US Army Corps of Engineers
Fort Worth District

DRAFT

INTEGRATED DETAILED PROJECT REPORT AND ENVIRONMENTAL ASSESSMENT

LAREDO RIVERBEND 206 RESTORATION PROJECT

AUGUST 2013

U.S. Army Corps of Engineers
Fort Worth District

DRAFT

FINDING OF NO SIGNIFICANT IMPACT

LAREDO RIVERBEND SECTION 206
AQUATIC ECOSYSTEM RESTORATION PROJECT
LAREDO, TEXAS

A Detailed Project Report and integrated Environmental Assessment (DPR/EA) have been prepared to evaluate environmental restoration alternatives for the Laredo Riverbend area, in Webb County, Texas. The proposed project would restore valuable aquatic, wetland, and riparian habitats along the Rio Grande, which have been degraded by historic gravel mining, invasive exotic plant species, road construction and trails, and stormwater runoff and drainage. Invasive exotic plants would be controlled, water quality and hydrologic connection would be restored, reduction of sedimentation during storm events, creation of wetlands and nesting habitat for avian species, and establishment of native plant species would occur. The proposed project would have benefits to the federally listed species Gulf Coast jaguarondi (*Herpailurus yagouaroundi cacomitli*), interior least tern (*Sternula antillarum*), Texas hornshell (*Popenaias popei*), and ocelot (*Leopardus pardalis*). Further, the proposed project would expand upon the habitat restoration for federally listed species through its connectivity with an ongoing U.S. Customs and Border Protection project that was recently implemented adjacent to the proposed project area.

Eight restoration measures were developed and carried forward for cost-benefit analysis. Each of these measures was independent of the others, meaning each could serve as a stand-alone plan. The eight measures were improving hydrology and connectivity between habitats, improving drainage, increasing water depth in the two largest ponds, improving shoreline topography and emergent vegetation cover, removal and control of Carrizo cane (*Arundo donax*), removal and control of tamarisk (*Tamarix* spp.), reducing erosion, and creating nesting habitat for birds. Alternatives evaluated included a No Action Plan, and all combinations of the eight measures. All restoration plans were evaluated using an incremental cost analysis to ensure that the most cost effective plan was selected. The Proposed National Environmental Restoration (NER or recommended) plan included measures to control aquatic and riparian exotic plants, measures to restore and create wetlands and aquatic habitats, and measures to reduce erosion within the Laredo Riverbend area.

The Proposed NER Plan would have short-term and minimal adverse effects on soils and surface water quality as a result of soil and substrate disturbance and consequent erosion and turbidity. Soil erosion would be minimized through development of a Stormwater Pollution Prevention Plan. Consistency of all Proposed NER Plan activities with a Texas Pollutant Discharge Elimination System General Permit would be certified by the Texas Commission on Environmental Quality prior to construction. Measures to restore the aquatic, wetland, and riparian habitat, removal of road and trails, and control of surface discharges would all have long-term beneficial effects on soils and water quality. The Proposed NER Plan would have a negligible effect on floodplains and would result in a net increase in the area and quality of wetlands in the project area. The restoration of the various habitats and removal of invasive exotic plant species would occur within jurisdictional waters of the U.S. The Proposed NER Plan would be authorized under Nationwide Permit (NWP) 27 for Stream and Wetland Restoration Activities. The Texas Commission on Environmental Quality has issued a water quality certification for NWP 27; thus, no further coordination for Section 401 water quality certification is required.

The U.S. Army Corps of Engineers and U.S. Fish and Wildlife Service (USFWS) have completed Section 7 Endangered Species Act consultation for the proposed project. The USFWS has issued a Biological Opinion (BO) for the proposed project with a no jeopardy determination.

The removal of exotic riparian and aquatic species, replanting of native vegetation, and improvement of hydrological connectivity within the project area would have the potential to adversely impact known and unknown cultural resources that may be located under the existing structure and pavement. Section 106 consultation with the Texas State Historic Preservation Officer has been completed and a Programmatic Agreement has been signed. This along with archaeological testing, monitoring, and demarcation of areas to be avoided, as necessary, would mitigate potential adverse impacts on cultural resources from the restoration project. The restoration project would not remove hazardous materials from the project area, as none exist within the project area.

Based on a review of the information contained in this EA, it is concluded that the implementation of the Laredo Riverbend Section 206 Aquatic Ecosystem Restoration Project is not a major Federal action that 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.

______________________________ ______________________

Charles H. Klinge, Jr. Date
Colonel, US Army Corps of Engineers
District Engineer

DRAFT

INTEGRATED
DETAILED PROJECT REPORT AND
ENVIRONMENTAL ASSESSMENT

Laredo Riverbend 206 Restoration Project

U.S. Army Corps of Engineers
Fort Worth District
Fort Worth, Texas

August 2013

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EXECUTIVE SUMMARY

This Detailed Project Report/Environmental Assessment (DPR/EA) is submitted under the authority of Section 206 of the Water Resources Development Act of 1996, as amended (33 U.S.C. 2201). This DPR/EA includes a detailed description of and supporting information for the decisions made during the planning process and the assessment of environmental effects necessary to fulfill National Environmental Policy Act requirements.

The purpose of this study is to identify potential aquatic ecosystem restoration alternatives for the Laredo Riverbend area in Webb County, Texas. The goal of the DPR/EA is to evaluate each proposed alternative, and, through coordination among the federal sponsor, the U.S. Army Corps of Engineers (USACE), Fort Worth District (CESWF), the non-federal local sponsor, the City of Laredo, and participating agencies, U.S. Fish and Wildlife Service (USFWS), and Texas Parks and Wildlife Department (TPWD), develop a National Ecosystem Restoration (NER) plan. Both the TPWD and USFWS are supportive of this Section 206 project.

Study Area

The City of Laredo is located in Webb County, Texas, approximately 120 miles south of San Antonio, Texas. The Laredo Riverbend restoration area, located along a sharp bend in the Rio Grande in the southwest corner of the city, comprises approximately 77 acres of riparian habitat that has been significantly degraded by historic gravel mining; proliferation of nonnative plants; erosion caused by runoff from adjacent development; and encroachment of numerous trails and roads by recreational users, illegal aliens, and law enforcement officials. Historically, these riparian habitats provided numerous benefits to the Rio Grande aquatic ecosystem, such as shade that reduced water temperatures; organic input from leaf litter and detritus that provided food sources for multiple aquatic organisms; branches and stems that provided structure for birds, reptiles, and insects; and a breeding, foraging, and migration corridor for resident and migratory wildlife, including three federally listed under the Endangered Species Act, the interior least tern (*Sternula antillarum*), ocelot (*Leopardus pardalis*), and the Gulf Coast jaguarundi (*Herpailurus yagouaroundi cacomitli*). Other benefits of having quality riparian habitat adjacent to the Rio Grande include protecting water quality by intercepting sediments and pollutants and helping to recharge groundwater, thus increasing groundwater availability.

Goals and Objectives

The primary goal of this study is to develop an aquatic ecosystem restoration plan that provides the greatest ecosystem benefits relative to implementation costs. The following objectives were developed to address specific problems and opportunities identified during the planning process:

- Restore the quality and quantity of aquatic, wetland, and riparian habitats
- Improve habitat suitability of aquatic, wetland, and riparian habitats
- Improve hydrological connectivity with surrounding waterbodies and reduce seasonal inundation
- Improve water quality and reduce erosion
- Improve vegetative structure to increase habitat quality and improve structural diversity
- Increase the habitat quality of the restoration area as part of a migration, foraging, and breeding corridor for common native wildlife and federally listed species

Development of Restoration Measures

Through coordination with the USFWS and TPWD, various restoration measures to improve hydrology and drainage, increase water depth, improve shoreline topography, remove monotypic stands of tamarisk (*Tamarix* spp.) and Carrizo cane (*Arundo donax*), reduce erosion, and create nesting habitat for avian species were developed. These measures were developed in sufficient detail to project their benefits, estimate costs, and assess engineering feasibility. Measures were then combined to create all possible alternative plans. Incremental Cost Analysis (ICA) was used to identify cost-effective plans. Thirty-five cost-effective plans were then compared based on incremental cost per incremental habitat unit of output to identify best-buy plans.

National Ecosystem Restoration (NER) Plan Selection

Habitat Evaluation Procedures (HEP) were used to quantify the suitability of the following habitats: deciduous forested wetland, deciduous scrub savannah, deciduous scrub/shrub wetland, and lacustrine/herbaceous wetland (USFWS 1980). Using HEP, baseline habitat data collected in the field were analyzed to reveal that the restoration area ecosystem currently provides 3.42 habitat units (HUs) of lacustrine herbaceous wetland (L/HW) habitat, 1.74 HUs of deciduous forested wetland (DFW) habitat, 9.66 HUs of deciduous scrub/shrub wetland (DSSW) habitat, 33.22 HUs of deciduous scrub savannah (DSS) habitat, and 0.032 HU of nesting habitat for a total of 48.06 HUs. Based on 12 years of in-field observations, the restoration area has not changed substantially since the origination of this study in the early 2000. The nonnative plant species have remained constant without recognizable change or expansion, the water quality of L/HW habitats has remained poor, erosive features have remained present with negligible increases, and the trails and roads have remained a constant. Development and impervious surfaces to the north, which affect runoff into the site, are at maximum capacity with no room for expansion. Therefore, no additional effects from impervious surfaces could occur. The City of Laredo, who owns the property, will not allow any further development of the restoration area and is in full support of this restoration plan. Due to these reasons, it is presumed that these baseline conditions would remain relatively unchanged without implementation of any restoration measures.

ICA generated 11 best-buy plans, including the No Action Plan. Best-buy Plan 1 (No Action Plan) represents the future without project (FWOP) conditions. Under this plan, the restoration area habitats would remain in their current highly degraded state and no restoration activities would occur. Therefore, no habitat for federally listed species would be restored or improved, nor would nonnative and invasive species be removed and controlled. This plan would provide 48.06 Average Annual Habitat Units (AAHUs) over the life of the project and does not meet the goals and objectives of the study.

At an incremental cost of $3,293 per incremental habitat unit, Best-buy Plan 2 provides an additional 1.65 AAHUs over the No Action Plan. This plan would improve the quality of the deciduous forested wetland habitats by replacing exotic monocultures with native species that provide better vegetative structure for foraging by songbirds. This measure would also improve habitat suitability for the ocelot by increasing the canopy height. Tamarisk produce abundant and dense growth near the ground, and ocelot prefer a canopy height of greater than 8 feet (USFWS 1990). Best-buy Plan 2 would improve habitat suitability for common and listed species and is “worth it.”

At an incremental cost of $3,607 per incremental habitat unit, Best-buy Plan 3 provides an additional 7.91 AAHUs over Best-buy Plan 2. This plan would also remove tamarisk from the restoration area, resulting in benefits similar to Best-buy Plan 2. This plan would also substantially increase the area and suitability of lacustrine and herbaceous wetland habitats by restoring wetland benches around the perimeter of the largest ponds, and by improving the hydrology of the entire system such that germination, establishment, and spread of wetland plants are improved. Best-buy Plan 3 would improve habitat suitability for both common and listed species and is “worth it.”

At an incremental cost of $6,884 per incremental habitat unit, Best-buy Plan 4 provides an additional 1.45 AAHUs over Best-buy Plan 3. In addition to the benefits of Best-buy Plan 3, this plan would remove roads from within deciduous scrub/shrub habitat, thereby improving habitat suitability for the eastern cottontail (*Sylvilagus floridanus*). Although not quantified by the HSI models, it is assumed that removal of these gravel roads would also reduce turbidity within lacustrine habitats. The primary incremental benefit of this plan is the increase in habitat area, and this plan is “worth it.”

At an incremental cost of $8,109 per incremental habitat unit, Best-buy Plan 5 provides an additional 1.81 AAHUs over Best-buy Plan 4. In addition to the benefits of Best-buy Plan 4, this plan would remove Carrizo cane from the restoration area. The benefits of replacing Carrizo cane with native species are the same as those described for Best-buy Plan 2, and this plan is “worth it.”

At an incremental cost of $10,037 per incremental habitat unit, Best-buy Plan 6 provides an additional 0.86 AAHU over Best-buy Plan 5. In addition to the benefits of Best-buy Plan 5, this plan would increase the depth of the two largest ponds in the restoration area. Increasing the depth of the ponds would provide opportunity for slider turtles (*Pseudemys scripta*) to escape predation and would also reduce water temperatures. A reduction in water temperatures would improve suitability for the warmouth (*Lepomis gulosus*) and other native fishes in these lacustrine habitats. Best-buy Plan 6 is “worth it.”

At an incremental cost of $10,549 per incremental habitat unit, Best-buy Plan 7 provides an additional 0.49 AAHU over Best-buy Plan 6. In addition to the benefits of Best-buy Plan 6, this plan would plant native species following the removal of Carrizo cane. Planting natives, as opposed to allowing natural recruitment, would not only result in a faster accumulation of benefits, it would also increase species diversity throughout the system and provide habitat for the federally listed cats. Best-buy Plan 7 is “worth it.”

At an incremental cost of $16,097 per incremental habitat unit, Best-buy Plan 8 provides an additional 0.13 AAHU over Best-buy Plan 7. In addition to the benefits of Best-buy Plan 7, this plan would result in the stabilization of a head cut in the restoration area. This substantial head cut creates a large sediment plume and area of disturbance that does not provide suitable habitat for eastern cottontail. Although not quantified, it is also assumed that this plan would substantially reduce turbidity and sediment accumulation in the downstream ponds, thereby improving habitat suitability. Best-buy Plan 8 is "worth it."

At an incremental cost of $21,217 per incremental habitat unit, Best-buy Plan 9 provides an additional 0.42 AAHU over Best-buy Plan 8. In addition to the benefits of Best-buy Plan 8, this plan would result in the restoration of nesting habitat for colonial nesting birds. Measures to improve hydrology would create an island of habitat surrounded by water, and this plan would plant trees in that habitat, providing nesting structure. This plan would create nesting opportunities for colonial birds in an area where nesting habitats are sparse. Best-buy Plan 9 is "worth it."

At an incremental cost of $201,251 per incremental habitat unit, Best-buy Plan 10 provides an additional 0.06 AAHU over Best-buy Plan 9. In addition to the benefits of Best-buy Plan 9, this plan would result in the restoration of nesting habitat for the federally listed interior least tern. Although suitable nesting habitat occurs in the restoration area on an intermittent basis, this plan would create permanent habitat for this listed species. Best-buy Plan 10 is "worth it."

At an incremental cost of $838,247 per incremental habitat unit, Best-buy Plan 11 provides an additional 0.01 AAHU over Best-buy Plan 10. In addition to the benefits of Best-buy Plan 10, this plan would result in improvement to hydrology that would largely be gained by implementation of Best-buy Plan 3. Because this plan would not meet additional objectives or goals beyond Best-buy Plan 10, this plan is not "worth it."

Best-buy Plan 10 is "worth it" and has been identified as the NER Plan. The total investment cost of the NER Plan, including lands, easements, rights of way, relocation, and disposal areas; general construction costs over the 3-year construction period; planning, engineering, and design; and construction management, profit, and interest during construction with allowances for contingencies, is $2,877,059 (Table ES-1).

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Table ES-1. Implementation Costs of the National Ecosystem Restoration Plan by Measure

Cost Item	Implementation Cost (dollars)								
	HYDRO2	DEPTH	SHORE	CANE2	TAM2	TAM and HYDRO2	ERODE2	NEST	Total
Lands, Easements, Right of Way, Relocation, and Disposal Areas	**124,926**	**560**	**43,629**	**30,855**	**26,711**		**194,806**		**421,486**
General Construction									
Initial Construction	338,174	171,881	75,957	213,884	71,312	6,724	33,703	535,592	1,447,226
3-year Establishment Period	23,202		8,350	26,701	18,174	4,064	9,139	1,920	91,549
Subtotal	361,375	171,881	84,307	240,585	89,486	10,788	42,842	537,512	1,538,775
Contingency (%)	14.44	5.82	9.14	7.31	9.41	9.41	9.73	10.94	
Contingency Value	52,179	10,004	7,701	17,597	8,417	1,015	4,170	58,795	159,878
Subtotal	**413,554**	**181,885**	**92,008**	**258,183**	**97,902**	**11,803**	**47,012**	**596,307**	**1,698,654**
Planning, Engineering, and Design (PED)									
PED (10%)	36,138	17,188	8,431	24,059	8,949	1,079	4,284	53,751	153,878
Contingency (19.67%)	7,110	3,382	1,659	4,733	1,761	212	843	10,575	30,275
Subtotal	**43,247**	**20,570**	**10,089**	**28,792**	**10,709**	**1,291**	**5,127**	**64,326**	**184,152**
Construction Management									
Construction Management (10%)	36,138	17,188	8,431	24,059	8,949	1,079	4,284	53,751	153,878
Contingency (10.94%)	3,953	1,880	922	2,632	979	118	469	5,879	16,832
Subtotal	**40,090**	**19,068**	**9,353**	**26,690**	**9,927**	**1,197**	**4,753**	**59,631**	**170,709**
Subtotal First Cost	**621,818**	**222,083**	**155,079**	**344,519**	**145,250**	**14,290**	**251,697**	**720,264**	**2,475,001**
Profit (10%)	62,182	22,208	15,508	34,452	14,525	1,429	25,170	72,026	247,500
TOTAL FIRST CONSTRUCTION COSTS	**683,999**	**244,291**	**170,587**	**378,971**	**159,775**	**14,719**	**276,867**	**792,291**	**2,721,501**
Interest During Construction	38,831	13,869	9,684	21,514	9,070	892	15,718	44,979	154,557
INVESTMENT COST	**722,830**	**258,160**	**180,272**	**400,486**	**168,845**	**16,612**	**292,585**	**837,269**	**2,877,059**
Interest	27,106	9,681	6,760	15,018	6,332	623	10,972	31,398	107,890
Amortization	5,113	1,826	1,275	2,833	1,194	118	2,070	5,923	20,353
Annual Operations, Maintenance, Repair, Rehabilitation, and Replacements	1,735	2,467	1,979	1,996	1,385	-	769	706	11,038
AVERAGE ANNUAL COST UNIT (AACU)	**33,955**	**13,975**	**10,015**	**19,847**	**8,911**	**740**	**13,811**	**38,027**	**139,280**

HYDRO2 – Excavation of channels and shorelines
DEPTH – Excavate two largest ponds to a depth of 4 feet
SHORE – Create shallow wetland benches and points and plant native emergent vegetation
CANE2 – Remove Carrizo cane and plant native trees and shrubs
TAM2 – Remove tamarisk and plant native trees and shrubs
ERODE2 – Remove roads and control erosion at head cut
NEST – Create nesting habitat on barges in two largest ponds

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The City of Laredo proposes the inclusion of recreational components in the NER Plan. These additional recreational components are considered minimal facilities as described in USACE Engineering Regulation 1105-2-100, Appendix E. With the inclusion of cost of the recreational components ($263,978) proposed by the City of Laredo, the total cost of the NER Plan would be approximately $3,141,037.

Environmental Effects

Proposed measures for restoration of the Laredo Riverbend ecosystem were developed within the constraints of local, state, and federal policy and statutes. The proposed NER plan would primarily have beneficial effects on the human and biological environment. Standard best management practices would be implemented to avoid and minimize the adverse effects of soil disturbance, pesticide use, noise, and potential hazardous waste spills. Proposed aquatic alterations are anticipated to be permitted under Clean Water Act Section 404 Nationwide Permit 27 - Aquatic Habitat Restoration Establishment and Enhancement Activities. Impacts on the 100-year floodplain would occur if the restoration measures are implemented; however, these impacts would not be significant. No materials would be brought into the study area and the material that is excavated would be displaced over the study area for the creation of wetland benches or removed from the site. No hazardous, toxic, or radioactive waste impacts are expected as none are known to exist in the study area. The removal of nonnative species and planting of native species would not increase the area of vegetation within the study area as these actions would occur within the same location. Measures to avoid and minimize potential impacts (i.e., avoidance of nesting or breeding seasons, preconstruction surveys, and phasing of construction activities) on federally endangered species would be developed through Section 7 consultation with USFWS. By implementing these measures, impacts would be minimal and are likely to be beneficial. Terrestrial wildlife (e.g., birds and small mammals) inhabiting the area are likely common and acclimated to the urban environment. Work would occur during daylight hours in order to avoid disturbance to neighborhoods. Due to the topography and geology of the study area in combination with the past results of previously conducted archaeological surveys in the area, there is a potential for deeply buried cultural deposits to be present. Section 106 consultation with the Texas State Historic Preservation Officer (SHPO) would be completed prior to any ground-disturbing activities. It is anticipated that, during consultation with the SHPO, a Programmatic Agreement would be established between the City of Laredo, SHPO, and USACE.

The City of Laredo, as the non-federal, local sponsor, would provide the lands required for the proposed project. The City of Laredo would also be responsible for all operation, maintenance, replacement, and repair costs. Both the TPWD and USFWS are supportive of this Section 206 project. This report includes sections that contain information necessary to fulfill National Environmental Policy Act requirements, such as Study Purpose and Scope; Environmental Restoration Measures; NER Plan; and an assessment of Environmental Effects.

SECTION 1.0
INTRODUCTION

1.0 INTRODUCTION

This Detailed Project Report/Environmental Assessment (DPR/EA) provides the findings of an Ecosystem Restoration Study of the Laredo Riverbend ecosystem. The Ecosystem Restoration Study included identification of goals and objectives, as well as opportunities and constraints, evaluating baseline habitat suitability, developing restoration measures, and using estimated costs and benefits to evaluate and compare alternatives. Through this planning process, the most cost-effective alternative that met the study goals was selected as the National Ecosystem Restoration (NER) Plan. This DPR/EA also includes documentation of the assessment of the potential adverse and beneficial effects of the NER Plan (i.e., proposed action) on the human and natural environment necessary for compliance with the National Environmental Policy Act (NEPA) (Public Law [P.L.] 91-190, 42 U.S. Code [U.S.C.] 4321 et seq.)

1.1 LOCATION

The City of Laredo is located in Webb County, Texas, approximately 120 miles south of San Antonio, Texas. The proposed restoration area includes a former sand and gravel mining operation along a sharp bend in the Rio Grande in the southwest corner of the city, commonly referred to as the Laredo Riverbend area (Figure 1-1).

1.2 STUDY AUTHORITY

The proposed ecosystem restoration study was undertaken under the authority of Section 206 of the Water Resources Development Act (WRDA) of 1996. Under the authority provided by Section 206, the U.S. Army Corps of Engineers (USACE) may participate in planning, engineering and design, and construction of projects to restore degraded aquatic ecosystem structure, function, and dynamic processes to a less degraded, more natural condition when the restoration will improve the environment, is in the public interest, and is cost-effective. The proposed aquatic ecosystem restoration project would be cost-shared with the non-federal local sponsor, the City of Laredo, which currently owns the property. The lead federal agency for this project is the USACE, Fort Worth District (CESWF). The U.S. Fish and Wildlife Service (USFWS) and Texas Parks and Wildlife Department (TPWD) are participating agencies.

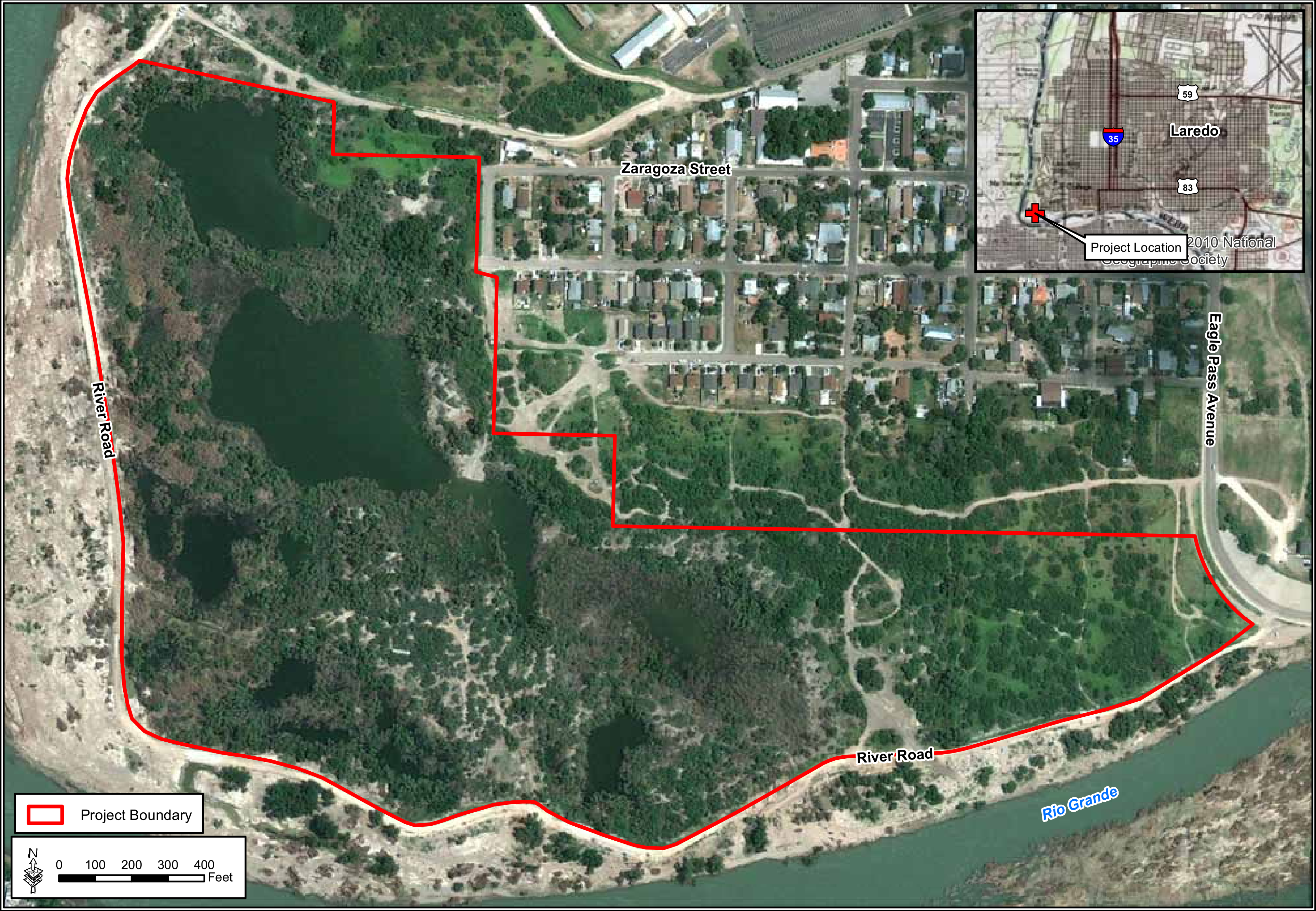

Figure 1-1. Laredo Riverbend Section 206 Aquatic Ecosystem Restoration Area

May 2013

1.3 PURPOSE AND SCOPE

The purpose of this study is to identify areas of aquatic 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 sponsor. The goal of the NER Plan would be to restore riparian, wetland, and aquatic habitats to benefit a variety of resident and migratory wildlife, including any threatened or endangered species that utilize the area.

1.4 SITE VISITS AND PARTICIPANTS

Numerous site visits and biological surveys have been conducted within the restoration area for this project over the past 12 years. Table 1-1 shows the date and participants of the various site visits and surveys.

Table 1-1. Site Visit/Survey Dates and Participants

Date	Participants	Purpose
Week of June 18, 2001	Gulf South Research Corporation (GSRC)	Biological Survey
Week of July 23, 2001	GSRC	Biological Survey
Week of June 2, 2003	GSRC	Biological Survey
Week of May 10, 2004	GSRC	Biological Survey
Week of August 28, 2010	GSRC and USACE	Site Visit
Week of May 9, 2011	GSRC, USACE, and USFWS	Biological Survey and Site Visit
Week of June 20, 2011	USFWS	Baseline Fisheries Study

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SECTION 2.0
EXISTING CONDITIONS AND REGULATORY BACKGROUND

2.0 EXISTING CONDITIONS AND REGULATORY BACKGROUND

This section of the DPR/EA provides a description of the existing conditions of the restoration area and the regulatory background as it pertains to the status of resources.

2.1 LAND USE

The restoration area has not been substantially developed, but consists of a mosaic of disturbed and natural areas with a network of roads and trails and a few small wooden structures. The restoration area is bordered to the north and east by residential and industrial areas associated with urban development and the City of Laredo, and by the Rio Grande to the south and west. In addition, the area is adjacent to the Laredo Community College (LCC). The restoration area is currently accessed by a public road paralleling the river (i.e., River Road) and offers some recreational use such as hiking and bird watching. Up to present time, there have not been issues or problems with private all-terrain vehicle (ATV) use within the restoration area. On any typical day, there is one U.S. Border Patrol (USBP) agent at the entrance to the restoration area, and other agents patrol along River Road in vehicles on a routine basis. USBP agents may also search the interior of the restoration area on foot, ATV, or bicycle to pursue illegal aliens as necessary within the restoration area. The USBP conducts routine operations along River Road and, when required, pursues illegal aliens on roads and trails within the restoration area (Department of Homeland Security [DHS] 2005). No formal easement would be issued for the use of the restoration area by USBP agents, as it is not required. However, improvements were made by USBP to River Road through an easement from the City of Laredo to provide all-weather access along the Rio Grande and improve the safety of USBP agents and the public. Other projects include an ongoing project on approximately 22 acres in the area between the Rio Grande and River Road to remove nonnative vegetation and reestablish native species. This project is being completed by U.S. Customs and Border Protection (CBP).

2.2 TOPOGRAPHY

Historically the restoration area consisted of typical ridge and swale floodplain topography. However, due to the extraction of gravel and the construction of roads, the topography has been substantially altered. The ridge and swale topographic features once prevalent are now limited to the northwestern portion of the restoration area, while the remainder of the restoration area has been excavated, resulting in a generally flat area with slight topographic change. The boundaries of the restoration area are higher in elevation than the interior, resulting in a bowl-shaped landscape. Figure 2-1 depicts the elevation changes in 5-foot increments. The development to the north of the restoration area is located on a bluff overlooking the restoration area and is a major contributor to runoff, sedimentation, and the head cut located in the northern portions of the restoration area.

There are numerous unimproved roads and trails throughout the Laredo Riverbend area (Figure 2-2). River Road traverses the western and southern boundaries of the restoration area and creates an artificial berm surrounding the interior. Although the majority of River Road occurs along a natural ridge, much of the road has been built up, thus limiting drainage of stormwater in the restoration area to the Rio Grande, even with the three low-water crossings and two box culverts that currently exist.

Photograph 2-1. ATV Trail

There are two roads that can be accessed from River Road that lead into the interior of the Laredo Riverbend area and numerous spurs and loops extending from these two roads, some of which have also been built up with gravel. A third road leads westward from the developed areas to the north and divides the two largest artificial ponds. In addition to this road network, there are numerous foot and ATV trails throughout the area (Photograph 2-1). Under existing conditions, these unimproved roads and trails cause many problems within the restoration area, including serving as impediments to natural drainage, contributing to sedimentation problems since they are highly erodible areas of disturbed, unvegetated soils, and serving as areas of encroachment for additional human-induced activities and for the spread of the nonnative Carrizo cane (*Arundo donax*), tamarisk (*Tamarisk* spp.), and buffelgrass (*Pennisetum cliare*) plant species present on-site.

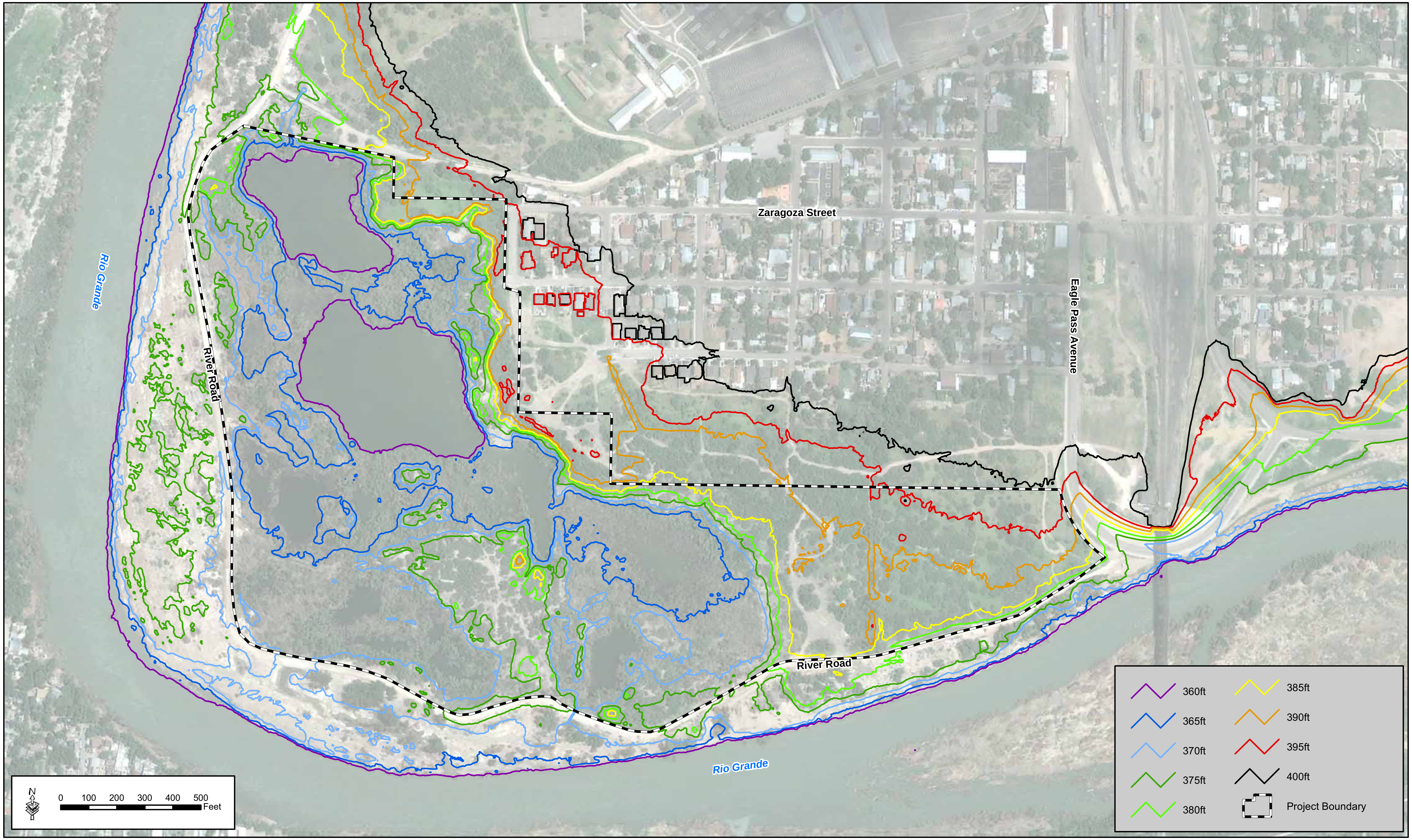

Figure 2-1. Topography of the Restoration Area

May 2013

Figure 2-2. Roads and Trails within the Restoration Area

GSRC

May 2013

2.3 SOILS AND GEOLOGY

Two soil types are located in the restoration area: Rio Grande very fine sandy loam, occasionally flooded, and Lagloria silt loam, 0 to 1 percent slopes (Figure 2-3, Natural Resources Conservation Service [NRCS] 1985). The Rio Grande very fine sandy loam is located on the floodplain of the Rio Grande and covers approximately 52 acres of the restoration area. The soil is well drained, with runoff being slow and permeability being moderately rapid. The Lagloria silt loam, 0 to 1 percent slopes, covers approximately 25 acres of the restoration area and is characterized by deep, almost level soils parallel to the Rio Grande. The soil is well-drained, with slow runoff and moderate permeability. Main uses for both soils include rangeland and wildlife habitat.

Prime farmland is protected under the Farmland Protection Policy Act (FPPA) of 1980 and 1995. The FPPA's purpose is to minimize the extent to which federal programs contribute to the unnecessary and irreversible conversion of farmland to non-agricultural uses. Both soil units in the restoration area are considered prime farmland where irrigated. "Where irrigated" means that a dependable supply of irrigation water of adequate quality has been developed. There is no dependable supply of irrigation water in the restoration area; therefore, soils in the restoration area are not considered prime farmlands.

2.4 WATER RESOURCES

The water resources in and adjacent to the Laredo Riverbend restoration area include several ponds created from historic gravel mining operations, ephemeral drainage, and the Rio Grande, which runs along two sides of the roughly boot-shaped restoration area (Figure 2-4).

