DEPARTMENT OF THE ARMY
SOUTHWESTERN DIVISION, CORPS OF ENGINEERS
1100 COMMERCE STREET
DALLAS, TEXAS 75242-0216

Reply to
Attention of:

December 28, 2006

CESWD-PDS-P

MEMORANDUM FOR Commander, Fort Worth District

SUBJECT: Report Approvals

1. References:

a. Memorandum, CESWF-PM-C, 15 December 2006, subject: Submittal of Final Detailed Project Report and Integrated Environmental Assessment, Section 206 Aquatic Ecosystem Restoration Project, Olmos Creek, San Antonio, Bexar County, Texas (PWI# 171463).

b. Memorandum, CESWF-PM-C, 5 December 2006, subject: Response to SWD Review of the Final Detailed Project Report and Integrated Environmental Assessment, Lewisville Lake Section 1135 Ecosystem Restoration Project, Frisco, Texas (PWI# 167355)

c. Memorandum, CESWF-PM-C, 8 August 2006, subject: Submittal of Final Detailed Project Report and Integrated Environmental Assessment, Section 206 Aquatic Ecosystem Restoration Project, Spring Lake, San Marcos, Texas (PWI# 167351).

2. The Final Reports submitted with the referenced memoranda are approved. The District may continue plans and specifications within available funds.

3. The draft project cooperation agreement (PCA) for each project is anticipated to conform to the model based on preliminary review. Final review and approval of each PCA is pending HQUSACE ongoing revision of these models.

4. The District Commander may not execute the PCA until the project conforms to all of the requirements (as yet undetermined) that may be associated with expiry of the current PCA moratorium, budgetary guidance and other requirements.

5. The District will separately submit a request for project approval to us, including updated cost estimates and real estate information, at an appropriate time during the plans and specifications phase. No work may be performed unless funds are available.

5. Questions on these projects should be directed to Sam Arrowood, 469-487-7069.

Jo Ann M. Duman

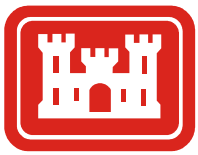
JO ANN M. DUMAN
Chief, Planning and Policy

CF:
CESWD-PDF
CESWF-PM-C

DETAILED PROJECT REPORT
AND
ENVIRONMENTAL ASSESSMENT

FOR

LAKE LEWISVILLE SECTION 1135 ECOSYSTEM RESTORATION PROJECT
DENTON AND COLLIN COUNTY, TEXAS



U.S. ARMY CORPS OF ENGINEERS
FORT WORTH DISTRICT
819 TAYLOR STREET
FORT WORTH, TEXAS 76102-0300

In Cooperation with

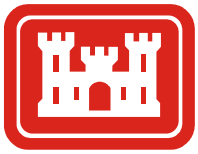
CITY OF FRISCO, TEXAS

DECEMBER 2006

DETAILED PROJECT REPORT
AND
ENVIRONMENTAL ASSESSMENT

FOR

LAKE LEWISVILLE SECTION 1135 ECOSYSTEM RESTORATION PROJECT
DENTON AND COLLIN COUNTY, TEXAS



U.S. ARMY CORPS OF ENGINEERS
FORT WORTH DISTRICT
819 TAYLOR STREET
FORT WORTH, TEXAS 76102-0300

In Cooperation with

CITY OF FRISCO, TEXAS

DECEMBER 2006

FINDING OF NO SIGNIFICANT IMPACT
PROPOSED IMPLEMENTATION OF THE LAKE LEWISVILLE
SECTION 1135 ECOSYSTEM RESTORATION PROJECT
LAKE LEWISVILLE, DENTON AND COLLIN COUNTY, TEXAS

Description of Action. The United States Army Corps of Engineers (USACE) has developed a Detailed Project Report (DPR) and integrated Environmental Assessment (EA) to assess the potential impacts to the environment that may result from the implementation of the Section 1135 Ecosystem Restoration Project at Lake Lewisville, Denton and Collin County, Texas. The recommended alternative would include the construction of six wetland cells adjacent to Hackberry Creek and Stewart Creek, which would total approximately 38.6 acres in size. Seventy-eight (78) wood duck boxes would be installed within, and adjacent to the created wetlands, to promote breeding habitat for wood ducks. Approximately 57.1 acres of old field habitat would be replanted with different mixes of bottomland hardwood species, including a native grass seed mix along Hackberry Creek. In addition, approximately 183.6 acres of USACE fee-owned property and privately-owned flowage easement property would be included in the project to protect existing wildlife habitat, maintain existing riparian corridor connectivity, and reduce the potential for development adjacent to restoration features. The recommended plan would also include a 16,400 linear foot operation and maintenance access system consisting of an 8-foot wide soil path that would provide incidental recreation use and pedestrian access to the restoration area.

Anticipated Environmental Effects. Ecological factors guiding the development of restoration alternatives included the existing low diversity of vegetation within the riparian corridor, a lack of mast producing trees, a lack of cavities suitable for cavity-nesting wildlife, and a lack of emergent wetlands in proximity to wildlife food and cover. Five economically feasible restoration alternatives, including the no action alternative, were identified through the planning process to address ecological needs within the project area. Under the no action alternative, proposed project measures would not be implemented and existing wildlife habitat would degrade in the future due primarily to adjacent urban encroachment. Other alternatives addressed various options for wetland cell placement, vegetation plantings, and nest-cavity creation. Three of the four remaining alternatives were eliminated from further consideration either because they did not meet habitat restoration objectives of the proposed project or had inferior benefit/cost ratios. The recommended alternative that was identified through the planning process would meet the long-term ecological and habitat restoration objectives of the project, provide an incrementally justified benefit/cost ratio, and have support from participating resource and sponsor agencies.

No significant adverse environmental impacts are anticipated with the recommended alternative for geologic, biological, or cultural resources. The recommended alternative is not likely to adversely affect any plant or animal species or habitat that is proposed or listed as threatened or endangered according to the Endangered Species Act. During construction, the recommended alternative would result in minor, short-term discharges to waters of the United States and is subject to provisions of Section 404 of the Clean Water Act. The recommended alternative would meet the conditions of Nationwide Permit (NWP) 27, Stream and Wetland Restoration Activities, and NWP 14, Linear Transportation Projects, under Section 404. The portion of the recommended alternative within the Stewart Creek floodplain, as proposed, would not induce or increase flood damages within the study area and is in compliance with executive order 11988, Floodplain Management.

Facts and Conclusions. Based on a review of the information contained in this EA, it is concluded that the implementation of the Lake Lewisville Section 1135 Ecosystem Restoration Project is not a major Federal action, which would significantly affect the quality of the human environment within the meaning of Section 102(2)(c) of the National Environmental Policy Act of 1969, as amended.

DATE: 11/3/04

JOHN R. MINAHAN
Colonel, U.S. Army Corps of Engineers
District Engineer

LAKE LEWISVILLE SECTION 1135 ECOSYSTEM RESTORATION PROJECT

SYLLABUS

This Detailed Project Report/Environmental Assessment is submitted under the authority of Section 1135(b) of the Water Resources Development Act of 1986, as amended (33 USC 2201). The purpose of this feasibility study is to identify areas of ecosystem degradation, evaluate measures to restore important ecological resources, and recommend a plan for implementation, if one can be found that is technically feasible, environmentally acceptable, and supported by the non-Federal partner. The goal of the recommended restoration plan would be to restore wetland and riparian communities to benefit the variety of resident and migratory wildlife that utilize the study area.

Lake Lewisville is located in the southern portion of Denton County, Texas, approximately 25 miles northwest of the City of Dallas central business district, and was created by the impoundment of the Elm Fork Trinity River to provide flood control and water conservation for north-central Texas. After construction of the Lewisville Dam and subsequent impoundment of the Elm Fork Trinity River, a substantial acreage of wetlands and bottomland and upland forests were permanently altered due to prolonged inundation. Further degradation of shoreline habitats occurred when the conservation pool was permanently raised in 1988. The study area, comprised of old fields, remnant riparian and bottomland forests, and lacustrine wetlands, lies within the Hackberry Creek and Stewart Creek watersheds, and was found to be suitable for ecosystem restoration.

The recommended plan consists of the reforestation of approximately 57.1 acres providing linkage among existing riparian and bottomland hardwood habitat, the construction of a series of wetland cells comprising a total of approximately 38.6 acres, maintenance and protection of approximately 183.6 acres of USACE fee-owned property and privately-owned flowage easement property, and approximately 3.0acres of operation and maintenance access features. The total project cost is estimated at $1,893,992. The total project cost would be shared between the Federal government ($1,420,494) and the City of Frisco ($473,498), who would represent the non-federal partner. Per an agreement with the USACE, the City of Frisco would agree to waive credit or reimbursement for the $2,394,627 in Land, Easements, Rights of Way, Relocation, and Disposal Areas (LERRDs) above the 25% non-Federal cost share guidance for ecosystem restoration. The City of Frisco would also be responsible for all operation, maintenance, replacement, and repair costs upon completion of construction.

This report includes an environmental assessment to evaluate the potential risks that could result from project implementation. Items marked with an (*) indicate information required to fulfill National Environmental Policy Act requirements. A Finding Of No Significant Impact, if appropriate, would be issued after public review of the environmental assessment.

For more information, please contact U.S. Army Corps of Engineers, Fort Worth District, CESWF-PER-EE, ATTN: Jeffry Tripe (817)-886-1716, 819 Taylor Street, Fort Worth, Texas 76102-0300.

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INTRODUCTION

Location*

Lake Lewisville is located in the southern portion of Denton County, Texas, approximately 25 miles northwest of the City of Dallas central business district. The study area is located on federally and privately owned land along the lower reaches of Hackberry Creek and Stewart Creek on the east side of the lake. **Figure 1** shows the project vicinity within the Dallas/Fort Worth Metroplex. **Figure 2** shows the specific location of the study limits in greater detail.

Existing Project

Lake Lewisville is a multipurpose reservoir that was authorized primarily for flood control and water conservation purposes. The City of Dallas constructed the original lake, Lake Dallas, in the 1920's. Because the water storage capacity of the original Lake Dallas was reduced by siltation, the U.S. Army Corps of Engineers (USACE) began construction of the Lake Lewisville Dam in 1948. Lake Lewisville was created by the completion of the dam in 1955. The operation of Lake Lewisville was modified in 1988 as part of construction of Lake Ray Roberts, resulting in a permanent increase of the conservation pool elevation from 515' National Geodetic Vertical Datum (NGVD) to the current 522' NGVD. The conservation pool inundates 23,280 acres of land. The controlled flood pool elevation of 532' NGVD inundates a total of 28,980 acres. Secondary purposes of the lake include recreation, hydroelectric power generation, and fish and wildlife management.

Study Authority*

The study is authorized under the continuing authority provided to the Chief of Engineers by Section 1135(b) of the Water Resources Development Act of 1986, as amended. The USACE is the lead agency for this study. This study was initiated at the request of the City of Frisco in a letter dated March 21, 2001.

