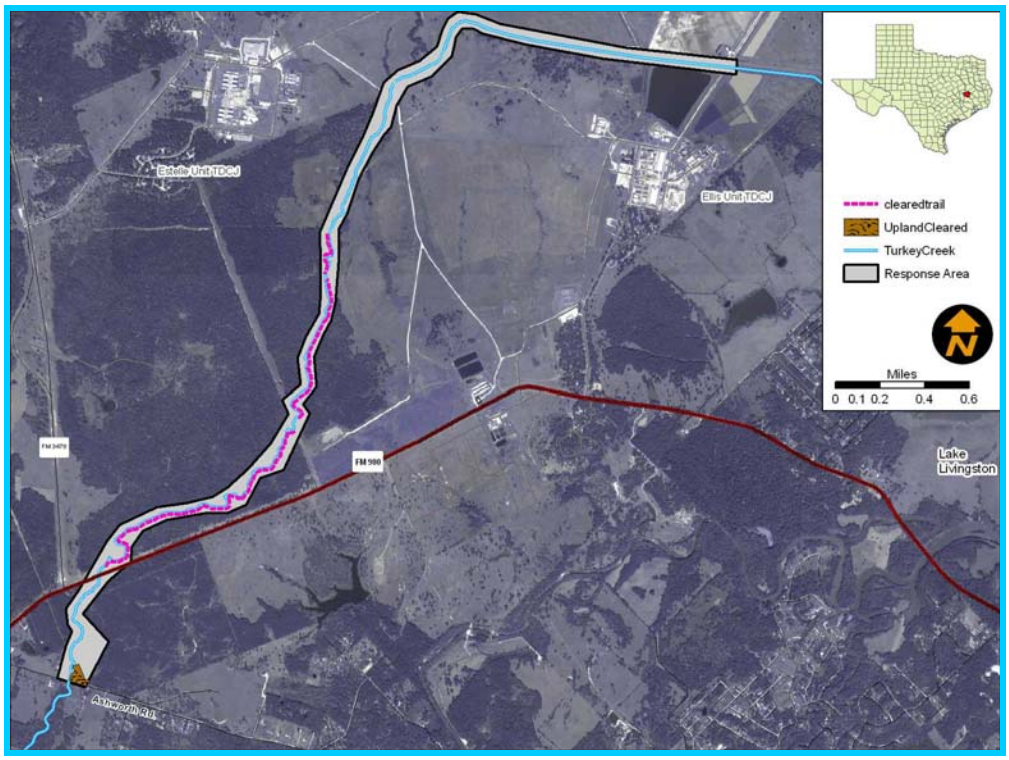

Figure 3. The portion of Turkey Creek impacted by the spill.

Surface waters and associated biota within Turkey Creek sustained injury due to the Incident. Fish, reptiles, amphibians and aquatic invertebrates, such as snails and crawfish, sustained acute effects due to direct exposure to the Jet A fuel as well as potentially chronic adverse effects due to the more persistent and less mobile components of the Jet A fuel. Riparian hardwoods, the grassland pasture, as well as some small oak and large pine trees near the release point were impacted from direct exposure to oil products. Further impacts resulted from clearing as part of the response activities. Avian resources and small mammals which utilized the affected area were adversely impacted through direct contact with oil products as well as the loss of nesting, mating, and feeding habitats.

2.4 Injury and Service Losses Due to Response Actions

Response actions are conducted by potentially the RP, EPA, or state response agencies and focus on controlling exposure to released hazardous substances or crude oil products, by removing, neutralizing, or isolating them in order to protect human health and the environment from the threat of harm. Response actions are separate and distinct from the damage assessment process. However, at times, response actions can cause additional injuries to natural resources. When such injuries result from response actions, the additional injuries are included in the damage assessment (15 CFR §990.51).

During the response to the Jet A fuel spill, clearing activities to provide access to the spill area resulted in further impacts to the woodland and pasture (terrestrial habitat) areas. These actions included cutting pathways to the creek, and clearing pasture areas for vehicle access and excavation of the ruptured pipeline. These habitat impacts were considered in the assessment of injuries related to the spill. A total of 1.5 acre of woodlands and 2.9 acres of pasture were excavated, cleared, and re-graded by heavy equipment as part of the spill response effort (Figure 4). The Trustees therefore have reason to believe that the response actions undertaken during the event did not prevent, remedy, or compensate for potential injuries to or losses of natural resources under their jurisdiction. The Trustees have concluded that a compensable injury resulted from the Incident and response actions taken.

Figure 4. Upland areas excavated as part of the remedial response.

2.5 Endangered and Threatened Species

The federal Endangered Species Act (ESA) of 1973 and the state of Texas statutes regarding endangered animals (1975) and plants (1981) direct federal and state agencies to protect and conserve listed endangered and threatened animals and plants. The habitat of endangered and threatened species takes on special importance because of these laws and because conservation of the species requires careful management. The historical distribution of the species that appear on the threatened and endangered list was more widespread than is observed currently. In evaluating the injuries from the Jet A fuel spill, the Trustees considered the known distribution and potential occurrence of threatened and endangered species.

3 INJURY AND SERVICE LOSS EVALUATION

This section describes the potential injuries and quantifies the potential ecological service losses caused by the Incident and subsequent response actions. It begins with an overview of the Trustees' preassessment evaluation, notice of intent for restoration planning, assessment strategy, and description of the habitat equivalency analysis (HEA). The remainder of the section presents the results of Trustee assessments for the specific resources affected by the spill of Jet A, including the approaches used to determine potential or actual injuries and quantify service losses.

3.1 Preassessment Evaluation

The preassessment phase is the initial step undertaken by the Trustees as part of the NRDA process at an oil spill. During the preassessment phase, trustees collect the necessary information to make critical determinations that shape the remainder of the NRDA. The preassessment is based on the circumstances of a given incident and helps the trustees determine whether NRDA actions under OPA are justified and make the necessary preliminary determinations regarding the type of injury assessment and restoration actions that may be pursued. The preassessment serves to document the Trustees decision process as well as coordinating other matters that may be considered during the preassessment phase including data collection, opening the Administrative Record, coordination, and emergency restoration.

The preassessment phase as described in the NRDA regulations pursuant to OPA has three threshold requirements that must be met during the preassessment phase before restoration planning can proceed. It must be concluded that:

1. a release of oil has occurred as defined by OPA § 990.30,

2. the release was not a permitted action, and

3. natural resources under trusteeship may have been or may be injured as a result of the incident.