2.4.1 Surface Water

There are approximately 12 ponds located within the restoration area, the three largest of which are permanently inundated. Based on several years of observation, it appears that the water in these excavated ponds is made up of flow captured from localized precipitation, stormwater runoff from upgradient developments, and groundwater hydraulically connected to the Rio Grande. Because the largest ponds are historic gravel pits, their shorelines are relatively steep and do not readily support emergent vegetation. Inundation during the growing season, caused by large volumes of runoff from developed areas and floodwaters and insufficient

Figure 2-3. Soils in the Laredo Riverbend Restoration Area

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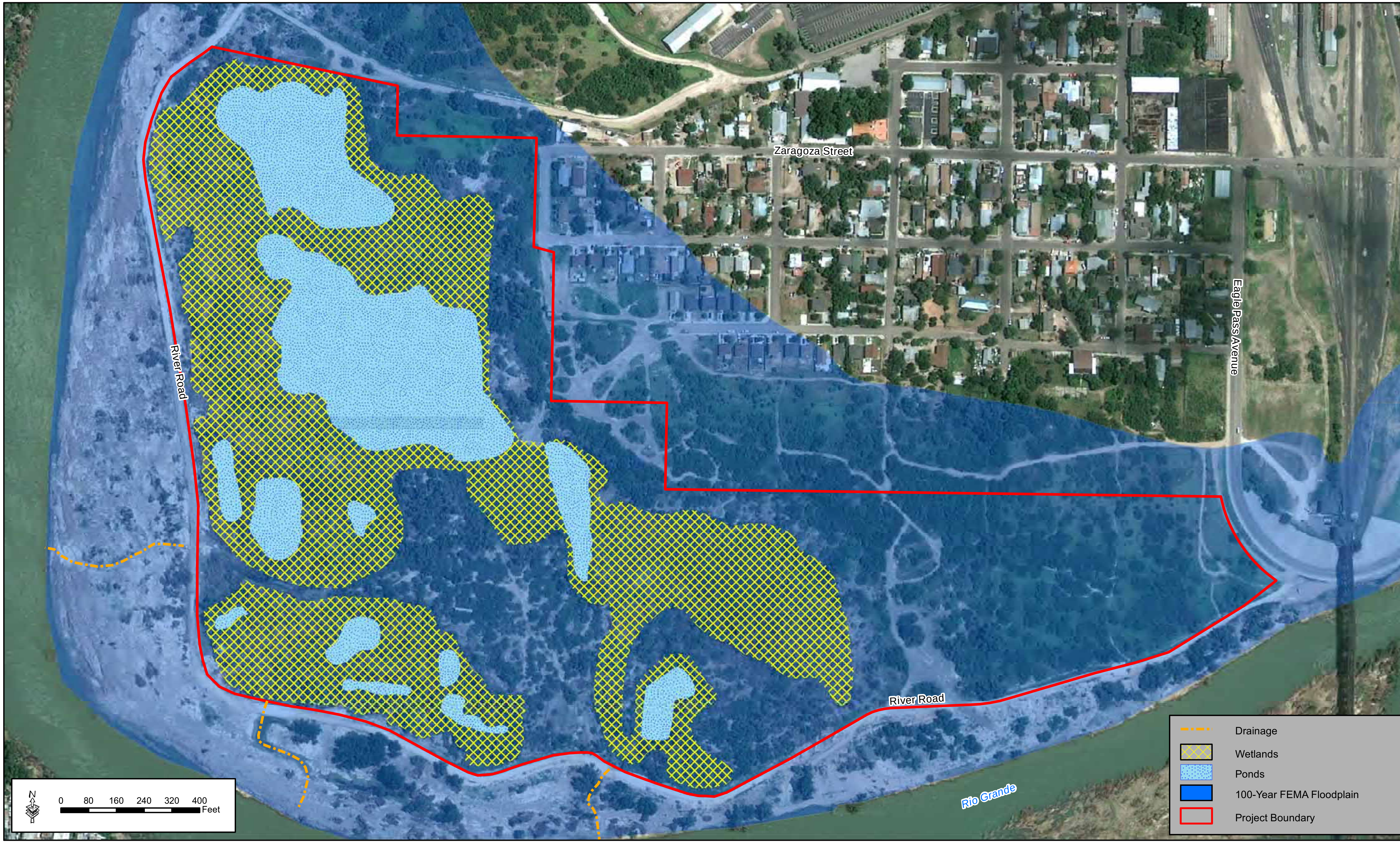

Figure 2-4. Water Resources within the Laredo Riverbend Restoration Area

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exterior drainage, further exacerbates establishment of vegetation, leaving expanses of areas devoid of vegetation once waters recede (Photograph 2-2).

Photograph 2-2. Area devoid of emergent vegetation surrounding an excavated pond in restoration area

A bathymetric survey of the three largest ponds revealed depths no greater than 3 feet, relatively flat bottoms, and steep banks (Figure 2-5). Depths of 1 foot were recorded within 6 inches of the banks, and soundings varied less than 6 inches across the majority of the ponds. Accumulated sediments on the bottoms were fine, silty clays and were at least 1 foot thick. The shallow depths and fine sediments contribute to high turbidity. Even slight winds across the ponds stir up sediments, which remain suspended most of the year. There is no structure in the interior of the larger ponds, except for tires and other debris beneath the water surface. Overhanging trees and exposed roots were observed but were uncommon. It is assumed that, due to the shallow depths and lack of aquatic vegetation, these ponds have high water temperatures and low dissolved oxygen concentrations. Several smaller ponds also occur within the area, and most of these ponds are dry for some portion of the year and provide limited habitat for aquatic organisms.

The Rio Grande, one of the longest rivers in the U.S., originates in Colorado and flows through New Mexico and Texas before reaching the Gulf of Mexico. The Rio Grande serves as the border between the U.S. and Mexico along its entire length within Texas. The Rio Grande is the sole source of drinking water for the City of Laredo, Texas, and Nuevo Laredo, Mexico, and the other communities within Webb County, Texas (Montemayo 2004). Approximately 200 miles upstream from the restoration area, the Rio Grande's flows are impounded in the Amistad International Reservoir, and river flows in Laredo are partially controlled by reservoir releases.

2.4.2 Groundwater

The only significant aquifer in Webb County is the Carrizo-Wilcox Aquifer that extends from the Louisiana border to the U.S./Mexico border and consists of the Wilcox Group and the overlying Carrizo Formation of the Claiborne Group. The aquifer is composed of sand locally bedded with gravel, silt, clay, and lignite. The aquifer reaches 3,000 feet deep, but the freshwater thickness of the sands averages 670 feet (Klemt et al. 1976; Texas Water Development Board 2012).

Figure 2-5. Bathymetry Map

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The Laredo Formation is another water-bearing formation near the City of Laredo and yields small quantities of water for irrigation and livestock use. Other aquifers in the region occur north (Edwards Aquifer) and south (Catahoula Formation) of the City of Laredo.

2.4.3 Floodplains

According to the Federal Emergency Management Agency (FEMA 2012), the proposed restoration area lies within the 100-year floodplain of the Rio Grande (see Figure 2-4).

2.4.4 Waters of the U.S., including Wetlands

Waters of the U.S., according to Section 328.3[2] of the Clean Water Act (CWA) of 1977, are those waters used in interstate or foreign commerce, subject to ebb and flow of tide, and all interstate waters including interstate wetlands, intrastate lakes, rivers, streams, mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, natural ponds, or impoundments of waters, tributaries of waters, and territorial seas. Jurisdictional boundaries for waters of the U.S. are defined in the field as the ordinary high water mark, which is that line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural lines impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas. Wetlands are those areas inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (USACE 1987). Based on information gathered during biological surveys and interpretation of aerial photography, up to 29 acres of the restoration area are potentially jurisdictional wetlands. In addition, several sand and gravel mine pits excavated in the project area have created wetlands that may be considered jurisdictional.

The USACE is directed by Congress under Section 404 of the CWA of 1977 (33 U.S.C. 1251-1376) to regulate the discharge of dredged and fill material into all waters of the U.S., including wetlands. The intent of the law is to protect the Nation's waters from the indiscriminate discharge of material capable of causing pollution and to restore and maintain their chemical, physical, and biological integrity.

The Rio Grande is classified as one of the waters of the U.S. under CWA regulations. In addition, it is considered a navigable waterway under Section 10 of the Rivers and Harbors Act of 1899 (USACE 1999). Stormwater runoff from the City of Laredo and local precipitation are conveyed through the restoration area via natural drainages that are potentially waters of the U.S. Drainage crossings along River Road were improved in 2005 under the authority of a Nationwide Permit 14 (DHS 2005).

2.4.5 Water Quality

The restoration area is adjacent to the stream segment identified by the U.S. Environmental Protection Agency (USEPA) as the San Ambrosia-Santa Isabel Watershed of the Rio Grande Basin (USEPA 2012). The Texas Commission on Environmental Quality (TCEQ) includes this portion of the Rio Grande within stream segment 2304, which begins below the reservoir and extends past the restoration area. The CWA (Sections 301-320) establishes standards and enforcement guidelines for the protection of water quality. As required by the CWA, the TCEQ regulates activities related to water quality. The CWA requires that states categorize waters by the uses they provide and establish maximum pollutant levels acceptable for their identified use. If a water body should become polluted to the extent that it is not suitable for its designated use, the TCEQ is required to list this water as impaired under section 303(d) of the CWA.

The TCEQ has listed the Rio Grande below Amistad Reservoir as impaired (TCEQ 2010). The area of this reach below International Bridge #2 (see Figure 1-1) does not support contact recreation use due to elevated levels of bacteria. Aquatic life use is only partially supported in some areas and nutrient enrichment is a concern for this use. These pollutants enter the river through municipal and urban runoff adjacent to the restoration area.

Water quality of the ponds within the restoration area is poor. As noted above in the Surface Waters section, the ponds generally have shallow water depths and sediments with relatively deep layers of fine, silty clays, and contain little or no emergent or shoreline vegetation. The result is water with high temperatures, low dissolved oxygen concentrations, and high turbidity, which combine to limit the habitat suitability for all but the most tolerant aquatic species (USFWS 2011).

2.5 BIOLOGICAL RESOURCES

2.5.1 Description of Existing Habitats

During biological surveys, four habitat types were observed within the Laredo Riverbend area: deciduous scrub savannah (DSS), deciduous scrub/shrub wetlands (DSSW), deciduous forested wetlands (DFW), and lacustrine herbaceous wetlands (L/HW) (Figure 2-6). A fifth habitat type, nesting habitat for interior least terns (*Sternula antillarum*), occurs intermittently in the center of the two largest ponds during dry years. In general, these habitats are situated within the restoration area relative to elevation, with DSS habitats located at the highest elevation, followed by DSSW, then DFW, and finally L/HW, with occasional nesting habitat at the lowest elevations. The DSS habitat type was the most prevalent observed in the restoration area, accounting for almost 50 percent of the total area (Photograph 2-3). This habitat type is common along the perimeter and on the ridges within the interior of the restoration area. Dominant vegetation observed included mesquite (*Prosopis glandulosa*), retama (*Parkinsonia aculeate*), buffelgrass, and spiny hackberry (*Celtis ehrenbergiana*). One eastern cottontail (*Sylvilagus floridanus*) was observed within the DSS habitat during the surveys.

Photograph 2-3. Representative DSS habitat within the restoration area

DSSW is located between DSS and DFW habitat types and is dominated by shrub and herbaceous stratum species (Photograph 2-4).

Photograph 2-4. Representative DSSW habitat within the restoration area

The species observed were mesquite, hackberry, tamarisk, black willow (*Salix nigra*), Carrizo cane, seedbox (*Ludwigia alternifolia*), redroot flatsedge (*Cyperus erythrorhizos*), Canada cocklebur (*Xanthium strumarium* var. *canadense*), mule-fat (*Baccharis salicifolia*), and Johnson grass (*Sorghum halepense*). Raccoon (*Procyon lotor*), dog (*Canis* sp.), and cat (*Felis* sp.) tracks were present in this habitat along the edges of the wetlands. Several species of birds were also observed within this habitat, including mourning dove (*Zenaida macroura*), white-winged

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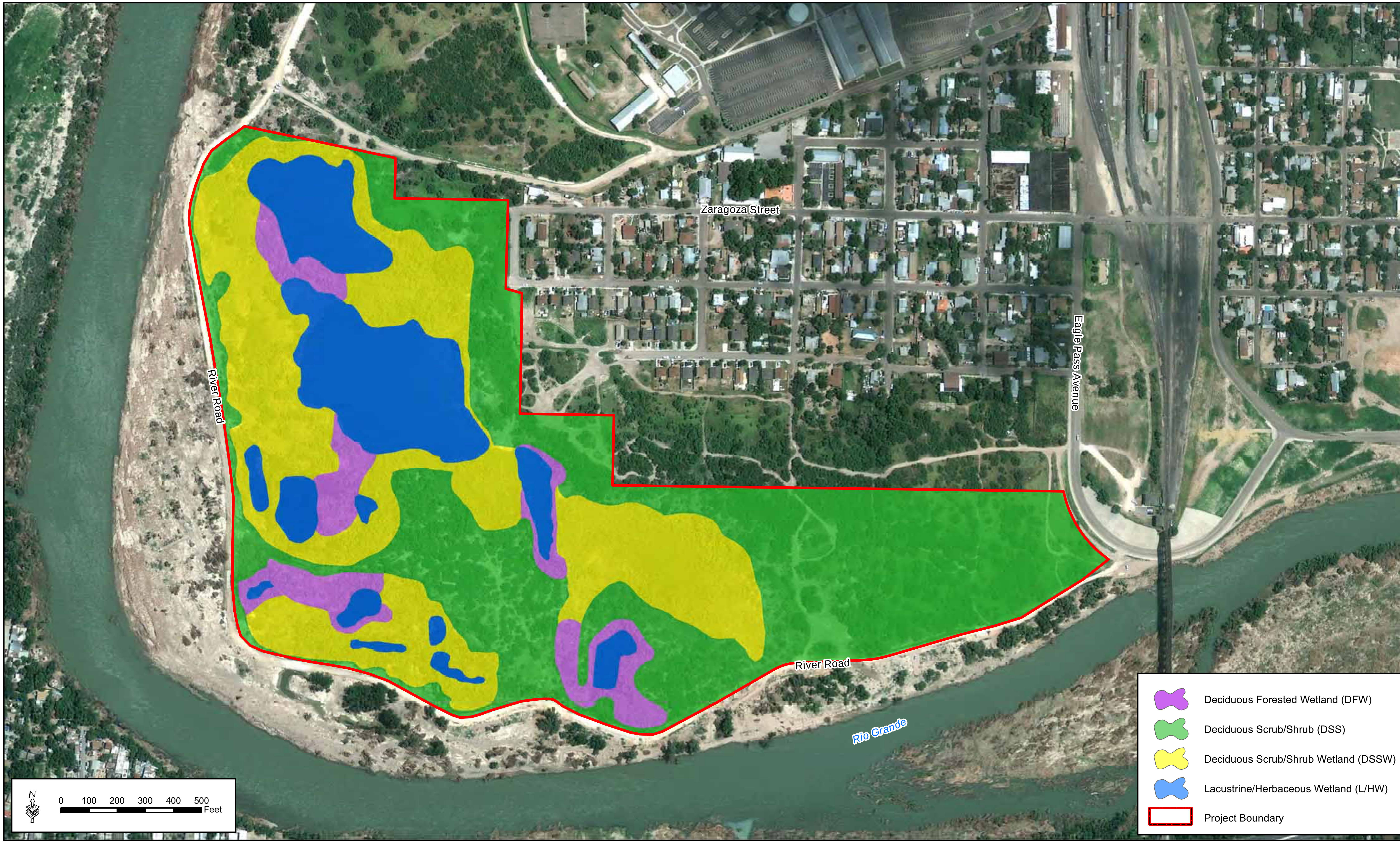

Figure 2-6. Existing Habitat Types within the Laredo Riverbend Restoration Area

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dove (*Zenaida asiatica*), red-winged blackbird (*Agelaius phoeniceus*), and great kiskadee (*Pitangus sulphuratus*).

The common species observed within the DFW habitat type were mesquite, tamarisk, black willow, Carrizo cane, and spiny hackberry (Photograph 2-5). The following wildlife species were observed: mourning dove, white-winged dove, red-winged blackbird, and great kiskadee.

Photograph 2-5. Representative DFW habitat within the restoration area

The L/HW habitat type is located along the lowest elevation of the restoration area and was inundated during the time of surveys (Photograph 2-6) The dominant species observed in the L/HW habitat type were softstem bulrush (*Schoenoplectus tabernaemontani*), redroot flatsedge, and sedge species (*Carex* spp.). Bird species observed within the L/HW habitat type included red-winged blackbird, great kiskadee, blue-winged teal (*Anas discors*), gadwall (*Anas strepera*), and American coot (*Fulica americana*). No mammals were observed; however, raccoon and dog tracks were observed along the banks of the inundated or damp areas. The two northernmost ponds have been known to support nesting habitat for interior least terns, a species listed as endangered under the Endangered Species Act of 1973 (ESA). Nesting was observed in 2001 and 2003 on the exposed shallows of at least one of the two larger ponds; however, the success of nesting is unknown.

Photograph 2-6. Representative L/HW habitat within the restoration area

The USFWS conducted a baseline fisheries survey of the restoration area within two of the L/HW habitat areas (USFWS 2011). The purpose of the survey was to determine baseline fish community structure and to infer water quality conditions based on the assemblage of fish observed. This survey yielded a total of over 1,180 individuals, which comprised 17 species. The most prevalent species was the gizzard shad (*Dorosoma cepedianum*), which represented 55 percent of the total number of fish collected. Gizzard shad are extremely tolerant of poor water quality. Other relatively tolerant species collected include threadfin shad (*Dorosoma* *petenense*), blue tilapia (*Oreochromis aurea*), white crappie (*Pomoxis annularis*), bluegill (*Lepomis macrochirus*), inland silverside (*Menidia beryllina*), red shiner (*Cyprinella lutrensis*), and western mosquitofish (*Gambusia affinis*).

Three of the plant species identified as common to the Laredo Riverbend restoration area are nonnative species that form monotypic stands: Carrizo cane, tamarisk (also known as salt cedar), and buffelgrass. These nonnative species establish as monocultures and the resulting lack of structural diversity does not provide suitable habitat for native wildlife. Prior to its removal by CBP, Carrizo cane was predominant in the area between River Road and the Rio Grande. Carrizo cane remains prevalent within an interior drainage bordering River Road at the north end of the Laredo Riverbend area and north of the restoration area. Tamarisk is prevalent within many of the areas that are subject to seasonal inundation and is also scattered throughout the area. Buffelgrass is the prevalent understory species throughout all of the topographically higher elevation areas within the Laredo Riverbend area.

2.5.2 Baseline Habitat Suitability

In order to evaluate potential restoration opportunities, it was necessary to establish baseline habitat suitability for the study area. An overall evaluation of the quality of existing habitats within the study area was conducted using Habitat Evaluation Procedures (HEP) (USFWS 1986). HEP allows assessment of the current and potential value of habitat to wildlife species based on a Habitat Suitability Index (HSI), which assigns a comparative habitat value based on a single species, multiple species, or an ecosystem basis. An HSI value of 0.0 reports the lowest habitat value and a 1.0 represents the optimum value of habitat.

For this study, nine HSI models were selected for use in HEP based on their distribution and applicability to existing and future habitat types within the study area (Table 2-1). Existing HSI models were reviewed to determine species applicable to the study area and applicability of species to cover types affected by ecosystem restoration. Applicable species models were selected by interagency team members and ranked using criteria relevant to the project to determine the likely effect of addressing one or more of the study planning measures listed in the preliminary restoration plan (PRP) on model output (Appendix A). Those models that are likely to reflect changes in the environment occurring both with and without the implementation of measures identified in the PRP were selected for further consideration. The interior least tern model was included in response to Agency Technical Review. The selected suite of models includes over 35 variables that were measured in the field (Appendix B, Table B-2a through B-2h).

Table 2-1. Applicability of Selected HSI Models to Existing and Future Habitat Types at Laredo Riverbend

Model	Lacustrine	Herbaceous Wetland	Deciduous Shrub/Scrub Wetland	Deciduous Forested Wetland	Deciduous Shrub/ Scrub	Shorebird Nesting
American coot (AC)	applicable	applicable				
Eastern cottontail (EC)			applicable	applicable	applicable	
Great egret feeding (GEf)	applicable	applicable	applicable			
Great egret nesting (GEn)	applicable	applicable	applicable	applicable		
Interior least tern (LT)						applicable
Red-winged blackbird (RWB)		applicable				
Slider turtle (ST)	applicable	applicable	applicable	applicable		
Yellow warbler (YW)			applicable			
Warmouth (WM)	applicable	applicable				

Habitats within the study area were delineated by hand-digitizing boundaries in a Geographic Information System (GIS) on aerial photography using geographic delineations created in the field with Global Positioning System (Appendix B, Table B-1a; see Figure 2-6). These boundaries were then used to select sample plot locations representative of each habitat type and water regime (Appendix B, Figure B-1). For the purpose of estimating benefits, it was assumed that the nesting habitats are approximately 0.05 and 0.11 acre in size. A list of variables (i.e., habitat conditions) necessary to complete the HSI models was compiled, and a data collection sheet was composed (Appendix B, Figure B-2). Field data collections of the study area were conducted in May 2011 by representatives from USACE, Gulf South Research Corporation (GSRC), USFWS, and the City of Laredo. A kayak and sounding rod were employed to conduct a bathymetric survey of the three largest ponds, and sounding rods were used from the banks to determine the depths of the smaller ponds. Estimates of vegetative cover were made by ocular estimation. Supporting information was gathered through site reconnaissance by a multi-disciplined, multi-agency team, literature reviews, database searches, reviews of historic planning documents, and personal contact with adjacent landowners, City of Laredo officials, and representatives of USBP, DHS, USFWS, and TPWD.

Field data and selected HSI models were then used to calculate existing habitat suitability for each habitat (Appendix B, Table B-1a). Assumptions for all models can be found in Appendix B, Table B-2. An HSI was calculated for each of the selected models in each patch of applicable habitat. The suitability of each patch was then calculated as the average HSI of each applicable model in a patch, and the suitability of each habitat was calculated as the average HSI of all patches. The value of each patch and of each habitat type is quantified as Habitat Units (HUs). HUs are derived by multiplying the HSI for a patch or habitat by the area of that patch or habitat. The existing quality of habitats ranges from low (L/HW and nesting) to high (DSS), and the 76.66-acre study area currently provides 48.06 HUs (Table 2-2; see also Appendix B, Table B-1b through Table B-1f and Figure B-1).

Table 2-2. Existing Area, HSI, and HU by Habitat Type

Habitat	Area (acres)	Average Patch HSI	Average Patch HU
L/HW	12.37	0.25	3.42
DFW	5.46	0.30	1.74
DSSW	23.66	0.46	9.66
DSS	33.57	0.98	33.22
Nesting	0.16	0.2	0.01
Roads and Trails	1.50	0	0.00
Head Cut Sediment Plume	0.10	0	0.00
Total	**76.82**		**48.06**

Existing L/HW habitats were delineated as 12 separate patches. Existing suitability of L/HW habitats was limited by a lack of emergent vegetation, high water temperatures, shallow water depths, presence of common carp (*Cyprinus carpio*), lack of nesting areas, and a small ratio of vegetation-water edge to surface area. Existing DFW habitats were delineated as five separate patches. Existing suitability of DFW habitats was limited by the short duration of inundation in these areas and the general lack of herbaceous vegetation. Existing DSSW habitats were delineated as seven separate patches. The suitability of existing DSSW habitats was limited by short duration of inundation, lack of herbaceous vegetation, and small cover of hydrophytic shrubs. Existing DSS habitats were delineated as five separate patches. DSS habitats were evaluated as providing near-optimum habitat for the eastern cottontail (EC).

In general, existing conditions provide limited habitat suitability within L/HW and DFW habitats, and moderate habitat suitability within DSSW and DSS habitats, as evaluated by the selected set of HSI models (Appendix B, Table B-1a through B-1e). Existing DSSW and DSS models provide higher habitat suitability because the EC model evaluated most DSSW habitats as highly suitable due to the balanced cover of shrubs, trees, and herbaceous vegetation, and evaluated existing DSS habitats as optimum or near-optimum due to the high cover of herbaceous vegetation and moderate cover of shrubs and trees.

For the purpose of evaluating baseline conditions, it was assumed that, when exposed, the shallows in the two largest ponds provide near-optimum nesting habitat. Nesting habitat is limited by the proportion of aquatic habitat within flight distance of the interior least tern (Appendix B, Table B-1f). For the purpose of evaluating baseline conditions, the roads and trails within the study area and the sediment plume of the head cut were assumed to provide no habitat value. Although these areas may support vegetation intermittently, the highly disturbed nature of these areas limits their value as wildlife habitat.

2.6 LISTED SPECIES

2.6.1 Federally Listed Species and Critical Habitat

The ESA [16 U.S.C. 1532 et. seq.] of 1973 was enacted to provide a program for the preservation of endangered and threatened species and to provide protection for the ecosystems upon which these species depend for their survival. All federal agencies are required to implement protection programs for designated species and to use their authorities to further the purposes of the act. Responsibility for the identification of a threatened or endangered species and development of any potential recovery plans lies with the Secretary of the Interior and the Secretary of Commerce.

The USFWS is responsible for implementing the ESA. The USFWS is responsible for birds, terrestrial, and freshwater species including (1) the identification of threatened and endangered species; (2) the identification of Critical Habitats for listed species; (3) implementation of research on, and recovery efforts for, these species; and (4) consultation with other federal agencies concerning measures to avoid harm to listed species.

Within Webb County, Texas, there are five federally endangered species and one federal candidate for listing under the ESA (USFWS 2012; Table 2-3). Throughout the development of the restoration measures and this study, coordination with USFWS regarding listed species potentially occurring in the restoration area occurred (Appendix C). It was determined that three of these species have potential to occur within the restoration area and include the interior least tern, ocelot (*Leopardus pardalis*), and the Gulf Coast jaguarundi (*Herpailurus yagouaroundi cacomitli*). No designated Critical Habitat occurs within the restoration area.

Table 2-3. Federally Listed Species in Webb County, Texas

Common/Scientific Name	Federal Status	Habitat	Potential to Occur in Restoration area?
Birds			
Interior least tern *Sternula antillarum*	Endangered	Nests along sand and gravel bars within braided streams and rivers.	Yes
Invertebrates			
Texas hornshell *Popenaias popei*	Candidate	Freshwater; native to Pecos River and Rio Grande drainages in New Mexico, Texas, and Mexico.	No
Mammals			
Gulf Coast jaguarundi *Herpailurus yagouaroundi cacomitli*	Endangered	Dense, thorny thickets in chaparral communities.	Yes
Ocelot *Leopardus pardalis*	Endangered	Dense, thorny chaparral communities and cedar breaks.	Yes
Plants			
Ashy dogweed *Thymophylla tephroleuca*	Endangered	Grassland, blackbrush, or cenzio shrublands on fine sandy loam soils.	No
Johnston's frankenia *Frankenia johnstonii*	Endangered	Shrublands on flats with saline sandy to clayey soils and on rocky gypseous slopes.	No

Source: USFWS 2012

Interior Least Tern

The interior least tern (Photograph 2-7) was listed as endangered under the ESA of 1973 (16 U.S.C. 1531) in 1985 (50 Federal Register [FR] 21784).

Photograph 2-7. Interior Least Tern

Least terns (all currently recognized subspecies and populations) are the smallest members of the subfamily Sterninae and family Laridae of the order Charadriiformes, measuring about 8 to 10 inches long with a 20-inch wingspread. Sexes are alike, characterized by a black-capped crown, white forehead, grayish back and dorsal wing surfaces, snowy white undersurfaces, legs of various orange and yellow colors depending on the sex, and a black-tipped bill whose color also varies depending on sex (Watson 1966, Davis 1968, Boyd and Thompson 1985).

The riverine nesting areas of interior least terns are sparsely vegetated sand and gravel bars within a wide unobstructed river channel, or salt flats along lake shorelines. Nesting locations usually are at the higher elevations and away from the water's edge because nesting starts when the river flows are high and small amounts of sand are exposed. The size of nesting areas depends on water levels and the extent of associated sandbars. The interior least tern breeds inland along the Missouri, Mississippi, Colorado, Arkansas, Red, and Rio Grande river systems. Historically, interior least terns have nested at six reservoirs on the Rio Grande/Pecos River System and a single reservoir (O.C. Fischer) on the nearby North Concho River (Kasner et al. 2005). Habitat conditions at Lake Casa Blanca (5 miles west of the restoration area) on the Rio Grande and O.C. Fischer Reservoir on the North Concho River seem to have declined to where interior least terns will no longer nest, and no interior least terns were recorded during the 2005 census at both of these locations (Engineer Research and Development Center (ERDC) 2006). The 2005 count of 85 interior least terns at Amistad Reservoir (190 miles north/upstream of the restoration area) is below average compared to counts between 1999 and 2004, which have been variable. Large numbers of interior least terns were counted at Falcon Reservoir (80 miles south/downstream of the restoration area) in the late 1980s and early 1990s. However, habitat conditions have declined since then (Lee Elliot, The Nature Conservancy, personal communication, as referenced in ERDC 2006), and it is unclear how many interior least terns are still nesting there.

In 2005, a total of 138 interior least terns were counted at three reservoirs on the Pecos River (Bitter Lake National Wildlife Refuge and Brantley Lake State Park in New Mexico and Imperial Reservoir in Texas) and a single reservoir on the Rio Grande (Amistad National Recreation Area) (ERDC 2006). During the 2005 census, water levels at Falcon Reservoir (a historically important nesting area on the Rio Grande) were very high during the survey window and all nesting habitat was presumed to be under water (Kay Jenkins, TPWD, personal communication, as referenced in ERDC 2006). Therefore, surveys of Falcon Reservoir were not conducted. Additional surveys will be necessary to document if (and how many) interior least terns are still nesting at Falcon Reservoir.

Interior least tern nesting on sandbars on either the Rio Grande or the Pecos River have not been reported; however, interior least terns have been observed nesting on the exposed, unconsolidated bottoms of the ponds in the restoration area in 2001 and 2003. Due to the limited availability of nesting habitat within the restoration area, these are the only years that terns have been observed. These colonies were small and success of nesting activities is unknown.

Ocelot

The ocelot (Photograph 2-8) was listed as endangered in 1972 under the authority of the Endangered Species Conservation Act of 1969 (USFWS 1972). The 1969 Endangered Species Conservation Act maintained separate lists for foreign and native wildlife. The ocelot appeared on the foreign list, but due to an oversight, the ocelot did not appear on the native list. Following passage of the ESA, the ocelot was included on the January 4, 1974, list of "Endangered Foreign Wildlife" that "grandfathered" species from the lists under the 1969 Endangered Species Conservation Act into a new list under the ESA (USFWS 1974). The entry for the ocelot included "Central and South America" under the "Where found" column in the new ESA list. Endangered status was extended to the U.S. portion of the ocelot's range for the first time with a final rule published July 21, 1982 (USFWS 1982). The "Historic range" column for the ocelot's entry in the rule reads, "U.S.A. (TX, AZ) south through Central America to South America." The entry on the current list (USFWS 2003) is essentially the same, and reads "U.S.A. (TX, AZ) to Central and South America". The species has a recovery priority number of 5C, meaning that it has a low potential for recovery with a relatively high degree of conflict with development projects.

Photograph 2-8. Ocelot

The ocelot is a medium-sized spotted cat (USFWS 2010). The ocelot belongs to the genus *Leopardus*, which also includes the margay and the oncilla. The ocelot is further divided into as many as 11 subspecies that ranged from the southwestern U.S. to northern Argentina (Pocock 1941, Cabrera 1961, Eizirik et al. 1998). Two subspecies occurred in the U.S.: the

Texas/Tamaulipas ocelot *(L. p. albescens)* and the Arizona/Sonora ocelot *(L. p. sonoriensis)* (Hall 1981).

The ocelot uses a wide range of habitats throughout its range in the Western Hemisphere (Tewes and Schmidly 1987). Despite this, the species does not appear to be a habitat generalist. Ocelot spatial patterns are strongly linked to dense cover or vegetation, suggesting that it uses a fairly narrow range of microhabitats (Emmons 1988, Horne 1998). South Texas ocelots prefer shrub communities with greater than 95 percent canopy cover and avoid areas with intermediate (50 to 75 percent) to no canopy cover (Horne 1998). Ocelots did not prefer or avoid communities with 75 to 95 percent canopy cover. Other microhabitat features important to ocelots appear to be canopy height (greater than 7.8 feet) and vertical cover (89 percent visual obscurity at 3 to 6 feet). Ground cover at locations used by ocelots was characterized by a high percentage of coarse woody debris (50 percent) and very little herbaceous ground cover (3 percent), both consequences of the dense woody canopy (Horne 1998). The Texas/Tamaulipas ocelot likely ranged from the Sierra Madres Oriental from Hedley, Texas, to the north and Marfa, Texas, to the west to Tamaulipas, Mexico, in the south and the Gulf Coast to the east (USFWS 2010). Currently, its distribution in Texas is limited to two fragmented populations on the Gulf Coast, approximately 200 miles east of the restoration area and populations in Mexico. Individuals have occurred outside of these two populations, but there is no recent evidence that a breeding population occurs in other areas of Texas. If ocelot occurs in the restoration area, it is likely to be a non-breeding disperser.

Gulf Coast Jaguarundi

The Gulf Coast subspecies of jaguarundi (Photograph 2-9) was listed under the ESA as endangered in 1976 (41 FR 24062). The jaguarundi is a small cat, slightly larger than a house cat (*Felis catus*). With a slender build, long neck, short legs, small and flattened head, and long tail, it resembles a weasel (*Mustela* sp.) more than other felines (Tewes and Schmidly 1987, Oliveira de 1998).

Photograph 2-9. Gulf Coast Jaguarundi

The jaguarundi is a lowland species, inhabiting forest and bush (Guggisberg 1985). The *cacomitli* subspecies is found in the Tamaulipan Biotic Province of northeast Mexico and south Texas (Caso 1994). Within Mexico it occurs in the eastern lowlands and has not been recorded in the Central Highlands (Tewes and Schmidly 1987). In southern Texas, jaguarundis have used dense thorny shrublands.

In Texas, jaguarundis historically were limited to the southern portion of the state, including Cameron, Hidalgo, Willacy, and Starr counties (Bailey 1905, Davis 1974). In a boundary survey of the U.S. and Mexico, Baird (1859) notes that evidence of jaguarundi existing along the Rio Grande was established by a skull in the collection of Dr. Berlandiere. According to Dr. Berlandiere, “the animal was common in Mexico before the conquest, but is now rare…a few have been killed on the Rio Grande near Matamoros.” Also, in this same survey (Baird 1859), there was a description of a skull in Dr. Berlandiere’s collection from *Felis eyra*, which we now classify as the Gulf Coast jaguarundi. Mabie (1983) noted that jaguarundi may have existed in the “big live oak area of east central Texas.” However, there are no verified records of the subspecies beyond extreme southern Texas, and there is not enough information to determine how abundant the subspecies was historically (USFWS 2012). No historical records of jaguarundis have been documented north of the Rio Grande Valley of Texas (Tewes and Caso 2011).

The restoration area is located at the extreme northern edge of the historic distribution of the Gulf Coast jaguarundi. The last confirmed sighting of this subspecies within the U.S. was in April 1986, when a road-killed specimen was collected 2 miles east of Brownsville, Texas, and positively identified as a jaguarundi (USFWS 2012). Numerous unconfirmed sightings have been reported since then, including some sightings with unidentifiable photographs, but no U.S. reports since April 1986 have been confirmed as jaguarundi. Unconfirmed sightings of jaguarundi have been reported in the mid-1980s and in 1993 for Webb County (USFWS 2008). The closest known Gulf Coast jaguarundis to the U.S. border are found approximately 95 miles southwest in Nuevo Leon, Mexico. Habitat in the restoration area is likely to be suitable for the jaguarundi, but this species is likely to be isolated from existing populations due to habitat fragmentation.

Although unverified, Gulf Coast jaguarundi and ocelot potentially use the restoration area for foraging and dispersal. Habitats in the western portion of the restoration area between the Rio Grande and River Road include a young stand of native scrub/shrub that was restored and managed by the USBP. The portion of the restoration area where the proposed restoration measures will occur consists of a mix of native scrub/shrub, nonnative scrub/shrub and forest, and marsh. The buffelgrass shrub savanna in the eastern portion of the restoration area likely provides suitable foraging and dispersal habitats for this Gulf Coast jaguarundi.