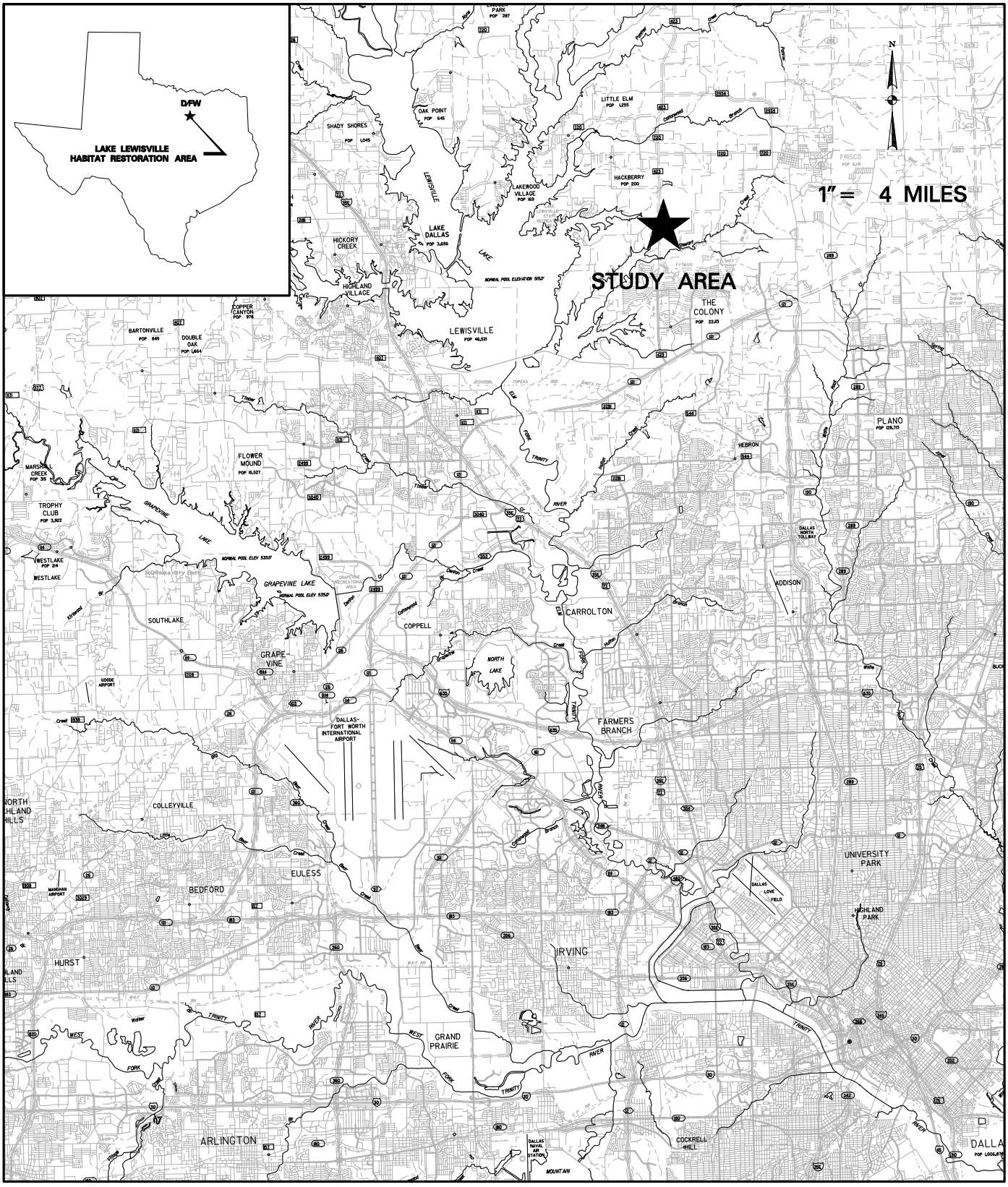
Study Purpose, Area, and Scope*

The purpose of the feasibility study was to identify areas of ecosystem degradation, evaluate measures to restore important ecological resources, and recommend a plan for implementation, if one can be found that is technically feasible, environmentally acceptable, and supported by the non-Federal partner. The goal of a recommended restoration plan would be to restore wetland and riparian communities to benefit the variety of resident and migratory wildlife that utilize the study area. The study limit is the flowage easement (537' feet NGVD) of Lake Lewisville within the Hackberry Creek and Stewart Creek watersheds on the east side of Lake Lewisville.

Field investigations were conducted to characterize vegetative coverage of the study area and to evaluate the overall quality of the habitats for their ability to support wildlife. A multidisciplinary team approach was used to conduct the studies and included the USACE, U.S. Fish and Wildlife Service (USFWS), and the City of Frisco.

Identification of Preliminary Goals

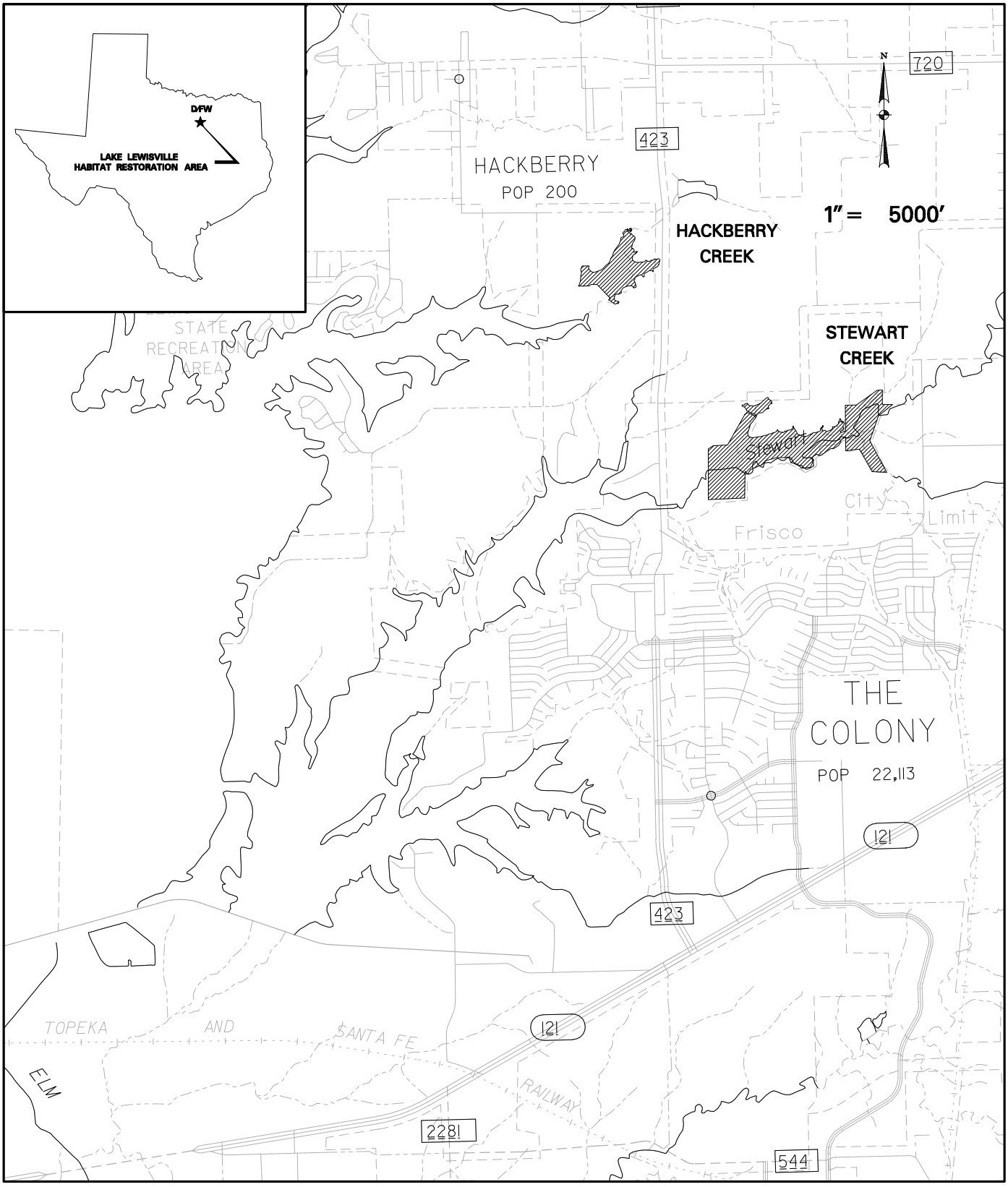
Stream channels and associated riparian corridors are natural resource types that are increasingly exposed to threat by removal or modification as urban areas continue to grow. The importance and need for protection of these types of habitats is supported by the evolution of the Federal regulations under Section 404 of the Clean Water Act, which not only places emphasis on avoiding and minimizing stream impacts, but also stresses the need for maintaining vegetative buffers or corridors when practicable.



U.S. Army Corps of Engineers
Fort Worth District

LAKE LEWISVILLE
ECOSYSTEM RESTORATION
FRISCO, TEXAS

FIGURE 1
GENERAL STUDY LOCATION MAP



U.S. Army Corps
of Engineers
Fort Worth District

LAKE LEWISVILLE
ECOSYSTEM RESTORATION
FRISCO, TEXAS

FIGURE 2
STUDY AREA MAP

The Hackberry Creek and Stewart Creek systems have experienced moderate degradation due to construction and management of Lake Lewisville and adjacent agricultural land uses. The study team recognized opportunities for restoration and enhancement of the local Hackberry Creek and Stewart Creek stream corridors through only minimal modification of the existing landscape. The study team decided that the restoration plan would focus on enhancing the riparian forest vegetative component of the Hackberry Creek and Stewart Creek stream corridors and enhancing the long-term water quality of the stream systems through the construction of several floodplain wetland cells.

EXISTING CONDITIONS*

Climate

The Trinity River watershed of north central Texas is in a zone of dramatic transition of regional climates and is often considered subtropical. According to the National Weather Service, the 30-year mean rainfall amount is 35.02 inches per year with the most recent ten-year (1991-2000) average being 38.03 inches. The extreme annual rainfall values since 1898 are a maximum of 53.54 inches in 1991 and a minimum of 17.91 inches in 1921. A large part of the annual precipitation results from thunderstorm activity, with occasional heavy rainfall over brief periods of time. Thunderstorms occur throughout the year, but are most common in the spring.

Winters are typically mild, but short-lived sudden drops in temperature often accompany winter cold fronts. The highest temperatures of summer are associated with fair skies, westerly winds, and low humidities. Summer high temperatures frequently exceed 100º F with nighttime lows frequently exceeding 80º F. Average low and high temperatures range from 37º F in January and 98º F in August. The average length of the warm season (freeze-free period) is about 249 days. The average last occurrence of sub-freezing temperatures is in mid-March, and the average first occurrence of sub-freezing temperatures is in late November.

Soils

Two soil series are located within the proposed project area adjacent to Hackberry Creek (Soil Conservation Service, 1980). The Ovan series consists of deep, clayey soils that formed on recent alluvium in bottomlands. Slopes typically range from 0-1%. The Heiden series consists of deep, clayey soils that formed in clayey marine sediments. Slopes in the project area typically range from 1-5%. Neither of the soils is classified as hydric; however, the clayey texture and slow permeability of both soils may accommodate the construction of wetlands. Ovan soils are at lower elevations and are frequently inundated by the operation of Lake Lewisville. Otherwise, the soils cover areas that are maintained as old-field grasslands with little or no woody vegetation.

Soils associated with Stewart creek include the Ovan, Heiden, and Ferris-Heiden series. The Ferris-Heiden series is likewise a clayey soil; however, the gently sloping nature of this series does not make it conducive to the construction of wetlands. The Ovan series comprises the majority of the mapped series and may be frequently inundated by the operation of Lake Lewisville. Soil pH for all mapped series ranges between 7.9-8.4, which is typical for many north central Texas soils.

Surface Water and Other Aquatic Resources

Portions of the study area are between the conservation pool and flowage easement elevations (522' NGVD and 537' NGVD respectively) of Lake Lewisville. Therefore, scattered depressions within the study area may seasonally pond water for extended periods as the lake level rises and recedes. Sediment deposition from lake fluctuations, together with changes in flow characteristics caused by upstream impoundments, has reduced Hackberry Creek within the study area to an ephemeral slough with very little conveyance value. Under normal circumstances, Stewart Creek would be classified as an

intermittent stream. However, the Frisco Wastewater Treatment Plant discharges treated effluent into Stewart Creek creating a continual flow characteristic of a perennial stream system. Hackberry Creek and Stewart Creek are waters of the United States as regulated by Section 404 of the Clean Water Act.

For purposes of this study, wetlands are those areas inundated or saturated by ground water at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (USACE, 1987). Within the proposed project area, the USFWS National Wetlands Inventory (NWI) maps show palustrine forest and emergent seasonal wetland classifications for Stewart Creek and Hackberry Creek respectively. The NWI maps in this case depict vegetational cover types and should not be construed as a confirmation that wetlands exist. Site investigations verified the presence of wetlands located within the study area along Stewart Creek. These were remnant channel scars or sloughs caused by overbank flooding adjacent to Stewart Creek that pond water for extended periods of time based on the presence of an ordinary high water mark. Based on their adjacency to Stewart Creek, these features are regulated as waters of the United States.

Hackberry Creek is a waterway that extends upstream from its confluence with Lake Lewisville in a northeasterly direction past Farm to Market (FM) 423. The stream has several on-channel stock ponds upstream of FM 423 that overflow into the project area located just downstream of FM 423. Hackberry Creek is not an incorporated Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) stream, nor was there any other modeling information available to define existing conditions. The project area on Stewart Creek extends upstream from its confluence with Lake Lewisville eastward to just upstream of Lebanon Road. Stewart Creek is an incorporated FEMA FIS stream.

Terrestrial Wildlife Habitats

The majority of the study area may be characterized as old field, which are open fields that were used as hay meadows or pastures for grazing and have since been abandoned. The study area adjacent to Hackberry Creek lacks woody vegetation, contains no vertical stratification, and is of relatively low value to wildlife species. The study area adjacent to Stewart Creek also consists of old field; however, a narrow riparian corridor of predominantly cedar elm (*Ulmus crassifolia*) exists within the floodplain. Although lacking in species richness and overall species diversity, all structural layers are present (herbaceous, shrub, tree) which provide more opportunities for wildlife use.

Endangered and Threatened Species

According to the USFWS, several species have utilized Denton County or similar areas as a migratory corridor primarily during fall and/or spring migrations. **Table 1** provides a listing of all endangered and threatened species known to occur in Denton County.

Table 1 – Threatened and Endangered Species for Denton County

Common Name	Scientific Name	Listing Status
American peregrine falcon	*Falco peregrinus anatum*	Endangered
Arctic peregrine falcon	*Falco peregrinus tundrius*	Threatened
Bald eagle	*Haliaeetus leucocephalus*	Endangered
Black-capped vireo	*Vireo atricapillus*	Endangered
Interior least tern	*Sterna antillarum*	Endangered
Piping plover	*Charadrius melodus*	Threatened
Whooping crane	*Grus americanus*	Endangered

Recreational, Scenic, and Aesthetic Resources

Lake Lewisville serves as one of the most popular outlets for water sports and outdoor recreation in the Dallas-Fort Worth Metroplex. Development continues to approach from all directions, with the western shoreline being the most developed. The USACE only operates two campgrounds, Hickory Creek and Oakland Park, both of which are located on the west side of the lake. Hickory Creek is open year-round; Oakland is open between April 1st and September 30th.