The Trustees must also make the further determination to conduct restoration planning. OPA requires the Trustees to address the following criteria in making a determination to conduct restoration planning:

1. Injuries to natural resources that the Trustees have trusteeship over are likely to or have been injured.

2. Response actions taken have not or are not expected to compensate for natural resource injuries.

3. Primary or compensatory restoration actions are feasible.

The Trustees made an early decision to conduct a preassessment to determine if natural resources damage assessment was necessary. Immediately after the spill, during response activities, Trustee agencies had representatives on site beginning July 16, 2007. The information collected during the preassessment phase for the Incident satisfies the three criteria listed above and confirms the need for restoration planning to address injuries to natural resources as a result of the spill. In accordance with 15 CFR §990.42, the Trustees determined in February of 2008 that the requisite conditions existed to justify proceeding with natural resource damage assessment and restoration planning beyond the preassessment phase. These conditions, discussed in more detail below, include: existence of natural resource injuries resulting from the discharge or from associated response actions; response actions were

inadequate or inapplicable to restoration of natural resource injuries and losses; and existence of feasible actions to address the injured resources.

3.2 Notice of Intent for Restoration Planning

The Trustees determined that the July 2007 Jet A fuel discharge into Turkey Creek in Walker County, Texas met the criteria of an OPA incident releasing oil into the navigable waters of the United State. It was further determined that this release was not an authorized or permitted activity and that natural resources under trusteeship by the Trustees were likely impacted by the release. The Trustees further determined that the response actions did not and were not anticipated to compensate for injuries to natural resources. The Trustees having satisfied the criteria listed in OPA regulations determined to proceed with damage assessment and restoration planning to address injuries to natural resources as a result of the spill. During the assessment phase the Trustees quantified the types of resources, acreage, and habitat types affected by the spill. Appropriate scientific methodologies were used to determine the nature and extent of natural resource injuries.

A Notice of Intent to Conduct Restoration Planning letter was provided to Explorer Pipeline on February 21, 2008. The letter also included an invitation to participate in a cooperative assessment and restoration planning. A notice of intent to conduct restoration planning in accordance with 15 CFR §990.44 was published in the Texas Register on February 29, 2008 (33 TexReg 1902). Notice was also provided in the local newspaper, the Huntsville Item. The Trustees did not receive any comments on the proposal and subsequently the Trustees determined to proceed with the assessment and restoration planning.

3.3 Assessment Strategy

The Trustees conducted site surveys to document natural resource injuries and recovery at the site. Information gathered during surveys allowed the Trustees to quantify the percent reduction in ecological services provided by the impacted habitat and associated ecological communities over time. The surveys also quantified recovery of resources from service reductions caused by the Jet A fuel spill. The Trustees used photographic, global position system data and a geographical information system to document and quantify impacts and recovery. The assessment completed by the Trustees also quantified the resources provided by the restoration alternatives evaluated. The scale (or size) of the restoration action should be that which provides the value to adequately offset the value of the losses. The process of determining the size of restoration is called restoration scaling. Restoration scaling requires a framework for quantifying the value of losses and for quantifying the benefits of restoration so the losses and benefits can be compared. The Trustees used HEA as the framework for quantifying losses and benefits. The data collected during the preassessment, response and subsequent surveys were evaluated and used as inputs for the HEA.

3.4 Description of Habitat Equivalency Analysis

HEA is an approach to restoration scaling that has been used successfully for scaling restoration actions at a number of locations in Texas and around the Unites States (NOAA 2000). Losses are quantified as lost habitat resources and services. The restoration projects are to provide comparable habitat resources and services. The scale of the restoration projects is that which provides approximate equivalency between the lost and restored habitat resources and services. Restoration of habitat of the same type, quality, and comparable value should be provided to compensate for the resource and service losses so that the total losses approximately equal the total restoration benefits.

The HEA requires the development of injury parameters to quantify lost habitat resources and services. The parameters needed to estimate losses include the area of habitat injury, the degree of injury within that habitat, and how that degree of injury changes over time. The degree of injury is determined by the condition of key or representative resources or services in the habitat (for example, primary production or macrofaunal density). The losses are quantified or converted to habitat acres and then quantified by year as lost service acre-years, where a service acre-year is the loss of one acre of habitat and its resources and services for a year.

Because the losses occur in different time periods, they are not directly comparable. People place more value on the use or consumption of goods and services in the present rather than postponing their use or consumption to some future time. To make the losses that occur in different time periods comparable, a discount factor is applied to the losses to determine discounted service acre-years (DSAYs). In general, HEA is a technique that balances “debits” (habitat or other injuries) that have occurred as a result of a discharge of oil against compensatory “credits” (habitat restoration projects) and uses a discount factor to account for the difference in time that the restoration services are delivered.

Other parameters are necessary to quantify the benefits of restoration actions in a HEA. They include when the habitat restoration action begins, the time until the habitat provides full services, the level of services provided between the time when the restoration action begins and when it provides full services, and the relative services of the created or enhanced habitat compared to the injured habitat before the injury. These parameters, along with the size of a restoration action, the developmental pressure on the restoration area, and the discount rate, define the DSAY benefits that result from a restoration action. The task is to determine the size of the restoration action such that the DSAY benefits approximately offset the losses.

3.5 Quantification of Injury

Data collected during the response, preassessment and subsequent site evaluations were used in the quantification of lost services due to the unauthorized release of oil. This information was then used for the HEA. The principal concept underlying this methodology is that the public can be compensated for past and future losses of natural resource services through a habitat

replacement project that provides resource services of at least the same level and type as those lost.

HEA characterizes the reduction of natural resource service losses associated with the release of oil to the environment over the time required for the lost services to recover to pre-incident level. The concept of services refers to those functions a natural resource provides to the habitat and its associated biotic components as a whole. As previously noted, the inputs for the HEA were based on observations and measurements taken during the Incident as well as the best professional judgment of technical experts (NOAA 2000).

The Trustees assessed injuries resulting from the spill of oil into the environment during and after the Incident. Interim lost use of the aquatic habitat as well as pasture and woodland uplands in the vicinity of the spill were included in this evaluation. Interim lost use is defined as "the period of time that an injured resource or habitat will require before returning to baseline service flows or those service flows which it provided prior to the spill or release". This information was used as part of the HEA development and consideration for the actions taken during and after the response actions which may have increased or reduced injuries were included in the interim lost use calculations.

Aquatic components included the impacted tributary waters as well as impacted bottomlands adjacent to the tributary. Terrestrial components were separated into pasture and woodland (including upland and riparian). Table 3-1 outlines the ecological evaluation criteria for each habitat type and the associated injury determination. Appendix B lists the habitats and contains all HEA parameters and calculations of these injury scenarios.

Table 3-1. Habitat injury evaluation by habitat type.