Texas Hornshell

The Texas hornshell (Photograph 2-10) was listed as a candidate for listing under the ESA in 2007 (72 FR 69034). The Texas hornshell is a freshwater mussel found in the Black River in New Mexico, as well as in the Rio Grande and the Devils River in Texas (77 FR 69993). The Texas hornshell is found in shallow, slow-running water, tucked under travertine shelves and in between boulders (WildEarthGuardians 2013). Recent surveys (Great Lakes Center 2013) suggest that the mussel's preferred habitat includes crevices under flat boulders resting on the bedrock. This habitat provides stable substrata and flow refuges for mussels from strong currents and tremendous flooding events typical for the Rio Grande.

Photograph 2-10. Texas Hornshell
photo credit: Joel Lusk, USFWS

Until March 2008, the only known extant populations were in New Mexico's Black River and one locality in the Rio Grande near Laredo, Texas (77 FR 69994). In March 2008, two new localities were confirmed in Texas: one in the Devils River, and one in the main stem of the Rio Grande in the Rio Grande Wild and Scenic River segment downstream of Big Bend National Park. In 2011, the Rio Grande population near Laredo was resurveyed and found to be large and robust. In cooperation with the USFWS, the Great Lakes Center is conducting an assessment of the current distribution and habitat requirements of Texas hornshell in Texas, evaluating existing populations and their trends, and studying the species' biology to develop the recovery plan and management options for Texas hornshell in Texas (Great Lakes Center 2013). In April 2012, the Great Lakes Center surveyed the Devils River from Bakers Crossing to Dolan Falls and four live specimens were found confirming the presence of a small reproducing population on the Devils River. Later in April of 2012, the group continued efforts at a mark-and-recapture site on the Rio Grande in the La Bota area (northern limits of urbanization associated with Laredo). These efforts recorded and tagged 432 untagged specimens and 297 specimens tagged in 2011. Also in 2012, the group surveyed approximately 75 miles of the Rio Grande above and below Laredo, which includes the La Bota site. An additional 300 live specimens were recorded in the 45-mile reach of the survey above the North Laredo and Nuevo Laredo sewage treatment plant discharge locations. No live specimens were recorded in the 3-mile reach below the sewage treatment discharge locations.

The North Laredo sewage treatment plant is approximately 1.5 miles north of the restoration area and the Nuevo Laredo sewage treatment plant outfall is in the restoration area approximately 0.6 mile above the southern limits of the restoration area. Although no specimens were observed, substrates were considered suitable for the Texas hornshell in this reach.

2.6.2 State-Listed Species

The TPWD maintains a list of state threatened and endangered species (Appendix C). This list includes flora and fauna whose occurrence in Texas is or may be in jeopardy or with known or perceived threats or population declines. These species are not necessarily the same as those protected by the federal government under the ESA. In addition to the federally listed species that could occur in the restoration area, several state-listed species are known to occur or could potentially occur, including the American peregrine falcon (*Falco peregrinus anatum*), Texas horned lizard (*Phrynosoma cornutum*), and Texas indigo snake (*Drymarchon melanurus erebennus*).

2.7 CULTURAL RESOURCES

Under the National Historic Preservation Act (NHPA) (16 USC 470 et seq, 36 CFR 800), a federal agency with jurisdiction over a federal undertaking, or one that is federally assisted or federally licensed, must take into account the effect that the undertaking will have on properties included in or eligible for listing on the National Register of Historic Places (NRHP). Section 106 of the NHPA governs the process in which agencies assess those impacts. The Section 106 process requires that the federal agency identify and evaluate the significance of historic properties that may be affected by the proposed undertaking in consultation with the State Historic Preservation Officer (SHPO) and consistent with the Secretary of the Interior's Guidelines and Standards for NRHP evaluation. If the agency head and the SHPO agree that a property potentially affected by the undertaking is eligible for listing on the NRHP, then they shall apply the Criteria of Adverse Effect found in 36 CFR 800.5 to such a property. If an adverse effect is determined, then the federal agency and the SHPO shall seek ways to either avoid or minimize those impacts to the fullest possible extent.

This study also falls under the purview of the Antiquities Code of Texas (ACT) because it may involve archeological sites located "on land owned or controlled by the State of Texas or any city, county, or local municipality thereof." The ACT considers all such properties potential State Antiquities Landmarks and requires that each be examined for potential significance. Chapter 26 of the Texas Historic Commission's (THC's) Rules of Practice and Procedure for the ACT outlines the standards for determining significance.

Previous Investigations and Recorded Cultural Resources

The *Texas Archeological Sites Atlas* has 14 different archaeological projects on record within 1 mile of the restoration project area. The majority of the archaeological investigations were focused on Fort McIntosh to the north of the proposed restoration area. McCulloch and Warren's (2002) report provides a synthesis of investigations conducted at Star Fort and Fort McIntosh. Only one investigation in the *Texas Archeological Sites Atlas* database, an archaeological survey performed for CBP and CESW, crosses the current project area (Higgins et al. 2005). No archaeological sites were recorded within the project area during that survey. An additional archival investigation was noted on the archaeological site records for sites 41WB417 and 41WB418. Though both of these site forms indicate that the study was conducted, the *Texas Archeological Sites Atlas* does not list the investigation.

Eleven archaeological sites are on record with the *Texas Archeological Sites Atlas* within 1 mile of the proposed restoration area (Table 2-4). Two of those previously recorded archaeological sites are located within the proposed restoration area, 41WB417 and 41WB418.

Table 2-4. Archaeological Sites on Record with the Texas Archeological Sites Atlas within 1 Mile of the Project Area

Site Number	Site Type	Record/Form Date	Recorder	Eligibility
41WB11	Fort; lithic scatter	12/14/1998 06/22/2002	Cynthia Auman Samuel D. McCulloch	Listed State Archaeological Landmark Listed National Register Property
41WB19	Historic	03/18/1980	John W. Clark	Not determined
41WB22	Cemetery	04/29/1980	Mary Jane McReynolds	Not determined
41WB36	Home	08/15/1980	Wayne Cox	Not determined, probably destroyed
41WB37	Home	08/15/1980	Wayne Cox	Not determined, probably destroyed
41WB38	Home	08/15/1980	Wayne Cox	Not determined, probably destroyed
41WB417	School	08/20/1996	Nina Nixon-Mendez, Mary Mahoney	Not eligible
41WB418	Modern Quarry	08/20/1996	Nina Nixon-Mendez, Mary Mahoney	Not eligible
41WB224	NA	NA	NA	Not determined
41WB85	NA	NA	NA	Not determined
41WB646	Historic	02/21/2006	James E. Warren	Not determined

Site 41WB417 consists of the remains of the Laredo Seminary or Holding Institute. The site was recorded by Nina Nixon-Mendez and Mary Mahoney. The site form notes that the study was archival only and no archaeology was undertaken. The site form states that the site spans 1,400 feet in length by 800 feet in width situated along the Rio Grande bank. Cultural features and material noted on the site form include two isolated finds of possible bifacial flint tools that were recorded on the surface, historic building rubble including building foundations (one foundation found *in situ*), and historic artifacts. Historic artifacts recorded include bricks, ceramic tile, stoneware sherds, window glass, metal strapping, an inkwell, glass vessel fragments, iron cable, a knife, wall plaster, insulators, wood floor planks, a kettle, and a baluster fragment. The site form states that there is extreme site disturbance by quarrying and that there is no NRHP or State Archaeological Landmark (SAL) potential. Site 41WB418 is listed as a modern quarry and was also recorded by Nina Nixon-Mendez and Mary Mahoney as part of the same archival study. The site consists of quarries and building rubble from gravel extraction operations with one foundation of a gravel separator still remaining *in situ*. Other features noted include two quarries, a cylindrical concrete structure, and building rubble from the Laredo Ready Mix office. The site record notes that the site has no historic research value as the quarry is less than 50 years old. The site is listed as having no NRHP or SAL potential.

An additional archaeological site, 41WB11 (Fort McIntosh), is located immediately adjacent to the project area to the north. The site represents the historic remains of Fort McIntosh, along with burned rock and chert artifacts that represent the prehistoric, protohistoric, and early historic periods. Over 100 features have been found that are associated with 41WB11, including sandstone foundation remains, brick features that probably represent outdoor ovens, brick foundations of small structures, remnants of early utility lines, debris concentrations, and other Historic period features. Other features include a probable hearth, scattered burned rock, and chert debitage that may represent a former campsite. Artifacts recovered from the surface surveys and from excavations include military buttons, a bridle rosette and harness buckles, a curb chain hook, cartridge cases, lead balls and bullets, a gunflint, several primers for cannons, medical equipment found near the various Post hospitals, and clay smoking pipe fragments. Numerous glass bottle fragments, window pane fragments, and other glass artifacts were recovered. A number of ceramic fragments included stoneware, ironstone, yellowware, and whiteware. The site is considered to have good research potential, particularly in regards to the earthen “star” fort, as well as the potential for other features related to buildings associated with the fort that remain to be discovered. Site 41WB11 is listed as a SAL and on the NRHP as the Old Fort McIntosh Historic District.

Seven properties that are listed on the NRHP are located within 1 mile of the proposed restoration area (Table 2-5). The closest of these properties is the Fort McIntosh Historic District, which is located immediately adjacent to the proposed restoration area to the north. A description of the Fort McIntosh Historic District can be found in the discussion of site 41WB11 above. One Recorded Texas Historic Landmark (RTHL), the Biggio-Kowalski-De La Garza House, is on record with the *Texas Archeological Sites Atlas* as being within 1 mile of the proposed restoration area. An RTHL is a property judged by the THC to be historically and architecturally significant. The THC awards RTHL designation to buildings at least 50 years old that are judged worthy of preservation for their architectural and historical associations. A total of 349 structures have been recorded within 1 mile of the proposed restoration project as part of neighborhood surveys (Appendix D). While none of these structures have been officially listed on the NRHP, many of the properties are considered to be eligible for the NRHP by the recorder. It should be noted that the information on these properties reflects each property when it was originally recorded and may not reflect the current state of the property.

Table 2-5. Listed NRHP Properties on Record with the Texas Archeological Sites Atlas within 1 mile of the Project Area

Property Name	Resource Type	Date Listed
Barrio Azteca Historic District	District	05/21/2003
Capitol of the Republic of Rio Grande	Building	08/1972
Fort McIntosh	District	06/25/1975
Hamilton Hotel	Building	04/14/1992
Laredo U.S. Post Office, Court House, and Custom House	Building	05/18/2001
San Augustin de Laredo Historic District	District	09/19/1973
Webb County Courthouse	Building	05/04/1981

2.8 AIR QUALITY

Federal and State Standards

The USEPA established National Ambient Air Quality Standards (NAAQS), for specific pollutants determined to be of concern with respect to the health and welfare of the general public. The USEPA defines ambient air quality in 40 Code of Federal Regulations (CFR) 50 as "that portion of the atmosphere, external to buildings, to which the general public has access." Ambient air quality standards are intended to protect public health and welfare and are classified as either "primary" or "secondary" standards. Primary standards define levels of air quality necessary to protect the public health. National secondary ambient air quality standards define levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. The major pollutants of concern, or criteria pollutants, are carbon monoxide, sulfur dioxide, nitrogen dioxide, ozone, suspended particulate matter less than 10 microns, and lead. NAAQS represent the maximum levels of background pollution that are considered safe, with an adequate margin of safety, to protect the public health and welfare. Short-term standards (1-, 8- and 24-hour averaging periods) are established for pollutants contributing to acute health effects, while long-term standards (annual averages) are established for pollutants contributing to long-term health effects (Table 2-6). Areas that do not meet these standards are called non-attainment areas; areas that meet both primary and secondary standards are known as attainment areas.

Table 2-6. National Ambient Air Quality Standards

Pollutant	Primary Standards		Secondary Standards	
	Level	Averaging Time	Level	Averaging Times
Carbon Monoxide	9 ppm (10 mg/m^3)	8-hour [(1)]	None	
	35 ppm (40 mg/m^3)	1-hour [(1)]		
Lead	0.15 μg/m^3 [(2)]	Rolling 3-Month Average	Same as Primary	
	1.5 μg/m^3	Quarterly Average	Same as Primary	
Nitrogen Dioxide	53 ppb [(3)]	Annual (Arithmetic Average)	Same as Primary	
	100 ppb	1-hour [(4)]	None	
Particulate Matter (PM-10)	150 μg/m^3	24-hour [(5)]	Same as Primary	
Particulate Matter (PM-2.5)	15.0 μg/m^3	Annual [(6)] (Arithmetic Average)	Same as Primary	
	35 μg/m^3	24-hour [(7)]	Same as Primary	
Ozone	0.075 ppm (2008 std)	8-hour [(8)]	Same as Primary	
	0.08 ppm (1997 std)	8-hour [(9)]	Same as Primary	
	0.12 ppm	1-hour [(10)]	Same as Primary	
Sulfur Dioxide	0.03 ppm	Annual (Arithmetic Average)	0.5 ppm	3-hour [(1)]
	0.14 ppm	24-hour [(1)]		
	75 ppb [(11)]	1-hour	None	

Source: USEPA 2013a at http://www.epa.gov/air/criteria.html
Units of measure for the standards are parts per million (ppm) by volume, parts per billion (ppb - 1 part in 1,000,000,000) by volume, milligrams per cubic meter of air (mg/m^3), and micrograms per cubic meter of air (μg/m^3).
[(1)] Not to be exceeded more than once per year.
[(2)] Final rule signed October 15, 2008.
[(3)] The official level of the annual NO_2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard
[(4)] To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 100 ppb (effective January 22, 2010).
[(5)] Not to be exceeded more than once per year on average over 3 years.
[(6)] To attain this standard, the 3-year average of the weighted annual mean PM2.5 concentrations from single or multiple community-oriented monitors must not exceed 15.0 μg/m3.
[(7)] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 μg/m3 (effective December 17, 2006).
[(8)] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm. (effective May 27, 2008)
[(9)] (a) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.
(b) The 1997 standard—and the implementation rules for that standard—will remain in place for implementation purposes asUSEPA undertakes rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard.
(c)USEPA is in the process of reconsidering these standards (set in March 2008).
[(10)] (a)USEPA revoked the 1-hour ozone standard in all areas, although some areas have continuing obligations under that standard ("anti-backsliding").
(b) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is $\leq$ 1.
[(11)] (a) Final rule signed June 2, 2010. To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb.

The USEPA requires each state to develop a State Implementation Plan (SIP) that sets forth how the Clean Air Act (CAA) provisions will be implemented within that state. The SIP is the primary means for the implementation, maintenance, and enforcement of the measures needed to attain and maintain compliance with the NAAQS within each state. To provide consistency in different state programs and ensure that a state program complies with the requirements of the CAA and USEPA, the USEPA must approve the SIP. The purpose of the SIP is twofold. First, it must provide a strategy that will result in the attainment and maintenance of the NAAQS. Second, it must demonstrate that progress is being made in attaining the standards in each non-attainment area.

Texas is located in the USEPA's Region 6. TCEQ is the state agency responsible for "controlling present and future sources of air pollution." Texas' Ambient Air Quality Standards for the criteria pollutants are currently the same as the NAAQS. Webb County is currently in attainment for all criteria pollutants (USEPA 2013).

Greenhouse Gases and Climate Change

Global climate change refers to a change in the average weather on the earth. Greenhouse gases (GHG) are gases that trap heat in the atmosphere. They include water vapor, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), fluorinated gases including chlorofluorocarbons (CFC) and hydrochlorofluorocarbons (HFC), and halons, as well as ground-level O_3.

GHG Threshold of Significance

The Council on Environmental Quality (CEQ) drafted guidelines for determining meaningful GHG decision-making analysis. The CEQ guidance states that if the Project would be reasonably anticipated to cause direct emissions of 25,000 metric tons (27,557 U.S. tons) or more of CO_2 GHG emissions on an annual basis, agencies should consider this a threshold for decision makers and the public. CEQ does not propose this as an indicator of a threshold of significant effects, but rather as an indicator of a minimum level of GHG emissions that may warrant some description in the appropriate NEPA analysis for agency actions involving direct emissions of GHG.

The GHG covered by Executive Order (EO) 13514 are CO_2, CH_4, N_2O, HFC, perfluorocarbons, and sulfur hexafluoride. These GHG have varying heat-trapping abilities and atmospheric lifetimes. CO_2 equivalency (CO_2e) is a measuring methodology used to compare the heat-trapping impact from various greenhouse gases relative to CO_2. Some gases have a greater global warming potential than others. Nitrous oxides (NOx), for instance, have a global warming potential that is 310 times greater than an equivalent amount of CO_2, and CH_4 is 21 times greater than an equivalent amount of CO_2.

2.9 NOISE

Noise is generally described as unwanted sound, which can be based either on objective effects (i.e., hearing loss, damage to structures) or subjective judgments (e.g., community annoyance). Sound is usually represented on a logarithmic scale with a unit called the decibel (dB). Sound on the decibel scale is referred to as sound level. The threshold of human hearing is approximately 3 dB, and the threshold of discomfort or pain is around 120 dB. The A-weighted decibel (dBA) is a measurement of sound pressure adjusted to conform with the frequency response of the human ear. The dBA metric is most commonly used for the measurement of environmental and industrial noise.

Noise levels occurring at night generally produce a greater annoyance than do the same levels occurring during the day. It is generally agreed that people perceive intrusive noise at night as being 10 dBA louder than the same level of intrusive noise during the day, at least in terms of its potential for causing community annoyance. This perception is largely because background environmental sound levels at night in most areas are also about 10 dBA lower than those during the day. Long-term noise levels are computed over a 24-hour period and adjusted for nighttime annoyances to produce the day-night average sound level (DNL). DNL is the community noise metric recommended by the USEPA and has been adopted by most federal agencies (USEPA 1974). A DNL of 65 dBA is the level most commonly used for noise planning purposes and represents a compromise between community impact and the need for activities like construction.

Noise Thresholds

Acceptable noise levels have been established by the U.S. Department of Housing and Urban Development (HUD) for construction activities in residential areas (HUD 1984):

Acceptable (not exceeding 65 dBA) – The noise exposure may be of some concern, but common building construction will make the indoor environment acceptable, and the outdoor environment will be reasonably pleasant for recreation and play.

Normally Unacceptable (above 65 but not greater than 75 dBA) – The noise exposure is significantly more severe; barriers may be necessary between the site and prominent noise sources to make the outdoor environment acceptable; special building construction may be necessary to ensure that people indoors are sufficiently protected from outdoor noise.

Unacceptable (greater than 75 dBA) – The noise exposure at the site is so severe that the construction costs to make the indoor noise environment acceptable may be prohibitive, and the outdoor environment would still be unacceptable.

Noise Attenuation

As a general rule of thumb, noise generated by a stationary noise source, or "point source," will decrease by approximately 6 dBA over hard surfaces and 9 dBA over soft surfaces for each doubling of the distance. For example, if a noise source produces a noise level of 85 dBA at a reference distance of 50 feet over a hard surface, then the noise level would be 79 dBA at a distance of 100 feet from the noise source, 73 dBA at a distance of 200 feet, and so on.

The study area is undeveloped and surrounded by urban development. The City of Laredo, Texas, and Nuevo Laredo, Mexico, are the only major urbanized areas near the study area. Noise levels in the study area would be average or below common noise levels of other major urban areas. There are no sources of noise within or adjacent to the study area that would be evaluated as greater than moderately loud.

2.10 HAZARDOUS MATERIALS

Solid and hazardous wastes are regulated in Texas by a combination of mandated laws promulgated by USEPA, the TCEQ, and Regional Councils of Government. In 2009, a review of standard environmental record sources was conducted by Environmental Data Resources, Inc. as part of a hazardous waste investigation for a separate project within the Laredo Riverbend area. Search distances ranged from 0.25 mile to 1 mile. A search was conducted on

USEPA's Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS). CERCLIS contains information on hazardous waste sites, potential hazardous waste sites, and remedial activities, including sites that are on the National Priorities List (NPL) or being considered for the NPL. This search identified two leaking petroleum storage tanks (LPST) and one Resource Conservation and Recovery Act (RCRA) – Non-generator site. The RCRA-Non-generator site is located approximately 0.25 mile to the northeast while the LPST sites are 0.5 mile to the northeast of the project site. Additionally, during biological surveys no evidence of hazardous, toxic, or radioactive waste (HTRW) was observed. Construction debris and concrete have been observed in an area adjacent to a gravel pit directly south of the LCC campus (Photograph 2-11). In addition, solid waste (e.g., water bottles, clothes, and food wrappers) and debris (e.g., tree branches and tires) deposited from high flow events or illegal alien traffic has been observed within the restoration area. Based on reconnaissance, there is no indication that HTRW are present on the site.

Photograph 2-11. Concrete debris located within the restoration area

2.11 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

Webb County is one of 254 counties in Texas, and is part of the Laredo Metropolitan Statistical Area. Population in the region of influence (ROI), Webb County, was 256,496 in 2011 (Table 2-7). The 2011 estimated racial mix of Webb County was predominantly Caucasian (97.8 percent), followed by Asian (0.7 percent) and African American and Native American (0.6 percent), and less than 1 percent of the populations were native Hawaiian or other pacific islander. In Webb County, 94.5 percent of the population claimed to be Hispanic or Latino (of any race) (U.S. Census Bureau 2011).

Table 2-7. State of Texas and Webb County Population and Race Statistics (2011)

Geographic Region	Total Population	Race							
		White	African American	Native American	Asian	Native Hawaiian or other Pacific Islander	Two or more races	Hispanic or Latino Origin	White persons, not Hispanic
Texas	25,674,681	80.9	12.2	1.0	4.0	0.1	1.7	38.1	44.8
Webb County	256,496	97.8	0.6	0.6	0.7	<1	0.3	95.4	3.6

Source: U.S. Census Bureau 2011

In 2010, there were 172,983 people employed within the ROI (BEA 2011), with approximately 62.6 percent employment rate. The unemployment rate for Webb County in 2010 was 5.2 percent (BEA 2011). Per capita personal income (PCPI) was $23,680 in Webb County in 2010, up from $15,371 in 2000, an annual growth rate of 4.4 percent (Table 2-8). The PCPI in the ROI is below both the National and state average. Total Personal Income in 2010, measured in thousands of dollars, was $5.9 million in Webb County, compared to $2.9 million in 2000. In 2010, Webb County was ranked 23rd in the state of Texas in Total Personal Income, and accounted for 0.6 percent of the state total. The average annual growth rate between 2000 and 2010 was 7.7 percent.

Table 2-8. Per Capita Personal Income (PCPI)

Geographic Location	Per Capita Personal Income (PCPI) 2010	State Rank	Percent State Average	Percent National Average	Average Annual Growth Rate 2000-2010
Texas (Average)	$37,747	-	-	-	5.3
Webb County	$23,680	245	63	59	4.4

Source: BEA 2011

The percentage of all people living in poverty in Webb County was 29.8 in 2011, which was larger than the percentage for both the state and the Nation (Table 2-9). Median household income in the ROI was $36,684.

Table 2-9. Poverty and Median Income

Location	Percentage in Poverty 2011	Median Income 2011
Texas	16.8	$36,684
Webb County	29.8	$49,646

Source: U.S. Census Bureau 2011.

A summary of housing in the ROI is given in Table 2-10. The total number of housing units in the ROI is 73,686 with a 90.5 percent occupancy rate.

Table 2-10. Housing Units

Geographic Region	Total Housing Units	Occupied				
		Total	Percent Occupied	Owner	Renter	Vacant
Texas	9,996,209	8,738,664	87.4	63.6	36.4	12.6
Webb County	73,686	66,716	90.5	59.8	40.2	5.0

Source: U.S. Census Bureau 2011

2.12 RECREATIONAL, SCENIC, AND AESTHETIC RESOURCES

In general, the project corridor is highly disturbed and surrounded by areas of development at higher densities and the aesthetic value is low. These developed areas are visible from openings in the canopy, but are typically blocked from view by dense vegetation. Trash left by illegal aliens after crossing the Rio Grande and litter from the urban area to the north detracts from the aesthetic quality of the overall area. Recreational uses observed within the restoration area include hiking, bird watching, fishing, and biking.

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SECTION 3.0
PLAN FORMULATION

3.0 PLAN FORMULATION

According to USACE's *Policy and Planning Guidance for Conducting Civil Works Planning Studies* (Engineering Regulation [ER] 1105-2-100), ecosystem restoration projects should be formulated in a systems context to improve the potential for long-term survival of aquatic, wetland, and terrestrial complexes as self-regulating, functioning systems. This section details the steps that were taken to formulate a plan that meets the guidance; considers the problems, opportunities, and constraints; and meets the study's planning objectives. Measures were identified that solve the identified problems, and the beneficial and adverse contributions of each measure were then evaluated against FWOP conditions. Finally, combinations of measures (plans) were compared against each other using cost-effectiveness and incremental analyses.

Coordination and meetings were held with representatives from the City of Laredo, as the non-federal study sponsor; GSRC (under contract to the Government); USFWS; TPWD; and a multidisciplinary water resources team from the CESWF to discuss and define problems and opportunities and to determine potential measures for ecosystem restoration and recreation within the restoration area. Field surveys conducted to document the existing conditions of the natural resources within the restoration area were also utilized to identify specific resource needs and any constraints that might limit the implementation and future viability of potential ecosystem restoration measures. Comments and recommendations from the resource specialists were incorporated into a number of possible restoration measures appropriate to the habitat type, site location, and existing conditions.

3.1 ENVIRONMENTAL PROBLEMS AND OPPORTUNITIES

The first step in the planning process is the identification of problems (i.e., undesirable conditions to be resolved) and opportunities (i.e., positive conditions to be improved) that the planning team seeks to address. Problems and opportunities specific to the Laredo Riverbend restoration area are detailed below:

Problem 1: Due to impacts of historic gravel mining operations, the current topography and site conditions of the ponds, including 1) steep banks that prevent establishment of a wetland fringe; 2) shallow depths and excessive sedimentation that create high turbidity; and 3) shallow depths and lack of emergent and fringe vegetation that lead to high water temperatures and evapotranspiration rates (especially exacerbated in some of the smaller ponds), severely limit the value of the aquatic habitat in the restoration area for resident and migratory wildlife and bird species.

Problem 2: The existing roads and trails within the restoration area have erosive soil, which increases turbidity in watersbodies in the restoration areas. They also channelize, capture, and redirect surface water flow and impede hydrologic connectivity within the restoration area.

Problem 3: Storm events and flood events can produce large volumes of water, which enter the restoration area from both the development to the north and the Rio Grande. Due to the scouring and deposition created by the head cut in the northern portion of the restoration area, native habitat development has been limited. Because the perimeter drainage is inadequate, the interior site remains inundated for long periods, which prevents establishment of plants, and when the waters evaporate or percolate into the soils these areas remain unvegetated during the dry season.

Problem 4: Three nonnative species have formed large monotypic stands within the restoration area: Carrizo cane, tamarisk, and buffelgrass.

Opportunity 1: Excavating the ponds to increase their depth and recontouring their banks would substantially improve the habitat quality by lowering water temperature and increasing suitability for aquatic vegetation. Improved habitat quality would provide additional foraging habitat for resident and migratory wildlife species, as well as federally listed species.

Opportunity 2: Removing interior roads and trails within the restoration area by regrading them to match the elevation of adjacent topography and replanting the disturbed areas with native vegetation would improve water quality by reducing the amount of sedimentation and pollutants flowing into the ponds. This would also help restore a more natural hydrological connection within the area by eliminating channeling of sheet flow along these artificial linear structures. USBP would continue use of the main access routes that are currently established within the restoration area and this removal of the interior roads would not significantly hamper USBP's ability to complete its mission. CBP owns an easement on River Road that allows routine access and patrol along River Road. The interior trails are currently open to CBP and there are no restrictions on CBP's use of these trails. The main access trails through the interior would remain available for CBP use.

Opportunity 3: Improving surface water management and drainage in the restoration area would create adequate perimeter drainages and interior hydrologic connectivity. The stormwater and floodwater could provide a means of flushing the area of nutrients and extending the duration of shallow inundation that would greatly benefit aquatic and wetland habitats. By implementing techniques to reduce the scouring and sediment deposition due to the head cut, diverse native habitat surrounding the head cut and within the restoration area would be allowed to develop.

Opportunity 4: The removal of the nonnative species as part of this project would meet federal mandates and would eliminate large monotypic stands of these nonnative species. The replacement of these stands with a diverse assemblage of native species would provide substantial benefits as a migration, foraging, and breeding corridor for common and endangered resident and migratory wildlife species.

3.2 STUDY GOALS

The following study goals were developed during the Value Engineering (VE) Study process:

- Aquatic ecosystem restoration
- Improve and enhance native habitats for wildlife
- Enhance recreational opportunities

3.3 OBJECTIVES AND CONSTRAINTS

Planning objectives are statements that describe the desired results of the planning process by solving the problems and taking advantage of the opportunities identified. The planning objectives are directly related to the problems and opportunities identified for the study and are used for the formulation of measures. Constraints are restrictions that limit the planning process or that might limit the implementation and future viability of potential ecosystem restoration measures. Resource constraints are those associated with limits on knowledge, expertise, experience, ability, data, information, money, and time. Legal and policy constraints are those defined by law and USACE policy and guidance.

The following study objectives were developed to address specific problems and opportunities identified during the planning process:

- Restore the quality and quantity of aquatic, wetland, and riparian habitats.
- Improve habitat suitability of aquatic, wetland, and riparian habitats.
- Improve hydrological connectivity with surrounding waterbodies and reduce seasonal inundation.
- Improve water quality and reduce erosion.
- Improve vegetative structure to increase habitat quality and improve structural diversity.
- Increase the habitat quality of the restoration area as part of a migration, foraging, and breeding corridor for common wildlife and federally listed species.

Achieving the objectives for this study would meet the federal goal of aquatic ecosystem restoration.

The project delivery team (PDT) also identified potential resource and legal constraints that could limit the scope of measures developed to achieve the study objectives. They are as follows:

- Law enforcement access cannot be prohibited due to the high amount of illegal cross-border traffic in the Laredo Riverbend area; therefore, cooperation with law enforcement, primarily USBP, and consequent improvements to the area (i.e., improved access roads) would be necessary.
- Nonnative species have become established along the majority of the Rio Grande in Laredo. Although methods for removal and control of Carrizo cane, tamarisk, and

buffelgrass have been effective in the region, the conditions within the restoration area present greater challenges due to the interspersion of nonnative and native species.

- Measures that would cause a migration of the Rio Grande channel and, thus, result in a change of the international boundary would be unacceptable to the City of Laredo and United States Section, International Boundary and Water Commission (USIBWC).

3.4 FUTURE WITHOUT PROJECT CONDITIONS

The FWOP conditions described in the following paragraphs are equivalent to those described for the "no action" alternative. In order to effectively evaluate changes to the environment of the Laredo Riverbend restoration area if proposed ecosystem restoration measures are implemented, it is necessary to forecast likely future environmental conditions if they are not.

Using GSRC's and USACE's 15 years of in-field observations within the restoration area, the PDT made the following assumptions to evaluate the FWOP conditions:

- Law enforcement activities within and around the restoration area are likely to continue. Because the area has consistently remained heavily impacted by trails, and roads and trails are adequate for law enforcement use, it is not likely that the number of trails would increase.
- Development and impervious surfaces, which cause runoff into the restoration area, are at maximum capacity with no room for expansion. The City of Laredo will not allow further anthropogenic disturbance of the restoration area or adjacent lands. Therefore, runoff would remain constant and associated impacts would not be expected to increase.
- The monotypic stands of nonnative species have remained constant with negligible increases or encroachment into new areas over the past 15 years. Therefore, it is assumed that in the future, the tamarisk will remain near the drainages and ponds edges, the Carrizo cane will remain along the northwestern boundary of the restoration area, and the buffelgrass will remain the dominant grass species in the topographically higher areas.
- The Riverbend area is known to be a migration, foraging, and breeding corridor for common wildlife and the endangered interior least tern. It is presumed to be a corridor for the ocelot and jaguarundi as well, although no confirmation exists that either of the cat species has been recently observed in the area. Ongoing efforts to remove Carrizo cane and other exotics in lands adjacent to the restoration area would improve the suitability of this area as a migratory corridor in the short term.

Without the proposed project, the most probable future conditions represent a baseline for evaluation of benefits resulting from proposed measures. In order to quantify changes in suitability occurring throughout the 50-year life of the project, target years (TYs) were established at TY1, TY10, and TY50. Average annual habitat units (AAHUs) were then calculated following HEP methods (USFWS 1980). Assumptions regarding FWOP conditions, as they relate to HEP models, are provided for HEP model and TY in detail in Appendix B, Tables B-2a through B-2h. Given these assumptions, the restoration area would provide 48.06 AAHUs over the life of the project (Appendix B, Table B-3a).

SECTION 4.0
ECOSYSTEM RESTORATION MEASURES

4.0 ECOSYSTEM RESTORATION MEASURES

Numerous aquatic restoration measures were identified and considered during the planning stages of the restoration project. Each measure considered was then evaluated to determine if it met the planning objectives discussed in Section 3. Additional criteria considered included Local Sponsor input and support, reasonableness of restoration project cost, professional judgments, and environmental benefits.

In 2011, a modified VE study was conducted for this project. The PDT met in Laredo, Texas, and identified a variety of restoration measures and/or scales of measures applicable to the restoration area, which are the same measures carried forward in this briefing report. Measures are features or activities that can be implemented at specific sites to solve problems and address one or more of the planning objectives. Guidelines provided in the following documents would be adhered to during design and implementation of proposed measures, where applicable:

- Engineering Manual (EM) 1110-2-1205, Environmental Engineering for Local Flood Control Channels, 15 November 1989
- EM 1110-2-1902, Slope Stability, 31 October 2003
- Engineer Research and Development Center/Coastal and Hydraulics Laboratory (ERDC/CHL) TR-01-28, Hydraulic Design of Stream Restoration Projects, September 2001

4.1 EXCLUDED RESTORATION MEASURES

All possible restoration measures that could solve the identified problems were initially evaluated. However, as the plan formulation progressed, it was determined that several of the initial measures would need to be excluded due to cost, lack of enhancement of habitat suitability, and limited likelihood for success. Table 4-1 shows the measures considered but eliminated during the plan formulation process.

Table 4-1. Measures Considered but Eliminated

Problem	Measure	Reason for Elimination
Water quality of ponds	Replenish water in ponds with groundwater or siphon from river	Costly, limited likelihood for success, and non-compliance with City of Laredo and federal regulations
Water quality of ponds	Install aerators in ponds	Costly and limited likelihood for success
Existence of nonnative species	Prescribed burn for nonnative vegetation control	Non-compliance with City of Laredo regulations and likely public controversy
Existence of nonnative species	Bio-controls for nonnative vegetation (e.g., goats and wasps)	Lack of enhancement of habitat and low likelihood of success
Existence of nonnative species	Flood lands for nonnative vegetation control	Non-compliance with City of Laredo and federal regulations; could damage native vegetation
Existence of nonnative species	Removal of buffelgrass	Ubiquitous in the region and in the seed bank; long-term removal and control measures have proven unsuccessful
Existence of roads and trails	Close all roads and trails	Not possible due to law enforcement activities and requirements

4.2 EVALUATED RESTORATION MEASURES

General and specific restoration measures were formulated through coordination with the City of Laredo, USACE, USFWS, and TPWD. Each measure must be quantified in terms of the area affected, the effects of the measure on habitat suitability, and the cost to implement the measure. After receiving input from the interagency team, all measures and scales carried forward were developed in sufficient detail to estimate costs. A total of eight measures were evaluated, with four measures (HYDRO, CANE, TAM, ERODE) including two scales (Table 4-2). Each possible combination of measures was evaluated as an alternative plan for ecosystem restoration. The eight measures carried forward were combined to create 1,295 possible plans.

Although DRAIN was carried forward as a measure, based on the cost-benefit analysis completed for this study it was not carried forward as part of the NER Plan. The following measures are the only measures carried forward in the NER Plan.