As residential and commercial development expands to areas adjacent to the study area, most notably the City of The Colony and the City of Frisco, the desire for scenic and aesthetic resources at Lake Lewisville-managed properties is expected to increase. The Colony Lake Parks Division operates two recreation parks, Hidden Cove and Stewart Creek, in the vicinity of the study area. Both provide camping, boating, swimming access to Lake Lewisville. The Colony has several smaller open space parks in the vicinity of the study area that provide hike and bike trails. Although existing City of Frisco park facilities are few, the City of Frisco is actively seeking to expand its parks base.

Cultural Resources
An archaeological investigation was conducted to determine if significant cultural resources were present within the study area, primarily in areas that would be excavated for wetland construction. No evidence of historic or prehistoric occupation was found, although it is likely that prehistoric inhabitants may have used the Hackberry Creek and Stewart Creek corridors while in transit through the Elm Fork floodplain. The absence of prehistoric sites in the study area supports patterns for upland areas in Dallas where potential for artifacts is likewise low. Historic sites were known to occur in the immediate area; however, these were in upland areas beyond the study area. A copy of the complete archaeological survey is provided in **Appendix A.**

Hazardous Materials
A preliminary assessment was conducted to identify sites in the study area that may be at risk of environmental contamination from hazardous wastes/substances. The scope of the investigation consisted of the following tasks:

- Review of aerial photography to establish land use in the study area;
- Review of federal and state environmental regulatory agency database listings of sites in the vicinity of the study area; and
- Conducting a field reconnaissance to confirm and/or supplement information pertaining to the existing land use in the study area, and search for visual evidence of contamination.

Information from a Federal and State environmental regulatory database search was used for the study area and vicinity in accordance with the American Society for Testing and Materials (ASTM) E-1527-00 recommended databases and minimum search distances. These databases were derived directly from government sources, which are updated on approximately quarterly intervals. No Environmental Protection Agency (EPA) or Texas Commission on Environmental Quality (TCEQ) registered facilities were identified within the study area. A copy of the database information is presented in **Appendix B**.

A visual inspection of the study area was conducted and no evidence of potential hazardous substances or contamination, such as surface stains, stressed vegetation, industrial sites, or petroleum storage tanks was observed.

ENVIRONMENTAL DEGRADATION

Lake Lewisville and the Dallas-Fort Worth Metroplex are located in an area of north central Texas that represents the transition zone between eastern deciduous forest and the central North American grassland prairie. Combined with the region's unique geologic and climatic variation, north central Texas accounts for 2,223 flora species, roughly 46 percent of the species known to occur in Texas (Diggs et. al. 1999). Human activities have had, and are continuing to have, a significant impact on the plants and animals of the region.

Lake Lewisville lies within the transition between the Blackland Prairie and Cross Timbers ecoregions of Texas. The west side of the lake tends to be more wooded and characteristic of the Cross Timbers, whereas the east side of the lake, including the study area, is characterized by open fields which were once native grass prairies. Early settlement accounts described the Blackland Prairie landscape as extensive prairies interrupted with sporadic mesquite and oak groves. Trees were often rare on the Blackland Prairies and restricted to riparian corridors along major streams and rivers. Given the high rainfall over much of the Blackland Prairie, suppression of fire by humans has facilitated the expansion of tree and shrub species from the floodplains.

Significance

The bottomland hardwood ecosystem in Texas prior to European settlement once extended over 6.5 million hectares and it is estimated that less than 40 percent of this original extent remains. Intact bottomland forests can be some of the most productive ecosystems and are among the list of endangered and threatened ecosystems in the United States (Noss, 1997). One hundred and eighty-nine species of trees and shrubs, 42 species of woody vines, 75 species of grasses, and 802 species of herbaceous plants occur in Texas' bottomland forests. At least 74 threatened and endangered species depend directly on bottomland hardwood ecosystems and over 50 percent of neotropical songbirds not listed as endangered or threatened are associated with these systems. Besides providing critical habitat, bottomland hardwood ecosystems serve as catchment and water retention areas in times of flooding, help control erosion, contribute to the nutrient cycle, and help maintain water quality by collecting sediments, wastes, and pollutants from surface runoff (USACE, 1999).

In contrast to the loss of terrestrial communities of the Blackland Prairie is the substantial increase in aquatic habitat within this ecoregion. However, this increase is in the form of lacustrine habitats as most native palustrine wetlands, including the "pothole-like" prairie wetlands, have been lost with the construction of the numerous reservoirs, lakes, and ponds in north central Texas. Over 1.5 million acres of natural vegetation, including 600,000 acres of bottomland hardwood forests, are estimated to have been lost from reservoirs constructed in Texas (TPWD).

The land inundated by Lake Lewisville was historically covered by a mixture of bottomland and upland forests, floodplain wetlands, and tall grass prairies. The new open water habitat replaced these historical habitats and subsequent commercial and residential development further degraded the new shoreline habitats. After impoundment, adjacent forested lands were cleared and leased for agricultural purposes. The agricultural activities further degraded remaining bottomland hardwood and wetland habitats. Agricultural leases during the early years of lake management perpetuated the maintenance of cleared fields that were historically bottomland forests (USACE, 1998). Although the reservoir has increased fisheries habitat, fluctuation of lake levels through water supply and flood control management has resulted in inadequate aquatic plant production in the littoral zone to provide key habitat for other forms of aquatic wildlife.

PLAN FORMULATION*

The existing terrestrial and aquatic communities in the study area do not represent the maximum habitat quality that could be expected within the study area. Due to continued urban growth and development in the region, open spaces are either removed from the landscape or degraded due to secondary effects such as fragmentation or sedimentation of aquatic habitats. As urban encroachment continues, greenbelts along streams and rivers are becoming increasingly scarce and fragmented. Subsequent effects from removal or fragmentation of habitat include reduction of vegetative structural diversity and overall species richness.

Specific ecological factors guiding the development of restoration alternatives included the low diversity of the existing riparian corridor, a lack of mast producing trees, a lack of cavities suitable for cavity-nesting wildlife, and a lack of emergent wetlands in proximity to wildlife food and cover. Currently, the riparian corridor along Stewart Creek, although continuous, is very narrow and lacking in species diversity. Given the lack of mast producing species in the area, natural regeneration is limited to invasion by light-seeded plants propagated by wind. Seedlings of heavy-seeded oak species are most prevalent in areas where floodwaters cause deposition of acorns and where duff is sufficient for regeneration. Currently, there is an inadequate supply of hard mast producers within the contributing watershed to provide natural establishment of a forest dominated by hard mast producers. Reforestation efforts were directed towards diversifying species types and planting in higher areas to reduce the possibility of restoration efforts being damaged by lake fluctuation levels. As such, plan formulation was guided by a number of objectives, which included:

- Restoration and enhancement of emergent wetland habitats adjacent to the Hackberry Creek confluence with Lake Lewisville;
- Creation of floodplain wetlands compatible with the existing riparian corridor of Stewart Creek;
- Increasing species diversity of existing riparian corridors focusing on mast producing species;
- Reforestation with appropriate species of open areas thereby expanding existing riparian corridors;
- Restoration of waterfowl nesting and wintering habitat; and
- Enhancement and maintenance of vegetative buffers between existing habitats to reduce adverse impacts caused by proposed future developments.

Lake Lewisville management guidelines allow work within the flowage easement provided the activity does not result in a loss of storage capacity for the lake. The requirement of no net loss of lake storage may constitute a significant constraint to a landowner as it limits space and types of activities that are usually associated with residential or commercial development (e.g. no habitable structure below 537' NGVD). However, this limitation on land use was viewed as an attribute or opportunity when selecting the Hackberry Creek and Stewart Creek corridors as a site suitable for a habitat restoration plan. It was determined the restoration plan objectives could be designed to meet the flowage easement management guidelines. In turn, the flowage easement management guidelines would provide additional regulation to exclude activities that would adversely affect the intent and goals of the habitat restoration plan.

Utility corridors are recognized design constraints as the need for maintained rights-of-way or easements can affect revegetation goals or define the limits of wetland creation. Overhead transmission lines may have cumulative affects on wildlife travel corridors as transmission lines may pose a navigation hazard for some of the slender-bodied, slow moving bird species that may be found in aquatic areas (NUS, 1979). Utility corridors are not viewed as a significant constraint to restoration plan design as the existing sanitary sewer line and overhead transmission line in the study area are situated along the fringes of the Stewart Creek portion of the study area or beyond the limits of the study area.

Wetland design would need to consider the location within the respective drainage basins, impacts to the existing 100-year floodplain, and impacts to existing habitats. The Hackberry Creek portion of the study area was a low-quality grassland habitat, which allowed the potential for large-scale wetland creation. Stewart Creek had an array of various habitat types, some of which provided adequate aquatic and terrestrial habitat. Due to the topography and existing riparian corridor, a series of smaller wetland areas was deemed more appropriate. Designed wetland areas would need to be self-sustaining without any need for an artificial source of hydrology.

Habitat Evaluation Procedure

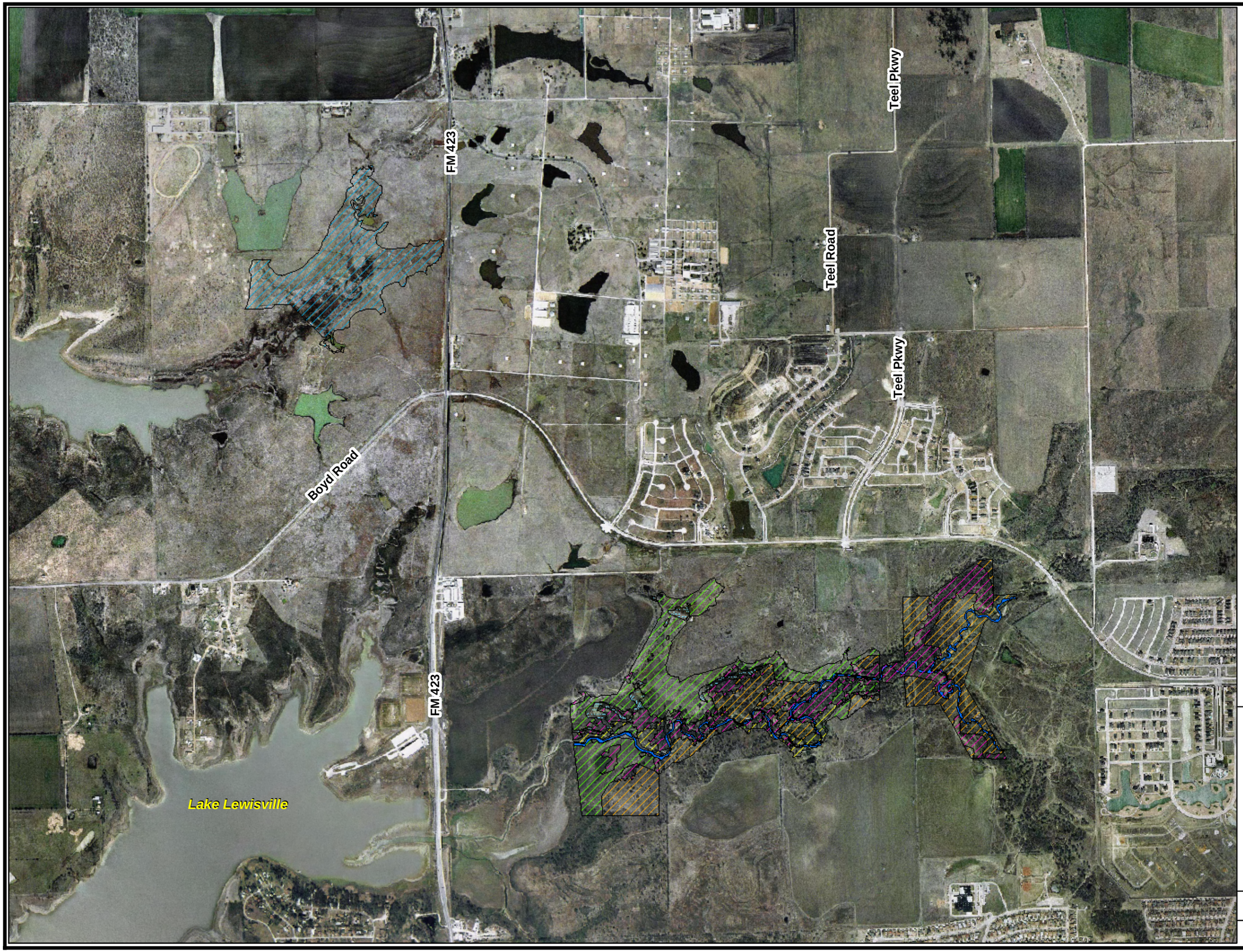
To identify and evaluate potential restoration opportunities, it was necessary to quantify baseline habitat conditions within the study area. An overall evaluation of the quality of existing habitats within the proposed project area was conducted implementing the Habitat Evaluation Procedure (HEP) developed by the USFWS. The HEP utilizes determination of a Habitat Suitability Index (HSI), which ranks the comparative value of habitat either for a single species, multiple species, or on an ecosystem basis. Within the evaluation, an HSI value of 0.0 represents the lowest comparative value of habitat whereas 1.0 represents the optimum value of a particular habitat. Ten habitats were selected that best represent wildlife communities that use habitats surveyed in the project areas. The wood duck, raccoon, and green heron were used to represent species that utilize aquatic habitats. The barred owl, Carolina chickadee, eastern meadowlark, fox squirrel, raccoon, eastern cottontail, red-tailed hawk, and scissor-tailed flycatcher were used to represent species that utilize terrestrial habitats. These baseline values were used to determine the average annual habitat units gained over the life of the project for each restoration alternative. **Table 2** summarizes the habitat values of the existing natural resources for each habitat type surveyed in the study area during the HEP. **Figures 3-5** show the locations of the various baseline habitats within the study area that were identified during the HEP.