Habitat	Lost (Acres)	Lost (DSAY)
Aquatic	4.25	16.44
Woodland	1.46	17.39
Pasture	2.89	7.19

Notes: DSAY – Discounted Service Acre Years

4 GENERAL RESTORATION ALTERNATIVES

The goal of the OPA is to make the environment and public whole for injuries to natural resources and services resulting from an incident involving the discharge or substantial threat of a discharge of oil. The OPA recommends that this goal be achieved by returning injured natural resources to their baseline condition and by compensating for any interim losses of natural resources and services that occur during the period of recovery to baseline or pre-spill condition.

The overall objective of the restoration planning process is to identify restoration alternatives that are appropriate to restore, rehabilitate, replace or acquire natural resources and their services equivalent to natural resources injured or lost as a result of discharges of oil. The restoration planning process has two components: primary restoration and compensatory restoration. Primary restoration actions are actions designed to return resources and services to their baseline levels on a natural recovery (no action) or accelerated (active restoration actions) time frame. Compensatory restoration is any action taken to compensate for interim losses of natural resources and services, pending return of the resources and their services to baseline level.

In accordance with NRDA regulations, the Trustees developed appropriate restoration alternatives and selected preferred alternatives to address resource injuries and losses of services. The Trustees first identified and evaluated general alternatives capable of serving as compensatory restoration for the injured natural resources and/or services. As part of the effort to develop general restoration alternatives, the Trustees consulted with local scientists and state agency personnel to get their perspective on the benefits and feasibility of various types of restoration alternatives. These efforts were important in assisting the Trustees in identifying projects that are potentially feasible, have strong net environmental benefits, and meet restoration requirements to compensate for injuries resulting from the Incident.

Some compensatory alternatives considered by the Trustees would provide similar resources and/or services to those injured, while other alternatives would compensate by providing a comparable resource enhancement or preservation. The Trustees preferentially seek to restore injured natural resources in-kind (e.g., create new wetlands to compensate for lost aquatic function), in the geographical vicinity affected, while working to maximize ecosystem benefit, benefit to human uses of the environment (such as fisheries), and cost-effectiveness of 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. Finally, 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.

4.1 Evaluation Criteria for Selecting Preferred Restoration Alternatives

Once a reasonable range of restoration alternatives is developed, the OPA NRDA regulations (15 CFR §990.54) require the Trustees to identify preferred restoration alternatives based on certain criteria. The Trustees used the evaluation criteria listed below to consider and prioritize all restoration project alternatives currently identified. The criteria are not ranked in order of priority:

The cost to carry out the alternative: The benefits of a project relative to its cost are a major factor in evaluating restoration alternatives. In addition, the Trustees consider the total cost of the project. Factors that can affect and increase the costs of implementing the restoration

alternatives may include project timing, access to the project site (for example with heavy equipment), obtaining state or federal permits, acquiring the land needed to complete a project, and potential liability from project construction.

The extent to which each alternative is expected to meet the Trustees' goals and objectives in returning the injured natural resource and services to baseline and/or compensating for interim losses: The fundamental goal of any compensatory restoration project is to provide resources and services of the same quality that were lost. Thus, the ability of the restoration project to provide comparable resources and services is an important consideration in the project selection process. Projects that restore, rehabilitate, replace, enhance, or acquire the equivalent of the resources and services injured by the spill are preferred to projects that benefit other comparable resources or services. To quantify the provision of resources and services, the Trustees must consider the potential relative productivity of the restored habitat. Finally, future site management issues and the opportunity for conservation easements are also considered because they can influence the extent that the project meets objectives. The proposed alternative must comply with all applicable federal or state laws and regulations.

The likelihood of success of each alternative: The Trustees consider technical factors that represent either risk to the success of project construction or the long-term viability of the resources and services involved. For example, project sites with high subsidence rates are problematic due to concerns about the long-term existence of constructed habitats. An alternative that is susceptible to future degradation or loss through contaminant releases or erosion is considered less viable. Sites that require long-term maintenance of project features are less feasible. A proven track record demonstrating success of projects utilizing a similar or identical restoration technique can be used to satisfy these evaluation criteria.

The extent to which each alternative will prevent future injury as a result of the incident and avoid collateral injury as a result of implementing the alternative: Alternatives should avoid or minimize adverse impacts to the environment and the associated natural resources. Projects should not contaminate the surrounding area or conflict with the viability of endangered species populations. Projects should be compatible with surrounding land use.

The extent to which each alternative benefits more than one natural resource and/or service: This concept is related to the interrelationships among natural resources and between natural resources and the services they provide. Projects that provide benefits to more than one resource and/or service yield more benefits.

The effect of each alternative on public health and safety: Projects that would negatively affect public health or safety are not appropriate.

The regulations allow the Trustees to prioritize these criteria, and to use additional criteria as appropriate. The key criterion for the Trustees are the extent to which an alternative will

compensate for losses and the likelihood of its success as these criterion most clearly indicate whether the goal of making the public whole from losses resulting from the discharge is met.

4.2 Compensatory Restoration Alternatives

As previously discussed and in accordance with the OPA regulations, the Trustees developed a reasonable range of restoration alternatives to address resource injuries and losses of service. Primary restoration to return the injured area back to baseline levels sooner than 2014 (the assumed 7 years for natural attenuation) was infeasible and considered to be not cost-effective. The injuries considered for compensatory restoration consisted of the interim lost services associated with the upland and aquatic habitats. During the compensatory restoration planning, the Trustees evaluated what actions, if any, were appropriate to replace equivalent ecological services lost due to exposure to oil as a result of the Incident. Some compensatory alternatives considered by the Trustees would provide similar resources and/or services to those injured, while other alternatives would compensate by providing a comparable resource or service.

4.2.1 General Alternatives Considered

The following subsections discuss a range of possible alternatives for restoration, an evaluation of each alternative as compared to the selection criteria shown above, and describe the alternative selected by the Trustees for implementation.

Alternative 1 - No action

The Trustees evaluated the No Action alternative, which would provide no compensation beyond natural attenuation for injuries at the site. Under this alternative, the Trustees would take no direct action to obtain compensation for interim losses, pending recovery, associated with the injured resource and/or lost service in question. This alternative would be appropriate where no significant interim losses were incurred as a result of the oil spill at the site, or where actions to provide compensation for those losses are not cost-effective.

The principal advantages of this approach are the ease of implementation and the absence of monetary costs. The Trustees may select natural recovery under three conditions: (1) if feasible, (2) if cost-effective primary restoration is not available, or (3) if injured resources would recover quickly to baseline without human intervention. The No Action alternative is not appropriate for the Incident because the Trustees have determined that there were significant interim losses of natural resource services and that the No Action alternative would not provide compensation for lost use of natural resources and services. Further, it is inconsistent with OPA because interim ecological service losses have occurred and the public and the environment would not be made whole (compensated) through this alternative and cost-effective methods to achieve compensation are available. The Trustees have not selected the No Action alternative as the preferred restoration alternative.