Table 4-2. Measures and Scales Carried Forward for Analysis

Measure	Scale	Name
Improve Hydrology and Connectivity between Lacustrine Habitats	1- Minor excavation of channels	HYDRO
	2- Excavation of channels and shorelines	
Improve Drainage	1- Replace low-water crossings with culverts	DRAIN
Increase Water Depth	1- Excavate two largest ponds to a depth of 4 feet	DEPTH
Improve Shoreline Topography to Increase Cover of Emergent Vegetation	1- Create shallow wetland benches and points and plant native emergent vegetation	SHORE
Remove Carrizo Cane from DSSW1	1- Remove Carrizo cane	CANE
	2- Remove Carrizo cane and plant native trees and shrubs	
Remove Tamarisk	1- Remove tamarisk	TAM
	2- Remove tamarisk and plant native trees and shrubs	
Reduce Erosion	1- Remove roads	ERODE
	2- Control erosion at head cut	
Create Nesting Habitat for Birds	1- Create nesting habitat on barges in two largest ponds	NEST

4.2.1 Improve Hydrology and Restore Native Vegetation (HYDRO)

4.2.1.1 Initial Construction

Improving hydrology would include the excavation of two minor channels and shallow excavation around existing ponds (Figure 4-1). The first channel would be excavated in a stand of Carrizo cane in the western portion of the restoration area, where surface flows from the roadside ditch and the Carrizo cane stand are currently directed to several locations through a network of ridges and swales. This channel would collect surface flows and discharge them into two small ponds to the south. The second channel would carry excess flows from L/HW habitats and impounded flows in DSSW located in the center of the restoration area southward to be discharged into the Rio Grande. By reducing the duration of inundation, implementation of this measure would increase the cover of emergent vegetation in the L/HW habitats and increase cover of wetland shrubs in DSSW affected areas. Both channels would be excavated to a depth of no more than 2 feet. Channel depth would reduce prolonged inundation of shoreline vegetation and deposition of sediments in the ponds and depressions throughout the restoration area. Meandering channels would be created following USACE guidelines and standard practices for stormwater control in arid environments.

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Figure 4-1. Improve Hydrology and Connectivity between Lacustrine Habitats (HYDRO)

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Use of these methods would allow natural processes of scouring and deposition to maintain the channels; thus, these channels would be largely self-sustaining and would require minimal long-term maintenance.

The channel banks would be stabilized by planting native shrubs and herbaceous wetland plants. The predominant plantings within the area would be black willow pole cuttings and wattles. Species that tolerate some inundation would be planted closer to the excavation channel, and grasses and forbs would be planted further up the slope. Wetland shrubs would be planted along the excavation channel. Forbs species would include blue mistflower (*Conoclinium coelestinum*), zigzag iris (*Iris brevicaulis*), Virginia iris (*I. virginica*), water-primrose (*Ludwigia peploides*), Texas frogfruit (*Phyla nodiflora*), western bracken fern (*Pteridium aquilium*), lanceleaf arrowhead (*Sagittaria lancifolia*), softstem bulrush, and giant bulrush (*S. californicus*). Wetland shrubs to be included in the planting pallet would be buttonbush (*Cephalanthus occidentalis*), coralbean (*Erythrina herbacea*), turkscap (*Malvaviscus arboreus* var. *drummondii*), and common elderberry (*Sambucus nigra* ssp. *canadensis*). Grasses and grass-like plants would include bushy bluestem (*Andropogon glomeratus*), eastern woodland sedge (*Carex blanda*), inland sea oats (*Chasmanthium latifolium*), oneflower flatsedge (*Cyperus retroflexus*), and nimblewills (*Muhlenbergia schreberi*).

Pole bundles or wattles would be planted a rate of 100 bundles per acre and other woody plants would be planted from 1-gallon containers at a rate of 250 plants per acre. A locally acquired seed mix containing target grass and grass-like species would be spread in suitable areas along the excavation channels. Planting would occur in early spring, and no irrigation or soil amendments would be required, as the spring rains and associated rise in the groundwater table would provide the water necessary for survival.

Improving the hydrology within the restoration area would also include shallow (less than 3 feet) excavation around existing wetlands to improve hydrology and increase the area of emergent vegetation (see Figure 4-1). Most excavation would occur within DFW habitats where tamarisk is dominant and would result in the conversion of DFW habitats to DSSW habitats. Excavation would include the removal of whole tamarisk individuals (i.e., including root masses) using small bulldozers, tractors, or similar equipment. Excavation would remove between 1 and 3 feet of surface material so that the elevation of the area is nearly equal to the average summertime elevation of the Rio Grande, which is approximately 360 feet above mean sea level.

Approximately 70 percent of the excavated areas would be planted with a planting palette similar to that described above. The only areas that would not be planted would be the areas that would be converted to aquatic habitats. Containerized plant species would be planted at a density of approximately 250 plants per acre. Approximately 100 pole cuttings would be used, and planting would be concentrated along the channel banks.

4.2.1.2 3-year Establishment Period

Each area would be monitored during TY1, TY2, and TY3. Monitoring would occur in the late fall to identify the functional status of hydrologic improvements, survival of plantings, establishment of nonnative invasive plants, and any damage caused by humans or wildlife. Any damage to drainages would be repaired, planted trees that have not been successful would be replaced, and exotic species would be controlled. Maintenance of native vegetation would be achieved through a site-specific, adaptive process of replacing lost plants with species proving successful at that location. Following the 3-year establishment period, it would be assumed that the areas would be self-sustaining and require minimal long-term maintenance.

4.2.1.3 Operation, Maintenance, Repair, Replacement, and Rehabilitation (OMRR&R)

Long-term maintenance would include monitoring every 5 years beginning at TY5 to document functional status of hydrologic improvements, survival of plantings, establishment of nonnative invasive plants, and any damage caused by humans or wildlife. Any damage to drainages would be repaired, planted trees that have not been successful would be replaced, and exotic species would be controlled. It was assumed that half of the area of minor drainages and 10 percent of the area of shallow excavation would require maintenance (i.e., clearing of obstructions, re-contouring). All best management practices (BMPs) would be implemented during maintenance and management.

4.2.2 Control Exotic Species and Restore Native Vegetation (CANE and TAM)

Carrizo cane and tamarisk have created monotypic stands in multiple locations within the Laredo Riverbend area, which reduces habitat suitability within these stands due to lack of structural diversity and forage availability.

Carrizo cane would be removed from a large portion of DSSW habitat located on the northwestern boundary of the project area by using a front-end loader, track-hoe, or similar equipment (Figure 4-2). Equipment would be used to pull the plants from the soil by digging

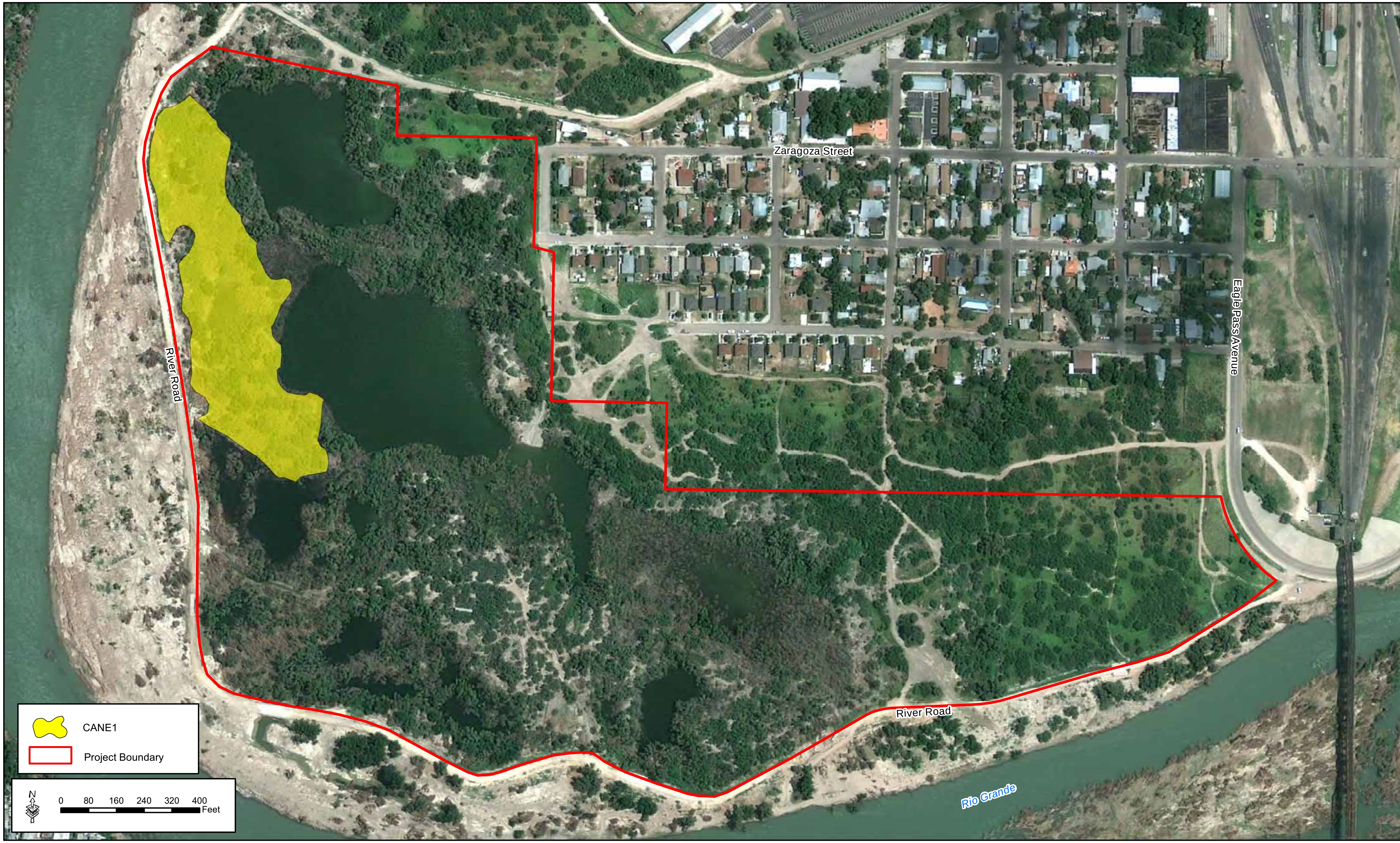

Figure 4-2. Remove Carrizo Cane from Deciduous Scrub/Shrub Wetland 1 (DSSW1) (CANE)

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underneath the rhizomes and pulling the whole plant upwards. The plant and soil material would be mechanically sifted and separated on-site. The captured soil would be spread across the area of removed cane. Plant material would be chipped using a mechanical chipper and would also be spread across the area of removed cane.

In areas where mechanical removal is not possible due to interspersion with native species or other access issues, an herbicide deemed safe for aquatic habitats would be used. Initial herbicide application would occur in the fall following the end of the migratory bird breeding season. Areas to be treated would be surveyed, and target areas would be flagged or otherwise marked. The Carrizo cane would be cut with hand equipment (i.e., flail or weed eaters) and would be removed from the site or chipped in place, if applicable. Immediately following the cutting of the cane, herbicide would be applied using backpack sprayers equipped with sponges to avoid overspray and damage to desirable species. The herbicide manufacturer's recommended rate of application for each targeted species would be followed. A qualified, State of Texas licensed herbicide applicator would apply the herbicide.

The area would be planted with riparian shrubs and trees in tree cells, gallon containers, or poles at a density of approximately 250 plants per acre. Grass and grass-like species would be sowed from a locally acquired seed mix. Mast- and forage-producing shrubs and trees would compose approximately 20 percent of the plantings in this area and would include common elderberry, spiny hackberry, red mulberry (*Morus rubra*), Mexican plum (*Prunus mexicana*), and pecan (*Carya illinoinensis*). A mechanical post-hole digger would be used to plant in areas where rhizomes remain in place.

Tamarisk would be removed from DFW habitats using chainsaws and herbicide (Figure 4-3). Trees would be cut at the base and an herbicide approved for use in aquatic environments would be immediately applied to the cambium of the cut base. Large logs would be bucked and removed from the area and branches less than 3 inches in diameter would be chipped and scattered across the area. These areas would be planted with the same palette of species and methods described above for Carrizo cane. As part of the tamarisk removal, the restoration measure HYDRO would create an island of existing substrates that currently support DFW habitat composed primarily of tamarisk. This island would be planted with tree species that provide suitable nesting habitat for great egret (e.g., red maple [*Acer rubrum*], hackberry, buttonbush, black willow).

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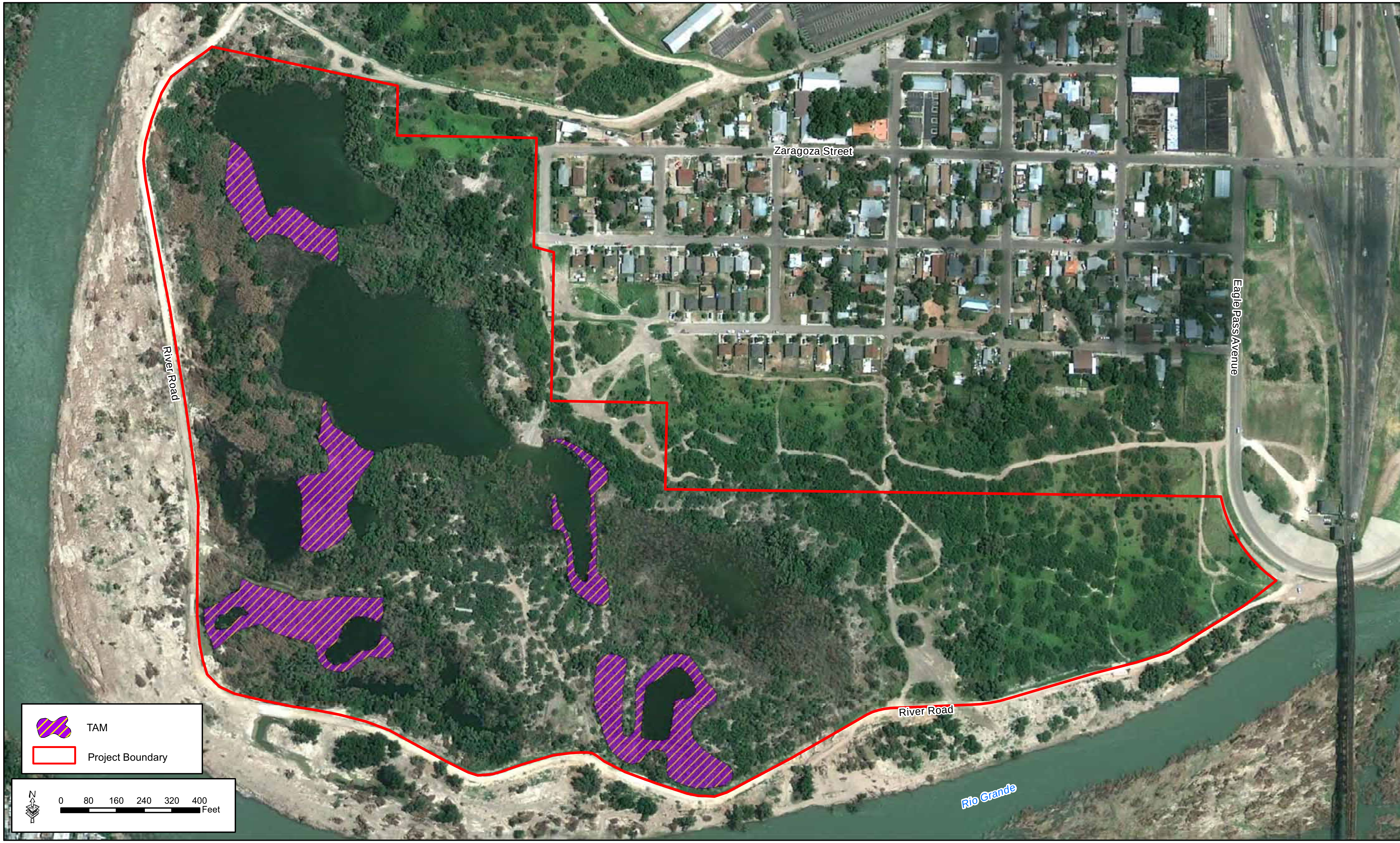

Figure 4-3. Remove Tamarisk from Deciduous Forested Wetland (DFW) Habitats (TAM)

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4.2.3 Increase Water Depth in the Two Largest Ponds (DEPTH)

4.2.3.1 Initial Construction

The two largest artificial ponds would be excavated to a depth of 4 feet (Figure 4-4) to reduce turbidity and water temperatures. It is estimated that more than 8,000 cubic yards of soil would be excavated using a barge and excavator and then transported off-site to an approved upland disposal area. Prior to disposal, one soil test would be done to ensure that there are no contaminants in the sediments. A soil analysis would also be conducted to determine the excavation depth limits.

4.2.3.2 3-year Establishment Period

It is assumed that no effort would be required to monitor or maintain water depth during the first 3 years of the project life.

4.2.3.3 OMRR&R

Long-term management would include monitoring every 10 years beginning at TY10 to quantify any sediment accumulation. It is assumed that additional dredging would be required once during the project life to maintain assumed benefits.

4.2.4 Restore Shoreline and Littoral Zone (SHORE)

4.2.4.1 Initial Construction

The shorelines and littoral zone of the largest ponds would be restored by creating a gentler slope and by creating wetland depressions and benches along the shoreline (Figure 4-5 and 4-6). Excavation and construction of wetland benches would be implemented using a modular spud barge with an excavator and a bobcat, mini-excavator, or similar equipment on the shore to create wetland benches according to USACE guidelines presented in ERDC/CHL TR-01-28 and EM 1110-2-1902 along the pond edges. Benches would be constructed so that the elevation of the bench is approximately 3 to 6 inches below the average summertime elevation of the Rio Grande, which is approximately 360 feet above mean sea level. It is estimated that 3,404 cubic yards of fill would be used for this measure. Soil would be obtained from a local source.

Riprap or similar material would be placed along the outer limits of the wetland benches in an effort to hold the soil in place, thus allowing native vegetation to be planted. Herbaceous wetland plants would be planted from seed or tubers at a density of approximately 250 plants

Figure 4-4. Increase Water Depth in the Two Largest Lacustrine Habitats (DEPTH1)

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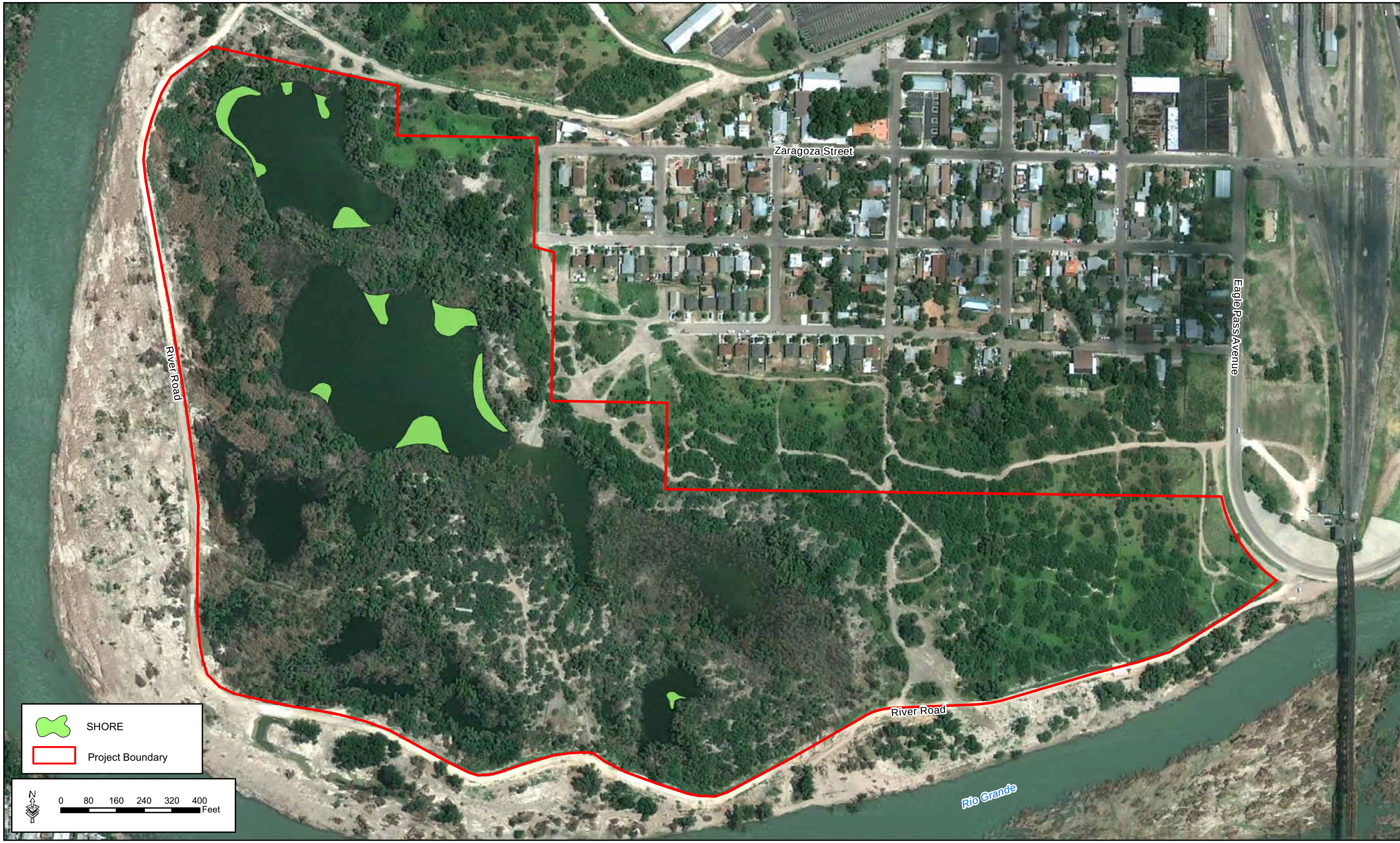

Figure 4-5. Improve Shoreline Topography to Increase Cover of Emergent Vegetation (SHORE)

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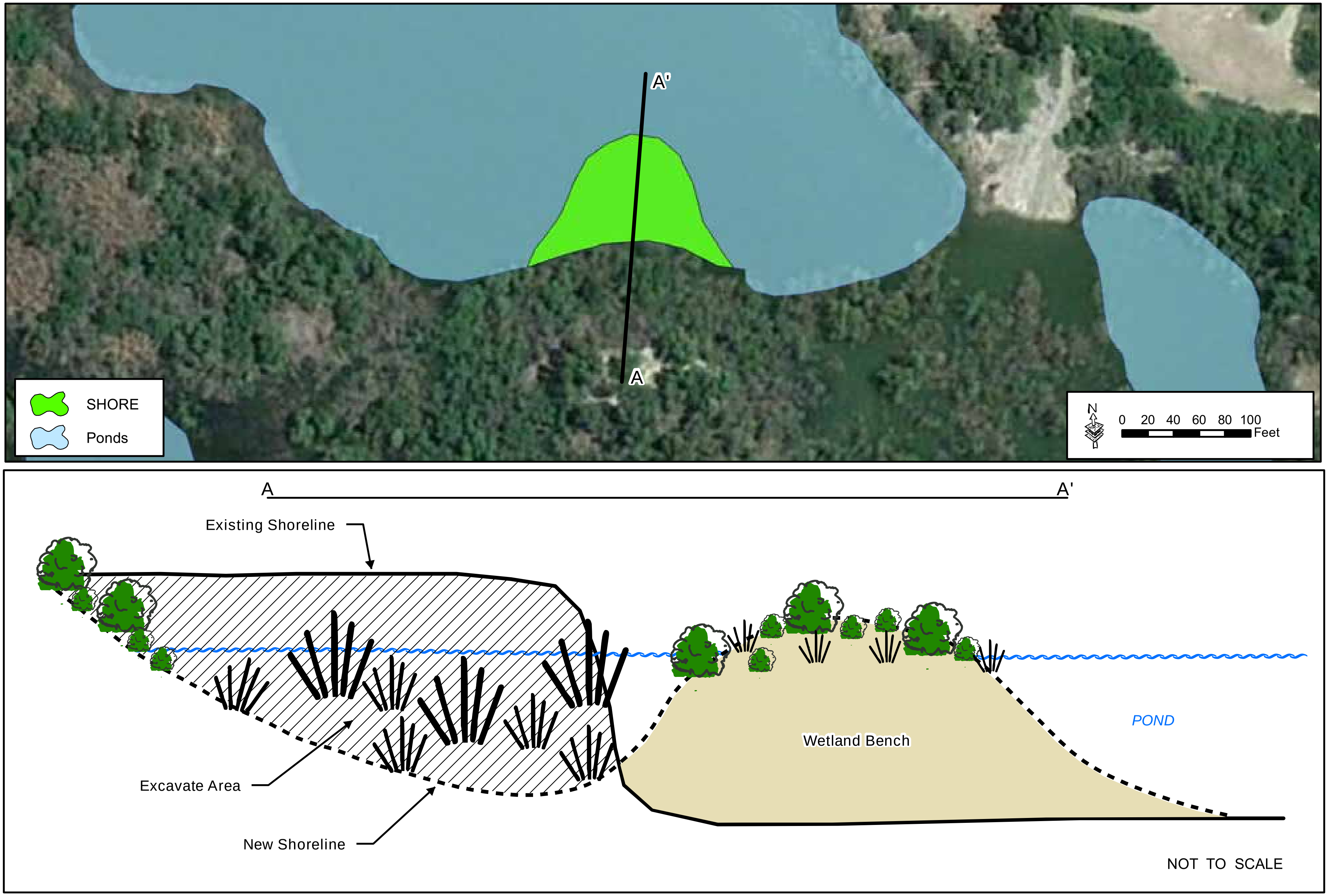

Figure 4-6. Conceptual Illustration of Proposed Wetland Benches

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per acre. Shrubs would be planted as tree cells (i.e., 1-inch by 1-inch by 8-inch biodegradable growing containers) or gallon containers at a density of approximately 250 plants per acre. Twenty percent of the palette would consist of woody plants and 80 percent would consist of herbaceous plants. To provide nesting habitat for red-winged blackbird, herbaceous plantings would consist predominantly of giant bulrush and other species that would provide enough structure for nesting habitat. A locally acquired seed mix containing target grass and grass-like species would be spread in suitable areas along the excavation channels. Planting would occur in early spring, and no irrigation or soil amendments would be required, as the spring rains and associated rise in the groundwater table would provide the water necessary for survival.

4.2.4.2 3-year Establishment Period

Wetland benches would be monitored during TY1, TY2, and TY3. Monitoring would occur in the late fall to identify the functional status of benches, survival of plantings, establishment of nonnative invasive plants, and any damage caused by humans or wildlife. Any damage to benches would be repaired, plants that have not been successful would be replaced, and exotic species would be controlled. Maintenance of native vegetation would be achieved through a site-specific, adaptive process of replacing lost plants with species proving successful at that location. Following the 3-year establishment period, it would be assumed that the areas would be self-sustaining and require minimal long-term maintenance.

4.2.4.3 OMMR&R

Long-term management would include monitoring every 5 years beginning at TY5 to document functional status of wetland benches, survival of plantings, establishment of nonnative invasive plants, and any damage caused by humans or wildlife. It is assumed that the wetland benches require cumulative maintenance or repairs equivalent to the initial installation efforts over the life of the project.

4.2.5 Reduce Erosion (ERODE)

4.2.5.1 Remove Roads

Initial Construction

A total of approximately 1.03 miles of roads and trails within the restoration area would be removed (Figure 4-7). The remaining trails would be left in place and used for recreation, maintenance, and USBP operational access within the restoration area. Roads would be removed by discing or cutting the soil using a tractor and a suitable implement (i.e., disc, box-

Figure 4-7. Reduce Erosion through Removal of Roads (ERODE1) and Structural Amendments to Head Cut (ERODE2)

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blade, or tines) and restoring the natural contour according to USACE guidelines (EM 1110-2-1902). Large logs, rocks, or pipegates would be placed in roadways to deter continued use, and vegetation would be allowed to recruit naturally within these areas. No plantings would occur. Where disturbed soils could result in erosion, fiber matting, mulch, wattles, or similar materials would be used to temporarily hold soils in place.

4.2.5.2 3-year Establishment Period

Removed roads would be monitored during TY1, TY2, and TY3. Minimal grading and installation of temporary erosion control measures could be necessary to maintain problem areas; however, it is assumed that no additional efforts would be required.

4.2.5.3 OMMR&R

No long-term maintenance of removed roads would be required.

4.2.5.4 Restore Head Cut

Measures to reduce flow velocity using natural materials would be installed within the head cut at the north end of the restoration area (see Figure 4-7). Measures would include terracing, wattles, planting of native vegetation, or some combination of all of these. There is currently a large sediment plume at the base of the head cut; thus, a shallow channel would be excavated according to USACE guidelines (EM 1110-2-1205, EM 1110-2-1902) to direct flows into the northern pond. The channel would be sized similar to the existing channel to the north and south of the sediment plume (i.e., less than 1 foot deep).

4.2.5.5 3-year Establishment Period

The restored head cut would be monitored during TY1, TY2, and TY3. It is assumed that additional contouring, stabilizing, planting, and temporary erosion control would be necessary.

4.2.5.6 OMMR&R

Long-term management would include monitoring every 10 years beginning at TY10 to document erosion, establishment of nonnative invasive plants, and any damage caused by humans or wildlife. It is assumed that additional contouring stabilization, plant replacement, and temporary erosion control would be required at least once during the project life.

4.2.6 Provide Artificial Nesting Habitat for Shorebirds (NEST)

4.2.6.1 Initial Construction

Modular spud barges would be placed within the two largest ponds (Figure 4-8). Mooring spuds would be driven into the ponds, and the barges would be coupled to these spuds, allowing the barges to float in place. The barges would be modified to hold approximately 4 inches of pea-gravel spread across the surface with sufficient drainage to discourage plant establishment.

4.2.6.2 3-year Establishment Period

The artificial nesting habitats would be monitored during TY1, TY2, and TY3; however, no additional restoration efforts are anticipated during this period.

4.2.6.3 OMMR&R

The nesting habitats would be monitored every 10 years beginning at TY10 and it is assumed that maintenance and repairs (i.e., replace aggregate, fix welds, replace spud) equivalent to 10 percent of installation costs would occur every 10 years over the life of the project.

Figure 4-8. Create Nesting Habitat for Waterfowl (NEST)

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SECTION 5.0
COST-EFFECTIVENESS AND INCREMENTAL COST ANALYSIS

5.0 COST-EFFECTIVENESS AND INCREMENTAL COST ANALYSIS

Cost-effectiveness and incremental cost analysis (ICA) were performed using the Institute for Water Resources Planning Suite Version 1.0.11.0, following guidelines presented in the *Evaluation of Environmental Investments Procedures Manual* (Robinson et. al. 1995). Each unique combination of measures is referred to as a plan. All possible plans were formulated using the "assemble all possible combinations of management measures" approach. To identify the cost-effective and non-cost-effective plans, all plans were sorted by Total AAHU production. Cost-effective plans are defined as those where greater output can be produced at a lesser or equal cost than previous plans or the same benefit output can be produced at a lesser cost. The cost-effectiveness analysis procedure identified 35 cost-effective plans from the 1,295 possible combinations.

5.1 ESTIMATION OF BENEFITS

The benefit of each restoration measure and changes in area as a result of the proposed measures were evaluated by making assumptions about the effects of each measure on each of the HSI models. The great egret HSI model was modified based on the known occurrence of nuisance egret rookeries (Grant and Watson 1995, Telfair et. al 2000) and known great egret rookeries occurring within developed areas (DFW Urban Wildlife 2013). The benefits of each possible plan were evaluated by applying these assumptions to a matrix of all possible combinations of measures using a Microsoft Excel database. AAHUs were calculated following USFWS guidance. AAHUs are presented for each patch of habitat by measure in Appendix B, Table B-3a. While each measure was assumed to have some effect on suitability as a stand-alone measure, the cumulative effects of combined measures (e.g., HYDRO2 and TAM2) were also considered and evaluated.

5.2 COST-EFFECTIVENESS EVALUATION

Costs were evaluated for each of the eight possible restoration measures as Average Annual Cost Units (AACUs) (Appendix E, Tables E-1 through E-9). AACUs included costs related to lands, easements, rights of way, relocation, and disposal areas (LERRDS); general construction; planning, engineering, and design (PED), construction management, interest during construction; and OMRR&R (Appendix E, Table E-1). LERRDS costs are based on June

2012 Real Estate Reconnaissance Estimate prepared in compliance with EC 405-1-04, Section III (4-19).

General construction costs include all labor with an overhead burden of 2.7 percent applied, materials, and equipment costs incurred during the first 3 years of the project, and OMRR&R costs include all costs incurred during the remaining 47 years of the project life. Quantities for general construction and OMRR&R features were measured using a GIS database, and prices are based on vendor quotes, internet-based estimates, and professional experience. An abbreviated risk analysis was conducted to calculate contingencies for each measure, for PED, and for construction management (Appendix E). First Cost was then calculated as LERRDS, general construction and contingency, PED and contingency, construction management and contingency, and 10 percent profit. Interest during construction was applied to First Cost at an annual rate of 3.75 percent during the 3-year general construction period. Not all costs were assumed to be additive. For example, it assumed that if HYDRO2 is implemented, then there would be no cost for TAM where these measures spatially overlap.

5.3 INCREMENTAL COST ANALYSIS (ICA)

The cost-effective plans were then evaluated based on incremental cost per incremental habitat unit of output (i.e., incremental AACU divided by incremental AAHU) to identify the best-buy plans. Best-buy plans are those that have the lowest incremental cost per unit of output. Because the No Action Plan does not have an associated cost, it is identified as the first best-buy plan. Each successive plan is then compared to the No Action Plan until the next best-buy plan producing greater output per cost than previous plans is selected. Plans producing less output than the best-buy plan are removed from the analysis, and the last identified best-buy plan becomes the baseline for comparison of successive plans. ICA identified 11 best-buy plans. Table 5-1 shows the plans and their outputs (Appendix F, page 2 and Figures F-1 and F-2).

Table 5-1. Cost and Output Summary of Final Best-Buy Plans Ordered by Benefit

Best – Buy Plan	Measure								Benefit (AAHU)	Cost (AACU)	Average Cost (AAHU)	Incremental Cost (AACU)	Incremental Output (AAHU)	Incremental Cost per Incremental Habitat Unit Output (AACU/AAHU)
	HYDRO	DRAIN	DEPTH	SHORE	CANE	TAM	ERODE	NEST						
1	0	0	0	0	0	0	0	0	48.06	0	0			
2	0	0	0	0	0	1	0	0	49.71	5,434	109	5,434	1.65	3,293
3	2	0	0	1	0	0	0	0	57.62	33,963	589	28,530	7.91	3,607
4	2	0	0	1	0	0	1	0	59.07	43,946	744	9,982	1.45	6,884
5	2	0	0	1	1	0	1	0	60.88	58,624	963	14,678	1.81	8,109
6	2	0	1	1	1	0	1	0	61.74	67,256	1,089	8,632	0.86	10,037
7	2	0	1	1	2	0	1	0	62.23	72,425	1,164	5,169	0.49	10,549
8	2	0	1	1	2	0	2	0	62.36	74,518	1,195	2,093	0.13	16,097
9	2	0	1	1	2	2	2	0	62.78	83,429	1,329	8,911	0.42	21,217
10	2	0	1	1	2	2	2	1	62.84	95,504	1,520	12,075	0.06	201,251
11	2	1	1	1	2	2	2	1	62.85	103,886	1,653	8,382	0.01	838,247

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SECTION 6.0
NATIONAL ECOSYSTEM RESTORATION (NER) PLAN

6.0 NATIONAL ECOSYSTEM RESTORATION (NER) PLAN

6.1 NER SELECTION

The NER Plan is selected by asking “Is it worth it?” for each successively more expensive best-buy plan and then considering potential benefits not captured by the HEP analysis. ICA generated 11 best-buy plans.

Best-buy Plan 1 (No Action Plan) represents the FWOP conditions. Under this plan, the restoration area habitats would remain in their current highly degraded state and no restoration activities would occur. Therefore, no habitat for federally listed species would be restored or improved nor would nonnative and invasive species be removed and controlled. This plan would provide 48.06 AAHUs over the life of the project and does not meet the goals and objectives of the study.

At an incremental cost of $3,293 per incremental habitat unit, Best-buy Plan 2 provides an additional 1.65 AAHUs over the No Action Plan. This plan would improve the quality of the deciduous forested wetland habitats by replacing exotic monocultures with native species that provide better vegetative structure for foraging by songbirds. This measure would also improve habitat suitability for the ocelot by increasing the canopy height. Tamarisk produce abundant and dense growth near the ground, and ocelot prefer a canopy height of greater than 8 feet (ocelot recovery plan USFWS 1990). Best-buy Plan 2 would improve habitat suitability for both common and listed species and is “worth it.”