It should be noted that the scope of the study area has been modified since completion of the HEP and **Table 2** numbers do not necessarily match those of the USFWS study. A copy of the original USFWS study is attached as **Appendix H**.

Table 2 – Summary of Acreage, Baseline Habitat Units, and Habitat Suitability Index (HSI) Values by Habitat Type Calculated Using the Habitat Evaluation Procedure (HEP)

Habitat Types	Acreage	HSI Value	Habitat Units
Grassland/Pasture (Hackberry Creek)	61.5	0.47	28.9
Grassland/Pasture (Stewart Creek)	72.8	0.52	37.8
Tree Savanna	68.4	0.76	52.0
Riparian Forest	51.9	0.49	25.4
Shrubland	7.7	0.93	7.2
Emergent Wetland	6.8	0.39	2.6
Total:	**273.2**	**NA**	**153.9**

Grassland/Open Pasture. It was determined that the HSI values for grassland communities within the study area ranged from 0.0-0.1 for the eastern cottontail to 0.4-0.5 for the eastern meadowlark to 0.95-1.0 for the red-tailed hawk, for an overall average of 0.47 along Hackberry Creek and 0.52 for Stewart Creek. Although the grasslands were considered optimum habitat for the red-tailed hawk, grassland habitats were considered only average quality due to the dominance of forbs and lack of nearby



LEGEND

- Stewart Creek Riparian
- Hackberry Creek Grassland
- Stewart Creek Grassland
- Stewart Creek Savanna
- Stewart Creek Wetlands
- Stewart Creek Shrubland
- Stewart Creek

N
W E
S

1 inch equals 400 feet

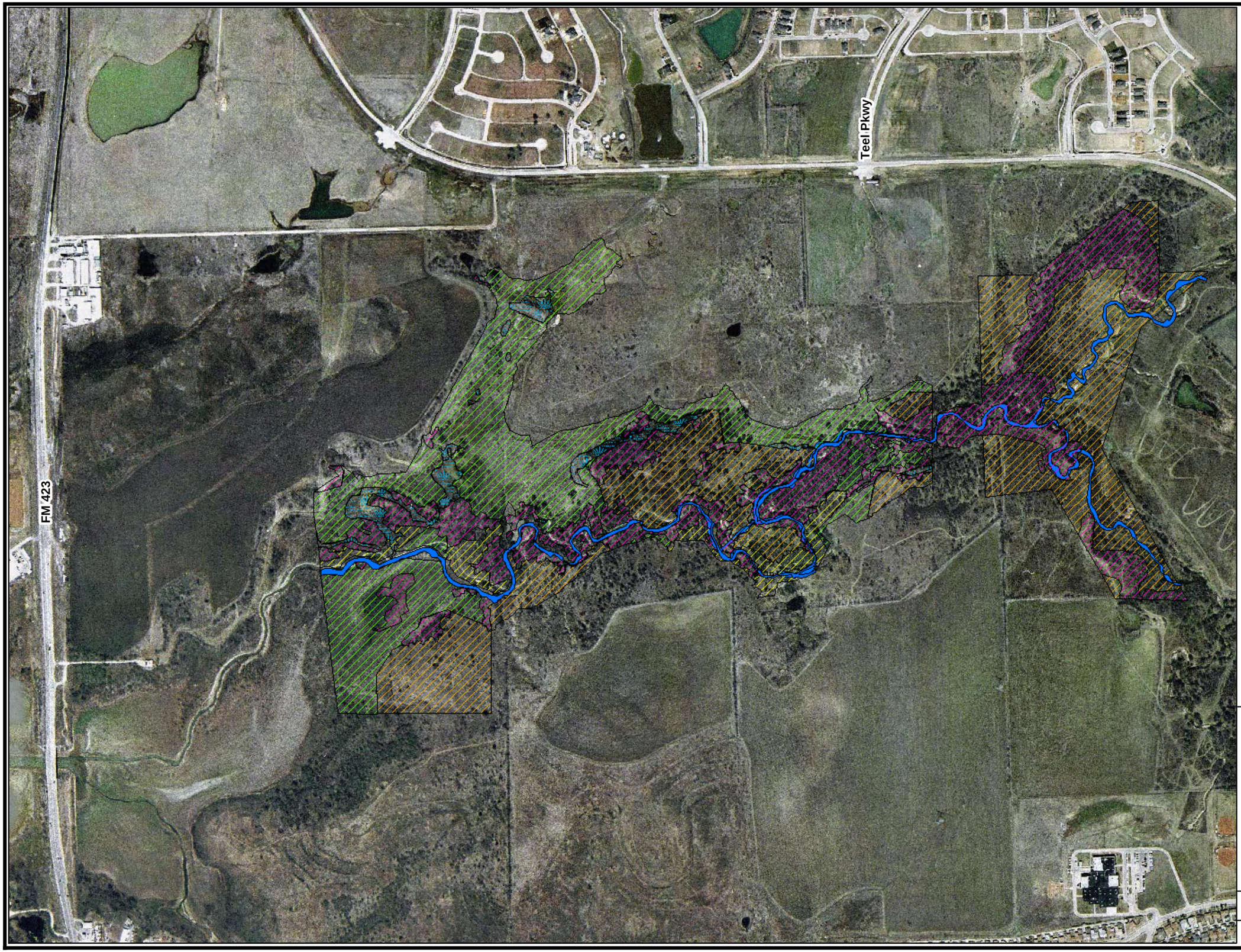
Habitat Evaluation Procedure for Hackberry and Stewart Creek

Lake Lewisville Habitat Restoration Frisco, Texas

U.S. Army Corps of Engineers Fort Worth District

Figure: 3

October 13, 2003



LEGEND

- Stewart Creek Riparian
- Stewart Creek Grassland
- Stewart Creek Savanna
- Stewart Creek Wetlands
- Stewart Creek Shrubland
- Stewart Creek

N
W E
S

1 inch equals 200 feet

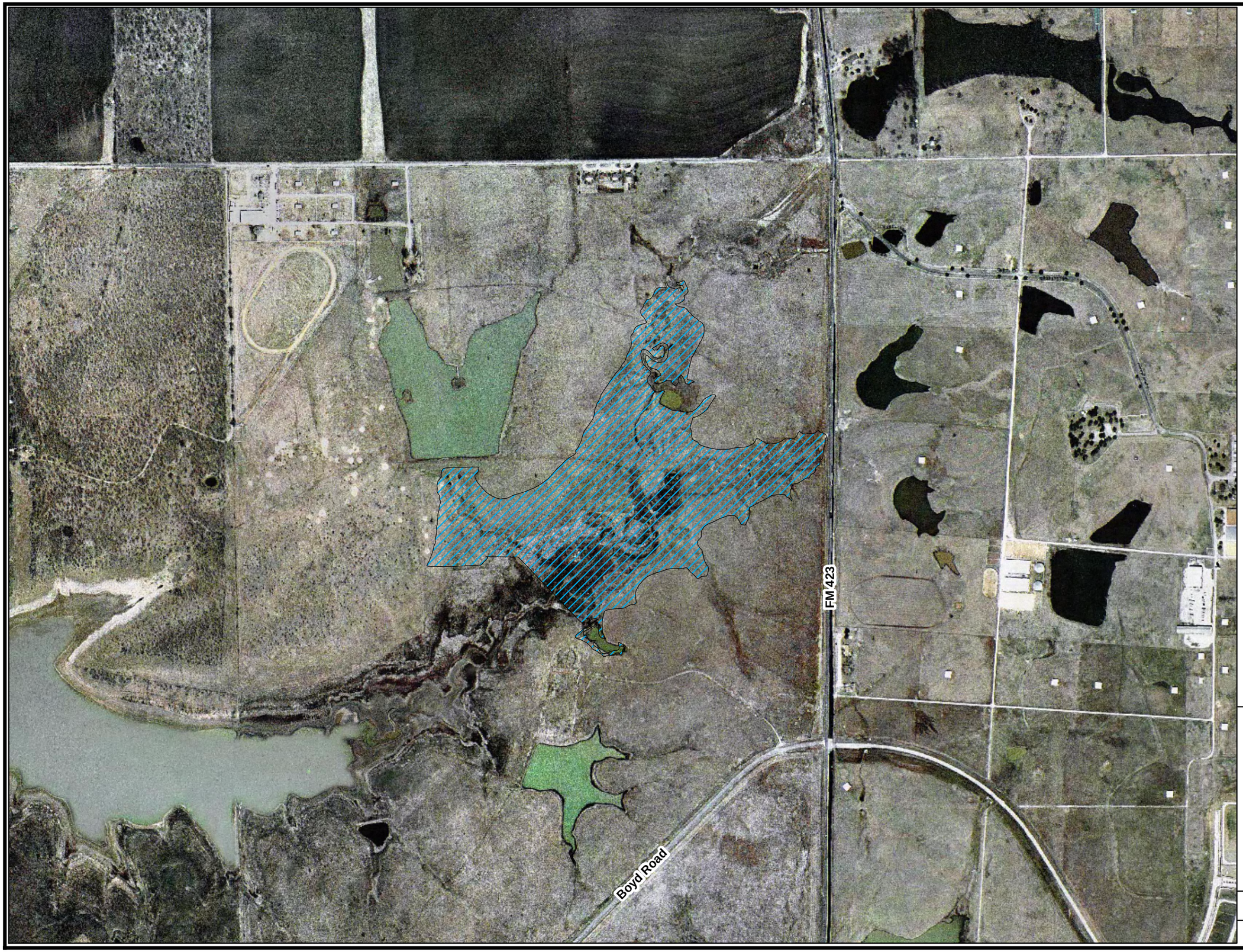
Habitat Evaluation Procedure for Stewart Creek

Lake Lewisville Habitat Restoration Frisco, Texas

U.S. Army Corps of Engineers Fort Worth District

Figure: 4

October 13, 2003



LEGEND

Hackberry Creek Grassland

N
W E
S

1 inch equals 200 feet

Habitat Evaluation Procedure for Hackberry Creek

Lake Lewisville Habitat Restoration
Frisco, Texas

U.S. Army Corps of Engineers
Fort Worth District

Figure: 5

October 13, 2003

shrub or cover. Grassland habitats were deemed the most practical for conversion to emergent wetland or bottomland forest.

Tree Savanna. HSI values for tree savanna habitats ranged from 0.28 for the eastern meadowlark to 1.0 for the red-tailed hawk and eastern cottontail, for an average of 0.76. This is a relatively high HSI and indicates adequate habitat for these and species with similar life requirements. Restoration in these areas was limited; however, it is anticipated that recruitment of hard mast species from proposed reforestation efforts would increase stand diversity over the life of the project.

Shrubland. HSI values for shrubland habitats ranged from 0.84 for the scissor-tailed flycatcher to 0.86 for the raccoon to 1.0 for the red-tailed hawk and eastern cottontail, for an average of 0.93 (excellent habitat). Restoration in these areas was likewise limited; however, over the life of the project, the eventual conversion of these shrub areas into mature riparian forest would provide a different type of high quality habitat for other wildlife species.

Riparian Forest. HSI values for riparian forest habitats ranged from 0.0 for the fox squirrel to 0.35 for the red-tailed hawk to 0.63 for the raccoon to 0.71 for the Carolina chickadee to 0.75 for the barred owl, for an average of 0.49. Proposed reforestation measures would introduce a hard mast seed source, which should facilitate hard mast colonization of existing stands over the life of the project. Lack of mast producing tree species and overall low species diversity was the limiting factor for HSI values for all species.

Emergent Wetlands. HSI values for emergent wetland habitats ranged from 0.25 for the wood duck to 0.45 to the raccoon to 0.47 for the green heron, for an average of 0.39, which is considered fair wetland habitat. The future development of the immediate watershed would likely increase sediment and nutrient loading in the existing wetland systems. The proposed restoration project would benefit the existing wetlands in several ways, in particular by providing a vegetative buffer from future development.