Alternative 2 - Creation of habitat

This alternative would involve the creation of woodland and pasture as well as aquatic habitats to offset the injuries to the habitats affected by the Incident. The creation of aquatic habitat in the form of freshwater open water/wetland habitat is technically feasible. However, this process requires re-contouring existing habitats to the correct hydrology for wetland inundation and providing connection to existing fresh water bodies. Vegetation of the wetland areas would be accomplished by planting native species and eliminating invasive species. The habitat would be monitored for sustained growth of native species dependent upon an aquatic habitat.

Woodland and pasture habitat construction is also technically feasible. The correct ground preparation and contouring would create the appropriate elevation and hydrology for successful planting of native canopy, mid-story, and groundcover species. The habitat would have to be monitored for many decades after planting and invasive species would have to be eliminated to sustain and ensure the growth of native species.

This alternative while technically feasible and meeting the OPA criteria is a very costly process with varying levels of success. It is generally recognized that constructed wetlands never fully reach the productivity levels of natural wetlands, thus requiring additional acreage to offset lost services. In addition, the duration and manpower effort required to ensure the long term success of constructed pasture and woodland habitats is not cost-effective. Due to the difficulty of constructing these different types of habitats and the reduced probability of success this alternative is not selected as the preferred restoration alternative.

Alternative 3 - Acquisition and preservation of existing high quality habitat

This alternative would provide protection for existing habitat, with similar ecological services to those habitats impacted by the oil spill. These habitats should support a diverse range of flora and fauna similar to those affected as well as, having some intrinsically unique value that is at threat of being lost. This alternative meets all the selection criteria described by OPA and property is available with similar characteristics, in sufficient quantity and exists within the same watershed as the spill site.

The Trustees have determined that properties within the vicinity of the spill site exist that have ecological services similar to those impacted and have unique habitats that are threatened by current land use and development within the Pineywoods ecoregion. Acquisition and preservation of the property is cost-effective, technically feasible, and has a high certainty of success. The habitat is established, avoids any additional injury to existing habitats and has the beneficial collateral effects of protecting the surrounding watershed. Thus, Alternative 3 is selected as the restoration alternative to be implemented using the criteria established under NOAA regulations (15 CFR §990.54).

Alternative 4 – Acquisition, preservation and enhancement of habitat

Property that has high quality or intrinsically unique qualities is not always readily available. In these cases the acquisition of property for enhancement and preservation may be more appropriate. Examples of this would be a riparian area that has been affected by agricultural practices or lumbering, being enhanced through elevation adjustments and hydrological modifications. The area would be allowed to naturally re-colonize with native species, or fringe vegetation could be planted to accelerate recovery to a pre-disturbed condition. These modifications would create additional services to compensate for lost natural resources services from the Incident.

A site for acquisitions, preservation and enhancement may not be readily available in the Pineywoods ecoregion whereas viable preservation properties are. Selective acquisition of any such sites in sufficient quantity to compensate for lost services would likely be expensive and potentially cost prohibitive. Ecological services gains from riparian enhancement projects are often difficult to quantify and the probability of their success is uncertain. Expensive corrective actions may be required and long-term monitoring would be necessary to ensure project success. Significant collateral impacts to existing habitat may also result from project activities, thereby reducing the total benefits of the enhancement. Therefore, the Trustees conclude that the enhancement of an existing habitat in the Pineywoods ecoregion is not as beneficial or cost-effective as the acquisition and preservation of existing off site high quality habitats. This alternative is not selected as the preferred restoration alternative.

4.2.2 Selected Restoration Alternative

The Trustees, having concluded the alternatives analysis as required by OPA, have selected Alternative 3, the acquisition and preservation of existing high quality habitat in the Pineywoods ecoregion as the selected restoration alternative which meets all the selection criteria and best meets the Trustees' goals and objectives in compensating for interim losses. It is technically feasible and cost-effective to implement. In compliance with OPA, the selection of restoration alternatives will be finalized following public review and comment on this DARP. In compliance with CERCLA, the Draft DARP has been presented for public comment and review. Since the commenter on the Draft DARP supported the Trustee findings that the restoration alternative in Angelina County is appropriate, the Trustees have determined to proceed with the finalization of this document and implementation of the selected restoration alternative without additional public comment. Concerns expressed by the commenter will be, to the maximum extent possible, addressed within the framework of the implementation of the selected restoration action.

5 RESTORATION SCALING

As previously discussed in Section 3, HEA was used to scale the size of the restoration project necessary to compensate for lost services. Input parameters for the HEA calculations to determine lost services include acreage affected, the estimated level of services at the time of

the injury, number of months or years of impact and how many months or years until full recovery can be achieved. A summary of the injury parameters values for the HEA is shown in Appendix B. In order to determine the scale of restoration required, the result of the injury evaluation is then compared to the HEA evaluation of the benefits associated with restoration alternatives.

Injuries were scaled based on the habitat type, percent decline in services provided by that habitat type, and the type of restoration to be undertaken. As previously discussed in Section 3.4, base injuries were determined by habitat type. Injuries were grouped into three distinct categories that accounted for the majority of lost services; woodland, pasture, and aquatic habitat. Appendix B provides a detailed description of the HEA calculations used to determine base injuries and the minimum acreage requirements for construction and preservation projects.

The injured acreage was a mixture of grassy uplands (pasture), riparian and upland hardwoods (woodland), and aquatic habitats. To facilitate restoration planning, the Trustees chose to convert the injury values for all habitat types to aquatic habitat equivalent injury values. Table 5-1 summarizes the values used to calculate the total aquatic habitat equivalent injury values. Based on the relative ecological services provided by the wooded habitat, a Habitat Conversion Factor (HCF) of 1.5 was used to convert the 17.39 DSAY woodland losses to 26.09 DSAYs of aquatic habitat equivalent losses (HEL). The relative ecological services provided by the pasture (7.19 DSAYs) was also converted to aquatic HELs using an HCF of 0.25 which resulted in 1.80 DSAYs of aquatic HELs. The total aquatic equivalent DSAYs of all three habitat types was determined to be 44.32 aquatic habitat equivalent DSAYs. The minimum amount of acreage required for construction of freshwater wetlands was derived by dividing the total aquatic equivalent DSAYs by the calculated gains per 1 acre of constructed habitat or 13.16 DSAYs (Appendix B). Therefore, the Trustees determine that the minimum number of acres required for a freshwater wetland construction project to compensate for lost natural resource services from all three habitat types is 3.4 acres.