At an incremental cost of $3,607 per incremental habitat unit, Best-buy Plan 3 provides an additional 7.91 AAHUs over Best-buy Plan 2. This plan would also remove tamarisk from the restoration area resulting in benefits similar to Best-buy Plan 2. This plan would also substantially increase the area and suitability of lacustrine and herbaceous wetland habitats by restoring wetland benches around the perimeter of the largest ponds, and by improving the hydrology of the entire system such that germination, establishment, and spread of wetland plants are improved. Best-buy Plan 3 would improve habitat suitability for both common and listed species and is “worth it.”

At an incremental cost of $6,884 per incremental habitat unit, Best-buy Plan 4 provides an additional 1.45 AAHUs over Best-buy Plan 3. In addition to the benefits of Best-buy Plan 3, this plan would remove roads from within deciduous scrub/shrub habitat, thereby improving habitat suitability for the eastern cottontail. Although not quantified by the HSI models, it is assumed that removal of these gravel roads would also reduce turbidity within lacustrine habitats. The primary incremental benefit of this plan is the increase in habitat area, and this plan is "worth it."

At an incremental cost of $8,109 per incremental habitat unit, Best-buy Plan 5 provides an additional 1.81 AAHUs over Best-buy Plan 4. In addition to the benefits of Best-buy Plan 4, this plan would remove Carrizo cane from the restoration area. The benefits of replacing Carrizo cane with native species are the same as those described for Best-buy Plan 2, and this plan is "worth it."

At an incremental cost of $10,037 per incremental habitat unit, Best-buy Plan 6 provides an additional 0.86 AAHU over Best-buy Plan 5. In addition to the benefits of Best-buy Plan 5, this plan would increase the depth of the two largest ponds in the restoration area. Increasing the depth of the ponds would provide opportunity for slider turtles to escape predation and would also reduce water temperatures. A reduction in water temperature would improve suitability for the warmouth and other native fishes in these lacustrine habitats. Best-buy Plan 6 is "worth it."

At an incremental cost of $10,549 per incremental habitat unit, Best-buy Plan 7 provides an additional 0.49 AAHU over Best-buy Plan 6. In addition to the benefits of Best-buy Plan 6, this plan would plant native species following removal of Carrizo cane. Planting natives, as opposed to allowing natural recruitment, will not only result in a faster accumulation of benefits, it would also increase species diversity throughout the system. Best-buy Plan 7 is "worth it."

At an incremental cost of $16,097 per incremental habitat unit, Best-buy Plan 8 provides an additional 0.13 AAHU over Best-buy Plan 7. In addition to the benefits of Best-buy Plan 7, this plan would result in the stabilization of a head cut in the restoration area. This substantial head cut creates a large sediment plume and the area of disturbance does not provide suitable habitat for eastern cottontail. Although not quantified, it is also assumed that this plan would substantially reduce turbidity and sediment accumulation in the downstream ponds, thereby improving habitat suitability. Best-buy Plan 8 is "worth it."

At an incremental cost of $21,217 per incremental habitat unit, Best-buy Plan 9 provides an additional 0.42 AAHU over Best-buy Plan 8. In addition to the benefits of Best-buy Plan 8, this plan would result in the restoration of nesting habitat for colonial nesting birds. Measures to improve hydrology would create an island of habitat surrounded by water, and this plan would plant trees in that habitat providing structure for nesting. This plan would create nesting opportunities for colonial birds in an area where nesting habitats are sparse. Best-buy Plan 9 is "worth it."

At an incremental cost of $201,251 per incremental habitat unit, Best-buy Plan 10 provides an additional 0.06 AAHU over Best-buy Plan 9. In addition to the benefits of Best-buy Plan 9, this plan would result in the restoration of nesting habitats for interior least terns. Although suitable nesting habitat occurs in the restoration area on an intermittent basis, this plan would create permanent habitat for this federally listed species known to occur in and near the project area. Best-buy Plan 10 is "worth it".

At an incremental cost of $838,247 per incremental habitat unit, Best-buy Plan 11 provides an additional 0.01 AAHU over Best-buy Plan 10. In addition to the benefits of Best-buy Plan 10, this plan would result in improvement to hydrology that would largely be gained by implementation of Best-buy Plan 3. Because this plan would not meet additional objectives or goals beyond Best-buy Plan 10, this plan is not "worth it."

Best-buy Plan 10 is "worth it" and has been identified as the NER Plan. The total investment cost of the NER Plan, including LERRDS; general construction costs over the 3-year construction period; PED; and construction management, profit, and interest during construction with allowances for contingencies, is $2,877,059.

The City of Laredo proposes the inclusion of recreational components in the NER plan. These additional recreational components are considered minimal facilities as described in USACE ER 1105-2-100, Appendix E. With the inclusion of cost of the recreational components ($263,978) proposed by the City of Laredo, the total cost of the NER Plan would be approximately $3,141,037.

Based on the results of the ICA, consideration of HEP limitations and non-quantifiable ecosystem benefits (e.g., benefits to federally listed species), and interagency review by USACE, Rock Island District, Best-buy Plan 10 is justified as the NER Plan. The following measures would be implemented under the NER Plan: HYDRO2, DEPTH, SHORE, TAM2, CANE2, ERODE2, and NEST (Figure 6-1). A summary of activities included in the NER Plan by restoration measure and TY is provided in Table 6-1. Additional considerations are discussed below in sections 6.1 through 6.7. An Adaptive Management Plan has been developed for the NER Plan and is included in Appendix G.

Table 6-1. Overview of Restoration Measures and Implementation Phases

Restoration Measure	General Construction			47-year Maintenance
	Initial Construction	Initial Construction Duration*	3-year Establishment	
Restore hydrology (HYDRO2)	• excavation to improve connectivity and hydrology of wetlands	• 40 days	• annual monitoring • control of invasive plants • maintenance of native vegetation	• monitoring (every 5 years) • maintenance of hydrology • control invasive plants
	• establishment of native wetland vegetation	• 21 days (2-person crew) following the completion of excavation		
Control Carrizo cane (CANE2)	• mechanical removal and herbicide treatment of Carrizo cane	• 40 days (4-person crew)	• annual monitoring • control of Carrizo cane and other invasive plants • maintenance of native vegetation	• monitoring (every 5 years) • control invasive plants
	• establishment of native vegetation	• 22 days (2-person crew) following completion of cane removal		
Control tamarisk (TAM2)	• Mechanical removal and herbicide treatment of tamarisk	• 10 days (2-person crew)	• annual monitoring • control of tamarisk and other invasive plants • maintenance of native vegetation	• monitoring (every 5 years) • control invasive plants
	• establishment of native vegetation	• 8 days (4-person crew) following completion of tamarisk removal		
Increase water depth (DEPTH)	• excavation of two ponds to a depth of 4 feet	• 10 days	• none	• maintenance of depth (TY25)
Restore shoreline and littoral zone (SHORE)	• contouring of shorelines and construction of wetland benches	• 11 days (2-person crew) following completion of DEPTH and HYDRO2	• annual monitoring • control of invasive plants • maintenance of native vegetation	• monitoring (every 5 years) • maintenance of wetland benches • control invasive plants
	• establishment of native emergent vegetation	• 4 days (2-person crew) following completion of contouring		

Table 6-1, continued

Restoration Measure	General Construction			47-year Maintenance
	Initial Construction	Initial Construction Duration*	3-year Establishment	
Remove roads and restore head cut (ERODE2)	• shallow discing or cutting of soil	• 3 days	• annual monitoring • control of invasive species • maintenance of temporary erosion control • maintenance of native vegetation	• monitoring (every 10 years) • additional remediation, as necessary • control invasive plants
	• placement of obstructions	• 1 day		
	• temporary erosion control	• 0.5 day		
	• remediation of head cut using natural materials	• 1 day		
	• establishment of native vegetation	• 0.5 day		
Provide artificial shorebird nesting habitat (NEST1)	• installation of pylons and modified barges	• 11 days (2-person crew) following the completion of DEPTH, HYDRO2, and SHORE	• annual monitoring	• monitoring (every 10 years) • maintenance of barges • control vegetation

*construction durations are not necessarily consecutive days

6.2 NER PLAN BENEFITS AND ACCOMPLISHMENTS

The NER Plan would provide 14.78 AAHUs above the No Action Plan.

The NER Plan would provide benefits to 12.37 acres of L/HW habitat, 5.46 acres of DFW habitat, 23.66 acres of DSSW habitat, and 33.57 acres of DSS habitat. The NER Plan would improve habitat suitability within the existing gravel mining ponds by restoring the ponds to a more natural state. Excavation between wetlands and ponds within the restoration area would improve hydrology and connectivity between water bodies, and increase the area of emergent vegetation. Increasing the water depth to a minimum of 4 feet over at least half the surface area of the two largest ponds in the restoration area would reduce turbidity and water temperatures, thus improving water quality and habitat suitability for evaluation species and other wildlife. Improving shoreline topography along the ponds would be an important measure to increase the amount of foraging habitat for not only the ocelot and jaguarundi, but also common wildlife within the restoration area. The removal of cane and tamarisk in multiple locations would increase habitat suitability within the restoration area by allowing the establishment of native shrubs and trees, thus increasing structural diversity. Further, this would expand the nonnative plant removal and control effects that are ongoing by CBP on adjacent parcels. Planting native tree, shrub, and terrestrial and emergent herbaceous species within the restoration area would

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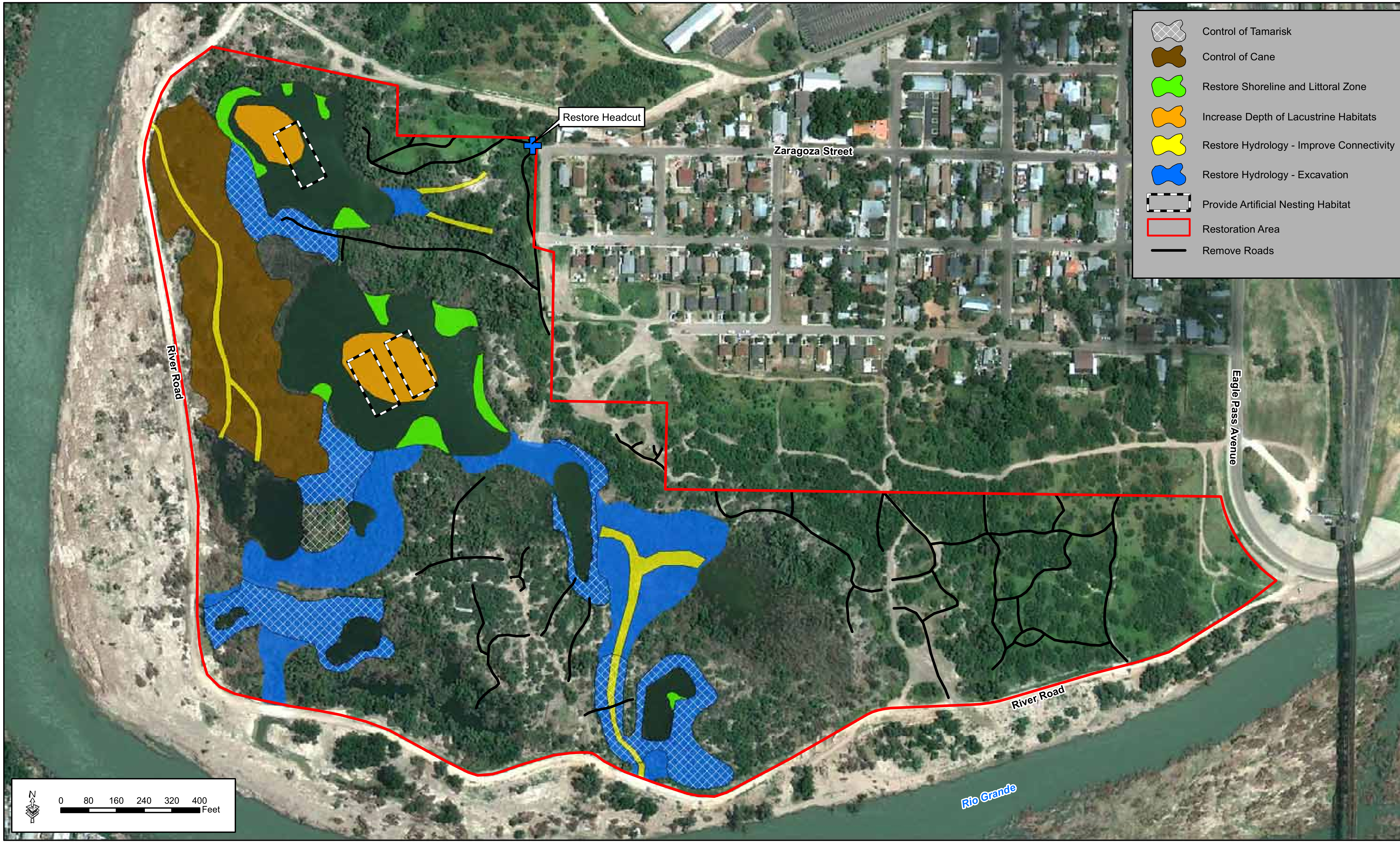

Figure 6-1. Proposed NER Plan

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be included in the NER Plan and would provide higher-quality habitat to a greater diversity of native wildlife and federally listed species. The removal of roads and trails, as well as the construction of a channel and energy dissipaters, would improve water quality and restore degraded native habitat. The installation of barges in the two largest ponds would create a permanent source of nesting habitat for the interior least tern and great egret, which is known to nest in the Laredo Riverbend area. The NER Plan would accomplish the objectives and goals established in Section 3.

Improvements to and creation of additional habitat under the NER Plan has the potential to result in a net gain of approximately 5.66 L/HW AAHUs, 8.82 DSSW AAHUs, 1.44 DSS AAHUs, and 0.067 Barges (nesting) AAHU. Conversely, the DFW habitats have a net loss of 1.29 AAHUs as a result of the NER Plan (Table 6-2). From an ecological standpoint, the recommended plan would provide much needed improvements to habitat quality and quantity, which can be used by a wide variety of species that depend on habitat created by the unique environmental conditions of Laredo Riverbend.

Table 6-2. Estimated Average Annual Habitat Units (AAHU) with Implementation of the NER Plan

Representative Habitat	Output (AAHU)		
	Without Project	With Project	Net Change
L/HW	3.42	9.08	+5.66
DFW	1.74	.45	-1.29
DSSW	9.66	18.48	+8.82
DSS	33.22	34.66	+1.44
Barges	0	0.067	+0.067
Total	**48.06**	**62.84**	**14.78**

6.3 PROPOSED NER PLAN COSTS

The total estimated investment cost, including LERRDs, general construction costs over the 3-year construction period with risk-based contingencies, PED with allowances for contingencies, construction management with contingency, 10 percent profit, and interest during construction is $2,877,059 (Table 6-3).

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Table 6-3. Implementation Costs of the National Ecosystem Restoration (NER) Plan

Cost Item	Implementation Cost (dollars)								
	HYDRO2	DEPTH	SHORE	CANE2	TAM2	TAM and HYDRO2	ERODE2	NEST	Total
LERRDS	**124,926**	**560**	**43,629**	**30,855**	**26,711**		**194,806**		**421,486**
General Construction									
Initial Construction	338,174	171,881	75,957	213,884	71,312	6,724	33,703	535,592	1,447,226
3-year Establishment Period	23,202		8,350	26,701	18,174	4,064	9,139	1,920	91,549
Subtotal	361,375	171,881	84,307	240,585	89,486	10,788	42,842	537,512	1,538,775
Contingency (%)	14.44%	5.82%	9.14%	7.31%	9.41%	9.41%	9.73%	10.94%	
Contingency Value	52,179	10,004	7,701	17,597	8,417	1,015	4,170	58,795	159,878
Subtotal	**413,554**	**181,885**	**92,008**	**258,183**	**97,902**	**11,803**	**47,012**	**596,307**	**1,698,654**
Planning, Engineering, and Design (PED)									
PED (10%)	36,138	17,188	8,431	24,059	8,949	1,079	4,284	53,751	153,878
Contingency (19.67%)	7,110	3,382	1,659	4,733	1,761	212	843	10,575	30,275
Subtotal	**43,247**	**20,570**	**10,089**	**28,792**	**10,709**	**1,291**	**5,127**	**64,326**	**184,152**
Construction Management									
Construction Management (10%)	36,138	17,188	8,431	24,059	8,949	1,079	4,284	53,751	153,878
Contingency (10.94%)	3,953	1,880	922	2,632	979	118	469	5,879	16,832
Subtotal	**40,090**	**19,068**	**9,353**	**26,690**	**9,927**	**1,197**	**4,753**	**59,631**	**170,709**
Subtotal First Cost	**621,818**	**222,083**	**155,079**	**344,519**	**145,250**	**14,290**	**251,697**	**720,264**	**2,475,001**
Profit (10%)	62,182	22,208	15,508	34,452	14,525	1,429	25,170	72,026	247,500
TOTAL FIRST CONSTRUCTION COSTS	**683,999**	**244,291**	**170,587**	**378,971**	**159,775**	**14,719**	**276,867**	**792,291**	**2,721,501**
Interest During Construction	38,831	13,869	9,684	21,514	9,070	892	15,718	44,979	154,557
INVESTMENT COST	**722,830**	**258,160**	**180,272**	**400,486**	**168,845**	**16,612**	**292,585**	**837,269**	**2,877,059**
Interest	27,106	9,681	6,760	15,018	6,332	623	10,972	31,398	107,890
Amortization	5,113	1,826	1,275	2,833	1,194	118	2,070	5,923	20,353
Annual Operations, Maintenance, Repair, Rehabilitation, and Replacements	1,735	2,467	1,979	1,996	1,385	-	769	706	11,038
AVERAGE ANNUAL COST UNIT (AACU)	**33,955**	**13,975**	**10,015**	**19,847**	**8,911**	**740**	**13,811**	**38,027**	**139,280**

HYDRO2 – Excavation of channels and shorelines
DEPTH – Excavate two largest ponds to a depth of 4 feet
SHORE – Create shallow wetland benches and points and plant native emergent vegetation
CANE2 – Remove Carrizo cane and plant native trees and shrubs
TAM2 – Remove tamarisk and plant native trees and shrubs
ERODE2 – Remove roads and control erosion at head cut
NEST – Create nesting habitat on barges in two largest ponds

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6.4 PROPOSED NER PLAN SUSTAINABILITY

Part of the USACE Mission Campaign is to develop sustainable water resource solutions. The maintenance of most restoration measures following the 3-year establishment period is expected to be minimal; thus, the relatively low cost of annual OMRR&R. Ecosystem restoration measures were developed to be self-sustaining to the greatest extent practicable, and long-term maintenance is primarily limited to the control of newly established exotic species. There are several complementary actions that have occurred or are anticipated to occur near the restoration area including the Carrizo cane removal and control project by CBP and mitigation area development by CBP. These complementary actions will help control sources of invasive species and restore the Laredo Riverbend area to its natural ecosystem. The Proposed NER Plan was developed and is designed to contribute to the overall sustainability of the Laredo Riverbend Ecosystem.

6.5 REAL ESTATE CONSIDERATIONS

The subject property is located within the City of Laredo, which owns the land. The restoration area has not been substantially developed and consists of natural areas with a network of roads and trails and a few, small wooden structures. The area has been degraded over time by gravel mining, dumping of waste, and disturbance related to illegal alien traffic. The restoration area is bordered to the north and east by residential and industrial areas associated with urban development within the City of Laredo, and by the Rio Grande to the south and west. The restoration area is currently accessed by the public via a public road paralleling the river. Although the Laredo Riverbend area is owned by the City of Laredo, cooperation with law enforcement, primarily CBP, is important, and CBP would continue to require access to the area in order to apprehend cross-border violators. The entire property was valued at $420,000 (Appendix H).

6.6 CONSTRUCTION CONSIDERATIONS

Design plans, additional testing, preparation of a construction schedule, and contracting would occur during the PED phase. The timing of some measures is likely to be contingent on conservation measures; however, this is not anticipated to affect the cost of PED or of implementing those measures. The cost of PED was estimated as 10 percent of general construction costs and an appropriate contingency was applied through cost risk analysis.

It is not anticipated that any adverse effects would occur such that the feasibility, costs, or benefits of the proposed measures would be substantially altered. An abbreviated cost risk analysis was conducted to identify areas where efforts to comply with, or obtain, a decision document could result in increased costs, and an appropriate contingency was applied. All NEPA requirements including the requirements of all permits and plans that must be completed prior to initiation of construction are presented in Section 7.0.

6.7 OPERATION, MAINTENANCE, REPAIR, REHABILITATION, AND REPLACEMENT CONSIDERATIONS (OMRR&R)

The local sponsor, the City of Laredo, would assume all long-term OMRR&R following completion of the 3-year construction period. Estimated total operations and maintenance cost would be $518,786 over the 47-year OMRR&R phase. Under the NER Plan, OMRR&R would include the continued control of nonnatives such as Carrizo cane and tamarisk.

6.8 RECREATION FEATURES

Plans to enhance recreational opportunities include construction of a pavilion, bird-watching stations, picnic tables, and signage and improvement of some existing trails (Figure 6-2). Trails would be compliant with the Americans with Disabilities Act; thus, improvements would include placement of a trail-suitable aggregate mix followed by treatment with a soil binding agent. The proposed pedestrian trail system would utilize existing ATV trails and would connect proposed bird-viewing areas.

The City of Laredo supports the incorporation of the described recreational features into the NER Plan. The proposed recreational features are compatible with the recommended restoration project and would serve the surrounding neighborhoods and region by providing non-consumptive recreational opportunities. The recreational features would not detract from the goals of the restoration plan and, where possible, would utilize areas designated for operation and maintenance access. These features would function primarily for recreation

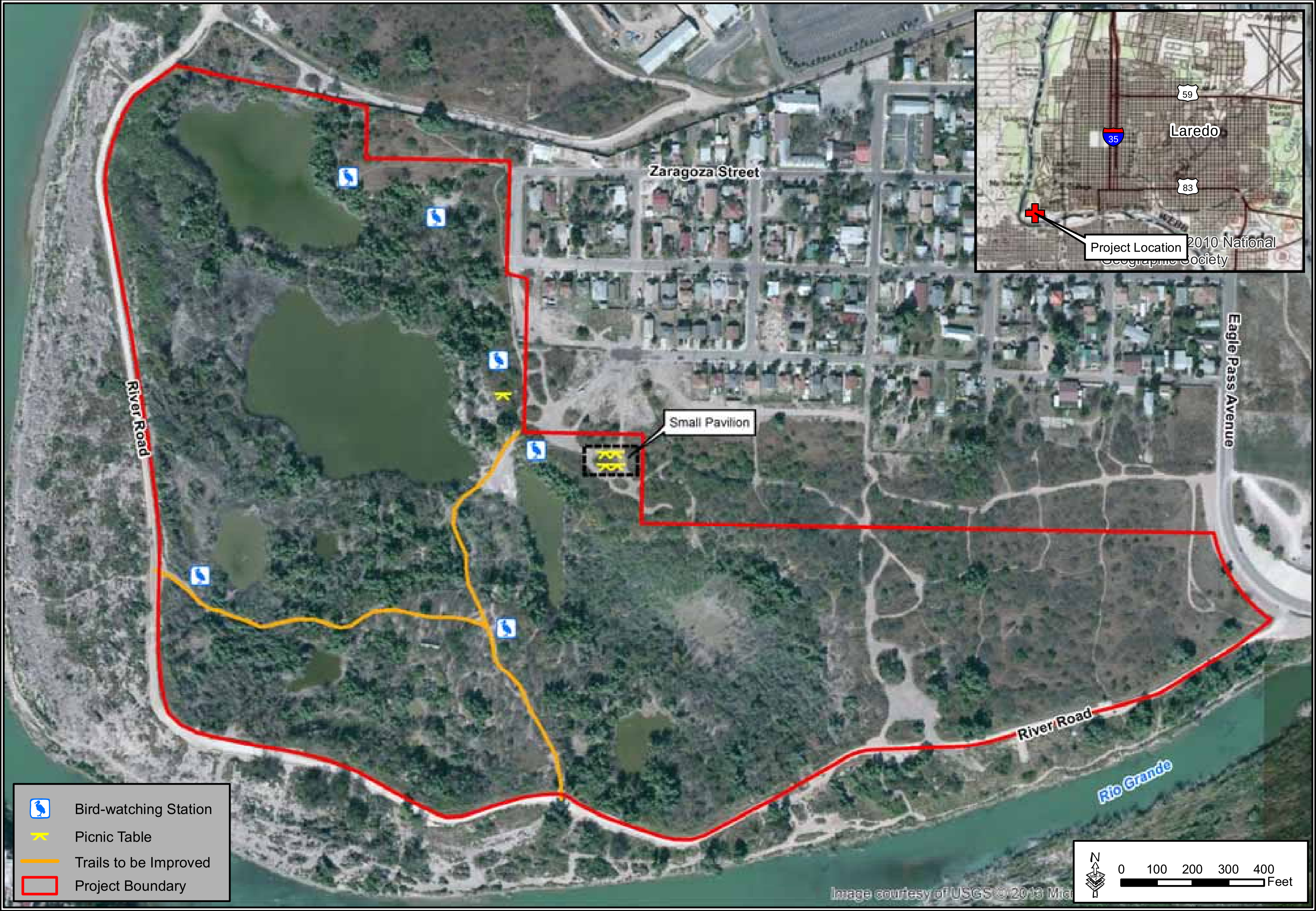

Figure 6-2. Recreation Features

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May 2013

purposes and the cost would be shared equally (up to 10 percent of the total federal restoration costs) between the Federal Government and the Local Sponsor per USACE guidance.

The formulation of the recreational features is based on the educational and social potential afforded by the restoration project. The justification for federal participation in recreational features as part of the recommended plan is defined in Policy Guidance Letter No. 59, Recreation Development at Ecosystem Restoration Projects.

The formulation of recreational features was conducted within the following framework:

- are totally ancillary (i.e., project was not formulated solely for recreation)
- take advantage of the project's recreation potential
- are not vendible
- would not exist without the project

Economic justification is based on an evaluation of competing facilities, existing and expected future use with and without the NER Plan, and unfulfilled demand. According to the TPWD, Texas Outdoor Recreation Plan (TPWD 2010), which identifies population, usage, and demand trends within the region, the demand for local recreation facilities, such as trails, is steadily increasing.

As directed by ER 1105-2-100, Appendix E, Section VII, the value of recreational opportunities is assessed for both with and without project conditions using the unit-day value method following the guidelines provided in Economics Guidance Memorandum (EGM) 13-03. First, point values are assigned to each condition based on selective criteria applicable to the proposed recreation improvements (Table 6-4).

Table 6-4. Assessment of Recreational Value With and Without Project

Criteria	Without Project (points)		With Project (points)	
Recreation Experience	Several general activities; one high-quality value activity	13	Several General activities; more than one high-quality activity	20
Availability of Opportunity	Several within 1 hour travel time; a few within 30 minutes of travel time	1	Several within 1 hour travel time; a few within 30 minutes of travel time	1
Carrying Capacity	Basic facility to conduct activities	3	Optimum facilities to conduct activities	10
Accessibility	Fair access, fair road to site; fair access, good roads within site	7	Good access, high standard road to site; good access within site	17

Table 6-4, continued

Criteria	Without Project (points)		With Project (points)	
Environmental	Low aesthetic factors that significantly lower quality	2	Above-average aesthetic quality; any limiting factors can be reasonably rectified	9
Total		**26**		**57**

Next, the unit-day value is determined. The unit-day value is the amount of money users would be willing to pay for each day of a given recreational opportunity based on its point value, and is provided in EGM 13-03. For Fiscal Year 2013, the unit-day value for FWOP (26 points) is $4.98 and the unit-day value for FWP conditions (57 points) is $8.07. Then, the participation rates are estimated based on past participation in similar activities within the State Planning Region (Table 6-5). Detailed information regarding recreational use within the Laredo area is very limited; therefore, the most recent available information was used, which dates back to 2000. The data from 2000 was extrapolated to match 2011 population estimates for the Laredo area. The participation rates shown in Table 6-5 represent the estimated participation rates based on 2011 population statistics. Based on observed participation rates within the Laredo area, population estimates for the City of Laredo (USCB 2011), and acreage available for recreational use, it is preliminarily estimated that the restoration area currently supports 12,000 visitor-days per year and with the proposed restoration project would realize 36,000 visitor-days per year.

Table 6-5. Participation Rates for Selected Recreation Activities in the Laredo Planning Region

Activity	Visitor-Days per Year
Bicycling on trails	258,000
Hiking	161,000
Walking	195,000
Nature study	68,000
Picnicking	1,199,000

Applying the estimated visitor-days to the estimated user-day values yields an approximate annual benefit in terms of unrealized cost associated with recreational activities provided by the restoration area. Without the restoration project and associated recreational features, this annual benefit would be approximately $59,760 ($4.98 x 12,000). With the improvements to recreational opportunities provided by the proposed project, this annual benefit would be approximately $290,520 ($8.07 x 36,000) (Table 6-6). All recreational features (i.e., bird-watching stations, picnic tables, benches, and trail improvements) would be assigned solely to recreational costs, which total $263,978 or $5,280 per year of the project life (Table 6-6).

Table 6-6 displays the costs associated with the recreational features and a summary of their expected annual costs and benefits. Thus, the benefit-cost ratio for recreational features is 55:1.

Table 6-6. Economic Justification of Recreational Feature Costs

Implementation Cost ($)	Annual Cost	Annual Benefit	Benefit-Cost Ratio
263,978	5,280	$290,520	55:1

SECTION 7.0
ENVIRONMENTAL EFFECTS

7.0 ENVIRONMENTAL EFFECTS

This section of the DPR/EA describes and, where practical, quantifies the potential effects of each viable alternative on the resources within or near the restoration area. The assessment of the No Action Plan includes proposed, planned, and ongoing actions that are or are reasonably certain to affect resources in the restoration area in the foreseeable future. Geology would neither affect nor be affected by the NER plan and is not discussed. An effect is defined as either a beneficial or adverse modification to the human or natural environment that would result from the implementation of an action. The impacts can be direct, indirect, or cumulative. Direct effects are caused by the action and occur at the same time and place. Indirect effects are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Cumulative impacts result when the effects of an action are added to or interact with other effects in a particular place and within a particular time. The concept of cumulative impacts takes into account all disturbances since cumulative impacts result in the compounding of the effects of all actions over time.

The effects can be short-term, long-term, or permanent. For purposes of this DPR/EA, short-term effects are defined as those that would occur while restoration measures are being implemented and possibly a few days thereafter. Long-term effects are defined as those that would result in a change that lasts for many years following implementation of restoration measures. Permanent impacts would result in a change that cannot be undone and, thus, requires an irretrievable commitment of resources.

Impacts can vary in degree or magnitude from a slightly noticeable change to a total change in the environment. The significance of the impacts presented in this DPR/EA is based upon existing regulatory standards, scientific and environmental knowledge, and best professional opinions of the authors of the DPR/EA. The significance of the impacts on each resource would be described as significant, moderate, negligible, or no impact. Significant impacts are those effects that would result in substantial changes to the environment (as defined by 40 CFR 1500-1508) and should receive the greatest attention in the decision-making process. Negligible impacts are discountable (near the limits of detection) or reasonably unlikely to occur. All impacts described in the following sections are considered to be adverse, unless stated otherwise.

7.1 LAND USE

7.1.1 No Action Plan

Under the No Action Plan, no development would occur and the restoration area would continue to be used as a natural area. Recreational use would continue to be impaired by disturbance and degradation associated with unauthorized roads and trails. Invasive species would continue to limit the floral and faunal diversity of the area, thereby, limiting the opportunities for and value of wildlife watching. Thus, the No Action Plan would result in continued indirect impacts on land use.

7.1.2 Proposed NER Plan

The NER Plan would benefit land use, as the largely undeveloped, but degraded land within the restoration area would be improved for use by wildlife and for recreation. The replacement of nonnative and invasive vegetation with native vegetation and other project measures would result in the expansion of native wetland and shrubland habitats and improved wildlife suitability of existing habitats. Trails, picnic tables and benches, and bird-watching stations would enhance recreational use within the restored area. Access control gates would be placed immediately north of River Road, and would prevent uncontrolled vehicular access and further degradation from illegal debris disposal on the site while limiting trail use to pedestrian traffic within the restoration area. Nonnative and invasive vegetation would be removed from the area and wildlife habitats would be improved, resulting in beneficial impacts on short-term and long-term recreational and wildlife uses.

7.2 SOILS

7.2.1 No Action Plan

Under the No Action Plan, soils within the restoration area would remain the same and no direct impacts would occur. However, possible indirect impacts from the degradation of soils might occur from the illegal traffic and consequent CBP apprehension efforts within the restoration area. These disturbances would result in erosion and a loss of soils within the restoration area.

7.2.2 Proposed NER Plan

If implemented, the NER Plan would have both permanent and temporary impacts on the soils within the restoration area. Surplus soils as a result of the DEPTH and SHORE measures would be removed from the restoration area, thus creating a permanent impact on the soils within the restoration area. Although permanent impacts would occur within the restoration area, they are not considered significant because the soils are locally and regionally common and the City of Laredo would reuse the soil at a later date. Other permanent impacts would occur, as the pedestrian trails would consist of an impervious surface, therefore rendering the 0.6 acre of trails biologically unproductive. Short-term impacts, such as increased runoff, can be expected on soils from the restoration measures; however, these impacts would be alleviated once the construction period is finished. Beneficial impacts would also occur, as soils in the restoration area would have improved productivity and the ability to support high-quality native habitats.

Soils that are currently eroding would be stabilized with vegetation, soil cement, or gunite. A Stormwater Pollution Prevention Plan (SWPPP) would be prepared and submitted under the Texas Pollutant Discharge Elimination System (TPDES) through the TCEQ permit process for this restoration project since the total area of disturbance is greater than 5 acres. Pre- and post-construction BMPs would be developed and implemented to reduce or eliminate erosion and sedimentation. Design techniques and erosion control measures, such as waterbars, gabions, straw bales, and the use of riprap, are some of the BMPs that would be implemented to avoid or minimize potential erosion. Other BMPs identified in the SWPPP would be administered throughout the project area to reduce erosion and consequent soil loss during the construction activities and are described in further detail in Section 8.0.

7.3 WATER RESOURCES

7.3.1 Surface Water

7.3.1.1 No Action Plan

Under the No Action Plan, surface water conditions would remain the same as they are now, with the potential for increased pollution. Stormwater run-off would continue to carry eroded soils into the abandoned gravel pits and, during peak storm events, into the Rio Grande.

7.3.1.2 Proposed NER Plan

The Proposed NER Plan could result in temporary impacts on water quality during construction activities. Water quality variables that can be affected by construction operations include turbidity, dissolved solids, dissolved oxygen, nutrients, temperature, pH, and concentrations of trace metals and organic contaminants, if they are present in the sediment. Dredging and construction would cause temporary increases in the local levels of suspended material (turbidity) in the water column. Increases in turbidity are generally temporary, dissipating within a few days depending on the size of the pond, the pond's hydrodynamics and sediment characteristics. The impacts of changes in turbidity depend on the amount of area affected, currents, and seasonal turbidity levels. Increased turbidity also affects water temperatures and dissolved oxygen and can adversely impact fish and amphibian egg buoyancy and feeding capabilities of plankton feeding organisms. Resuspension of contaminants, if they are present, could also be a concern during construction activities, as contaminants such as mercury and other metals can become available for bioaccumulation upon resuspension. The increased area of emergent wetlands and establishment of native wetland species would reduce the potential for contaminants to affect water quality by helping to remove contaminants from waters and soils.

No long-term, adverse impacts on surface waters are anticipated from implementing the Proposed NER Plan Alternative. The potential for short-term impacts on surface water quality during the construction period would be minimized through the implementation of a SWPPP and BMPs specifically designed for this restoration project.

The improved vegetation structure and diversity, increased area of emergent wetlands, improved hydrology, and reduction of erosion would all result in long-term benefits to the water quality of surface waters in the restoration area, including the ponds, ephemeral drainages, and, to a lesser extent, the Rio Grande.

7.3.2 Groundwater

7.3.2.1 No Action Plan

The No Action Plan would have no impact, either beneficial or adverse, on groundwater resources. However, the 5.4 acres of tamarisk would continue to lower water tables and reduce the water yield of wetland and riparian areas. Tamarisk phototranspiration has been known to use up to 9 acre-feet/acre/year of groundwater under favorable conditions, displacing native vegetation with slower phototranspiration rates (Montana War on Weeds 2002).