ENVIRONMENTAL RESTORATION ALTERNATIVES*

No Action

Under the “no action” alternative, the respective portions of the proposed project area would remain under the ownership of the USACE and Sponsor. Barring the future lease of these lands to interests that would result in further degradation of existing riparian corridors, the “no action” alternative would result in the preservation of existing riparian corridors whose habitat value would increase slightly through time as the forest matures. However, due to the isolated nature of the existing riparian corridor and lack of vegetative diversity, these areas would never achieve the high quality that could be achieved with the proposed restoration efforts. Furthermore, based on future land uses on adjacent properties, the potential for creating a manicured landscape on privately owned lands adjacent to USACE property could further reduce the quality of the habitat.

Hackberry Creek

The gentle grades associated with the Hackberry Creek portion of the study area provided a range of opportunities for large-scale wetland creation activities. However, the lack of nearby forested habitats would prevent the wetland(s) from performing at an optimum level of ecological performance. Although species such as black willow (*Salix nigra*) and green ash (*Fraxinus pennsylvanica*) would be expected to colonize, a planting plan with a diverse range of tree and shrub species was evaluated. Soil survey photography and historical aerial photography suggest that the Hackberry Creek drainage may not have

ever supported a dense, broad, riparian corridor. Therefore, the vegetative component of the restoration plan for Hackberry Creek focused on a less dense tree-planting plan with the incorporation of a native grass seed mix. Over the life of the project, the planted areas would represent an improved habitat type over the existing grassland/open pasture and would increase the quality of the created wetland area(s) by providing elements such as refuge and nesting areas.

All wetland alternatives would average between 0-2 feet in depth with outlet structures to provide the ability to manage water levels and maximize management options. However, since the need for semi-permanent to permanent standing water was one of the factors limiting the quality of the wetland, deeper pools up to a maximum depth of 4-5 feet were included. The outlet structure is intended for management of water levels and should not function as the sole avenue for overflow. Therefore, each cell would have an overflow emergency spillway in an effort to facilitate overflow during large storm events. Since each berm would be constructed on 10:1 side slopes, it is not anticipated that protective armoring would be needed. The addition of nesting boxes was included as a restoration measure and would be assumed with each wetland build alternative. For evaluation purposes, the Hackberry Creek alternatives were broken down as follows:

- Creation of a single 8.7-acre wetland cell with the option of planting 27.3 acres with a mixture of tree and shrub species;

- Creation of a single, larger wetland cell totaling 16.6 acres with the option of planting 43.6 acres with a mixture of tree and shrub species;

- Creation of two interconnected cells totaling 21.8 acres with the option of planting 37.4 acres with a mixture of tree and shrub species.

A third westernmost cell that would be constructed within the conservation pool of Lake Lewisville was initially evaluated but omitted due to potential permitting requirements, which could cause excessive delays in the eventual implementation of the project and the potential for excessive maintenance requirements for the non-Federal sponsor. However, the sponsor or adjacent landowner may pursue this option at a later date as an individual project.

Stewart Creek

In contrast to the Hackberry Creek study area; the topography in the Stewart Creek study area is gently rolling with a well-defined channel and riparian corridor. The rolling topography creates several smaller sub-drainages, which were identified as potential wetland creation areas. The riparian corridor is dominated by cedar elm with green ash common at lower elevations. Reforestation with bottomland hardwood species, with an emphasis on hard mast producing species, was viewed as a means to increase vegetative species diversity throughout the corridor, as well as provide a wider range of habitats for wildlife species over the life of the project.

All wetlands would be created as described in the **Hackberry Creek Restoration Alternative Section**. The addition of nesting boxes was included as a restoration measure and would be assumed with each wetland build alternative. For evaluation purposes, the Stewart Creek alternatives were broken down as follows:

- Creation of four wetland cells (identified as Wetland Cells C-3 through C-6) up to a maximum total of 16.8 acres, with each cell being evaluated as an independent entity;

- Reforestation with bottomland hardwood species up to a maximum total of 19.8 acres; planting alternatives include the use of only containerized plantings or a mixture of containerized plantings with bare-root seedlings.

Figure 6 shows the range of alternatives that were evaluated for the Hackberry Creek study area. **Figure 7** shows the range of alternatives that were evaluated for the Stewart Creek study area. All build alternatives would involve either levee construction or impoundment on privately owned property within the flowage easement of Lake Lewisville.

INCREMENTAL COST ANALYSIS

Cost analysis techniques (Robinson et al. 1995) were used to determine the most cost effective restoration alternative in terms of incremental cost per habitat unit gained. All of the alternative plans identified in the **Environmental Restoration Alternatives section** were evaluated using annualized habitat gains versus annualized cost estimates (including those for operation and maintenance). Annualized habitat unit gains for each solution, including the "no build" measure were computed for a 50-year period. This time period was established as the project life period based on the period of time it would take for all aspects of the restoration plan to reach a level of maturity necessary to meet the goals of the project.

Typically, the cost analysis technique evaluates a particular restoration solution (e.g. created wetland) that may have a range of different size scenarios, which are referred to as scales. A solution is often evaluated with a range of other restoration solutions (e.g. reforestation) of various scales. Solutions in the cost analysis usually have relationships of dependency or exclusion with other solutions. An example of dependency would be a restoration plan that specifies reforestation if and only if wetland creation is implemented. Therefore, when the model is processed, if a wetland solution other than the "no build" is deemed a cost effective alternative, the model will evaluate the various reforestation solutions. If the "no build" wetland solution is deemed to be cost effective, the "no build" reforestation solution is automatically represented in the model.

It is very important to note that assigning relationships between different solution scales is not possible in the model. For both the Hackberry Creek and Stewart Creek study areas, the acreage (i.e. scale) of the reforestation solution was dependent on the specific acreage, or scale, of the wetland creation solution. Therefore, each potential wetland cell was assigned as a solution with a complimentary reforestation solution dependency. The model evaluates the multiple combinations of the wetland solutions to develop plans that are cost effective and incrementally justified (i.e., best buy plans). The Hackberry Creek study area provided ample space to evaluate multiple wetland creation solution scenarios. The wetland creation solutions represented in the Stewart Creek study area represent the maximum size that is compatible with the landscape. Given that these sizes are relatively small, anything smaller was deemed by the plan formulation team to be equivalent of a "no build" scenario. Therefore, only the maximum wetland sizes for the Stewart Creek project area were carried forward for incremental analysis.

The alternatives analysis selected five plan combinations of restoration alternatives and measures that would be cost effective and incrementally justified. The following is a summary of the restoration measures identified in each of these plans. If a specific restoration measure is not listed, it means that the combination plan chose the "no action" or "no build" alternative for that measure. **Appendix C** contains the complete incremental analysis.

Plan 1. No action/future without project; land restrictions would not change, but due to the potential of creating a manicured landscape on privately owned lands adjacent to USACE property, average annual habitat units (AAHU) would decrease over time from 153.9 to 112.77.

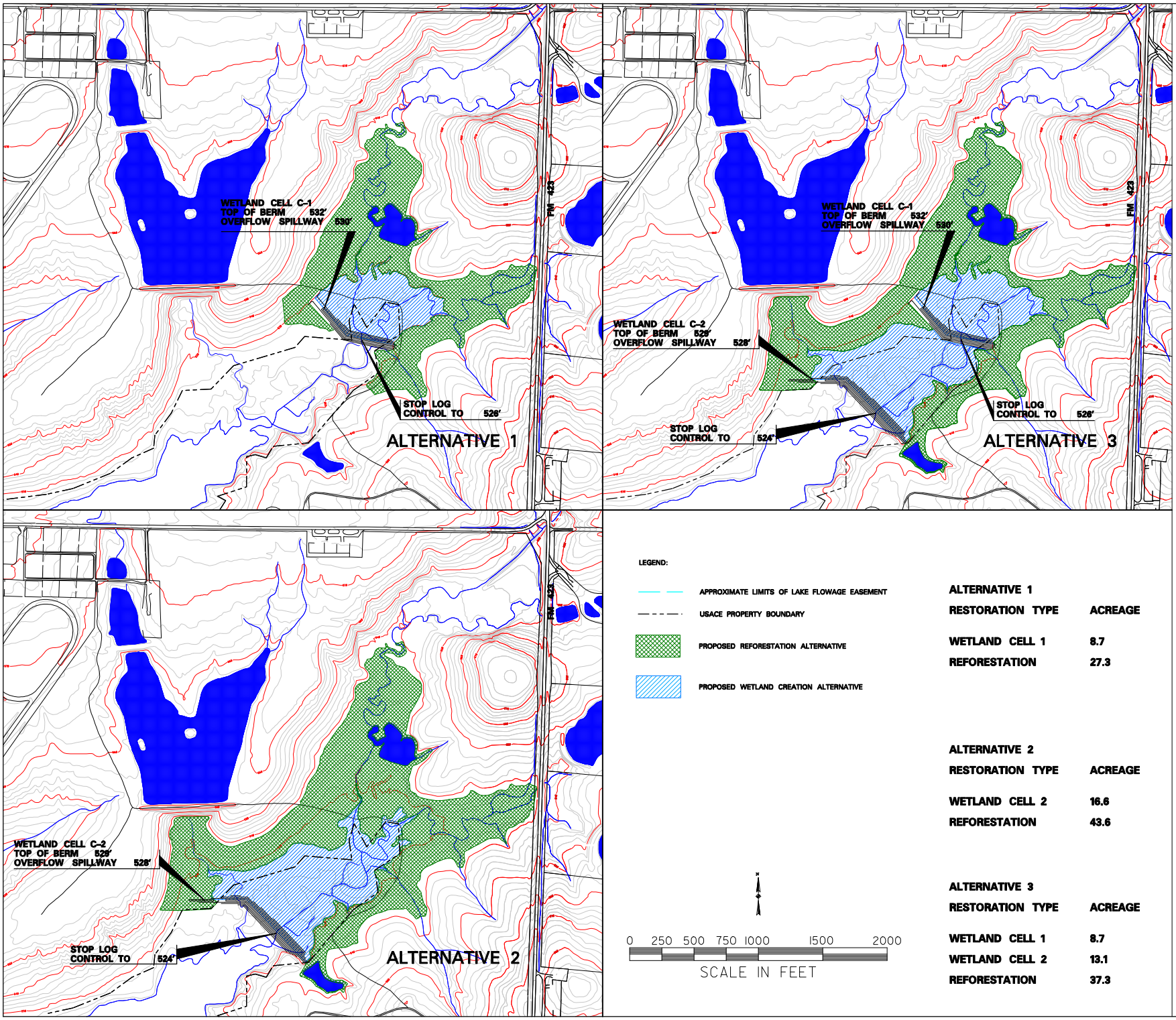


FIGURE 6
PRELIMINARY HACKBERRY CREEK
RESTORATION ALTERNATIVES

LAKE LEWISVILLE
ECOSYSTEM RESTORATION
FRISCO, TEXAS

U.S. Army Corps
of Engineers
Fort Worth District

RESTORATION TYPE	ACREAGE
WETLAND CELL 3	5.8
WETLAND CELL 4	2.0
WETLAND CELL 5	3.9
WETLAND CELL 6	5.1
REFORESTATION	19.8

LEBANON ROAD

WETLAND CELL C–6
OVERFLOW SPILLWAY 537′

WETLAND CELL C–3
TOP OF BERM 530′
OVERFLOW SPILLWAY 528′
STOPLOG TO 526′

WETLAND CELL C–4
TOP OF BERM 534′
OVERFLOW SPILLWAY 532′

STOPLOG CONTROL
TO 529′

WETLAND CELL C–5
TOP OF BERM 530′
OVERFLOW SPILLWAY 528′
STOPLOG TO 526′

CONSERVATION POOL
ELEVATION 522′

LEGEND:

- APPROXIMATE LIMITS OF LAKE FLOWAGE EASEMENT
- USACE PROPERTY BOUNDARY
- SANITARY SEWER LINE ALIGNMENT
- PROPOSED REFORESTATION ALTERNATIVE
- PROPOSED WETLAND CREATION ALTERNATIVE

N

0 250 500 750 1000 1500
SCALE IN FEET

FIGURE 7 – PRELIMINARY STEWART CREEK
HABITAT RESTORATION ALTERNATIVES

LAKE LEWISVILLE
ECOSYSTEM RESTORATION
FRISCO, TEXAS

U.S. Army Corps
of Engineers
Fort Worth District

Plan 2. Plan 1 with the addition of creating a 3.9-acre wetland cell (C-5) south of Stewart Creek; wetland cell C-5 is the only component of the restoration plan alternatives that can be constructed independent of purchasing private property; the effect from adjacent development would still outweigh the minimal gain from wetland construction, therefore, the AAHU would still decrease over time from 153.9 to 115.36.

Plan 3. Acquisition of approximately 90.8 acres of private property within the privately-owned flowage easement of the study area; creation of an 8.7-acre wetland cell and a 13.1-acre wetland cell with tree/shrub plantings totaling 37.3 acres along Hackberry Creek; creation of a 5.8-acre wetland cell (C-3), 2.0-acre wetland cell (C-4), and 5.1-acre wetland cell (C-6) to compliment the 3.9-acre wetland cell (C-5); includes 19.8 acres of bottomland hardwood reforestation consisting of a mixture of bare-root seedlings and containerized trees along Stewart Creek.