Table 5-1. Conversion of individual habitat losses to total aquatic habitat equivalent losses.

Injured Habitat Type	**Lost DSAYs**	**Habitat Conversion Factor (HCF)**	**Habitat Equivalent Losses** (Base DSAY x HCF)
Aquatic	16.44	1.0 (Aquatic: Wetland)	16.44
Woodland	17.39	1.5 (Woodland: Wetland)	26.09
Pasture	7.19	0.25 (Pasture: Wetland)	1.80
		Total Aquatic HELs	**44.32**

Notes: DSAYs – Discounted Service Acre Years

To consider preservation rather than creation of wetland or aquatic habitat, the Trustees determined the amount of habitat which would need to be preserved to provide the same level of ecological services as a constructed habitat. Based on the Trustees' best professional judgment and other cases in Texas, a ratio of 10:1 for preserved habitat to created habitat was established for this case. The 10:1 ratio is also consistent with the ranges of mitigation ratios used for bottomland hardwoods in other regulatory actions, such as Section 404 permit applications. Constructed habitat was considered to be 10 times more valuable than preserved habitat, because construction of a habitat provides additional ecological services to the whole ecosystem, while preservation of an existing habitat does not initially add ecological service flows. The benefits of preservation of habitat are the prevention of future degradation and future losses of ecological service flows. Preserved habitat does not immediately add any ecological services to the whole, because they already exist. In other words, creation of a new habitat is more valuable per acre because it very rapidly begins providing ecological service flows, eventually providing close to 100% ecological services. Thus ecological services are added to the whole system. Preservation of an existing habitat does not immediately add to the whole, so credit is provided based on ecological services which will not be lost in the future because the habitat is preserved. Thus, using the 10:1 ratio, it was determined that preservation of at least 34 acres of existing habitat would be needed to compensate for injuries to the aquatic HEL injured by the spill.

6 SELECTED RESTORATION PROJECT

In Section 4.2.2 the Trustees determined that preservation of existing high quality habitat was the selected restoration alternative. When considering the preservation of existing habitat as a restoration alternative, the Trustees further determined that a minimum of 34 acres of mixed hardwoods, riparian, and aquatic habitat would need to be preserved in order to provide the same or greater level of services/credits as those lost due to the release of Jet A fuel. The Trustees evaluated properties along Turkey Creek and outside of the Turkey Creek watershed but within the Pineywoods ecoregion as potential acquisition/preservation properties.

The goal of each restoration project would be to place a portion or all of a selected property into a conservation easement or through another equally protective measure to preserve the ecological services associated with existing habitat in perpetuity. As previously discussed any preservation project would have to preserve at least 34 acres of comparable mixed hardwoods, riparian, and aquatic habitat. To ensure the long term service flows from each of these projects, the selected property may be protected with a conservation easement held in perpetuity by a recognized and established non-profit 501(c)(3) organization with compatible goals or through another equally protective measure.

6.1 Site-Specific Restoration Alternatives Considered

This subsection discusses a range of site-specific projects that were evaluated by the Trustees as potential restoration alternatives and describes the project chosen for implementation.

Restoration Alternative 1 – Habitat Construction within Injured Area of Turkey Creek

Alternative 1 would involve the construction and preservation of wet riparian habitat that was injured due to the release of Jet A fuel and subsequent remediation efforts. New upland trees and riparian habitat would be constructed in place of the injured habitat and preserved.

While this project would result in the direct replacement of the habitat lost, constructing riparian habitat is an expensive alternative. Also much of the injured area is within property owned by the Texas Department of Criminal Justice (TDCJ) with conflicting needs of a naturally preserved wetland habitat. The area along Turkey Creek within TDCJ property is already managed heavily to preserve line of sight and other TDCJ security needs.

Because there are more cost effective alternatives available that are also technically feasible, Alternative 1 was not selected as the preferred restoration project.

Restoration Alternative 2 – Preservation of Turkey Creek Habitat Adjacent to Injury

Alternative 2 would preserve habitat adjacent to the injured area along Turkey Creek in Walker County. Area available for preservation is also within TDCJ property and with conflicting needs of a naturally preserved wetland habitat as noted in Alternative 1. Since the spill occurred near the headwaters of Turkey Creek, limited land upstream from the injured area is available for preservation. This area is also already under development for housing and other urban uses that are not readily compatible with the conservation of ecological values.

Because there are more cost effective alternatives available that are also more technically feasible, Alternative 2 was not selected as the preferred restoration project.

Restoration Alternative 3 – Preservation of Offsite Property

Alternative 3 involves the preservation of property with similar habitat outside of Turkey Creek but within the Pineywoods ecoregion. This property is located approximately 1 mile west of TPWD's Alazan Bayou Wildlife Management Area (WMA) and is adjacent to the Stephen F. Austin (SFA) Experimental Forest owned by the United States Forest Service (Figure 5). TPWD staff is currently in negotiations with a private seller for a 486-acre tract of contiguous bottomland hardwood habitat along 3.28 miles of the Angelina Riverfront as an addition to the Alazan Bayou WMA. The intrinsic biological value and diversity of bottomland hardwood forests makes this an ecologically important tract for conservation purposes. Adding the tract to the existing Alazan Bayou WMA would increase the total acreage of conserved bottomland hardwood habitat to 5,149 acres (including the SFA Experimental Forest). Once acquired, this tract would be managed as part of the existing WMA.