7.3.2.2 Proposed NER Plan

No direct impacts on groundwater resources would be anticipated as a result of implementation of the Proposed NER Plan. The removal of tamarisk and Carrizo cane would reduce the loss of groundwater through phototranspiration, resulting in an increased groundwater supply available to native vegetation.

7.3.3 Waters of the U.S. and Wetlands

7.3.3.1 No Action Plan

Under the No Action Plan, erosion of soils would continue to deposit sediment in wetlands and the Rio Grande. Continued illegal traffic through the restoration area would increase bank erosion and contribute to potential impacts on waters of the U.S and wetlands, resulting in long-term indirect impacts on waters of the U.S.

7.3.3.2 Proposed NER Plan

By implementing the Proposed NER Plan, approximately 29 acres of potentially jurisdictional wetlands that occur throughout the restoration area, especially along the edges of the existing ponds, would be impacted. During the construction phase of the Proposed NER Plan, these wetlands would be impacted from dredge and fill activities. Impacts would be minimized during construction efforts through the incorporation of BMPs. Additionally, once construction efforts are complete, all ground disturbances from mechanized vehicles would halt. Therefore, the direct impacts associated the Proposed NER Plan are considered moderate and short-term. Beneficial impacts as a result of the Proposed NER Plan would occur by increasing the total amount of wetlands within the restoration area by approximately 1 acre (SHORE) and improving the overall quality of the wetlands through the implementation of the restoration measures.

Implementation of the Proposed NER Plan would have impacts on waters of the U.S., including wetlands within the restoration area. However, there would be no net loss of wetlands or waters of the U.S. resulting from construction of any of the restoration measures. The waters of the U.S. are subject to Sections 401 and 404 of the CWA. Although USACE does not issue itself permits for construction activities that would affect waters of the U.S., USACE must meet the legal requirement of the Act. Although a USACE permit would not be issued for the Proposed

NER Plan, the restoration measures would be covered by Nationwide Permit (NWP) 27, Aquatic Habitat Restoration, Establishment, and Enhancement Activities. As part of the NWP 27 evaluation, a qualitative description of baseline conditions and description of the post-project condition would be conducted to demonstrate that the project components would be ecologically beneficial. NWP 27 authorizes activities in waters of the U.S. associated with the restoration, enhancement, and establishment of tidal and non-tidal wetlands and riparian areas, provided the activities result in a net increase in aquatic functions and services. The proposed restoration measures would improve hydrologic connectivity amongst the existing and created wetlands, reduce turbidity and sedimentation within the restoration area, and remove nonnative vegetation while replacing it with native hydrophytic herbaceous and shrub stratum vegetation or thereby improving aquatic functions and services of the waters of the U.S. within the restoration area.

In Texas, all activities carried out in compliance with the terms and conditions of NWP 27 are also considered to be in compliance with Section 401 of the CWA and do not require separate permitting for Water Quality Certification from TCEQ.

7.3.4 Floodplains

7.3.4.1 No Action Plan

No fill in the Rio Grande floodplain would occur under the No Action Plan because construction activities would not take place. Therefore, no direct impacts on floodplains would occur with the implementation of the No Action Plan.

7.3.4.2 Proposed NER Plan

Although the proposed restoration activities for the Proposed NER Plan would fall within the 100-year floodplain, the restoration project would result in the improvement of the existing aquatic habitats through reduced erosion and sedimentation, hydrological connectivity, nonnative and invasive species eradication and control, wetland habitat creation and restoration, and returning the restoration area to a native species dominated ecosystem. Properly designed erosion and sediment controls and stormwater management practices would be implemented during construction activities, as well as into the design of the restoration measures. The proper license and permits would be obtained from USIBWC and the City of Laredo prior to any restoration activities in the floodplain. Coordination with USIBWC has been initiated, and engineering designs would be submitted for USIBWC review. Recreational features such as picnic tables, bird-watching stations, and signage would be within an area that has historically flooded. The pavilion proposed as a recreational feature would be placed on a bluff overlooking the restoration area. This bluff is located on the same elevation as the adjacent neighborhoods and did not flood during the flood of 2010, which was the third largest flood in Laredo's history. Although these recreational features would be in the floodplain, they would not be impediments to stream flow or cause increases in stormwater runoff that could cause flood elevations, flood flow velocities, or flood duration to increase. The Proposed NER Plan would be in compliance with EO 11988.

7.4 BIOLOGICAL RESOURCES

7.4.1 Vegetation Communities

7.4.1.1 No Action Plan

Under the No Action Plan, Carrizo cane and tamarisk would continue to occupy large portions of the Laredo Riverbend area preventing the establishment of native species. The monotypic character of Carrizo can and tamarisk stands does not provide the vegetation structure or foraging, nesting, and cover opportunities that supports a diverse flora and fauna. Illegal alien activity and the subsequent CBP pursuits would continue to impact vegetation through the generation of dust, erosion and sedimentation, and trampling of vegetation.

7.4.1.2 Proposed Restoration Plan

Under the Proposed NER Plan, temporary direct impacts on native vegetation would be expected during construction activities, as equipment would have to establish access routes within the restoration area. These impacts would be minimized through the use of existing trails to the extent practicable. Therefore, these impacts on vegetation would be short-term and minor.

Beneficial impacts would occur as a result of the Proposed NER Plan, as monospecific stands of invasive species would be removed from the restoration area, including nearly 5.5 acres of Carrizo cane and 5.4 acres of tamarisk. The removal of Carrizo cane and tamarisk in multiple locations would increase habitat suitability within the restoration area by allowing the establishment of native shrubs and trees, thus increasing structural diversity. Further, this would expand the nonnative plant removal and control ongoing effects on adjacent parcels by CBP.

Additionally, excavation between wetlands and ponds within the restoration area would improve hydrology and connectivity between water bodies, and would increase the area of emergent vegetation. Improving shoreline topography along the ponds would be an important measure to increase the amount of foraging habitat for not only the ocelot and jaguarundi but also common wildlife within the restoration area. Planting native tree, shrub, and terrestrial and emergent herbaceous species within the restoration area would be included in the Proposed NER Plan and would provide higher-quality habitat to a greater diversity of native wildlife and federally listed species. The removal of roads and trails, as well as the construction of a channel and energy dissipaters, would restore degraded native habitat.

All monitoring and maintenance activities associated with the Proposed NER Plan, such as the replacement of dead native plantings and continued control of nonnative and invasive species, would have beneficial impacts on vegetation within the restoration area.

7.4.2 Wildlife

7.4.2.1 No Action Plan

Under the No Action Plan, shallow water depths, high water temperatures, lack of emergent and herbaceous vegetation, lack of nesting areas, small cover of hydrophytic shrubs, and monotypic stands of nonnative and invasive species would continue. The stands of Carrizo cane and tamarisk would continue to dominate the restoration area, thus, limiting the suitability of these habitats to a large number of wildlife that would otherwise occupy the area. Additionally, wildlife habitat would continue to be impacted by illegal alien and subsequent CBP pursuit activities.

7.4.2.2 Proposed NER Plan

Minor impacts on wildlife, such as increased turbidity in aquatic habitats and disturbance of terrestrial habitats during construction are expected to result from the restoration project. However, these impacts would be temporary, and both aquatic and terrestrial habitats would be beneficially affected over the long term. Reduced erosion, improved hydrology, and other measures included in the Proposed NER Plan would increase the quality and quantity of habitat for wildlife, thus improving the health, abundance, and diversity of wildlife populations. Modification of abandoned gravel pits would provide year-round water between the ponds and shoreline, increasing the forage base of fish in the ponds. The replacement of nonnative and invasive vegetation with native plants would expand native habitats and improve the suitability of existing habitats. Additionally, the planting pallet would be structured to increase nesting and foraging habitat for aquatic and terrestrial species. The creation of nesting islands would increase the available nesting habitat within the restoration area as well. Thus, although some minor impacts could occur as a result of construction activities, the Proposed NER Plan would substantially benefit wildlife populations over the long term.

7.5 LISTED SPECIES

7.5.1 Federally Listed Species

7.5.1.1 No Action Plan

With the No Action Plan, existing conditions in the restoration area would remain the same as they are now. Nonnative species would continue to occupy large portions of the Laredo Riverbend area and illegal activity would continue to further degrade listed species habitat. The abandoned gravel pits would continue to provide limited nesting habitat for interior least terns during low flow periods. The monotypic stands of Carrizo cane and tamarisk potentially provide cover for the ocelot and Gulf Coast jaguarundi migrating through the restoration area. However, this habitat does not provide other life requisites, such as abundant prey, and the potential for the listed cats to utilize the area would remain limited.

7.5.1.2 Proposed NER Plan

As part of the NEPA process, the CESWF has coordinated with USFWS and submitted a draft Biological Assessment in an effort to initiate formal Section 7 consultation for the Proposed NER Plan (see Appendix C). It is anticipated that a Biological Opinion (BO) resulting in a no jeopardy opinion would come as a result of the consultation efforts. The BO would be included with the Final DPR/EA upon completion of Section 7 consultation.

Potential adverse effects on interior least terns will be avoided through scheduling of heavy equipment use near the two largest ponds outside the breeding season (May 1 to July 31). Increased recreational use of the Laredo Riverbend area is not likely to adversely affect any interior least tern colonies that become established on the artificial nesting islands. Although human disturbance is a threat to colonies on sandbars and shorelines, these areas are directly accessible by humans, which results in trampling of chicks and eggs. Proximity to human activity does not appear to have a substantial effect on habitat suitability, as evidenced by the success of colonies on rooftops and other locations with frequent human activity. Other effects of the project will be largely beneficial. Although increased sedimentation and disturbance in the littoral zone could have short-term adverse effects on the forage base for interior least terns, the long-term restoration of the shoreline and littoral zone will improve suitability for fishes, including species that are important components of the interior least tern's diet. Providing artificial nesting habitat for interior least terns could result in the establishment of a colony in a region of the interior least tern's range that has recently seen declining numbers of colonies. Increasing the depth of the ponds surrounding the artificial nesting would likely reduce predation if a tern colony becomes established.

The Texas hornshell is not likely to be present in the reach of the Rio Grande adjacent to the restoration area and is not likely to be adversely affected. Road removal and restoration of the large head cut in the restoration area would reduce erosion and capture sediments from stormwater runoff in the restoration area. A reduction of sediment accumulation in the Rio Grande would improve habitat conditions for the Texas hornshell near the restoration area.

Potential adverse effects of the Proposed NER Plan on the Gulf Coast jaguarundi would be temporary and include removal of dispersal habitat, possible isolation of individuals and fragmentation of remaining habitat, and possible exposure to toxicity from herbicides. Restoration of thornscrub and other habitats in the restoration area, as well as the removal of roads, could have a long-term beneficial effect on Gulf Coast jaguarundi.

The effects of the Proposed NER Plan on the ocelot would be the same as those described above for the Gulf Coast jaguarundi.

7.5.2 State-Listed Species

7.5.2.1 No Action Plan

Under the No Action Plan, none of the ecosystem restoration measures would be implemented. The indigo snake, Texas tortoise, and Texas horned lizard, if present in the restoration area, would be affected similar to other wildlife in the area. Invasive species and illegal activity would continue to limit habitat suitability and threaten long-term stability.

7.5.2.2 Proposed NER Plan

Under the Proposed NER Plan, any state-listed species present in the restoration area would be affected similar to other wildlife in the restoration area. These species would be susceptible to take during vegetation clearing, but would benefit from habitat improvements over the long term.

7.6 CULTURAL RESOURCES

7.6.1 No Action Plan

Under the No Action Plan, no additional direct impacts on cultural resources are anticipated. Although illegal alien activities and subsequent pursuit by CBP or other enforcement agents would continue to disturb soils within the restoration area, the area has been previously disturbed by past sand and gravel mining operations and flood events. Thus, the potential for indirect damage to unidentified cultural resources in the restoration area is low.

7.6.2 Proposed NER Plan

Currently a Programmatic Agreement (PA) is being developed by the USACE, the City of Laredo, the Texas SHPO, and other interested parties. The PA will outline agreed-upon measures to minimize any effects on historic properties. With the implementation of the PA, no adverse effects on historic properties would be anticipated. Indirect, long-term beneficial effects are anticipated on the historic properties and potential historic properties within the viewshed of the proposed restoration project. The proposed restoration project will eliminate the recent invasive species that have grown up in the restoration area and would restore historic vegetation in the area. This would increase the visual integrity of those historic properties and potential historic properties within the viewshed of the project by increasing the visual integrity of the area. As a result, no adverse impacts on cultural resources are anticipated from the implementation of the Proposed NER Plan.

7.7 AIR QUALITY

7.7.1 No Action Plan

The No Action Plan would not have a direct impact on air quality because construction activities would not occur. However, continued illegal activity and subsequent CBP pursuit would cause indirect adverse impacts on the local air quality due to the continued fugitive dust.

7.7.2 Proposed NER Plan

Temporary and minor increases in air pollution would occur from the use of construction equipment (combustion emissions) and the disturbance of soils (fugitive dust) during construction. The following paragraphs describe the methodologies used to estimate air emissions produced by the construction activities.

Fugitive dust emissions were calculated using USEPA's preferred emission factor of 0.19 ton per acre per month (Midwest Research Institute 1996), which is a more current standard than the 1985 PM-10 emission factor of 1.2 tons per acre-month presented in AP-42 Section 13 Miscellaneous Sources 13.2.3.3 (USEPA 2001).

NONROAD2008a model was used to estimate air emissions from construction equipment. It is USEPA's preferred model for estimating emissions from non-road sources (USEPA 2009a). Combustion emission calculations were made for standard construction equipment, such as a backhoe, bulldozer, dump truck, crane, and cement truck. Assumptions were made regarding the total number of days and hours each piece of equipment would be used.

Construction workers would temporarily increase the combustion emissions in the airshed during their commute to and from the project area. Emissions from trucks delivering materials such as cement, fill, and supplies would also contribute to the overall air emission budget. Emissions from delivery trucks and construction worker commuters traveling to the job site were calculated using the USEPA's preferred on-road vehicle emission model MOVES2010a (USEPA 2009b).

The total air quality emissions from the construction activities were calculated to compare to the *de minimis* thresholds of the General Conformity Rule. Summaries of the total emissions for construction activities are presented in Table 7-1. Details of the conformity analyses are presented in Appendix I.

Table 7-1. Total Air Emissions (tons/year) from Construction Activities versus the *de minimis* Threshold Levels

Pollutant	Total (tons/year)	*de minimis* Thresholds (tons/year) [1]
CO	6.89	100
Volatile Organic Compounds (VOC)	3.22	100
Nitrous Oxides (NOx)	12.97	100
PM-10	26.41	100
PM-2.5	3.65	100
SO_2	1.46	100
CO_2 and CO_2 equivalents	4,958	27,557

Source: 40 CFR 51.853 and Gulf South Research Corporation (GSRC) model projections (Appendix I).
(1) Note that Webb County is in attainment for all NAAQS (USEPA 2013b).

Several sources of air pollutants would contribute to the overall air impacts of the construction project. The air results in Table 7-1 included emissions from:

1. Combustion engines of construction equipment
2. Construction workers commuting to and from work
3. Supply trucks delivering materials to construction site
4. Fugitive dust from job site ground disturbances

The only impacts on air quality expected from the Proposed NER Plan would be from emissions due to fuel combustion from heavy equipment during construction activities and a minimal increase in fugitive dust caused by soil disturbances. Increased emissions that would impact ambient air quality during construction activities are expected to be short-term and would be minimized through proper maintenance and inspection of equipment. Emissions are expected to be below the *de minimis* thresholds. As a result, the Proposed NER Plan would have no long-term impacts on local or regional air quality. Fugitive dust emissions resulting from vehicle traffic on the dirt trails would be eliminated due to surfacing of these trails.

7.8 NOISE

7.8.1 No Action Plan

No direct impacts would occur on ambient noise levels as a result of the No Action Plan because construction activities would not take place. Noise generated by CBP activities would remain at the same levels within the restoration area.

7.8.2 Proposed Restoration Plan

The proposed construction activities would require the use of common construction equipment. Table 7-2 presents noise emission levels for construction equipment expected to be used during the proposed construction activities. Anticipated sound levels at 50 feet from various types of construction equipment range from 76 dBA to 84 dBA, based on data from the FHWA (2007).

Table 7-2. A-Weighted (dBA) Sound Levels of Construction Equipment and Modeled Attenuation at Various Distances[1]

Noise Source	50 feet	100 feet	200 feet	500 feet	1000 feet
Backhoe	78	72	66	58	51
Crane	81	75	69	61	54
Dump Truck	76	70	64	56	49
Excavator	81	75	69	61	54
Concrete mixer truck	79	73	67	59	52
Bulldozer	84	78	72	64	57
Front-end loader	82	76	70	62	55

Source: FHWA 2007
[1.] The dBA at 50 feet is a measured noise emission. The 100- to 1,000-foot results are GSRC modeled estimates.

Construction would involve the use of a bulldozer, which produces a noise emission level of 84 dBA at 50 feet from the source. Depending upon the number of construction hours, and the number, type, and distribution of construction equipment being used, the noise levels near the project area could temporarily exceed 65 dBA up to 450 feet from the project area. GIS was used to determine the number of sensitive noise receptors within 450 feet from the edge of the project corridor. Approximately 47 residential homes may experience temporary noise intrusion equal to or greater than 65 dBA from construction equipment. Noise generated by the construction activities would be intermittent and last for approximately 12 months, after which noise levels would return to ambient levels. To minimize the potential for these impacts, construction activities should be limited to daylight hours during the workweek, between 8:00 a.m. to 5:00 p.m. on Monday through Friday. Noise impacts should be minor if these timing restrictions are implemented during construction. Therefore, the noise impacts from construction activities would be considered less than significant.

7.9 HAZARDOUS MATERIALS

7.9.1 No Action Plan

Under the No Action Plan, incidental spills of petroleum, oils, lubricants (POLs), or other hazardous materials associated with construction activities would not occur. However, the numerous tires and other debris would remain within the restoration area, and illegal dumping is likely to continue or increase. Thus, the potential for waste materials to adversely affect the natural or human environment would not change and could increase.

7.9.2 Proposed NER Plan

No hazardous materials were observed during field surveys. In addition, no known state or federal sites with known contamination exist in or near the restoration area. Temporary impacts could occur, as the potential exists for POLs and other hazardous materials to be released during construction activities. Through the use of proper BMPs, frequent vehicle inspections, and careful handling of hazardous materials, the possibility of either leaks or spills would be minimized; thus, no or negligible impacts are expected to occur.

7.10 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

7.10.1 No Action Plan

Impacts on population, racial composition, number of jobs, income, poverty levels, or housing are not anticipated from the implementation of the No Action Plan. No significant changes in the health and safety of children or disproportionate impacts on minority or low-income populations would result from the implementation of the No Action Plan.

7.10.2 Proposed NER Plan

The implementation of the Proposed NER Plan would have a short-term, minor beneficial impact on the income of the area while work is being conducted on-site. This would result from the purchase of materials, meals, lodging, and other items from local sources. The Proposed NER Plan would also improve wildlife habitats, eliminate unsightly waste, and provide recreation amenities such as improved trails and wildlife viewing stations. These improvements are likely to result in increased recreational use that could provide minor but long-term benefits to the local economy.

No impacts are anticipated on the number of jobs, unemployment, or poverty levels within the ROI. Beneficial health impacts are anticipated for all populations, including potential minority and low-income populations, as well as children. As a result, health and safety risks for people downstream from the site would be reduced. This would have a beneficial impact in regards to EO 3045, Environmental Justice, and EO 3045, Protection of Children.

7.11 CUMULATIVE IMPACTS

This section of the DPR/EA addresses the potential cumulative impacts associated with the implementation of the alternatives and other projects/programs that are planned for the region. The CEQ defines cumulative impacts as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable actions regardless of what agency (federal or non-federal) or person undertakes such other actions” (40 CFR 1508.7). This section continues, “Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.”

CBP has continually implemented projects along the Rio Grande and within Webb County in an effort to increase the success of their mission. Some of these projects include tactical infrastructure (roads, fence, and lights), facilities (boat ramps and stations), and removal and control of nonnative species along the Rio Grande. CBP recently implemented Carrizo cane removal along 1.1 miles of the Rio Grande, adjacent to the restoration area. As part of the Carrizo cane removal, CBP replanted 27 acres with native vegetation. The cane removal is part of a 16.1-mile-long pilot project to evaluate various methods of cane removal. All of the proposed removal areas under the pilot project are located along the Rio Grande in the City of Laredo. Additional cane removal activities would occur as CBP funding is available. Further, CBP has initiated planning efforts for cane removal activities along the Rio Grande for approximately 135 river miles. No definitive plans have been prepared, but large-scale cane removal activities are likely in the Laredo Sector in the future.

Other projects completed recently by CBP include the installation of a boat ramp approximately 1 mile downstream from the restoration area. This project was completed under the existing International Bridge, which was previously denuded of vegetation. This project also included a boat maintenance facility located near the eastern boundary of the restoration area. This facility permanently impacted 1.3 acres of buffelgrass-dominated upland scrub habitat. In addition to the installation of the boat ramp and maintenance facility, CBP also improved River Road north of the restoration area by widening it and applying an all-weather surface. Minimal impacts were associated with these improvements.

CBP also has plans to develop a mitigation site along River Road, starting at the northern boundary of the restoration area, as part of their requirements to fulfill agreements between CBP and the City of Laredo. The mitigation site would consist of approximately 5.6 acres of habitat restoration. Native herbaceous and shrub species would be planted, watered, and monitored for success as part of this effort. This mitigation site would add valuable native habitat for wildlife and listed species that may occur in the Laredo Riverbend area.

Plans by other agencies that would also affect the region's natural and human environment include various road improvements by Texas Department of Transportation or Webb County. All of the projects would be expected to occur along existing corridors or within previously disturbed sites. The magnitude of the impacts would depend upon the length and width of the roads' right of ways and the extant conditions within and adjacent to the ROW.

Union Pacific Railroad Company requested from the Department of State (which is charged with issuance of Presidential Permits for the construction of international bridges under the International Bridge Act of 1972) a permit to build a new railroad bridge between Laredo, Texas, and Nuevo Laredo, Tamaulipas, Mexico. This project will include the construction of rail lines in both countries to connect the new bridge to existing mainline tracks. The proposed railroad bridge will be located 6.5 miles northwest of the existing international railroad bridge crossing at Laredo. The work involves the construction of approximately 1.7 miles of new track on the U.S. side; the construction of a 1,169-foot-long bridge spanning the Rio Grande and the border; and the construction of 8.95 miles of new track in Mexico. It is expected that the new rail bridge would:

- Eliminate about 90 percent of Union Pacific rail traffic from downtown Laredo;
- Reduce inconvenience to the public due to blocked crossings; and
- Allow for anticipated future rail traffic growth generated by the North American Free Trade Agreement.

Earthwork and grading for the project would be designed and constructed to permit the operation of a double mainline track. However, the second mainline would be constructed in the future as demand increases. The proposed rail corridor would be between 200 and 400 feet wide, with the additional width required for construction of the curved transition into the existing tracks.

The Webb County Rural Rail Transportation District, in conjunction with the Corporación para Desarollo Fronteriza (the Corporation for Border Development), a Nuevo León state agency headquartered in Monterrey, Mexico, proposes to construct a new international railroad bypass around the City of Laredo. The project is located approximately 20 miles upriver from Laredo, and includes construction of a new rail bridge over the Rio Grande in the vicinity of the existing Colombia-Solidarity Bridge, as well as approximately 22.5 miles of new rail line to connect with existing rail lines.

The City of Laredo periodically mows the Carrizo cane along an approximately 1.5-mile-long corridor parallel to the Rio Grande in downtown. The maintained corridor is approximately 50 feet wide, at which point the cleared area joins a fence surrounding a city park. The City of Laredo will presumably continue mowing the vegetation along this 1.5-mile-long corridor. The city also has a project to replace electrical systems, tanks, pipes, and other vessels at the Jefferson Water Treatment Plant. All work occurring for this project is confined to the existing facility.

7.11.1 No Action Plan

Under the No Action Plan, ecosystem restoration measures would not be implemented. Thus, effects on surface waters, vegetation communities, and wildlife would be limited to minimal indirect effects resulting from illegal alien and subsequent CBP activities within the restoration area.

Sediment levels are not identified as a water quality concern for the Rio Grande, and cumulative impacts on surface waters would not be significant. Similar degradation of vegetation communities and wildlife habitats resulting from illegal activities occurs throughout the region. However, numerous other actions in the region have been implemented, resulting in a reduction of similar impacts. Thus, the No Action Plan, in combination with other projects, would not result in significant cumulative impacts.

7.11.2 Proposed NER Plan

The Proposed NER Plan would result in long-term benefits for aquatic resources, vegetation communities, wildlife, and listed species within the region. Although other actions have historically degraded these resources, the value of remaining resources has become more evident. Thus, most actions within the region, including the Proposed NER Plan, are designed to minimize adverse impacts on these resources. TCEQ regulations require development of a SWPPP and the use of BMPs which minimize impacts on water resources resulting from other projects, and the Proposed NER Plan would reduce water quality impacts over the long term. Natural communities along the Rio Grande have been significantly impacted by the invasion of nonnative species and loss to development. Although some conversion of habitat would occur through the various CBP projects and other agency projects, the Proposed NER Plan would benefit natural terrestrial and aquatic vegetation communities and wildlife resources, and consequently, would not contribute to any adverse cumulative effects associated with other actions. Thus, the Proposed NER Plan, in combination with other actions in the region, would not result in significant cumulative impacts.

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SECTION 8.0
BEST MANAGEMENT PRACTICES

8.0 BEST MANAGEMENT PRACTICES

This section describes BMPs that would be implemented as part of the Proposed NER Plan for the Laredo Riverbend area. Due to the nature of the project, the proposed restoration activities are not expected to cause any long-term negative effects. The BMPs discussed below would decrease the severity of short-term impacts on sensitive environments or species from restoration activities.

8.1 GENERAL BEST MANAGEMENT PRACTICES

General BMPs provided in USACE guidance documents (EM 1110-2-1205, Environmental Engineering for Local Flood Control Channels; EM 1110-2-1902, Slope Stability; ERDC/CHL TR 01-28, Hydraulic Design of Stream Restoration Projects) and applicable BMPs identified through review of species' listings, recovery plans, recent biological opinions, or consultation with USFWS are included in the proposed action. General construction BMPs, to be implemented for all restoration measures, include the following:

- Prior to any construction activities, a kickoff meeting will be scheduled. A representative from each contract will attend, along with representatives from the City of Laredo and the USACE. One of the primary purposes will be to discuss the BMPs and education training for all on-site workers.
- During ecosystem restoration construction activities (or such distance that noise, light, or other effects reach the habitat) a Government-designated environmental monitor, with authority to temporarily suspend construction at any time the appropriate BMPs are not being properly implemented, will be present on-site. Duties of the monitor will include ensuring that activities stay within designated project areas, evaluating the response of individuals that come near the project site, and implementing the appropriate BMP.
- Clearance of vegetation beyond the design parameters needed for construction and maintenance and use will be avoided.
- The perimeter of all areas to be disturbed during construction or maintenance activities will be clearly demarcated using flagging or temporary construction fence, and no disturbance outside that perimeter will be authorized.
- Materials such as sand will be obtained from existing developed or previously used sources, not from undisturbed areas adjacent to the project area.
- If new access is needed or existing access requires improvements to be usable for the project, access design and implementation will be coordinated with the USFWS.
- Removal of trees and brush in the project area will be limited to the smallest amount needed to meet the objectives of the project. This type of clearing consists of removal of invasive species and is likely to diminish over time. Loss of habitat is not likely after

initial construction. Permanent loss will be compensated if applicable, and native vegetation will be planted and managed, which will improve habitat conditions.

- To eliminate attraction of predators to protected animals, all food-related trash items such as wrappers, cans, bottles, and food scraps, will be disposed of in closed containers and removed daily from the project site.
- All staging of equipment, materials, and vehicles will occur at one of two staging areas; the staging areas are currently cleared of vegetation and covered with aggregate.
- The area to be disturbed should be minimized through limiting materials deliveries and equipment on-site to only those needed for effective project implementation.
- Construction and maintenance activities will be conducted only during daylight hours to avoid noise and lighting issues at night; noise levels for construction and maintenance should be minimized; all generators should be in baffle boxes (a sound-resistant box that is placed over or around a generator), have an attached muffler, or use other noise-abatement methods in accordance with industry standards.
- Vehicle traffic associated with restoration efforts will remain on established roads and reduce speeds to the maximum extent practicable.
- All access routes into and out of the project disturbance area should be flagged, and no construction outside of those boundaries should be authorized.
- No restoration activities will occur in November or December to avoid peak reproductive season for the Gulf Coast jaguarundi.
- Impermeable fences/barriers will not be constructed that bisect or fragment jaguarundi or ocelot dispersal corridors or prevent access to fresh water.
- Individual federally listed animals found in the project area will not be harassed and will be allowed to leave of their own volition. An individual with the authority to stop construction activities will be on-site during construction activities, and will halt all activities immediately upon report of ocelot or jaguarundi sighting. USFWS will be contacted immediately if a federally-listed animal is seen in the project vicinity
- Removal of wetland habitat or riparian vegetation beyond the design parameters will be avoided. Removal of dense thorn scrub will be minimized and restricted to the design parameters. When removing scrub habitat, root systems will be left intact where possible.
- All herbicides will be applied in the presence of an herbicide applicator licensed in the State of Texas.
- Waste water (water used for project purposes that is contaminated with construction materials or water used for cleaning equipment and thus carries oils or other toxic materials or other contaminants) should also be stored in closed containers on-site until removed for disposal in accordance with state regulations.
- The project management plan will provide for a report describing the implementation of the BMPs and their effectiveness
- All personnel involved with the on-the-ground construction or maintenance for the proposed action will receive training in the affected species, the agreed upon BMPs, and the role of the construction monitor

8.2 VEGETATION AND WILDLIFE RESOURCES

Native vegetation in and around the Laredo Riverbend area would be avoided to the extent practicable, especially large-diameter trees. Tamarisk and Carrizo cane would continuously be removed and controlled within the restoration area. EO 13112 for Invasive Species would be followed for all new planting areas and areas that will be disturbed. All mechanical site preparation activities would include measures to minimize erosion and sedimentation into the existing aquatic habitats, including BMPs such as silt fences, erosion mats, etc. All site preparation activities would follow guidelines presented in EM 1110-2-1902 and EM 1110-2-1205. Erosion matting would be staked around plantings.

To provide nesting habitat for red-winged blackbird, herbaceous plantings would consist predominantly of giant bulrush and other species that would provide enough structure for nesting habitat. A locally acquired seed mix containing target grass and grass-like species would be spread in suitable areas along the excavation channels.

The Migratory Bird Treaty Act requires that federal agencies coordinate with the USFWS if construction activity would result in the “take” of a migratory bird. If construction or clearing activities were scheduled during the breeding season (March 1-September 1), surveys would be performed to identify active nests. If construction activities could result in the “take” of a migratory bird, coordination with the USFWS and the TPWD would be conducted, and applicable permits would be obtained prior to construction or clearing activities. Another BMP that would be considered is to schedule all construction activities outside the nesting season, thus negating the requirement for nesting bird surveys.

8.3 WATER RESOURCES

Since the proposed construction affects greater than 5 acres, a SWPPP would be necessary. Applicable NPDES, CWA, and Section 404/401 permit procedures would be completed prior to initiation of construction activities. The use of BMPs would be expected to reduce any potential adverse impacts on water resources. All site preparation activities would follow guidelines presented in EM 1110-2-1902 and EM 1110-2-1205.

8.4 LISTED SPECIES

All use of heavy equipment will be completed before May 15 or after August 1 to avoid disturbance of potential interior least tern nesting habitats. No restoration activities, including monitoring, will occur between November and December to avoid the peak reproductive season of Gulf Coast jaguarundi. All soil disturbances will be minimized to avoid damage to native vegetation that could provide cover to any ocelot or jaguarundi dispersing through the area. In order to minimize potential loss of felid prey species, the use of herbicides will be limited to the minimum amount necessary to achieve adequate control of Carrizo cane. In order to avoid sedimentation of the Rio Grande and potential habitat for the Texas hornshell, all mechanical site preparation activities will include measures to minimize erosion and sedimentation into the existing aquatic habitats, including BMPs such as silt fences, erosion mats, etc. All site preparation activities will follow guidelines presented in EM 1110-2-1902 and EM 1110-2-1205. Additionally, impermeable fences/barriers will not be constructed that bisect or fragment jaguarundi or ocelot dispersal corridors or prevent access to fresh water.

8.5 CULTURAL RESOURCES

Prior to any ground-disturbing activity, Section 106 consultation would be completed with the Texas SHPO. Through consultation with the Texas SHPO, the appropriate mitigation measures would be developed and implemented to minimize the impacts on cultural resources. A PA would be developed by the USACE in consultation with the Texas SHPO outlining the mitigation measures that need to be implemented to minimize impacts on historic properties from the implementation of the proposed NER Plan. This PA would be completed and signed by all involved federal parties prior to implementation of the proposed NER Plan. If possible, the preferred mitigation measure would be avoidance.

8.6 HAZARDOUS MATERIALS

At this time, no known or potential hazardous or toxic waste sites have been identified at or adjacent to any of the project sites. However, if evidence of hazardous waste or other contamination is discovered during construction, work shall be immediately halted until the suspicious materials are analyzed and identified by an approved laboratory. If the materials are determined to be hazardous, they shall be removed and transported to a licensed disposal facility following appropriate coordination with applicable regulatory agencies.

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SECTION 9.0
PROJECT IMPLEMENTATION

9.0 PROJECT IMPLEMENTATION

9.1 PROJECT SCHEDULE

The project schedule for the aquatic ecosystem restoration project is presented in Table 9-1.

Table 9-1. Project Milestone Schedule

Milestone	Percent Complete
Habitat Analysis	100
USFWS Planning Aid Letter	100
Complete ICA	100
Complete Alternative Formulation Briefing	100
Draft Report	95
Section 7 Consultation	25
Sponsor National Environmental Restoration Meeting	0
Start Public Review	0
Finish Public Review	0
Execute FONSI	0
Final Report	0
Request Section 206 Plans & Specs Funding	0
Initiate Plans & Specs	0
Initiate Construction	0
Complete Construction	0
Project Complete	0

The detailed schedule for the PED Phase, Construction Phase, and Close-out Phase are presented in Table 9-2.

Table 9-2. Schedule for PED Phase, Construction Phase, and Close-Out Phase

Phase and Task Description	Projected Start Date	Projected Completion Date
PED Phase		
Initiate Plans and Specifications	N/A	December 2013
95 percent Plans and Specifications	December 2013	February 2014
Execute Program Commitment Agreement	N/A	February 2014
Request Construction Funds	February 2014	March 2014
Construction Phase		
Initiate construction	August 2014	N/A
HYDRO2	August 2014	December 2014

Table 9-2, continued

Phase and Task Description	Projected Start Date	Projected Completion Date
DEPTH	August 2014	October 2014
SHORE	January 2015	February 2015
ERODE2	February 2015	February 2015
NEST	September 2015	September 2015
CANE2	August 2014	March 2016
TAM2	August 2014	March 2016
Construction Complete	N/A	May 2016
Establishment, Monitoring and Adaptive Management	April 2016	May 2019
Close-Out Phase		
Initiate Project Close-out	May 2019	N/A
Final Transition to Operations and Maintenance	N/A	May 2019
Completion Report	June 2019	August 2019

N/A – not applicable

9.2 COST APPORTIONMENT

Project costs would be shared between the Federal Government and the Local Sponsor, the City of Laredo (Table 9-3). Under Section 206 guidance, the non-federal, Local Sponsor interest shall provide 35 percent of the cost of construction of any project carried out under Section 206, including provision of all lands, easements, rights of way, and necessary relocations. Because recreation costs are less than 10 percent of the federal restoration cost share, the recreation costs are equally shared between the Federal Government and non-federal Local Sponsor. No more than $5 million in federal funds may be allotted under a Section 206 project. For the Laredo Riverbend Section 206 aquatic ecosystem restoration project, the Federal Government would be responsible for $2,002,078 and the Local Sponsor would be responsible for $717,473.

Table 9-3. Summary of Project Cost (dollars) Apportionment

Project Item	Restoration Costs (65/35)	Recreation Costs (50/50)	Total Project Costs
Total Project Cost	**2,877,059**	**263,978**	**3,141,037**
Federal Share	1,870,089	131,989	2,002,078
Sponsor Share	1,006,970	131,989	1,138,959
Sponsor Requirements			
Sponsor LERRD Credit	421,486	0	717,473
Cash Contribution	TBD	131,989	TBD

9.3 PROJECT COOPERATION AGREEMENT

The Project Cooperation Agreement (PCA) is a contract between the Federal Government and the non-federal Local Sponsor 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. The project PCA would be a model Section 206 agreement in all aspects except for the addition of minor recreation features, which would require USACE Headquarters approval. Appendix J provides a draft PCA.