Plan 4. Plan 3 with the replacement of 5.7 acres of Stewart Creek seedling/containerized reforestation with containerized trees.

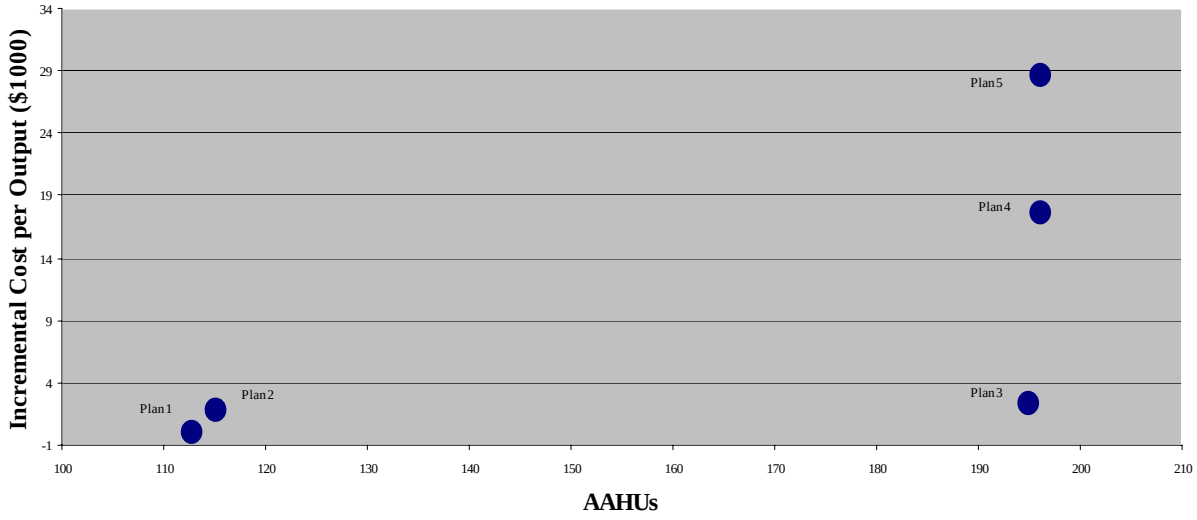
Plan 5. Plan 4 with the replacement of an additional 14.1 acres of Stewart Creek seedling/containerized reforestation with containerized trees.

Table 3 identifies AAHU, incremental AAHU's, annualized costs, incremental annualized costs, and incremental costs per output for each of the five incrementally justified or best buy plans. **Figure 8** is a graphic representation showing the AAHU's and annualized costs for all of the best buy plans. **Plan 3** represents the recommended plan in this study.

Table 3 - Incremental Cost Analysis of Best Buy Plan Combinations

Plan	AAHU's	Incremental AAHU's	Annualized Costs	Incremental Annualized Costs	Average Cost per AAHU	Incremental Cost per Output
1	112.77	112.77	$0	$0	$0	$0
2	115.36	2.59	$4,700	$4,700	$41	$1,800
3	195.66	80.3	$185,800	$181,100	$950	$2,250
4	196.20	0.54	$195,300	$10,300	$996	$17,600
5	196.33	0.13	$199,000	$3,700	$1,014	$28,600

Figure 8 - Incremental Cost per AAHU



RECOMMENDED RESTORATION PLAN*

The recommended restoration plan was designed to enhance existing wildlife habitat through a combination of measures directed at both specific habitat types and specific deficiencies within specific vegetative communities. The study team determined that Plan 3, as identified above, should be the recommended restoration plan based on the AAHU gained per annualized unit cost. The major structural components of the recommended plan are shown in **Figure 9**. Plan and profile sheets are included in **Appendix D.**

Hackberry Creek Project Area

The recommended restoration plan proposes the construction of two wetland cells (C-1 and C-2) in the Hackberry Creek area. The wetland cells would total 21.8 acres and average between 0-2 feet in depth with outlet structures to provide the ability to manage water levels and maximize management options. Deeper pools up to a depth of 4-5 feet would be excavated to provide deep-water habitat. Two wood duck boxes per acre of wetlands would be added to provide waterfowl nesting habitat.

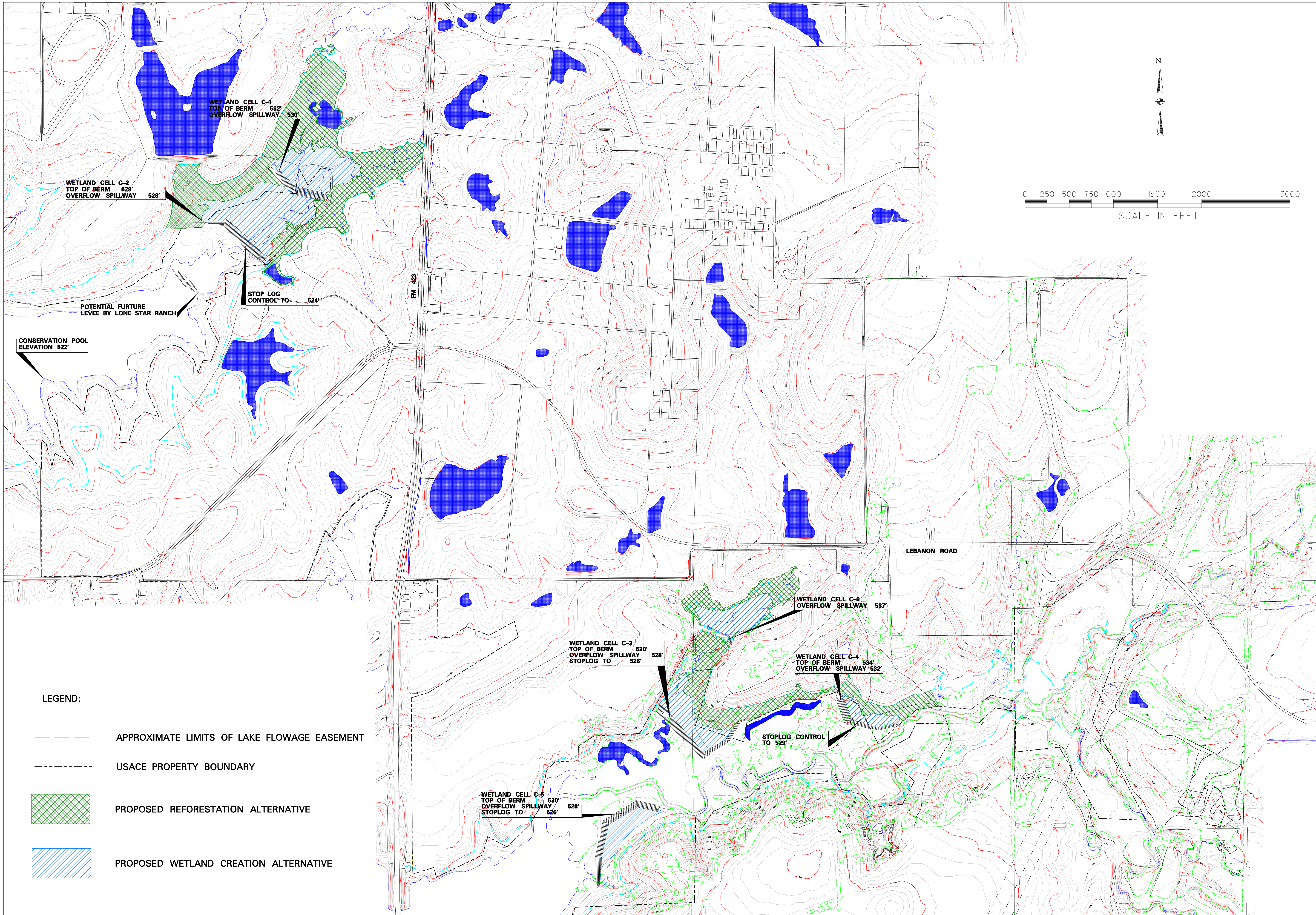
Plantings would consist of 5 containerized one-gallon trees and 15 containerized one-gallon shrubs per acre. Tree species such as Shumard red oak, bur oak, and cedar elm would be planted in clumped distributions at higher elevations to reduce the risk of damage caused by high lake levels. Shrub species such as eastern red cedar, chickasaw plum, and coralberry would be planted in similar clumps at similar elevations. Deciduous holly, a common component of seasonally flooded bottomland forests, may be planted at lower elevations that transition to the created wetlands. Buttonbush, if commercially available, may be planted at the water's edge.

Stewart Creek Project Area

The recommended restoration plan proposed the creation of four wetland cells (C3 through C6) in the Stewart Creek area. The wetland cells would total 16.8 acres and would be constructed in a similar fashion to those described for Hackberry Creek. Wood duck boxes (two per acre) would be added to provide additional waterfowl nesting habitat.

The vegetative component of the restoration plan for Stewart Creek focused on a higher density tree-planting plan consisting of a mixture of 10 containerized one-gallon trees, 5 containerized one-gallon

FIGURE 9 – RECOMMENDED HABITAT RESTORATION ALTERNATIVE



LAKE LEWISVILLE
ECOSYSTEM RESTORATION
FRISCO, TEXAS

U.S. Army Corps of Engineers
Fort Worth District

shrubs, and 150 bare root seedlings per acre. Tree and shrub species should focus on mast producing species such as Shumard red oak, bur oak, persimmon, deciduous holly, chickasaw plum, and coralberry with an emphasis on oak species. The recommended planting areas occur at higher elevations and inundation from high lake levels should not be considered a significant risk.

Operation and Maintenance Access Features

The City of Frisco is interested in incorporating operation and maintenance (O&M) access features into the recommended restoration plan to provide a route for vegetation watering and wetland management activities throughout the project life. O&M access would include approximately 16,400 linear feet of an 8-foot wide stabilized soil path. The soil path would also provide incidental recreation use and pedestrian access to the restoration area. The soil path along Stewart Creek would be concentrated on the north side of the restoration area with a low water crossing to provide access to the anticipated residential trail system south of Stewart Creek. The City of Frisco would eventually seek to tie the O&M soil path into The Colony's trail system at a later date independent of the restoration project. The soil path along Hackberry Creek would provide access to the restoration plantings, the two wetland cells (C1 and C2), and would also allow pedestrian access. O&M access at Hackberry Creek would allow for future trail linkages with the Eastvale Park and Turner Soccer Complex located to the south and the City of Frisco to the east, although it is anticipated that actual construction of these linkages would occur at a later date than construction of the restoration plan. **Figure 10** shows the proposed layout of the O&M features with the recommended restoration plan for both the Hackberry Creek and Stewart Creek areas.

The City of Frisco supports the incorporation of the described O&M access features into the recommended restoration plan. The proposed O&M access features are compatible with the recommended restoration project and would also provide incidental service to the surrounding neighborhoods and region by providing non-consumptive recreational opportunities and eventual links to adjacent trail systems.

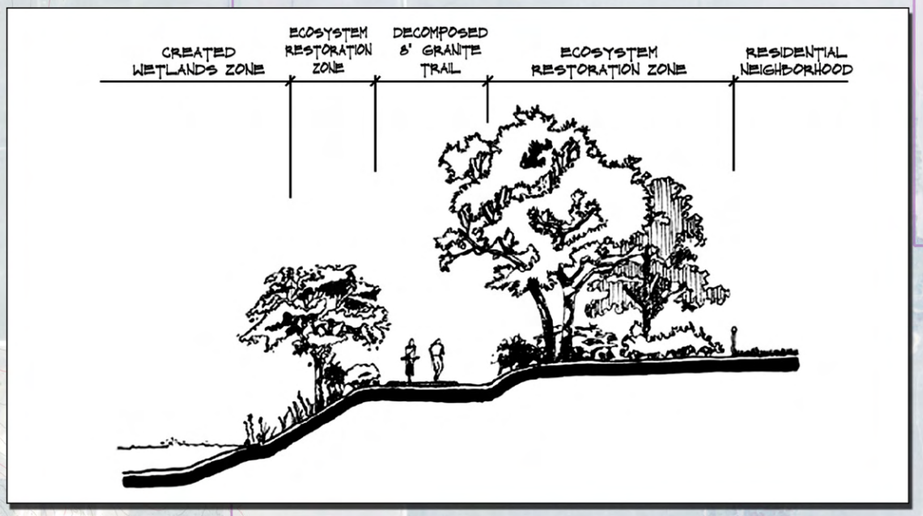
Importance of Project Outputs

The recommended plan was designed with the specific intent of improving wildlife habitat. Approximately 83 average annual habitat units would be gained in comparison to the no build alternative, which considered natural succession, and future land uses. The project as proposed would result in the reforestation of approximately 57.1 acres with mast producing tree and shrub species, thereby providing additional benefit to the adjacent 120 acres of tree savanna and riparian forest by providing a more diverse seed base for future generations. The decreased patchiness would provide better corridors for wildlife migration, primarily for fall and spring migrants such as neotropical songbirds.