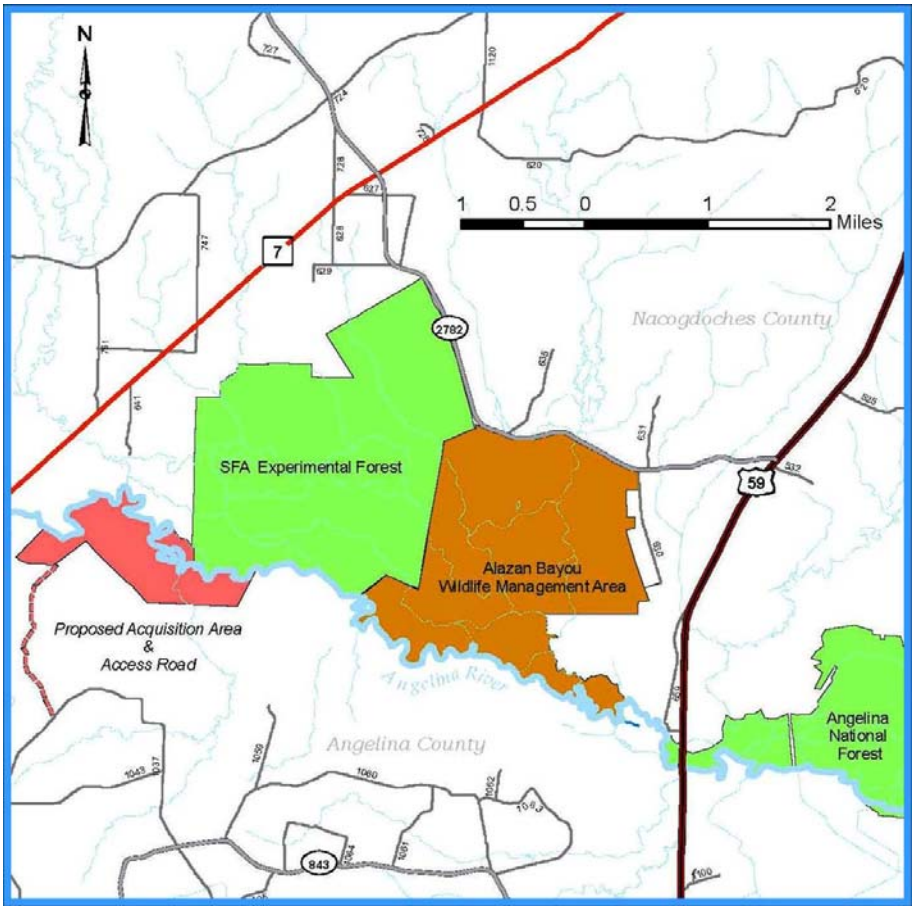

Figure 5. Location of preservation property and Alazan Bayou WMA.

The tract is primarily riparian-associated bottomland hardwood habitat along the Angelina River. Additionally, wetland habitats are found on the tract including sloughs, old river channels, and oxbows. In addition to providing habitat for relatively common species of wildlife in eastern Texas, including wintering and breeding waterfowl, the tract is potential habitat for the Louisiana black bear (*Ursus americanus luteolus*), Rafinesque's big-eared bat (*Corynorhinus rafinesquii*), southeastern myotis (*Myotis austroriparius*), bald eagle (*Haliaeetus leucocephalus*), swallow-tailed kite (*Elanoides forficatus*), wood stork (*Mycteria Americana*), alligator snapping turtle (*Macrochelys temminckii*), timber rattlesnake (*Crotalus horridus*), creek chubsucker (*Erimyzon oblongus*), orangebelly darter (*Etheostoma radiosum*), paddlefish (*Polyodon spathula*), and a variety of mollusks. The tract would offer recreation opportunities including but not limited to hunting, fishing and canoeing. The tract has two boat ramps that would provide access to the river for recreational and law enforcement purposes. Protection of the ecological services provided by this tract will be ensured through management of recreational access. Acquisition of the property would preserve the bottomland habitat from fragmentation and or conversion to agricultural use.

This project while not as proximal as other preservation projects to the impacted resources is more technically feasible, cost efficient, and would provide sufficient natural resources services

to compensate for losses associated with the Incident. In addition sufficient habitat is available to meet the minimum habitat requirements and the project is located in an area expected to replace services within the ecoregion impacted by the Explorer Pipeline oil spill. The Trustees are proposing to use settlement funds for this Incident to facilitate the acquisition of the property. Therefore, Alternative 3 is selected as the restoration project to be implemented to compensate for lost natural resource services.

6.2 Selected Restoration Alternative

Restoration Alternative 3 – Preservation of Offsite Property has been selected as the restoration alternative to be implemented due to the hydrological characteristics as well as the quality and diversity of the plant and wildlife community on the site. The ecological values of this selected property will be preserved through management of the property as part of the TPWD Alazan Bayou WMA to ensure that the natural and ecological integrity of the property be maintained.

7 CONCLUSION

As described above, the overall objective of the restoration process is to make the environment and public whole for injuries to natural resources and/or service losses resulting from the Incident. To meet that objective, the benefits of restoration actions must be related, or have an appropriate nexus, to the natural resource injuries and losses due to the discharge of oil. The relationships that must be considered include the following:

- Equivalency of created or enhanced resources or services to those affected or potentially affected by the discharge of oil, and

- Potential for restoration at or near the area where natural resource injuries/service losses occurred.

To achieve this fundamental objective, the Trustees determined that the restoration alternative selected must have an ecological and a geographical relationship to injured resources and lost services. The Trustees approached restoration planning with the view that the injured natural resources/lost services are part of an integrated ecological system and that the selected preservation project of contiguous bottomland hardwood habitat along 3.28 miles of the Angelina Riverfront, located within the Pineywoods ecoregion, provides the most relevant ecological benefits within the geographical area targeted for restoration actions. Areas within the Turkey Creek watershed, while more proximal to the injured resources, were determined to be technically less feasible and less cost effective than the selected alternative.

8 REFERENCES

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Appendix A: Fish Kill Report

Texas Parks and Wildlife Department

Resource Protection Division - Kills and Spills Team

Fish Kill/Pollution Complaint Detailed Report

General Description:

Event ID:	20073A267v1	**Estimated Killed:**	4,720
Type of Event:	Fish Kill	**Sum of Count Value:**	$2,075.71
Start Date:	July 14, 2007	**Sum of Additional Value:**	$0.00
End Date:	July 14, 2007	**Grand Total Value:**	$2,075.71
Region:	03	**Fiscal Year:**	2007
Record Status	Permanent	**Calendar Year:**	2007
Old Event ID:			

County(s):

Walker

Event Description:

Region 3 was notified about a pipeline break releasing approximately 4500 barrels of jet fuel to the air and then into Turkey Creek. Approximately 4.5 to 5 miles of Turkey Creek was reported to be impacted. Dead fish were reported as well. A huge cleanup effort was in place upon arriving at the site for the first time. During that investigation dead fish were observed in Turkey Creek just downstream of the location where the jet fuel initially entered the creek. The fuel also sprayed a nearby residence and impacted some small oak trees, large pine trees, and grass in the area. The pipeline break occurred in a small, approximate 2-3 acre, pasture adjacent to Ashworth Road. Some sheening from the fuel was observed a few feet upstream of the road crossing and appeared to have back-flowed upstream due to the lack of flow coming downstream. Numbers and species of fish killed were estimated during the first 3 days of the investigation. During this time very heavy rainfall far upstream in the watershed caused a significant rise on the Trinity River. These flood waters impacted tributaries in the area and appeared to be encroaching on the final containment dam at the furthest downstream point of the spill site. Although there was sheening down to the last underflow dam, it appeared that most/all of the free product was captured upstream of the first underflow dam and main recovery point. The fish kill ran its' course rather quickly. The cleanup will undoubtedly continue for some time. Additional site visits will be necessary to determine the extent of possible damage to riparian habitat.