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SECTION 10.0
PUBLIC INVOLVEMENT

10.0 PUBLIC INVOLVEMENT

10.1 AGENCY COORDINATION

This section discusses consultation and coordination that would occur during preparation of the draft and final versions of this document. This would include contacts that are made during the development of the proposed action and writing of the DPR/EA. Formal and informal coordination will be conducted with the following agencies:

- USFWS
- USEPA
- USACE
- Office of Border Patrol
- FEMA
- NRCS
- USIBWC
- Texas SHPO
- TPWD
- TCEQ
- City of Laredo
- THC
- LCC

10.2 PUBLIC REVIEW

A public scoping meeting was held at the City of Laredo's Environmental Services Department headquarters located at 619 Reynolds Street, Laredo, Texas on July 10, 2013. A copy of the Notice of Availability (NOA) that was published in the *Laredo Times* and comments provided at the meeting are included in Appendix K. The draft DPR/EA will be made available for public review for a period of 30 days, and the NOA will be published in the local newspaper. Proof of publication will be included in the final document. Comments received concerning the draft will also be included in the final document and changes will be incorporated into the final DPR/EA in Appendix K.

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SECTION 11.0
RECOMMENDATIONS

11.0 RECOMMENDATIONS

I propose that the recommended plan described in this DPR/EA be authorized for implementation under the authority of Section 206 of the WRDA of 1996, Public Law 104-303, 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, including an estimated cost of $263,978 for recreational features, is estimated to be $3,141,037.

Prior to the commencement of construction, local interests must agree to meet the requirements for Local Sponsor responsibilities as outlined in this report and future legal documents. The City of Laredo, Texas, has demonstrated that it has the authority and the financial capability to provide all Local Sponsor 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 or the perspective of higher review levels within the Executive Branch.

Charles H. Klinge, Jr.
Colonel, U.S. Army Corps of Engineers
District Engineer

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SECTION 12.0
REFERENCES

12.0 REFERENCES

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SECTION 13.0
LIST OF ACRONYMS/ABBREVIATIONS

13.0 LIST OF ACRONYMS/ABBREVIATIONS

μg/m3	micrograms per cubic meter
AACU	Average Annual Cost Unit
AAHUs	Average Annual Habitat Units
ATV	all-terrain vehicle
BEA	Bureau of Economic Analysis
BMP	best management practice
CAA	Clean Air Act
CANE	Remove Carrizo cane and plant native trees and shrubs
CBP	U.S. Customs and Border Protection
CEQ	Council on Environmental Quality
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CESWF	USACE, Fort Worth District
CFC	chlorofluorocarbon
CFR	Code of Federal Register
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalency
CWA	Clean Water Act
dB	decibel
dBA	A-weighted decibel
DEPTH	Excavate two largest ponds to a depth of 4 feet
DFW	deciduous forested wetland
DHS	Department of Homeland Security
DNL	day-night average sound level
DPR/EA	Detailed Project Report/Environmental Assessment
DRAIN	Replace low-water crossings with culverts
DSS	deciduous scrub/shrub
DSSW	deciduous scrub/shrub wetland
EC	eastern cottontail
EGM	Economic Guidance Memorandum
EM	Engineering Manual
EO	Executive Order
ER	Engineering Report
ERDC	Engineer Research and Development Center
ERODE	Remove roads and control erosion at head cut
ESA	Endangered Species Act
FCR	fire-cracked rock
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FPPA	Farmland Protection Policy Act
FR	Federal Register
FWOP	future without project
FWP	future with project
GHG	greenhouse gases
GIS	Geographic Information System
GPS	Global Positioning System

GSRC	Gulf South Research Corporation
HEP	Habitat Evaluation Procedures
HFC	hydrochlorofluorocarbon
HSI	Habitat Suitability Index Model
HTRW	hazardous, toxic, or radioactive waste
HU	Habitat Units
HUD	U.S. Department of Housing and Urban Development
ICA	Incremental Cost Analysis
LCC	Laredo Community College
LERRDS	lands, easements, rights of way, relocation, and disposal areas
LPST	leaking petroleum storage tanks
L/HW	lacustrine herbaceous wetland
m2/ha	square meters per hectare
mg/m3	milligrams per cubic meter
N2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NER	National Ecosystem Restoration
NEST	Create nesting habitat on barges in two largest ponds
NMFS	National Marine Fisheries Service
Nox	nitrous oxides
NPL	National Priorities List
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWP	nationwide permit
NWR	National Wildlife Refuge
OMRR&R	operation, maintenance, repair, replacement, and rehabilitation
P.L.	Public Law
PA	Programmatic Agreement
PCA	Project Cooperation Agreement
PCPI	per capita personal income
PED	planning, engineering, and design
PDT	project delivery team
PM-10	particulate matter less than 10 microns
PM-2.5	particulate matter less than 2.5 microns
ppb	part per billion
ppm	parts per million
PRP	preliminary restoration plan
RCRA	Resource Conservation and Recovery Act
ROI	region of influence
RTHL	Recorded Texas Historical Landmark
Rio Grande	Rio Grande River
SAL	State Archaeological Landmark
SHPO	State Historic Preservation Officer
SHORE	Create shallow wetland benches and points and plant native emergent vegetation
SIP	State Implementation Plan
SWPPP	stormwater pollution prevention plan
TAM	Remove tamarisk and plant native trees and shrubs
TCEQ	Texas Commission on Environmental Quality
THC	Texas Historical Commission

TPWD	Texas Parks and Wildlife Department
TY	Target Year
U.S.	United States
U.S.C.	U.S. Code
USACE	U.S. Army Corps of Engineers
USBP	U.S. Border Patrol
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USIBWC	U.S. Section, International Boundary and Water Commission
VE	Value Engineering
WRDA	Water Resources Development Act

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SECTION 14.0
LIST OF PREPARERS

14.0 LIST OF PREPARERS

The following people were involved in the preparation of this DPR/EA.

Name	Agency/ Organization	Discipline/Expertise	Experience	Role in Preparing DPR/EA
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APPENDIX A
HABITAT EVALUATION PROCEDURES MODELS SELECTION

LAREDO RIVERBEND 206 RESTORATION PROJECT:
HABITAT EVALUATION PROCEDURES MODELS SELECTION

Prepared for:

U.S. Army Corps of Engineers

Fort Worth District

December 3, 2010

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1.0 Background

The Continuing Authorities Program (CAP) and Section 206 of the Water Resources Development Act of 1996 authorizes the United States (U.S.) Army Corps of Engineers (USACE), Fort Worth District (CESWF) to participate in the development and implementation of projects to restore terrestrial and aquatic habitats that have been significantly disturbed, degraded, or altered. The proposed aquatic ecosystem restoration project at Laredo Riverbend in Laredo, Texas would be cost-shared with the City of Laredo.

A Feasibility Study for this project began in 2002, and a Preliminary Draft Detailed Project Report and Environmental Assessment (DPR/EA) was submitted in September of 2006. As part of the DPR/EA, Habitat Evaluation Procedures (HEP) were conducted to evaluate the suitability of existing habitats and to predict habitat suitability given the implementation of measures designed to improve habitat quality. An Incremental Cost Analysis (ICA) was conducted to determine the most cost effective plan (i.e., combination of measures) for ecosystem restoration of the Laredo Riverbend area. Since in 2006, habitats in the Laredo Riverbend have been substantially altered by Customs and Border Protection’s (CBP) ongoing Laredo Cane Removal Project, a significant flood event occurring in July 2010, and by continued encroachment of giant reed (*Arundo donax*) throughout much of the area. In March 2010, a meeting was held between CESWF and the City of Laredo to discuss and resolve issues regarding the reinitiation of the ecosystem restoration project. Given both the natural and anthropogenic alterations that have occurred within the Laredo Riverbend area, the interested parties determined that the 2006 baseline of habitat conditions, selection of restoration measures, and cost evaluation are no longer valid.

2.0 Location

The Laredo Riverbend is a large natural area located in the floodplain of the Rio Grande River, southwest of downtown Laredo (Figure 1). The area is bordered by floodplain both up and down stream and by developed lands, including Laredo Community College and residential areas to the northeast. Until the mid-1950s, Laredo Riverbend was the site of a sand and gravel mining operation. Presently, there remain seven sand and gravel quarry pits ranging in size from 0.2 to 5 acres with estimated depths of 1 to 4 feet. Mining activities also created 45-foot high bluffs bordering two of the larger pits, and spoil mounds that are scattered throughout the area. Most of the natural vegetation in the area has been substantially degraded, and numerous trails traverse the area from the river to the residential areas in the northeast.

Invasive plants dominate the area and include giant reed, buffelgrass (*Pennisetum ciliare*), saltcedar (*Tamarix* spp.), bermuda grass (*Cynodon dactylon*), chinaberry (*Melia azedarach*), and tree tobacco (*Nicotiana glauca*). Prior to CBP's installation of a post and cable fence running parallel to the river, use of All Terrain Vehicles (ATVs) by both law enforcement and the general public created numerous trails throughout the area. The area is a major corridor for non-documented immigrants traveling from the Rio Grande into the residential communities to the east, and prolific pedestrian traffic continues to maintain the extensive trail system. Additionally, the Laredo Riverbend area is degraded by past illegal dumping of construction and industrial waste (i.e., concrete rubble and tires).

Figure 1: Laredo Riverbend Location Map

GSRC
November 2010

3.0 Preliminary Restoration Plan

The 2006 DPR/EA Recommended Plan included invasive plant suppression, enhancement of existing wetlands, erosion control, establishment of native vegetation, removal of urban waste, fencing, and construction of trails and natural resource observation and interpretive areas. Each of these components is carried forward as the Preliminary Plan for ecosystem restoration under this renewed effort, except for the fencing measure which has been completed by CBP.

The lacustrine, herbaceous wetland, and deciduous shrub/scrub wetland habitats located within Laredo Riverbend are associated with abandoned gravel pits, shallow margins around these pits, and secondary drainages within the floodplain. The lacustrine habitats were created by excavation of gravel to a depth below the aquifer of the Rio Grande. These abandoned gravel pits are permanently flooded at a shallow depth. The herbaceous wetland habitats occur in low areas around the gravel pits. Deciduous shrub/scrub wetlands occur in low areas around the gravel pits and along the secondary drainage systems which carry stormwater runoff and floodflows from the floodplain to the Rio Grande. The wetland habitats are permanently saturated from the shallow aquifer and are intermittently to seasonally flooded by locally high rainfall events, high flows in the Rio Grande, or both. The upland habitats are rarely inundated and occur on soils with high runoff and low permeability.

The goal of the PRP is to create an expansive, shallow wetland system between and near the existing gravel pits that is suitable for avian species such as wading birds, waterfowl, and songbirds. Implementation of the PRP would result in replacement of upland habitats with shallow herbaceous and deciduous shrub/scrub wetlands that are semi-permanently flooded, to intermittently exposed. The resulting wetland system would not be highly suitable for fishes. The volume of excavation required to achieve water quality conditions (e.g., water clarity, dissolved oxygen, temperature, and productivity) capable of supporting an abundant fish population is assumed to be cost prohibitive.

In an effort to improve the suitability of deciduous shrub/scrub and deciduous forest habitats, the 2006 PRP included a measure to remove and supress non-native buffelgrass. Preliminary analyses showed that replacing buffelgrass with native grasses would require a substantial cost. Furthermore, the mechanical removal buffelgrass and herbicide applications would likely result in substantial adverse impacts on the short-term suitability of deciduous shrub/scrub and forest habitats while producing minimal gains in long-term suitability. However, the extensive stands of giant reed and tamarisk currently provide minimally suitable habitat quality. Habitat quality in these areas could be improved through measures that increase the structural diversity of the vegetation. Measures to remove homogenous stands of vegetation and establish habitats with greater structural diversity would result in minimal short-term losses and substantial long-term gains in habitat suitability.

4.0 Habitat Evaluation

Following USACE project planning guidelines (Engineering Report 1105-2-100), habitat quality with and without the project must be evaluated to determine National Ecosystem Restoration (NER) benefits. The most common method of evaluating habitat quality is use of HEP, which utilize species-based Habitat Suitability Index (HSI) models to derive indicators of suitability based on observed and projected physical conditions of the habitat. HSI models selected for use in HEP guide the development of alternative measures for ecosystem restoration. Measures are developed which are expected to improve specific habitat conditions identified by the selected HSI models. The combination of alternative measures which provide the most cost effective gains in habitat quality will be selected as the NER plan. Thus, the selection of HSI models has a substantial influence on the types of habitats and the specific conditions of those habitats that will be created as a result of implementing the NER plan.

Under the 2006 DPR/EA PRP, five HSI models were proposed for the evaluation of Laredo Riverbend habitats; American coot (*Fulica americana*) (Allen 19785), fox squirrel (*Sciurus niger*) (Allen 19872), red-winged blackbird (*Agelaius phoeniceus*) (Short 19785), slider (*Pseudemys scripta*) (Morreale 1986), and warmouth (*Lepomis gulosus*) (McMahon 19784). The renewal of the project provides an opportunity to review the model selection and, if necessary, refine this selection to provide a better representation of existing and future habitats at Laredo Riverbend. Following the HSI model habitat classification system (United States Fish and Wildlife Service [USFWS] 1981), the applicability of the previously selected HSI models to each of the existing and future habitat types present at Laredo Riverbend are presented in Table 1.

Table 1. Applicability of Selected HSI Models under 2006 DPR/EA PRP to Existing and Future Habitat Types at Laredo Riverbend

Model	Lacustrine	Herbaceous Wetland	Deciduous Shrub/Scrub Wetland	Deciduous Forested Wetland	Deciduous Shrub/Scrub
American Coot	applicable	applicable			
Fox Squirrel				applicable	
Red-winged Blackbird		applicable			
Slider	applicable	applicable	applicable	applicable	
Warmouth	applicable				

The two avian models selected under the 2006 DPR/EA cannot be utilized to evaluate each of the existing and future habitat types at Laredo Riverbend. The two selected avian models prefer shallow, herbaceous wetlands that are usually inundated throughout the year. The greatest difference between the two models is the effect of emergent vegetation growth forms on habitat suitability. The American coot prefers matt forming species, while the red-wing blackbird prefers broad-leafed monocots such as cattails (*Typha* spp.) The great egret (*Ardea alba*) HSI model (Chapman and Howard 1984) for feeding habitat is very similar to the American coot and red-winged blackbird model, but also evaluates water depth. Additionally, the great egret breeding habitat model provides a method for evaluating breeding habitat conditions. Great egrets nest on islands of deciduous shrub/scrub habitat. Inclusion of the great egret nesting model would guide the development of measures to create islands within the gravel pits. In order to evaluate existing and future deciduous shrub/scrub wetlands, it is recommended that the yellow warbler (*Dendroica petechia*) HSI model (Schroeder 1982) be included in the HEP fo r this project.

Under the assumptions of the 2010 PRP, it is recommended that the warmouth and slider turtle HSI models be removed from the HEP. The feasibility of developing high quality lacustrine habitats at Laredo Riverbend is limited by the substantial costs and potentially adverse effects of the extensive and deep excavation that would be required. Although the slider turtle model is more tolerant of habitat conditions occurring in shallow lacustrine systems and could be used to evaluate all of the existing and future, non-upland habitats, this species prefers conditions that are not optimal for the recommended bird models. If the slider turtle model were included in the HEP, some gains in habitat quality would be compromised between the slider turtle and avian models.

In order to evaluate existing conditions, at least one HSI model applicable to the evaluation of deciduous shrub/scrub habitats must be selected. Although the removal and control of the buffelgrass colonies at Laredo Riverbend is not a cost effective measure, the replacement of large stands of giant reed with native trees and shrubs could result in cost effective improvement of habitat quality. An HSI model should be selected that favors the replacement of habitat with low structural variability (i.e., monocultures), with a structurally diverse habitat (e.g., native hackberry [*Celtis laevigata*] forest). The lack of mast producing species, such as oak (*Quercus* spp.) and hickory (*Carya* spp.), limits the existing and potential suitability of upland habitats for the fox squirrel. There are two HSI models for mammalian species who's range overlaps Laredo Riverbend and do not depend on mast production of trees: beaver (*Castor canadensis*) and eastern cottontail (*Sylvilagus floridanus*). Because the beaver HSI model is not applicable to upland habitats, and because the beaver is a less desirable species in urban floodplains, utilization of this model is not recommended. The eastern cottontail model evaluates upland habitat based on the relative cover of trees, shrubs, and herbs. A measure to replace non-native species, such as giant reed and tamarisk, with native species, such as hackberry, may provide cost effective gains in habitat quality as measured by the eastern cottontail HSI model.

Under the 2010 PRP, five models are recommended for use in HEP (Table 2). The selection includes one waterfowl, one wading bird, two songbirds, and one mammal. Although some of the habitat conditions evaluated by these models are redundant, each model includes at least one condition that is specific to the given model. These five HSI models are applicable to evaluation of all existing and future habitat types at Laredo Riverbend under the 2010 PRP. Based on the habitat preferences specific to each HSI model, the development of a NER plan would require measures to achieve the goals of the PRP.

Table 2. Applicability of Selected HSI Models under 2010 PRP to Existing and Future Habitat Types at Laredo Riverbend

Model	Lacustrine	Herbaceous Wetland	Deciduous Shrub/Scrub Wetland	Deciduous Forested Wetland	Deciduous Shrub/Scrub
American Coot	applicable	applicable			
Red-winged Blackbird		applicable			
Great Egret	applicable	applicable	applicable		
Yellow Warbler			applicable		
Eastern Cottontail			applicable	applicable	applicable

5.0 Summary

Upon agreement of the proposed selection of HSI models, CESWF anticipates conducting a field survey to evaluate existing site conditions. Once baseline habitat conditions are established, measures which will improve habitat conditions can be developed. The selected HSI models would be used to evaluate restoration measures and determine the appropriate measures for HEP.

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APPENDIX B
HABITAT EVALUATION PROCEDURES DATA

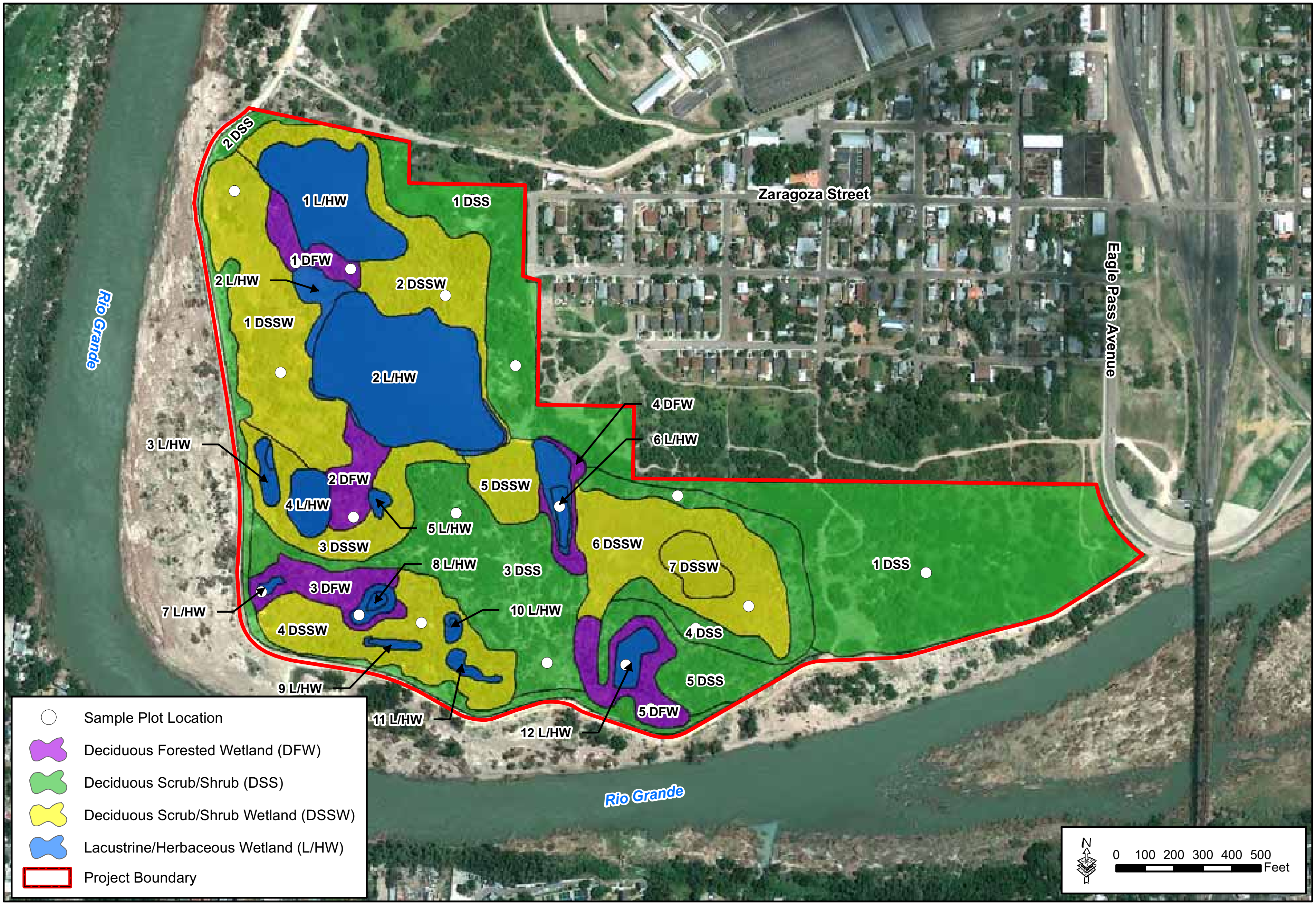

Figure B-1: Sample Plot Locations and Habitat Polygons

November 2012

Figure B-2. Sample Data Sheet for Collection of Habitat Suitability Index (HSI) Model Variables

Site # ________ Name: ________________________________

Cover Type: L/HW DFW DSSW DSS

PIC #s N ________ E ________ S ________ W ________

Water Regime	Explain:
1 Permanently Flooded	
2 Intermittently Exposed	
3 Semipermanently Flooded	
4 Seasonally Flooded	
5 Temporarily Flooded	
6a Saturated	
6b/7 Intermittently Flooded	

% of area with water 4 to 9 inches deep ________

mean water depth in (feet) ________

water temperature (C) ________

Canopy Cover (%)*		Vegegetation Characteristics	
________	emergent and submerged	% cover along shoreline	________
________	persistent emergent	broad leaf monocots dominant?	________
________	herbaceous	% shrubs hydrophtic	________
________	shrub	average shrub height (feet)	________
________	tree	mean woody height in DFW (feet)	________

% of aquatic veg in water 4 to 9 inches deep ________

Patchiness of emergent vegetation: nearly equal mix / mostly vegetation / mostly water

Table B-1a. Summary of Baseline (TY0) Area, Habitat Suitability Index (HSI), and Habitat Units (HU) by Habitat

Habitat	Area	Habitat Units (HU)*								Total Habitat HU
		ST	WM	AC	RWB	GE f	YW	EC	LT**	
L/HW	12.37	3.73	4.12	2.16	3.71	3.39	-	-	-	3.42
DFW	5.46	0.33	-	-	-	-	-	3.16	-	1.74
DSSW	23.66	1.55	-	-	-	-	9.34	18.10	-	9.66
DSS	33.57	-	-	-	-	-	-	33.22	-	33.22
Nesting	0.16	-	-	-	-	-	-	-	0.03	0.01
Roads and Trails	1.50	-	-	-	-	-	-	-	-	0.00
Headcut Sediment Plume	0.10	-	-	-	-	-	-	-	-	0.00
Total	**76.82**									**48.06**

* HUs are calculated for each patch by first calculating the HU of each model used in the patch an then averaging the HU produced by each model; thus, there is no HIS for all L/HW habitats but several HSIs for each patch of L/HW habitat (Tables B-1b through B-1f)

** Existing tern nesting habitat is assumed to be present once every 10 years.

Table B-1b. Baseline (TY0) Area, Habitat Suitablity Index (HSI) , and Habitat Units (HU) of L/HW Habitat by Patch and Model

Patch	Area	WM		ST		AC		RWB		GEf		Average Patch HSI	Average Patch HU
		HSI	HU	HSI	HU	HSI	HU	HSI	HU	HSI	HU		
1	3.00	0.33	1.00	0.29	0.87	0.16	0.49	0.30	0.90	0.19	0.56	0.25	0.76
2	6.29	0.33	2.10	0.39	2.43	0.22	1.35	0.30	1.89	0.31	1.96	0.31	1.95
3	0.30	0.33	0.10	0.89	0.02	0.10	0.03	0.30	0.09	0.46	0.14	0.42	0.07
4	0.67	0.33	0.22	0.10	0.06	0.11	0.07	0.30	0.20	0.22	0.15	0.21	0.14
5	0.12	0.33	0.04	0.06	0.01	0.05	0.01	0.30	0.04	0.30	0.04	0.21	0.03
6	0.72	0.33	0.24	0.33	0.24	0.19	0.13	0.30	0.21	0.24	0.17	0.28	0.20
7	0.07	0.33	0.02	0.06	0.00	0.05	0.00	0.30	0.02	0.30	0.02	0.21	0.02
8	0.31	0.33	0.10	0.18	0.06	0.09	0.03	0.30	0.09	0.15	0.05	0.21	0.06
9	0.14	0.33	0.05	0.00	0.00	0.00	0.00	0.30	0.04	0.30	0.04	0.19	0.03
10	0.13	0.33	0.04	0.06	0.01	0.13	0.02	0.30	0.04	0.59	0.07	0.28	0.04
11	0.18	0.33	0.06	0.06	0.01	0.05	0.01	0.30	0.05	0.30	0.05	0.21	0.04
12	0.45	0.33	0.15	0.06	0.03	0.05	0.02	0.30	0.13	0.30	0.13	0.21	0.09
Total	**12.37**		**4.12**		**3.73**		**2.16**		**3.71**		**3.39**	**0.25**	**3.42**

Table B-1c. Baseline (TY0) Area, Habitat Suitability Index (HSI) , and Habitat Units (HU) of DFW Habitat by Patch and Model

Patch	Area	ST		EC		Average Patch HSI	Average Patch HU
		HSI	HU	HSI	HU		
1	0.88	0.06	0.05	0.32	0.28	0.19	0.17
2	1.07	0.06	0.06	0.32	0.34	0.19	0.20
3	1.39	0.06	0.08	0.46	0.63	0.26	0.36
4	0.51	0.06	0.03	0.58	0.29	0.32	0.16
5	1.61	0.06	0.10	1.00	1.61	0.53	0.85
Total	**5.46**		**0.33**		**3.16**	**0.30**	**1.74**

Table B-1d. Baseline (TY0) Area, Habitat Suitabilty Index (HSI), and Habitat Units (HU) of DSSW Habitat by Patch and Model

Patch	Area	ST		YW		EC		Average Patch HIS	Average Patch HU
		HSI	HU	HSI	HU	HSI	HU		
1	5.93	0.06	0.36	0.00	0.00	0.51	3.02	0.19	1.13
2	4.02	0.06	0.24	0.44	1.75	0.74	2.97	0.41	1.65
3	2.87	0.06	0.17	0.53	1.52	0.95	2.73	0.51	1.47
4	3.97	0.06	0.24	0.48	1.92	0.86	3.41	0.47	1.86
5	0.98	0.06	0.06	0.64	0.63	0.90	0.88	0.53	0.52
6	4.99	0.06	0.30	0.59	2.94	0.86	4.30	0.50	2.51
7	0.91	0.20	0.18	0.64	0.58	0.86	0.78	0.57	0.52
Total	**23.66**		**1.55**		**9.34**		**18.10**	**0.46**	**9.66**

Table B-1e. Baseline (TY0) Area, HSI, and HU of DSS Habitats

Polygon	Area	EC	
		HSI	HU
1	18.78	1.00	18.78
2	2.87	0.88	2.53
3	6.77	1.00	6.77
4	2.81	1.00	2.81
5	2.33	1.00	2.33
Total	**33.57**	**0.98**	**33.22**

Table B-1f. Baseline (TY0) Area, HSI, and HU of Nesting Habitats

Polygon	Area	LT	
		HSI	HU
Barge1	0.05	0.20	0.01
Barge2	0.11	0.20	0.02

Table B-2a. Warmouth (WM) Model Assumptions for L/HW Habitat*

Variable	Assumptions (optimum)	Condition	1 L/HW	2 L/HW	3 L/HW	4 L/HW	5 L/HW	6 L/HW	7 L/HW	8 L/HW	9 L/HW	10 L/HW	11 L/HW	12 L/HW	13 L/HW
Area	Lacustrine/ Herbaceous Wetland Habitat	FWOP	3.00	6.29	0.30	0.67	0.12	0.72	0.07	0.31	0.14	0.13	0.18	0.45	0.00
(acres)		HYDRO2	3.29	0.00	0.00	0.00	0.00	1.04	0.00	0.00	0.00	0.00	0.00	0.00	1.27
V1	**Warm summer temperatures**	**Condition**	**1 L/HW**	**2 L/HW**	**3 L/HW**	**4 L/HW**	**5 L/HW**	**6 L/HW**	**7 L/HW**	**8 L/HW**	**9 L/HW**	**10 L/HW**	**11 L/HW**	**12 L/HW**	**13 L/HW**
binomial	Optimum = 25 to 30 °C	FWOP	0	0	0	0	0	0	0	0	0	0	0	0	0
	DEPTH would reduce water temperatures to optimum in L/HW 1 and 2	DEPTH	1	1											
V2	**Extensive shallow littoral area**	**Condition**	**1 L/HW**	**2 L/HW**	**3 L/HW**	**4 L/HW**	**5 L/HW**	**6 L/HW**	**7 L/HW**	**8 L/HW**	**9 L/HW**	**10 L/HW**	**11 L/HW**	**12 L/HW**	**13 L/HW**
binomial	Optimum < 40 %	FWOP	1	1	1	1	1	1	1	1	1	1	1	1	0
V3	**High amounts of aquatic vegetation or other cover present along the shoreline**	**Condition**	**1 L/HW**	**2 L/HW**	**3 L/HW**	**4 L/HW**	**5 L/HW**	**6 L/HW**	**7 L/HW**	**8 L/HW**	**9 L/HW**	**10 L/HW**	**11 L/HW**	**12 L/HW**	**13 L/HW**
binomial	Optimum > 40%	FWOP	0	0	0	0	0	0	0	0	0	0	0	0	0
	DEPTH would improve aquatic vegetation cover to optimum in L/HW 10	DRAIN										1			
	HYDRO1 would improve aquatic vegetation cover to optimum in L/HW 3, 4, and 12	HYDRO1			1	1								1	
	HYDRO1 would improve aquatic vegetation cover to optimum in L/HW 6, 10, and 12 and restore aquatic vegetation cover to optimum in L/HW 13	HYDRO2						1				1		1	1
	SHORE1 would improve aquatic vegetation cover to optimum in L/HW 1 and 2	SHORE1	1	1											
	HYDRO2 and SHORE1 would improve aquatic vegetation cover to optimum in L/HW 1 and 2	HYDRO2 and SHORE1	1	1											

* Blank cells indicate no change from FWOP condition

Table B-2b. Slider Turtle (ST) Model Assumptions for L/HW Habitat*

Variable	Assumptions	Condition	1 L/HW	2 L/HW	3 L/HW	4 L/HW	5 L/HW	6 L/HW	7 L/HW	8 L/HW	9 L/HW	10 L/HW	11 L/HW	12 L/HW	13 L/HW
Area	**Lacustrine/HW**	FWOP	3.00	6.29	0.30	0.67	0.12	0.72	0.07	0.31	0.14	0.13	0.18	0.45	0.00
acres		HYDRO2	3.29			0.00	0.00	1.04							1.27
V1	**Percent cover of emergent and submerged vegetatior**	**Condition**	**1 L/HW**	**2 L/HW**	**3 L/HW**	**4 L/HW**	**5 L/HW**	**6 L/HW**	**7 L/HW**	**8 L/HW**	**9 L/HW**	**10 L/HW**	**11 L/HW**	**12 L/HW**	**13 L/HW**
(%)	Optimum > 90%	FWOP	10	21	14	2	0	15	0	0	0	26	0	0	0
	DRAIN would improve cover of emergent and submerged vegetation L/HW 7-12 and	DRAIN							20	20	20	40	20	20	
	HYDRO1 would improve cover of emergent and submerged vegetation in L/HW 1, 3, 4, 6, 7, and 12	HYDRO1	20		40	40		30						40	
	HYDRO2 would improve cover of emergent and submerged vegetation in L/HW 1, 2, and 6-12 and would restore L/HW 13 with a percent cover of emerged and sumberged vegetation of 40%	HYDRO2	45	30				60	80	80	50	80	50	80	80
	SHORE1 would improve cover of emergent and submerged vegetation in L/HW 1 and 2	SHORE1	45	30											
	HYDRO2 AND SHORE1 would improve emergent and submerged vegetation percent cover in L/HW 1 and 2	HYDRO2 and SHORE1	60	50											
V2	**Water Depth**	**Condition**	**1 L/HW**	**2 L/HW**	**3 L/HW**	**4 L/HW**	**5 L/HW**	**6 L/HW**	**7 L/HW**	**8 L/HW**	**9 L/HW**	**10 L/HW**	**11 L/HW**	**12 L/HW**	**13 L/HW**
(meters)	Optimum = 1 to 2	FWOP	0.61	0.85	0.15	0.24	0.15	0.64	0.15	0.45	0.15	0.15	0.15	0.15	0
	DEPTH would improve water depth to optimum levels	DEPTH	1	1											
	HYDRO2 would restore L/HW 13 with a depth of 0.35 meters	HYDRO2													1
V3	**Water Regime**	**Condition**	**1 L/HW**	**2 L/HW**	**3 L/HW**	**4 L/HW**	**5 L/HW**	**6 L/HW**	**7 L/HW**	**8 L/HW**	**9 L/HW**	**10 L/HW**	**11 L/HW**	**12 L/HW**	**13 L/HW**
index	Optimum = a (permanently flooded)	FWOP	a	a	d	a	d	a	d	a	e	d	d	d	
	HYDRO2 would improve L/HW 7 and 12 to a semi-permanently flooded water regime and would restore L/HW 13 to a intermittently exposed water regime	HYDRO2							c					c	b
V4	**Water Temperature**	**Condition**	**1 L/HW**	**2 L/HW**	**3 L/HW**	**4 L/HW**	**5 L/HW**	**6 L/HW**	**7 L/HW**	**8 L/HW**	**9 L/HW**	**10 L/HW**	**11 L/HW**	**12 L/HW**	**13 L/HW**
index	Opitmum = 25 to 30 °C	FWOP	e	e	e	e	f	e	f	e	g	f	f	f	
	DEPTH would improve water temperatures in L/HW 1 and 2 to optimum levels	DEPTH	d	d											
	HYDRO2 would restore L/HW 13 to a wetland with slightly less than optimum water temperatures	HYDRO2													e