The proposed wetland cells would result in the seasonal inundation of approximately 38.6 acres of grassland/open pasture. Although the average depth of inundation would vary between 1-2 feet, deeper pools would be created to increase hydroperiod and to provide refuges. Although wetland cell locations were designed to minimize impacts to existing woody vegetation, wetland cell C-4 may require the removal of cedar elm saplings. The elimination of abundant lower quality vegetation may be necessary to promote optimum habitat conditions. The overall project would significantly increase the value of bottomland hardwood forest along Stewart Creek. The slight loss of woody vegetation associated with wetland cell C-4 would be insignificant.

Implementation of the ecosystem restoration project would provide a variety of benefits to participating stakeholders. Conversion of the flowage easement property into a native greenbelt would benefit the USACE by providing a buffer area between urban areas and fee-owned operations property. The non-federal sponsor and general public would benefit from the incidental recreational and educational

FIGURE 10 - OPERATION & MAINTENANCE ACCESS



City Of Frisco

PROPOSED REFORESTATION

PROPOSED LEVEE AND WETLANDS

POTENTIAL LINK TO FUTURE TRAIL SYSTEM

C.O.E. PROPERTY LIMITS

BELOW GROUND CROSSING

BOYD RD.

LAKE FLOWAGE EASEMENT (TYP.)

LONE STAR RANCH

TRAIL ACCESS POINT

C.O.E. SPONSORED TRAIL

POTENTIAL TRAIL CONNECTION TO FRISCO

PROPOSED REFORESTATION (TYP.)

LEBANON RD.

STEWART CREEK

POTENTIAL CITY SPONSORED TRAIL

FM 423

EASTVALE PARK AND TURNER SOCCER COMPLEX

TRAIL HEAD

LOW WATER CROSSING

PROPOSED LEVEE AND WETLAND CREATION (TYP.)

POTENTIAL TRAIL HEAD AND ACCESS POINTS

Lake Lewisville

C.O.E. PROPERTY LIMITS

POTENTIAL CITY SPONSORED TRAIL

LAKE FLOWAGE EASEMENT (TYP.)

TO THE COLONY

TXU UTILITY EASEMENT

POTENTIAL TRAIL CONNECTION TO THE COLONY

C.O.E. PROPERTY LIMITS

TRAIL HEAD

FRISCO COUNTY

FRISCO

THE COLONY

SCALE IN FEET

LEGEND:

- Potential C.O.E. Sponsored Trail
- Potential Future Trail
- Potential City Sponsored Trail
- Above Ground Crossing
- Below Ground Crossing
- Trail Access Point
- Trail Head

LAKE LEWISVILLE
ECOSYSTEM RESTORATION
FRISCO, TEXAS

U.S. Army Corps of Engineers
Fort Worth District

amenities associated with the restoration property. Developable property located adjacent to the restored flowage easement property would likely increase in value with the proposed restoration project.

Project Costs of the Recommended Plan

Table 4 displays a summary of the construction costs for the recommended restoration plan, based on March 2006 cost information (**Appendix C**). **Table 5** displays the estimated total project cost, comprised of all expenditures related to the Detailed Project Report/Environmental Assessment (DPR/EA), plans and specifications, land acquisition costs, and construction costs. The total project cost of the recommended plan, including feasibility, plans and specifications, restoration, and excess Land, Easements, Rights of Way, Relocation, and Disposal Areas (LERRDs) costs, is estimated at **$4,288,619**.

Table 4 - Summary of Estimated Construction Costs

Item	Construction Costs
Wetland Excavation and Berm Construction	$148,208
Emergent Plantings for Wetland Cells	$ 95,110
Broadcast Seeding for Berm Stabilization	$ 6,481
Installation of Five (5) Stoplog Control Structures ($6,000 each)	$ 35,400
Planting Plan for Hackberry Creek	$166,575
Reforestation Plantings for Stewart Creek	$ 66,915
Nesting Boxes for Created Wetland Cells (78 total @ $75/unit)	$ 7,060
Operation & Maintenance Access Features	$461,145
Total:	**$986,894**

Table 5 - Summary of Estimated Project Costs

Item	Costs
Detailed Project Report	$ 168,000
Plans and Specifications	$ 210,000
Lands, Easements, Rights-of-Way, Relocations, Disposal Areas (LERRD)	$2,868,125
Construction – Ecosystem Restoration	$ 986,894
–Warranty Period	$ 55,600
Total:	**$4,288,619**

ENVIRONMENTAL EFFECTS*

Soils

The recommended plan would utilize the qualities of existing soils to develop forested and wetland habitats in the Hackberry Creek and Stewart Creek drainages. The reforestation would be accomplished through commercial forestry techniques, which would minimize soil disturbance. The construction of the wetland cells would result in disturbance within the footprint of the cell levees, a small area along the levee on the upgradient side where borrow would occur for the material to construct the levees and a small area downgradient of the levees to facilitate drainage through water control structures. More than five acres of soil would be disturbed through construction of the wetland cells and a stormwater pollution prevention plan would need to be developed for the project. Best management practices (BMP's) would be implemented during project construction to prevent the pollution of storm water into adjacent aquatic resources from construction activities. A number of BMP's for erosion and sedimentation control would be implemented for the project including, but not limited to: (1) temporary seeding of disturbed areas, (2) seeding or hydromulching on erosion susceptible slopes, (3) establishing temporary sediment barriers consisting of a row of entrenched and anchored straw bales, and (4) construction of entrenched and staked filter fabric silt fences. It is anticipated that implementation of the proposed project would not have adverse impacts to soils.

Hydrology and Hydraulics

The alternative plans evaluated in the hydrology and hydraulics study succeed in producing feasible wetland restoration within the study areas without causing any adverse water surface effects outside of the study area. Existing conditions FIS hydrology and hydraulic models were provided by the City of Frisco via Birkhoff, Hendricks, & Conway Consulting Engineers (BH&C). All wetland cells would be strategically located in areas where surface runoff would be easily captured from the existing terrain. Analysis of the surface water elevation for Lake Lewisville shows that the wetland areas' supply of water would primarily come from local runoff during storm events rather than from backwater from the lake. Recharge would be expected during the spring and autumn seasons, which are prone to extended wet cycles. Since the local watershed is anticipated to become fully urbanized in the near future, rainfalls of only short duration and sufficient intensity should produce adequate runoff for recharge. Copies of the hydrology and hydraulics studies for Hackberry Creek and Stewart Creek are provided in **Appendix E**.

Constructed wetlands in a restoration plan should be designed to have a natural, reliable hydrology source and based on the results of the hydrology and hydraulics studies, failure to meet required runoff demands on an annual basis would be rare. However, maintaining a water supply is critical for emergent plantings in early stages after construction, especially for the larger Hackberry Creek wetland cells which would have a significantly larger planting area. In the event of drought conditions, the adjacent landowner entity would be capable of providing an artificial hydrology source to the Hackberry Creek wetlands. The farm operations pump system located off of the proposed project area would be used to pump water into upstream ponds. Water overflow from the upstream pond reserves would eventually flow into the proposed Hackberry Creek wetland cells and provide an ancillary water supply during periods of low precipitation. The operation and maintenance of the pump system would be solely at the cost of the landowner who in turn would receive aesthetic benefits from an adjacent, properly functioning, wetland area.

Waters of the United States

The recommended construction of the wetland cells could result in modifications to existing waters of the United States, including wetlands, as regulated by Section 404 of the Clean Water Act. Modifications include minimal fill in waters of the United States during levee and trail access construction; however, the primary habitat modification would be inundation of existing features after the project is complete. Habitat restoration measures may meet the criteria for Nationwide Permit (NWP) 27 - *Stream and Wetland Restoration Activities*, which authorizes activities in waters of the United States associated with the creation and enhancement of wetland and riparian areas. Recreational components of the project will

likely be below the impact threshold criteria for NWP 14 – *Linear Transportation Projects*. No channelization or work within the ordinary high water mark of Stewart Creek would be required. Portions of Hackberry Creek inundated by the project include remnant channel scars that have been degraded from inundation and subsequent sedimentation from Lake Lewisville and from upstream impoundments, which has altered historical channel flows. The project would not result in the conversion of forested wetlands into "green tree reservoirs" for waterfowl habitat. A green-tree reservoir is created when live timber stands are flooded, which provides resting places and food for wintering waterfowl. The TCEQ has issued a Section 401 water quality certificate for all NWPs and no further coordination is required if NWP 27 and NWP 14 are used and certain BMP's are implemented.

Surface Water

The recommended wetland cells would capture diffuse surface water runoff as well as occasional overflow water from Stewart Creek and Lake Lewisville. As development encroaches on the project area, trash accumulation and sedimentation may become potential impacts on the created wetland areas. The City of Frisco has adopted a storm water sediment/trash collector requirement in all storm water plans for future developments. This local policy of storm water management would serve to improve the quality of surface runoff that would initially enter the created wetland areas.

Most storage would occur in the fall and winter months when supply from runoff is in excess, lake levels tend to be highest, and evapotranspiration rates are lowest. The small quantity of water would have minimal effect on water supplies and would not affect the flood storage capacity of Lake Lewisville or cause rises in the 100-year floodplain of Stewart Creek. Expansion of the floodplain wetland system and riparian corridor would improve the ability of the Hackberry Creek and Stewart Creek drainages to filter pollutants from stormwater runoff, thereby improving the aquatic system in terms of water quality over the life of the project.

The maximum amount captured at any one time would be less than 200 acre-feet of water. The Texas Legislature has recently adopted water rights exemptions that extend to wildlife management areas. The project would be submitted to the Water Rights Division of the TCEQ during the planning and specifications phase of the project to determine whether a water rights permit is required. The City of Dallas, who owns water below 522' NGVD, would be allowed to comment during the public review phase.

Fish and Wildlife Habitat

Although temporary impacts to vegetation would be expected during project construction, the contribution to the vegetative community in terms of increased species and structural diversity would be significant over the life of the project. Increased vegetative diversity correlates to increased spatial heterogeneity, which increases the ability of a habitat type to accommodate the life requirements (e.g. food and cover) of a wider range of wildlife species. Temporary disturbance and displacement of resident wildlife would be expected during project construction; however, it is anticipated that wildlife would move back into the area once construction is complete.

Endangered or Threatened Species

The recommended plan has been reviewed by the USFWS (**Appendix H**) and it has been determined that the recommended plan would not adversely affect state or federally listed threatened or endangered species.

Cultural Resources
The archaeological investigation concluded that activities for the proposed wetland construction and reforestation activities would have an insignificant effect on cultural resources. The Texas Historical Commission (THC) has reviewed the results of the investigation and concurred that the project would not affect historic properties and that the project may proceed. A copy of the THC correspondence is attached in **Appendix I**. The potential still exists that buried archaeological deposits could be uncovered during construction. If the situation should arise, work would cease immediately in the area and the USACE Ft. Worth District and the Archaeology Division of Texas would be notified of the discovery.

Recreation
The recommended plan would have no adverse impacts on the recreational, scenic, and aesthetic resources in the area; rather, it is anticipated that over the life of the project, the proposed project features would have positive long-term effects. Impacts to scenic resources would be minimal during project construction and would be temporary in nature. Of the proposed reforestation plantings, the containerized trees and shrubs would become relatively quickly established and attractive to view. Eventually, seedling plantings would mature enough to provide additional aesthetic value to the study area. It is anticipated that the proposed wetlands would become quickly established and functional, thereby providing a semi-permanent to permanent aquatic landscape in areas that may be described as seasonal aquatic areas.

The incidental addition of public access to the restoration areas would increase the recreational and educational opportunities for local citizens. In addition, there is great potential for this access to provide future linkage to other city trail systems to the north and south. The City of Frisco would eventually seek to become part of the regional Trinity Trails Plan, thereby increasing the value of the proposed trail features on a broader scale.

PROJECT IMPLEMENTATION

Project Management Plan
The Project Management Plan (PMP) describes the activities to be taken and followed during project implementation, including plans and specifications, project construction, and maintenance and monitoring. The plans and specifications shall include a planting design for the recommended planting plan to ensure that prescribed tree and shrub species are planted in appropriate locations with appropriate distribution to optimize survivability and future habitat values. The plans and specifications shall also include a management plan for each wetland cell to maximize the range of aquatic plant and moist soil management techniques that benefit a variety of species. The plans and specifications would enable preparation of a firm cost estimate for the project. **Table 6** displays the approximate costs for the plans and specifications phase. The cost of the plans and specifications is part of the overall construction cost and would be shared jointly by the Federal and non-Federal sponsor.