Source and Cause:

Cause:	Pollutant (C)		
Specific Cause:	Fuel oil (C)	**Active Compound:**	7000 Barrel(s) of jet fuel - A
Source:	Industry, Oil and Gas (C)	**Action:**	Spill (C)
Specific Source:	Pipeline (C)		

Habitat(s):

2.5 Acre(s) of Land
4.5 Mile(s) of Stream

Water Segment(s):

0803 - Lake Livingston, Trinity River Basin

Location:

Latitude **Longitude**

Starting Lat/Long: 30°51'5.8" / -95°29'50" **Start Lat/Long Decimal:** 30.85161209 **/** -95.49722290

Ending Lat/Long: 30°53'34.2" / -95°27'21.7" **End Lat/Long Decimal:** 30.89283371 **/** -95.45602417

Exact Location: Turkey Creek - at Ashworth Rd. East of FM980, about 10 miles NE of Huntsville.

Comments:

Notification Information:

Date Notified:	July 14, 2007	**Investigator Name:**	KAST
Comments:		**Notified By:**	Alleged Responsible Party

Alleged Party Information:

Name:	Explorer Pipeline	**Phone:**	(918) 493-5143
Contact:	Jim Sieck	**Fax:**	(918) 493-5125
Title:	Director, Health and Safe	**City, State:**	Tulsa, OK
Address:	PO Box 2650	**Zip Code:**	74101-2650

Audit Information:

Keyed By:	Greg Conley	**Date Keyed:**	7/19/2007 1:08:48 PM
Edited By:	Jack Ralph	**Date Edited:**	8/30/2007 1:26:37 PM
Last User:	Jack Ralph	**Last Update:**	8/30/2007 1:26:37 PM
Prepared By:	Greg Conley		
Comments:			

Texas Parks and Wildlife Department

Resource Protection Division - Kills and Spills Team

Fish Kill/Pollution Complaint Detailed Counts Report

Event ID: 20073A267

Count Type: Modified AFS Guidelines

Report Header: Turkey Creek - at Ashworth Rd. East of FM980, about 10 miles NE of Huntsville. (Walker County) organism data from 07/14/2007. Field and expanded counts for organisms counted by species and inch class. Expansion Factor seg 1 is 11.4033, EF seg 2 is 1.

Segment 1

Expansion 11.40

Unit of Measure: 4.5 Mile(s)

Note: unidentified fish = Notropis sp., Etheostoma sp., and Fundulus sp.

Site: 1 **Unit of Measure:** 100 Yard(s)

Common Name	Scientific Name	Length	Actual Count	Expanded Count
Crayfish, Unidentified	Family Astacidae	2	10	114
Golden Shiner	Notemigonus crysoleucas	2	2	23
		5	1	11
Green Sunfish	Lepomis cyanellus	1	5	57
Largemouth Bass	Micropterus salmoides	1	1	11
		3	1	11
Longear Sunfish	Lepomis megalotis	5	3	34
Unclassified Sunfishes	Lepomis sp.	2	1	11
Unidentified Turtle		7	1	11
Western Mosquitofish	Gambusia affinis	1	1	11
		Site Totals:	26	294

Site: 2 **Unit of Measure:** 0.12 Mile(s)

Common Name	Scientific Name	Length	Actual Count	Expanded Count
* Unidentified Fish		1	6	68
		2	4	46
Crayfish, Unidentified	Family Astacidae	2	5	57
Green Sunfish	Lepomis cyanellus	2	3	34
		3	10	114
		4	15	171
		5	5	57
		6	1	11
Largemouth Bass	Micropterus salmoides	1	2	23
		2	1	11
		3	1	11
Longear Sunfish	Lepomis megalotis	3	1	11
		4	3	34
		5	1	11
Snapping Turtle	Chelydra serpentina	12	1	11
Unclassified Sunfishes	Lepomis sp.	2	6	68
		4	1	11
Western Mosquitofish	Gambusia affinis	1	1	11
Yellow Bullhead	Ameiurus natalis	2	1	11
		3	1	11
		4	3	34
		6	4	46
		8	1	11
		10	1	11
		Site Totals:	78	884

Site: 3 **Unit of Measure:** 100 Feet

Common Name	Scientific Name	Length	Actual Count	Expanded Count
Blacktail Redhorse	Moxostoma poecilurum	4	1	11
Bluegill	Lepomis macrochirus	2	1	11
		3	3	34
		4	1	11
Crayfish, Unidentified	Family Astacidae	2	3	34
Gizzard Shad	Dorosoma cepedianum	8	1	11
Golden Shiner	Notemigonus crysoleucas	2	4	46
		3	2	23

Site: 3 **Unit of Measure:** 100 Feet

Common Name	Scientific Name	Length	Actual Count	Expanded Count
Green Sunfish	Lepomis cyanellus	2	4	46
		3	5	57
		4	1	11
Largemouth Bass	Micropterus salmoides	2	1	11
		4	1	11
		5	1	11
Longear Sunfish	Lepomis megalotis	3	1	11
		6	1	11
Snapping Turtle	Chelydra serpentina	10	2	23
Unclassified Sunfishes	Lepomis sp.	1	3	34
		2	4	46
		3	3	34
Western Mosquitofish	Gambusia affinis	1	1	11
Yellow Bullhead	Ameiurus natalis	3	4	46
		4	4	46
		5	4	46
		6	4	46
	Site Totals:	60	682	

Site: 4 **Unit of Measure:** 250 Feet

Common Name	Scientific Name	Length	Actual Count	Expanded Count
* Unidentified Fish		1	1	11
		2	1	11
		3	1	11
Blacktail Redhorse	Moxostoma poecilurum	4	1	11
Blacktail Shiner	Cyprinella venusta	4	1	11
Bluntnose Darter	Etheostoma chlorosomum	1	4	46
Bullhead Minnow	Pimephales vigilax	3	1	11
Crayfish, Unidentified	Family Astacidae	2	8	91
Green Sunfish	Lepomis cyanellus	2	1	11
		3	1	11
		4	2	23
Largemouth Bass	Micropterus salmoides	4	2	23

Site: 4 **Unit of Measure:** 250 Feet

Common Name	Scientific Name	Length	Actual Count	Expanded Count
Longear Sunfish	Lepomis megalotis	3	1	11
		4	3	34
Longear Sunfish	Lepomis megalotis	5	1	11
Red Shiner	Cyprinella lutrensis	3	1	11
Unclassified Sunfishes	Lepomis sp.	2	2	23
		3	1	11
Yellow Bullhead	Ameiurus natalis	1	1	11
		2	7	80
		3	2	23
		4	1	11
		6	4	46
		Site Totals:	48	543

Site: 5 **Unit of Measure:** 200 Feet

Common Name	Scientific Name	Length	Actual Count	Expanded Count
* Unidentified Fish		2	1	11
		3	2	23
Blacktail Redhorse	Moxostoma poecilurum	4	1	11
Bluegill	Lepomis macrochirus	2	2	23
		3	1	11
Bluntnose Darter	Etheostoma chlorosomum	1	10	114
Bullhead Minnow	Pimephales vigilax	2	1	11
Crayfish, Unidentified	Family Astacidae	2	10	114
Green Sunfish	Lepomis cyanellus	2	1	11
		3	5	57
		4	1	11
Largemouth Bass	Micropterus salmoides	2	3	34
Longear Sunfish	Lepomis megalotis	3	4	46
		4	2	23
Red Shiner	Cyprinella lutrensis	2	3	34
		3	4	46
Unclassified Sunfishes	Lepomis sp.	2	4	46
Western Mosquitofish	Gambusia affinis	1	1	11

Site: 5 **Unit of Measure:** 200 Feet

Common Name	Scientific Name	Length	Actual Count	Expanded Count
Yellow Bullhead	Ameiurus natalis	1	2	23
		2	2	23
		3	1	11
		4	1	11
		Site Totals:	62	705

Site: 6 **Unit of Measure:** 100 Yard(s)

Common Name	Scientific Name	Length	Actual Count	Expanded Count
*No Data Taken		0	0	0
		Site Totals:	0	0

Site: 7 **Unit of Measure:** 100 Yard(s)

Common Name	Scientific Name	Length	Actual Count	Expanded Count
* Unidentified Fish		2	1	11
Black Bullhead	Ameiurus melas	2	1	11
Blacktail Redhorse	Moxostoma poecilurum	3	4	46
		4	1	11
Crayfish, Unidentified	Family Astacidae	2	23	262
Largemouth Bass	Micropterus salmoides	3	1	11
Longear Sunfish	Lepomis megalotis	4	2	23
		5	1	11
Red Shiner	Cyprinella lutrensis	2	2	23
Unclassified Sunfishes	Lepomis sp.	1	2	23
		2	17	194
		3	5	57
Western Mosquitofish	Gambusia affinis	1	4	46
	Site Totals:		64	729
	Segment Totals:		338	3,837

Segment 2
Expansion 1.00
Unit of Measure: 75 Feet
Note:

Site: 1 **Unit of Measure:** 75 Feet

Common Name	Scientific Name	Length	Actual Count	Expanded Count
* Unidentified Fish		1	45	45
		2	33	33
Black Bullhead	Ameiurus melas	2	2	2
		3	5	5
		4	1	1
		5	2	2
Blacktail Redhorse	Moxostoma poecilurum	2	3	3
		3	47	47
		4	20	20
Blacktail Shiner	Cyprinella venusta	3	4	4
Bluegill	Lepomis macrochirus	2	7	7
		3	1	1
		4	1	1
Bullhead Minnow	Pimephales vigilax	2	9	9
Channel Catfish	Ictalurus punctatus	6	1	1
Common Carp	Cyprinus carpio	3	3	3
		4	3	3
		5	1	1
Fathead Minnow	Pimephales promelas	3	3	3
Freshwater Drum	Aplodinotus grunniens	5	1	1
		10	1	1
		15	1	1
Gizzard Shad	Dorosoma cepedianum	4	9	9
		5	16	16
		6	70	70
		7	26	26
		8	3	3
Golden Shiner	Notemigonus crysoleucas	2	3	3
		3	2	2
		4	5	5
		5	1	1
Grass Pickerel	Esox americanus	5	1	1
		7	1	1

Site: 1 **Unit of Measure:** 75 Feet

Common Name	Scientific Name	Length	Actual Count	Expanded Count
Green Sunfish	Lepomis cyanellus	2	7	7
		3	25	25
		4	3	3
Largemouth Bass	Micropterus salmoides	2	3	3
Largemouth Bass	Micropterus salmoides	3	5	5
		4	14	14
		5	6	6
		8	1	1
		9	1	1
Longear Sunfish	Lepomis megalotis	2	151	151
		3	164	164
		4	69	69
		5	28	28
		6	1	1
Pirate Perch	Aphredoderus sayanus	1	1	1
		2	1	1
		4	2	2
Red Shiner	Cyprinella lutrensis	1	1	1
		2	14	14
		3	3	3
Warmouth	Lepomis gulosus	2	13	13
		3	4	4
		4	1	1
		5	1	1
Yellow Bullhead	Ameiurus natalis	2	15	15
		3	8	8
		4	3	3
		5	5	5
		6	2	2
	Site Totals:		883	883
	Segment Totals:		883	883
	Event Total Killed:		1,221	4,720

Appendix B: Habitat Equivalency Analysis

Table 1: Habitat Equivalency Analysis (HEA) Inputs

HEA Inputs	Aquatic/Wetland Habitat		Woodland		Pasture	
Area Injured (Acres)	4.25		1.46		2.89	
Injury Input*	Year	% Injury	Year	% Injury	Year	% Injury
Initial Year of Injury	2007	100.00	2007	100.00	2007	100.00
End of 1 Recovery Phase	2015	0.00	2037	0.00	2012	0.00
End of 2 Recovery Phase	2015	0.00	2037	0.00	2012	0.00
End of 3 Recovery Phase	2015	0.00	2037	0.00	2012	0.00
End of 4 Recovery Phase	2015	0.00	2037	0.00	2012	0.00
End of 5 Recovery Phase	2015	0.00	2037	0.00	2012	0.00
End Recovery Period	2015		2037		2012	
*2008 Base Injury Year						
Area Restoration (Acres)	1.00		1.00		1.00	
Restoration Input**	Year	% Service	Year	% Service	Year	% Service
Initial Year of Restoration	2011	0.00	2011	0.00	2011	0.00
End of 1 Restoration Phase	2016	80.00	2056	90.00	2020	90.00
End of 2 Restoration Phase	2041	80.00	2311	90.00	2020	90.00
End of 3 Restoration Phase	2041	80.00	2311	90.00	2308	90.00
End of 4 Restoration Phase	2041	80.00	2311	90.00	2308	90.00
End of 5 Restoration Phase	2041	0.00	2311	0.00	2308	0.00
End Restoration Period	2041		2311		2308	
**2008 Base Restoration Year						
HEA Summary	Aquatic/Wetland Habitat		Woodland		Pasture	
Total Discounted Service Acre Years Loss	16.44		17.39		7.19	
Total Discounted Service Acre Years Gain	13.16		15.63		24.83	
Total Required Constructed Acres	1.25		1.11		0.29	