Table 6 - Estimated Cost for Plans and Specifications (October 2003 Costs)

Plans and Specifications	Cost in Dollars
Field Survey Levee Locations	$ 15,000
Construction of New Levee Sections and Outlet Structures	$ 50,000

Restoration Plantings	$ 20,000
Operation and Maintenance Access Features	$ 10,000
Plan Layout/Cost Estimates	$ 12,000
Environmental Review, Coordination, and Compliance	$ 11,000
Real Estate Coordination	$ 5,000
Internal Technical Review	$ 10,000
Project Management	$ 50,000
Contingency (15%)	$ 27,000
Total:	**$210,000**

Warranty Period

After award of a construction contract, the Federal government would oversee the construction of the recommended project components. A warranty period for the actual construction items and the restoration plantings would be specified before final sponsor acceptance of the project (**Table 5**). The construction contractor would be required to inspect areas and plantings and determine any remedial actions such as vegetation replacement due to mortality. Restoration success is dependent on a number of variables and often is subject to unforeseen or unpredictable obstacles. Therefore, the warranty period would prove critical in maintaining restoration plantings until restored areas become self-sustaining. Well-documented warranty information would also provide a reference for future operation and maintenance needs. Remedial actions identified during the construction warranty period would be funded as part of the total project cost, and cost shared 75% Federal and 25% non-Federal.

As shown in **Table 7**, the construction phase from initiation of the plans and specifications to completion of construction is estimated to take approximately five years to complete.

Table 7 - Project Implementation Schedule

Milestones	Date
Approval of Final DPR/EA Report	December 2006
Request Section 1135 Plans & Specifications Funding	January 2007
Initiate Plans & Specifications	March 2007
100% Plans & Specifications	January 2008
Execute Project Cooperation Agreement	March 2008
Acquire Real Estate / Execute Real Estate Deed	May 2008
Advertise Construction Contract	June 2008
Initiate Construction	July 2008
Initiate Warranty Period	July 2010
Complete Construction Phase / Provide O&M Manual	July 2012

Project Cooperation Agreement

The Project Cooperation Agreement (PCA) is a contract between the Federal Government and the non-Federal partner describing the rights and responsibilities of each party during project implementation, including cost sharing. The PCA would be executed after the receipt of Federal project approval and prior to advertisement of a construction contract. **Appendix F** provides a draft copy of the cooperation agreement.

Cost Apportionment

As described in the PCA, the total project cost would be shared between the Federal Government and the non-Federal partner on a 75% and 25% proportion, respectively. The non-Federal partner's 25% of the project total cost share is comprised of a credit for the value of all LERRDs, and credit for the value of any work-in-kind (WIK) services performed. In the event the value of the LERRD or WIK is less than 25%, the non-Federal partner would contribute the remaining value in cash. Credit for WIK is limited to 80% of the total non-Federal partner contribution and cannot result in a reimbursement. Further, with regard to WIK, the non-Federal partner would comply with applicable Federal and state laws and regulations, including the requirement to secure competitive bids for all work to be performed by contract. Contributions of cash, funds, materials, or services from other than the non-Federal partner or their contractor(s) may be accepted; however, such contributions would not be credited to the non-Federal partner share. These contributions would be applied to the entire total project cost and therefore reduce both the Federal and non-Federal share.

In the event the value of the LERRD is more than 25% of the total non-Federal project share, the non-Federal partner would agree to waive reimbursement for the value of the excess LERRD credit. Credit for LERRD can account for 100% of the total non-Federal project share, but excess LERRDs cannot result in a reimbursement. **Table 8-9** displays the current estimated project cost apportionment prior to and after non-Federal waiver of excess LERRDs reimbursement.

Table 8 –Project Cost Apportionment Prior to Sponsor Waiver of Excess LERRD's Reimbursement

Cost Share Item	Federal Share (75%)	Non-Federal Share (25%)	Total Project Cost
Detailed Project Report	$126,000	$42,000	$168,000
Plans and Specifications	$157,500	$52,500	$210,000
Ecosystem Restoration / Warranty	$781,871	$260,623	$1,042,494
LERRDs	$2,151,094	$717,031	$2,868,125
Work-In-Kind Credit	$0	$0	$0
Total Project Cost	**$3,216,465**	**$1,072,154**	**$4,288,619**

Table 9 –Project Cost Apportionment After Sponsor Waiver of Excess LERRD's Reimbursement

Cost Share Item	Federal Share (75%)	Non-Federal Share (25%)	Total Project Cost

Detailed Project Report	$126,000	$42,000	$168,000
Plans and Specifications	$157,500	$52,500	$210,000
Ecosystem Restoration / Warranty	$781,871	$260,623	$1,042,494
Work-In-Kind Credit	$0	$0	$0
LERRDs	$0	$2,868,125	$2,868,125
Waived LERRDs****	$0	$2,394,627	$2,394,627
Adjusted LERRDs	$355,123*	$118,375**	$473,498
Total Project Cost	**$1,420,494**	**$473,498*** **	**$1,893,992**

*The Federal Share Adjusted LERRDs cost ($355,123) was calculated by adding-up all Non-Federal Cost Share Items (Detailed Project Report, Plans and Specifications, and Ecosystem Restoration / Warranty).
**The Non-Federal Share Adjusted LERRDs cost ($118,375) was calculated by dividing the Federal Share Adjusted LERRDs cost ($355,123) by 3.0 to obtain the required 25% Non-Federal Share.
***The Non-Federal Share Total Project Cost ($473,498) was calculated by adding-up all Non-Federal Cost Share Items (Detailed Project Report, Plans and Specifications, Ecosystem Restoration / Warranty, and Adjusted LERRDs).
****Waived LERRDs were calculated by subtracting the Non-Federal Share Total Project Cost ($473,498) from the total LERDDs ($2,868,125).

Real Estate Plan

The total project area for the ecosystem restoration plan is estimated at 282.3 acres. The majority of the study area (191.5 acres) is currently owned in fee by the United States of America and is under the primary jurisdiction of the USACE. Lone Star Ranch Development owns the remaining 90.8 acres of flowage easement property located within the study area. The City of Frisco would acquire the Lone Star Ranch Development properties within the flowage easement, which would then be incorporated in the habitat restoration area. The Fort Worth District Operations and Real Estate Divisions would develop a district recommendation and lease agreement for USACE fee property that would be included in the project area **Appendix G**. The lease agreement would outline the equal tradeoff of operation and maintenance responsibilities and lease costs between the non-Federal sponsor and the USACE. Per the real estate plan, the total cost of real estate, including contingency is estimated to be $2,868,125. However, per an agreement between the USACE and the City of Frisco (the local sponsor), the City of Frisco as the non-Federal partner agrees to waive credit or reimbursement for the $2,394,627 in LERRDs above the 25% non-Federal cost share guidance for ecosystem restoration (Table 9). The Real Estate components of the project are fully discussed in **Appendix G**.

Operation and Maintenance

Upon satisfying initial warranty requirements and close-out of construction, the non-Federal sponsor would be responsible for all long-term project Operations, Maintenance, Repairs, Replacements, and Rehabilitations (OMRR&R), including vegetation replacements, berm repairs, and management of water control structures throughout the project life. The non-Federal sponsor would assume operation and maintenance responsibility for the entire project footprint, which includes USACE fee-owned property and sponsor-owned flowage easement property. Since the non-Federal sponsor would assume operation and maintenance responsibility for USACE fee-owned property, the USACE would not charge the non-Federal sponsor for lease of the property. The Fort Worth District Operations and Real Estate Divisions would develop a district recommendation and lease agreement that outlines the equal tradeoff of operation and maintenance responsibilities and lease costs between the non-Federal sponsor and the USACE.

Estimated annual operations and maintenance costs totaling $25,600 were calculated with the restoration costs in the incremental cost analysis in **Appendix C**. Breakdown of the costs assumes $15,600 per year for labor based on 15 man-hours per week or 780 man-hours per year at a salary of approximately $20.00

per hour and $10,000 per year for supplies. The operation and maintenance schedule would vary by season and necessity and should include, but not be limited to the following activities: 1) periodic replanting and pruning of trees and shrubs in reforestation areas to improve stand health; 2) removal of debris from access paths in flood prone areas; 3) yearly cleaning and checking of wood duck boxes to remove pest species; 4) periodic maintenance of stoplog control structures for constructed wetland cells; 5) periodic mowing of levees to prevent shrub and tree growth as needed; and 6) monitoring of levee stability and repair when necessary.

The three, shrub, and herbaceous species recommended for planting were specifically selected because they are native to the region and are expected to grow with minimal maintenance. However, it is anticipated that some maintenance would be required as described above, especially during the early establishment period of the plantings, to ensure long-term survival of plantings.

Future OMRR&R needs could also include consideration of periodic inspections, habitat assessments, and management recommendations for restoration measures. Various types of monitoring and habitat assessment techniques could be utilized to determine the post project success of the restoration effort. At a minimum the USACE and non-Federal sponsor could monitor and evaluate the success of installed restoration measures such as wetland berms, water control structures, and vegetation plantings throughout the project life. The USFWS could assist in post project habitat assessments through the use of HEP analysis. The HEP analysis would likely occur approximately 5 to 10 years following completion of construction. The post project HEP analysis would be compared with pre and post habitat conditions to assess the progress and success of the restoration project. Additional HEP assessments could be used throughout the project life to further evaluate project success and recommend adaptive management techniques to maintain optimal habitat conditions.

COORDINATION OF RECOMMENDED PLAN

Views of Sponsor

The City of Frisco has been identified as the non-Federal partner. The City of Frisco has been involved during the development of restoration alternatives and concurs with the recommended restoration plan. The City of Frisco intends to participate in the implementation of the recommended plan. A letter of intent stating the City of Frisco's position is provided in **Appendix I**.

Results of Agency Coordination

As noted in the cultural resources section, the Texas State Historic Preservation Officer has reviewed preliminary proposed ecosystem restoration plans and concluded that the proposed activities would have an insignificant impact on potential cultural resources. The USFWS participated in the HEP analysis and served as a member of the team whose recommendations helped serve as the basis for the restoration measures proposed in the recommended plan.

Copies of the draft DPR/EA were sent to the following resource agencies as set forth by the National Environmental Policy Act (NEPA): TPWD; USFWS; EPA, Region 6; the THC; and the TCEQ. In addition to the above-mentioned letter of support from the USFWS and the concurrence letter from the THC, a letter was received from the EPA that documented their support for the project. Copies of all supporting documents of the proposed restoration plan are provided in **Appendix I.**

Regulatory Requirements

The proposed project has been reviewed in accordance with Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899. In addition, Executive Order 11990, Protection of Wetlands and Executive Order 11988, Floodplain Management was considered during development of

the proposed project. The project would be authorized under Nationwide Permit (NWP) 27, Wetland and Riparian Restoration and Creation Activities, and NWP 14, Linear Transportation Projects. The TCEQ has issued a water quality certification for NWP 27 and 14; therefore no further coordination for Section 401 water quality certification is required.

Due to the nature and intent of the proposed restoration activities, there are no practicable alternatives to conducting the project within the floodplain. However, the proposed project would not impact or significantly alter the existing boundary of the 100-year floodplain in any way. The proposed project is in compliance with Executive Order 11988, Floodplain Management. The proposed project would neither adversely impact nor result in any loss of wetlands, which complies with Executive Order 11990. Based on the findings in the Environmental Assessment (EA), a Finding of No Significant Impact (FONSI) has been prepared for signature by the Fort Worth District Engineer.

CONCLUSIONS

The DPR/EA documents the results of a study conducted under the authority of Section 1135 of the Water Resources Development Act of 1986, as amended (33 USC 2201). The purpose of the study was to develop a recommended alternative for modifying the Lake Lewisville project area, thereby restoring wetland and bottomland hardwood habitat components for resident and migratory wildlife.

The recommended plan would increase the habitat value of the study area over the life of the project by creating approximately 38.6 acres of emergent wetlands and reforesting approximately 57.1 acres with a mix of native tree and shrub species. Habitats not subject to direct management techniques would eventually become more valuable to wildlife species due to increased species and structural diversity (e.g. more food and cover). The proposed restoration would also provide a natural buffer between future development and the Hackberry Creek and Stewart Creek aquatic systems prior to their confluence with Lake Lewisville.

The City of Frisco has been identified as the non-federal sponsor, and has been presented with the findings of this report. The City of Frisco has offered their support for the recommended plan, including the cost-sharing plan, and has agreed to assume responsibilities for all OMRR&R costs.

An EA was integrated into the DPR to assess the potential environmental impacts of implementing the recommended plan. To meet requirements of NEPA, a public notice was released to the public, disclosing the availability of the EA. A FONSI was issued following completion of the 30-day public review process.

RECOMMENDATIONS

I propose that the recommended plan described in this Detailed Project Report be authorized for implementation under the authority of Section 1135 of the Water Resources Development Act of 1986, as amended, as a Federal project, with such modifications as in the discretion of the Chief of Engineers may be advisable. The initial cost of this project is estimated to be **$1,893,992**.

Prior to the commencement of construction, local interests must agree to meet the requirements for non-Federal responsibilities as outlined in this report and future legal documents. The City of Frisco has demonstrated that they have the authority and the financial capability to provide all non-Federal requirements for the implementation, operation, and maintenance of the project. The recommendations

contained herein reflect the information available at this time and current Department of the Army policies governing formulation of individual projects. They do not reflect the program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch.

JOHN R. MINAHAN
Colonel, U.S. Army Corps of Engineers
District Engineer

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