* Blank cells indicate no change from FWOP condition

Table B-2b (continued). Slider Turtle (ST) Model Assumptions for DFW and DSSW*

Variable	Assumptions	Condition	DFW1	DFW2	DFW3	DFW4	DFW5	DFW6	DSSW1	DSSW2	DSSW3	DSSW4	DSSW5	DSSW6	DSSW7	DSSW8	DSSW9	DSSW10	DSSW11	DSSW12
Area	**DFW or DSSW**	FWOP	0.88	1.07	1.39	0.51	1.61	0.00	5.93	4.02	2.87	3.97	0.98	4.99	0.91	0.00	0.00	0.00	0.00	0.00
acres		HYDRO2 and TAM2	0.00	0.00	0.00	0.00	0.00	0.41	5.93	3.78	2.55	3.97	0.98	4.99	0.91	0.81	0.20	1.39	0.51	1.76
		TAM1 or TAM2	0.00	0.41	0.00	0.00	0.00	0.00	5.93	4.02	2.87	3.97	0.98	4.99	0.91	0.88	1.07	1.39	0.51	1.61
		HYDRO2	0.00	0.41	0.00	0.00	0.00	0.00	5.93	3.78	2.55	3.97	0.98	4.99	0.91	0.81	0.20	1.39	0.51	1.76
V1	**Percent cover of emergent and submerged vegetation**	**Condition**	**DFW1**	**DFW2**	**DFW3**	**DFW4**	**DFW5**	**DFW6**	**DSSW1**	**DSSW2**	**DSSW3**	**DSSW4**	**DSSW5**	**DSSW6**	**DSSW7**	**DSSW8**	**DSSW9**	**DSSW10**	**DSSW11**	**DSSW12**
(%)	Optimum > 90%	FWOP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	HYDRO1 would improve cover of emergents in DSSW 1, 3, 5, 6, and 7	HYDRO1 (TY1, 10, 50)							5		20		20	20	35					
	TAM1 or TAM2 will restore DSSW (8 - 12) with low cover of emergents	TAM1 or TAM2 (TY1, 10, 50)														15	15	15	15	15
	HYDRO2 will restore DSSW (8 - 12) with moderate cover of emergents and improve cover of emergents in DSSW 1, 3, 5, 6, and 7	HYDRO2 (TY1, 10, 50)							15		35		35	35	40	35	35	35	35	35
	HYDRO2 and TAM2 will restore DFW6 as optimum nesting habitat for GE	HYDRO2 and TAM2						15	15											
	CANE1 and CANE2 will restore DSSW 1 with low cover of emergents	CANE1 or CANE2 (TY1, 10, 50)							15											
	CANE1 or CANE2 and HYDRO1 or HYDRO2 will restore DSSW with moderate cover of emergents	CANE1 or CANE3 and HYDRO1 or HDYRO2 (TY1, 10, 50)							35											
V2	**Water Depth**	**Condition**	**DFW1**	**DFW2**	**DFW3**	**DFW4**	**DFW5**	**DFW6**	**DSSW1**	**DSSW2**	**DSSW3**	**DSSW4**	**DSSW5**	**DSSW6**	**DSSW7**	**DSSW8**	**DSSW9**	**DSSW10**	**DSSW11**	**DSSW12**
(meters)	Optimum = 3.3 to 6.6	FWOP	0.15	0.15	0.15	0.15	0.15	0	0.15	0.15	0.15	0.15	0.15	0.15	0.5	0	0	0	0	0
	HYDRO2 would restore DSSW (8 - 12) with a flooding depth of approximately 0.5 meters	HYDRO2 (TY1, 10, 50)														0.5	0.5	0.5	0.5	0.5
V3	**Water Regime**	**Condition**	**DFW1**	**DFW2**	**DFW3**	**DFW4**	**DFW5**	**DFW6**	**DSSW1**	**DSSW2**	**DSSW3**	**DSSW4**	**DSSW5**	**DSSW6**	**DSSW7**	**DSSW8**	**DSSW9**	**DSSW10**	**DSSW11**	**DSSW12**
index	Optimum = a (permanently flooded)	FWOP	e	e	e	e	e	e	e	e	e	e	e	e	d	e	e	e	e	e
	HYDRO2 would restore DSSW (8 - 12) with a water regime of d - seasonally flooded	HYDRO2 (TY1, 10, 50)														d	d	d	d	d
V4	**Water Temperature**	**Condition**	**DFW1**	**DFW2**	**DFW3**	**DFW4**	**DFW5**	**DFW6**	**DSSW1**	**DSSW2**	**DSSW3**	**DSSW4**	**DSSW5**	**DSSW6**	**DSSW7**	**DSSW8**	**DSSW9**	**DSSW10**	**DSSW11**	**DSSW12**
index	Opitmum = 25 to 30 °C	FWOP	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e
	None of the proposed measures would affect water temperature																			

* Blank cells indicate no change from FWOP condition

Table B-2c. Red-winged Blackbird (RWB) Model Assumptions for L/HW Habitat *

Variable	Assumptions	Condition	1 L/HW	2 L/HW	3 L/HW	4 L/HW	5 L/HW	6 L/HW	7 L/HW	8 L/HW	9 L/HW	10 L/HW	11 L/HW	12 L/HW	13 L/HW
Area	**Herbaceous Wetland**	**FWOP**	3.00	6.29	0.30	0.67	0.12	0.72	0.07	0.31	0.14	0.13	0.18	0.45	0.00
(acres)		HYDRO2	3.29			0.00	0.00	1.04							1.27
Condition	**Condition**	**Condition**	**1 L/HW**	**2 L/HW**	**3 L/HW**	**4 L/HW**	**5 L/HW**	**6 L/HW**	**7 L/HW**	**8 L/HW**	**9 L/HW**	**10 L/HW**	**11 L/HW**	**12 L/HW**	**13 L/HW**
	Optimum = a	FWOP	b	b	b	b	b	b	b	b	b	b	b	b	0
	HYDRO1 would improve L/HW 3 to optimum levels	HYDRO1 (TY1, 10, 50)			a										
	HYDRO2 would improve L/HW 3,6, 7, 8, and 12 and restore L/HW 13 to optimum levels	HYDRO2 (TY1, 10, 50)			a			a	a	a				a	a
V1	**Growth form of emergent vegetation**	**Condition**	**1 L/HW**	**2 L/HW**	**3 L/HW**	**4 L/HW**	**5 L/HW**	**6 L/HW**	**7 L/HW**	**8 L/HW**	**9 L/HW**	**10 L/HW**	**11 L/HW**	**12 L/HW**	**13 L/HW**
binary	Optimum = 1 (broad leaf monocots)	FWOP	1	1	1	0.1	0.1	0.1	0.1	0.1	1	1	0.1	0.1	0
	HYDRO2 would improve L/HW 6-8 and restore L/HW 13 to optimum levels	HYDRO2 (TY1, 10, 50)						1	1	1					1
V2	**Flood frequency**	**Condition**	**1 L/HW**	**2 L/HW**	**3 L/HW**	**4 L/HW**	**5 L/HW**	**6 L/HW**	**7 L/HW**	**8 L/HW**	**9 L/HW**	**10 L/HW**	**11 L/HW**	**12 L/HW**	**13 L/HW**
binary	Optimum = 1 (semipermanently flooded)	FWOP	1	1	0.1	1	1	1	0.1	1	1	0.1	0.1	0.1	0
	HYDRO1 would improve L/HW 3 to optimum levels	HYDRO1 (TY1, 10, 50)			1										
	HYDRO2 would improve L/HW 3 and 7 and restore L/HW 13 to optimum levels	HYDRO2 (TY1, 10, 50)			1				1						1
V3	**Presence of Carp**	**Condition**	**1 L/HW**	**2 L/HW**	**3 L/HW**	**4 L/HW**	**5 L/HW**	**6 L/HW**	**7 L/HW**	**8 L/HW**	**9 L/HW**	**10 L/HW**	**11 L/HW**	**12 L/HW**	**13 L/HW**
binary	Optimum = 1 (carp absent)	FWOP	0.1	0.1	1	1	1	1	1	1	1	1	1	1	0
	The presence of carp would not be affected by any measure.														
V4	**Presence of damselfly and dragonfly larvae**	**Condition**	**1 L/HW**	**2 L/HW**	**3 L/HW**	**4 L/HW**	**5 L/HW**	**6 L/HW**	**7 L/HW**	**8 L/HW**	**9 L/HW**	**10 L/HW**	**11 L/HW**	**12 L/HW**	**13 L/HW**
binary	Optimum = 1 (larvae present)	FWOP	1	1	1	1	1	1	1	1	1	1	1	1	0
	It is assumed that larvae would be present under all with project conditions														
V5	**Patchiness (Interspersion)**	**Condition**	**1 L/HW**	**2 L/HW**	**3 L/HW**	**4 L/HW**	**5 L/HW**	**6 L/HW**	**7 L/HW**	**8 L/HW**	**9 L/HW**	**10 L/HW**	**11 L/HW**	**12 L/HW**	**13 L/HW**
index	Optimum = 1 (equal mix of open water and vegetation)	FWOP	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0
	HYDRO1 would improve L/HW 3 and 4 to optimum levels	HYDRO1 (TY1, 10, 50)			1	1									
	HYDRO2 would improve L/HW 1-4, 6-8, and 12 and restore L/HW 13 to optimum levels	HYDRO2 (TY1, 10, 50)	1	1	1	1		1	1	1				1	1
	SHORE1 would improve L/HW 1, 2, and 12 to optimum levels	SHORE1 (TY1, 10, 50)	1	1										1	
	DRAIN1 would improve L/HW 12 to optimum levels	DRAIN1 (TY1, 10, 50)												1	

* Blank cells indicate no change from FWOP condition

Table B-2d. Great Egret (GE) Model Assumptions for L/HW, DFW, and Island Habitat Types*

Variable	Assumptions	Condition	1 L/HW	2 L/HW	3 L/HW	4 L/HW	5 L/HW	6 L/HW	7 L/HW	8 L/HW	9 L/HW	10 L/HW	11 L/HW	12 L/HW	13 L/HW	DFW6	NEST1	NEST2
Area	**Lacustrine/Herbaceous Wetlanc**	**FWOP**	3.00	6.29	0.30	0.67	0.12	0.72	0.07	0.31	0.14	0.13	0.18	0.45	0.00			
acres		HYDRO2	3.29			0.00	0.00	1.04							1.27			
Area	**Deciduous Shrub/Scrub Wetland (Rookery)**	**Condition**	**1 L/HW**	**2 L/HW**	**3 L/HW**	**4 L/HW**	**5 L/HW**	**6 L/HW**	**7 L/HW**	**8 L/HW**	**9 L/HW**	**10 L/HW**	**11 L/HW**	**12 L/HW**	**13 L/HW**	**DFW6**	**NEST1**	**NEST2**
acres		HYDRO2 and TAM2														0.41		
		NEST															0.32	0.63
V1	**Percentage of area with water 4 to 9 inches deep**	**Condition**	**1 L/HW**	**2 L/HW**	**3 L/HW**	**4 L/HW**	**5 L/HW**	**6 L/HW**	**7 L/HW**	**8 L/HW**	**9 L/HW**	**10 L/HW**	**11 L/HW**	**12 L/HW**	**13 L/HW**	**DFW6**	**NEST1**	**NEST2**
%	Optimum = 100	FWOP	5	5	50	30	50	5	50	20	50	50	50	50	0			
	HYDRO2 would improve L/HW 1, 2, 6, and 8 and restore L/HW 13 to moderate levels	HYDRO2 (TY1, 10, 50)	15	5				50		50					40			
	SHORE1 would improve L/HW 1 and 2 to moderate levels	SHORE1 (TY1, 10, 50)	30	30														
	HYDRO2 and SHORE1 would improve L/HW 1 and 2 to moderate levels	HYDRO2 and SHORE1 (TY1, 10, 50)	55	45														
V2	**Distance to road or dwelling****	**Condition**	**1 L/HW**	**2 L/HW**	**3 L/HW**	**4 L/HW**	**5 L/HW**	**6 L/HW**	**7 L/HW**	**8 L/HW**	**9 L/HW**	**10 L/HW**	**11 L/HW**	**12 L/HW**	**13 L/HW**	**DFW6**	**NEST1**	**NEST2**
%	Optimum = 40 to 60	FWOP	10	21	14	2	0	15	0	0	0	26	0	0	0			
	DRAIN would improve cover in the feeding zone to less than optimum in L/HW (7-12)	DRAIN (TY1, 10, 50)							20	20	20	40	20	20				
	HYDRO1 would improve cover in the feeding zone to optimum levels in L/HW 3, 4 and 12 and slightly less than optimum in L/HW 6 and 7	HYDRO1 (TY1, 10, 50)			40	40		30	30					40				
	Distance to disturbance other than road or dwelling**	HYDRO2 (TY1, 10, 50)	30	30				40	20	20	20	40	20	40	40			
	SHORE1 would improve L/HW 1 and 2 to moderate levels and restore L/HW 13 to optimum	SHORE1 (TY1, 10, 50)	30	30											40			
	HYDRO2 and SHORE1 would improve L/HW 1 and 2 to optimum levels	HYDRO2 and SHORE1 (TY1, 10, 50)	40	40														

* Blank cells indicate no change from FWOP condition

** the great egret HSI model was modified based on the known occurrence of nuissance egret rookeries (Grant and Watson 1995, Telfair et. al 2000) and known great egret rookeries occuring within developed areas (DFW Urban Wildlife 2013)

Table B-2d (continued). Great Egret (GE) Model Assumptions for L/HW, DFW, and Island Habitat Types*

V3	**Percentage of Island covered by woody veg >= 1 meter in height**	**Condition**	**1 L/HW**	**2 L/HW**	**3 L/HW**	**4 L/HW**	**5 L/HW**	**6 L/HW**	**7 L/HW**	**8 L/HW**	**9 L/HW**	**10 L/HW**	**11 L/HW**	**12 L/HW**	**13 L/HW**	**DFW6**	**NEST1**	**NEST2**
%	Optimum > 60	FWOP	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	NEST would restore NEST 1 and NEST 2 to optimum levels	NEST (TY1, 10, 50)															60	60
V4	**Mean water depth in wooded wetlands**	**Condition**	**1 L/HW**	**2 L/HW**	**3 L/HW**	**4 L/HW**	**5 L/HW**	**6 L/HW**	**7 L/HW**	**8 L/HW**	**9 L/HW**	**10 L/HW**	**11 L/HW**	**12 L/HW**	**13 L/HW**	**DFW6**	**NEST1**	**NEST2**
meter		FWOP	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	None of the existing DFW habitats are inundated to sufficient depths to provide suitable nesting habitat. However, HYDRO2 and TAM2 would restore DFW6 to less than optimum mean water depth	HYDRO2 and TAM2 (TY1, 10, 50)														0.5		
V5	**Mean height of woody vegetation**	**Condition**	**1 L/HW**	**2 L/HW**	**3 L/HW**	**4 L/HW**	**5 L/HW**	**6 L/HW**	**7 L/HW**	**8 L/HW**	**9 L/HW**	**10 L/HW**	**11 L/HW**	**12 L/HW**	**13 L/HW**	**DFW6**	**NEST1**	**NEST2**
meter	Optimum > 7.0	FWOP	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	None of the existing DFW habitats are inundated to sufficient depths to provide suitable nesting habitat. However, HYDRO2 and TAM2 would restore mean height to optimum levels	HYDRO2 and TAM2 (TY1)														2		
		HYDRO2 and TAM2 (TY10)														6		
		HYDRO2 and TAM2 (TY50)														8		
V6	**Distance to road or dwelling****	**Condition**	**1 L/HW**	**2 L/HW**	**3 L/HW**	**4 L/HW**	**5 L/HW**	**6 L/HW**	**7 L/HW**	**8 L/HW**	**9 L/HW**	**10 L/HW**	**11 L/HW**	**12 L/HW**	**13 L/HW**	**DFW6**	**NEST1**	**NEST2**
kilometer	Optimum > 0.62	FWOP	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	HYDRO2 and TAM2 would restore DFW6 to optimum levels	HYDRO2 and TAM2 (TY1, 10, 50)														0.75		
	NEST would restore NEST 1 and NEST 2 to moderate levels	NEST (TY1, 10, 50)															0.2	0.2
V7	**Distance to disturbance other than road or dwelling****	**Condition**	**1 L/HW**	**2 L/HW**	**3 L/HW**	**4 L/HW**	**5 L/HW**	**6 L/HW**	**7 L/HW**	**8 L/HW**	**9 L/HW**	**10 L/HW**	**11 L/HW**	**12 L/HW**	**13 L/HW**	**DFW6**	**NEST1**	**NEST2**
meter	Optimum > 50	FWOP	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	HYDRO2 and TAM2 would restore DFW6 to optimum levels	HYDRO2 and TAM2 (TY1, 10, 50)														50		
	NEST would restore NEST 1 and NEST 2 to moderate levels	NEST (TY1, 10, 50)															50	50

* Blank cells indicate no change from FWOP condition

** the great egret HSI model was modified based on the known occurrence of nuissance egret rookeries (Grant and Watson 1995, Telfair et. al 2000) and known great egret rookeries occuring within developed areas (DFW Urban Wildlife 2013)

Table B-2e. American Coot (AC) Model Assumptions for L/HW Habitat*

Variable	Assumptions	Condition	1 L/HW	2 L/HW	3 L/HW	4 L/HW	5 L/HW	6 L/HW	7 L/HW	8 L/HW	9 L/HW	10 L/HW	11 L/HW	12 L/HW	13 L/HW
Area	**Lacustrine/Herbaceous Wetland**	FWOP	3.00	6.29	0.30	0.67	0.12	0.72	0.07	0.31	0.14	0.13	0.18	0.45	0.00
(acres)		HYDRO2	3.29			0.00	0.00	1.04							1.27
V1	**Percent of wetland basin dominated by persistent emergent herbaceous vegetation**	**Condition**	**1 L/HW**	**2 L/HW**	**3 L/HW**	**4 L/HW**	**5 L/HW**	**6 L/HW**	**7 L/HW**	**8 L/HW**	**9 L/HW**	**10 L/HW**	**11 L/HW**	**12 L/HW**	**13 L/HW**
%	Optimum = 40 to 60	FWOP	10	21	14	2	0	15	0	0	0	26	0	0	0
	DRAIN would improve emergent herbaceous vegetation in L/HW (7-12) ranging from moderate to optimum levels	DRAIN							20	20	20	40	20	20	
	HYDRO1 would improve L/HW 3, 4, 6, 7, and 12 to optimum or slightly less than optimum levels	HYDRO1			40	40		30	30					40	
	HYDRO2 would improve L/HW 1, 2, and 6-12 ranging from moderate to optimum levels and would restore L/HW 13 to an optimum emergent herbaceous vegetation percentage	HYDRO2	30	30				40	40	20	20	40	20	40	40
	SHORE1 would improve L/HW 1 and 2 to slightly less than optimum levels	SHORE1	30	30											
	HYDRO2 and SHORE1 would improve L/HW 1 and 2 to optimum levels	HYDRO2 and SHORE1	40	40											
V2	**Edge index between emergent vegetation and open water**	**Condition**	**1 L/HW**	**2 L/HW**	**3 L/HW**	**4 L/HW**	**5 L/HW**	**6 L/HW**	**7 L/HW**	**8 L/HW**	**9 L/HW**	**10 L/HW**	**11 L/HW**	**12 L/HW**	**13 L/HW**
index	Optimum > 4	FWOP	1	1	1	1	1	1	1	1	1	1	1	1	0
	HYDRO2 would improve L/HW 1 and 2 to moderate levesl	HYDRO2	2	2											
	SHORE1 would improve L/HW 1 and 2 to slightly less than optimum levels	SHORE1	3	3											
V3	**Water Regime**	**Condition**	**1 L/HW**	**2 L/HW**	**3 L/HW**	**4 L/HW**	**5 L/HW**	**6 L/HW**	**7 L/HW**	**8 L/HW**	**9 L/HW**	**10 L/HW**	**11 L/HW**	**12 L/HW**	**13 L/HW**
index	Optimum = 2 (semipermanently flooded)	FWOP	2	2	4	2	4	2	4	2	5	4	4	4	0
	HYDRO2 would improve the water regime in L/HW 1, 2, 6-9, and 12 to slightly less than optimum levels. HYDRO2 would also restore L/HW 13 to optimum levels	HYDRO2	3	3				3	3	3				3	3
	DRAIN would improve the water regime in L/HW 7, 8, and 12 to slightly less than optimum levels	DRAIN							3	3				3	

* Blank cells indicate no change from FWOP condition

Table B-2f. Yellow Warbler (YW) Model Assumptions for DSSW Habitat*

Variable	Assumptions	Condition	DSSW1	DSSW2	DSSW3	DSSW4	DSSW5	DSSW6	DSSW7	DSSW8	DSSW9	DSSW10	DSSW11	DSSW12
Area	**Deciduous Scrub/Shrub Wetland**	**FWOP**	5.93	4.02	2.87	3.97	0.98	4.99	0.91	0.00	0.00	0.00	0.00	0.00
(acres)		HYDRO2 and TAM2	5.93	3.78	2.55	3.97	0.98	4.99	0.91	0.81	0.20	1.39	0.51	1.76
		TAM1 or TAM2	5.93	4.02	2.87	3.97	0.98	4.99	0.91	0.88	1.07	1.39	0.51	1.61
		HYDRO2	5.93	3.78	2.55	3.97	0.98	4.99	0.91	0.81	0.20	1.39	0.51	1.76
Variable	**Percent deciduous shrub crown cover**	**Condition**	**DSSW1**	**DSSW2**	**DSSW3**	**DSSW4**	**DSSW5**	**DSSW6**	**DSSW7**	**DSSW8**	**DSSW9**	**DSSW10**	**DSSW11**	**DSSW12**
V1	Optimum = 60 to 80	FWOP	0	75	65	75	60	50	30	0	0	0	0	0
%	HYDRO1 would improve DSSW 7 at TY1 and shrub cover would	HYDRO1 (TY1,10)							45					
	continue to increase to TY50	HYDRO1 (TY50)							60					
	TAM1 or TAM2 would restore DSSW (8 - 12) with slightly higher than optimal shrub cover	TAM1 (TY1)								10	10	10	10	10
		TAM1 (TY10)								90	90	90	90	90
		TAM1 (TY50)								80	80	80	80	80
		TAM2 (TY1)								20	20	20	20	20
		TAM2 (TY10)								60	60	60	60	60
		TAM2 (TY50)								75	75	75	75	75
	HYDRO2 would restore DSSW (8 - 12) with optimal shrub cover	HYDRO2 (TY1)								30	30	30	30	30
		HYDRO2 (TY10)								60	60	60	60	60
		HYDRO2 (TY50)								75	75	75	75	75
	CANE1 or CANE2 would restore cover of native shrubs, with CANE2	CANE (TY1)	5											
	with cover increasing at the same rate under both measures	CANE (TY10, 50)	60											
V2	**Average height of deciduous shrub canopy**	**Condition**	**DSSW1**	**DSSW2**	**DSSW3**	**DSSW4**	**DSSW5**	**DSSW6**	**DSSW7**	**DSSW8**	**DSSW9**	**DSSW10**	**DSSW11**	**DSSW12**
meter	Optimum >2	FWOP	5	6	5	6	5	3	3	0	0	0	0	0
	All shrublands, existing or planted are assumed to be a minimum of 2 meters in height.	TAM1, TAM2, or HYDRO2 (TY1)								0.5	0.5	0.5	0.5	0.5
		TAM1, TAM2 or HYDRO2 (TY10,50)								2	2	2	2	2
	CANE1 or CANE2 would restore cover of native shrubs, with CANE2	CANE (TY1)	0.5											
	with height increasing at the same rateunder both measures	CANE (TY10, 50)	2											
V3	**Percent of shrub canopy comprised of hydrophytic shrubs**	**Condition**	**DSSW1**	**DSSW2**	**DSSW3**	**DSSW4**	**DSSW5**	**DSSW6**	**DSSW7**	**DSSW8**	**DSSW9**	**DSSW10**	**DSSW11**	**DSSW12**
%	Optimum = 100	FWOP	0	10	20	15	35	35	80	0	0	0	0	0
	TAM1 or TAM2 would restore DSSW (8 - 12) with less than optimal pproportion of hydrophytic shrubs in the shrub canopy	TAM1 (TY1, 10, 50)								40	40	40	40	40
		TAM2 (TY1)								100	100	100	100	100
		TAM2 (TY10, 50)								80	80	80	80	80
	HYDRO2 would double the proportion of hydrophytic shrubs in DSSW (3-	HYDRO2 (TY1)			20	15	35	35		100	100	100	100	100
	6) by TY10 and would restore DSSW (8-12) with optimum proportion of	HYDRO2(TY10,50)			40	30	70	70		100	100	100	100	100
	The proportion of hydrophytic shrubs in DSSW1 would not change over	CANE1 (TY1, 10, 50)	10											
	the live of the project, but would be lower under CANE1 than under	CANE2 (TY1, 10, 50)	50											
	HYDRO1 would improve proportion of hydrophytic shrubs in DSSW1 over	CANE1 and HYDRO1 (TY1,10,50)	20											
	CANE alone	CANE2 and HYDRO1 (TY1,10,50)	60											

* Blank cells indicate no change from FWOP condition

Table B-2g. Estern Cottontail (EC) Model Assumptions for DFW and DSSW Habitat Types*

Variable	Description	Condition	DFW1	DFW2	DFW3	DFW4	DFW5	DFW6	DSSW1	DSSW2	DSSW3	DSSW4	DSSW5	DSSW6	DSSW7	DSSW8	DSSW9	DSSW10	DSSW11	DSSW12
Area	**DFW or DSSW**	FWOP	0.9	1.1	1.4	0.5	1.6	0.0	5.9	4.0	2.9	4.0	1.0	5.0	0.9	0.0	0.0	0.0	0.0	0.0
(acres)		HYDRO2 and TAM2	0.0	0.0	0.0	0.0	0.0	0.4	5.9	3.8	2.6	4.0	1.0	5.0	0.9	0.8	0.2	1.4	0.5	1.8
		TAM1 or TAM2	0.0	0.0	0.0	0.0	0.0	0.0	5.9	4.0	2.9	4.0	1.0	5.0	0.9	0.9	1.1	1.4	0.5	1.6
		HYDRO2	0.0	0.4	0.0	0.0	0.0	0.0	5.9	3.8	2.6	4.0	1.0	5.0	0.9	0.8	0.2	1.4	0.5	1.8
		EROS1	0.9	1.1	1.4	0.5	1.6	0.0	5.9	4.0	2.9	4.0	1.0	5.0	0.9	0.0	0.0	0.0	0.0	0.0
		EROS2	0.9	1.1	1.4	0.5	1.6	0.0	5.9	4.0	2.9	4.0	1.0	5.0	0.9	0.0	0.0	0.0	0.0	0.0
V1	**Percent shrub crown closure**	**Condition**	**DFW1**	**DFW2**	**DFW3**	**DFW4**	**DFW5**	**DFW6**	**DSSW1**	**DSSW2**	**DSSW3**	**DSSW4**	**DSSW5**	**DSSW6**	**DSSW7**	**DSSW8**	**DSSW9**	**DSSW10**	**DSSW11**	**DSSW12**
V1	Optimum = 20 to 50	FWOP	5	5	5	5	20	0	100	75	65	75	60	50	30	0	0	0	0	0
%	HYDRO2 and TAM2 would restore DFW6 as optimum nesting habitat for GE	HYDRO2 and TAM2 (TY1,10, 50)						20												
	HYDRO1 would improve DSSW 7 at TY1 and shrub cover would continue to increase to TY50	HYDRO1 (TY1,10)													45					
		HYDRO1 (TY50)													60					
	TAM1 or TAM2 would restore DSSW (8 - 12) with slightly higher than optimal shrub cover	TAM1 (TY1)														10	10	10	10	10
		TAM1 (TY10)														90	90	90	90	90
		TAM1 (TY50)														80	80	80	80	80
		TAM2 (TY1)														20	20	20	20	20
		TAM2 (TY10)														60	60	60	60	60
		TAM2 (TY50)														75	75	75	75	75
	HYDRO2 would restore DSSW (8 - 12) with optimal shrub cover	HYDRO2 (TY1)														30	30	30	30	30
		HYDRO2 (TY10)														60	60	60	60	60
		HYDRO2 (TY50)														75	75	75	75	75
	CANE1 or CANE2 would restore cover of native shrubs, with CANE2 with cover increasing at the same rate under both measures	CANE (TY1)							10											
		CANE (TY10)							20											
		CANE (TY50)							60											
V2	**Percent tree canopy closure**	**Condition**	**DFW1**	**DFW2**	**DFW3**	**DFW4**	**DFW5**	**DFW6**	**DSSW1**	**DSSW2**	**DSSW3**	**DSSW4**	**DSSW5**	**DSSW6**	**DSSW7**	**DSSW8**	**DSSW9**	**DSSW10**	**DSSW11**	**DSSW12**
(%)	Optimum = 25 to 50	FWOP	85	85	70	50	70	0	0	5	5	5	5	0	0	0	0	0	0	0
	HYDRO2 and TAM2 would restore DFW6 as optimum nesting habitat for GE	HYDRO2 and TAM2 (TY1)						5												
		HYDRO2 and TAM2 (TY10)						10												
		HYDRO2 and TAM2 (TY50)						40												
	TAM1, TAM2, or HYDRO2 would restore DSSW (8 - 12) with a low cover of trees.	HYDRO2 (TY1)														0	0	0	0	0
		HYDRO2 (TY10)														5	5	5	5	5
		HYDRO2 (TY50)														10	10	10	10	10
	CANE1 or CANE2 would restore cover of native trees in DSSW1	CANE (TY1)							0											
		CANE (TY10, 50)							5											
V3	**Percent canopy closure of persistent herbaceous vegetation**	**Condition**	**DFW1**	**DFW2**	**DFW3**	**DFW4**	**DFW5**	**DFW6**	**DSSW1**	**DSSW2**	**DSSW3**	**DSSW4**	**DSSW5**	**DSSW6**	**DSSW7**	**DSSW8**	**DSSW9**	**DSSW10**	**DSSW11**	**DSSW12**
(%)	Optimum = 100	FWOP	5	5	20	30	20	0	0	5	5	5	5	0	10	0	0	0	0	0
	HYDRO2 and TAM2 would restore DFW6 as optimum nesting habitat for GE	HYDRO2 and TAM2 (TY1)						20												
		HYDRO2 and TAM2 (TY10, 50)						40												
	TAM1, TAM2, or HYDRO2 would restore DSSW (8 - 12) with a modest herbaceous cover	HYDRO2 (TY1)														20	20	20	20	20
		HYDRO2 (TY10, 50)														40	40	40	40	40
	CANE1 or CANE2 would restore cover of native trees in DSSW1	CANE (TY1)							20											
		CANE (TY10, 50)							40											
	HYDRO1 would improve DSSW 7 at TY1 and herbacesous cover would continue to increase to TY50	HYDRO1 (TY1)													40					
		HYDRO1 (TY10, 50)													60					

* Blank cells indicate no change from FWOP condition

Table B-2g (continued). Eastern Cottontail (EC) Model Assumptions for DSS

Variable	Description	Condition	DSS1	DSS2	DSS3	DSS4	DSS5
Area	**DSS**	FWOP	19.00	3.34	6.77	2.81	2.33
(acres)		HYDRO2 and TAM2	19.00	3.19	6.77	2.81	2.33
		TAM1 or TAM2	19.00	3.34	6.77	2.81	2.33
		HYDRO2	19.00	3.19	6.77	2.81	2.33
		EROS1	20.00	3.34	7.27	2.81	2.33
		EROS2	20.10	3.34	7.27	2.81	2.33
V1	**Percent shrub crown closure**	**Condition**	**DSS1**	**DSS2**	**DSS3**	**DSS4**	**DSS5**
(%)	Optimum = 20 to 50	FWOP	20	10	30	15	30
V2	**Percent tree canopy closure**	**Condition**	**DSS1**	**DSS2**	**DSS3**	**DSS4**	**DSS5**
(%)	Dependency	FWOP	5	0	10	5	5
V3	**Percent canopy closure of persistent herbaceous vegetation (100)**	**Condition**	**DSS1**	**DSS2**	**DSS3**	**DSS4**	**DSS5**
(%)	Optimum = 25 to 50	FWOP	5	0	10	5	5

Table B-2h. Least Tern (LT) Model Assumptions

Variable	Assumptions	Optimum	Condition	Barge 1	Barge 2
Area	Barges		FWOP	0.05	0.11
(acres)	The proposed barges would provide nesting habitat each year		NEST1	0.05	0.11
V1	**Percent Aquatic Area**	**> 50**	**Condition**	**Barge 1**	**Barge 2**
(%)	*Dependency*		FWOP	20	20
	This condition would not change		NEST1	20	20
V2	**Number of disperate aquatic wetlands**	**2+**	**Condition**	**Barge 1**	**Barge 2**
#	*Dependency*		FWOP	2	2
	This contidion would not change		NEST1	2	2
V3	**Percent herbaceous and shrub canopy cover**	**<20**	**Condition**	**Barge 1**	**Barge 2**
(%)	*Dependency*		FWOP	5	5
	This condition would not change		NEST1	5	5
V4	**Average height of herbaceous and shrub canopy**	**<10**	**Condition**	**Barge 1**	**Barge 2**
(cm)	*Dependency*		FWOP	4	4
	This conditions would not change		NEST1	4	4

Table B-3a. Summary of FWOP and FWP Habitat Area and AAHU

	L/HW		DFW		DSSW		DSS		Barges		Total	
Plan	Acres	AAHU	Acres	AAHU	Acres	AAHU	Acres	AAHU	Acres	AAHU	Acres	AAHU
No Action	12.37	3.42	5.46	1.74	23.66	9.66	33.57	33.22	0	0	75.06	48.05
HYDRO1	12.37	3.76	5.46	1.74	23.66	9.73	33.57	33.22	0	0	75.06	48.46
HYDRO2	13.46	6.87	0.41	0.12	27.96	16.18	33.40	33.08	0	0	75.22	56.24
DRAIN 1	12.37	3.49	5.46	1.74	23.66	9.66	33.57	33.22	0	0	75.06	48.12
DEPTH1	12.37	4.03	5.46	1.74	23.66	9.66	33.57	33.22	0	0	75.06	48.65
SHORE1	12.37	5.52	5.46	1.74	23.66	9.66	33.57	33.22	0	0	75.06	50.15
CANE1	12.37	3.41	5.46	1.74	23.66	10.53	33.57	33.22	0	0	75.06	48.90
CANE2	12.37	3.41	5.46	1.74	23.66	10.59	33.57	33.22	0	0	75.06	48.97
TAM1	12.37	3.41	0.00	0.02	29.10	13.04	33.57	33.22	0	0	75.04	49.69
TAM2	12.37	3.41	0.00	0.02	29.10	13.90	33.57	33.22	0	0	75.04	50.55
HYDRO2 and TAM 2*	13.46	6.87	0.41	0.49	27.96	16.14	33.40	33.08	0	0	75.22	56.58
EROSION1	12.37	3.41	5.46	1.74	23.66	9.66	35.07	34.71	0	0	76.56	49.53
EROSION 2	12.37	3.41	5.46	1.74	23.66	9.66	35.17	34.80	0	0	76.66	49.63
NEST1**	12.37	3.41	5.46	0.18	23.66	9.72	33.57	33.22	0.158678	0.0670	75.22	46.60
NER Plan	13.46	9.08	0.41	0.45	27.96	18.48	35.00	34.66	0.16	0.0670	76.98	62.74
All Measures	13.46	9.09	0.41	0.49	27.96	18.54	35.00	34.66	0.158678	0.0670	76.98	62.84

* GE nesting habitat is included as DFW6, which is only created when HYDRO2 and TAM2 are both implemented

** The area and AAHU of barges are added to the FWP totals.

Table B-3b. Summary of FWOP and FWP Area and AAHU of L/HW Habitats

Plan	Acres	WM	ST	AC	RWB	GE f	Average
No Action	12.37	4.12	3.73	2.16	3.71	3.39	3.42
HYDRO1	12.37	4.59	4.05	2.37	3.71	4.07	3.76
HYDRO2	13.46	8.96	5.72	6.67	6.01	6.96	6.87
DRAIN 1	12.37	4.17	3.73	2.25	3.71	3.59	3.49
DEPTH1	12.37	7.19	3.73	2.16	3.71	3.34	4.03
SHORE1	12.37	7.19	4.49	6.44	3.71	5.78	5.52
CANE1	12.37	4.12	3.73	2.16	3.71	3.34	3.41
CANE2	12.37	4.12	3.73	2.16	3.71	3.34	3.41
TAM1	12.37	4.12	3.73	2.16	3.71	3.34	3.41
TAM2	12.37	4.12	3.73	2.16	3.71	3.34	3.41
HYDRO2 and TAM2	13.46	8.96	5.72	6.67	6.01	6.96	6.87
EROSION1	12.37	4.12	3.73	2.16	3.71	3.34	3.41
EROSION 2	12.37	4.12	3.73	2.16	3.71	3.34	3.41
NEST1	12.37	4.12	3.73	2.16	3.71	3.34	3.41
NER Plan	13.46	12.12	7.99	9.32	6.01	9.97	9.08
All Measures	13.46	12.17	7.99	9.31	6.01	9.97	9.09

Table B-3c. Summary of FWOP and FWP Area and AAHU of DFW Habitats

Plan	Acres	ST	EC	GE n*	Average
No Action	5.46	0.33	3.16	0.00	1.74
HYDRO1	5.46	0.33	3.16	0.00	1.74
HYDRO2	0.41	0.09	0.16	0.00	0.12
DRAIN 1	5.46	0.33	3.16	0.00	1.74
DEPTH1	5.46	0.33	3.16	0.00	1.74
SHORE1	5.46	0.33	3.16	0.00	1.74
CANE1	5.46	0.33	3.16	0.00	1.74
CANE2	5.46	0.33	3.16	0.00	1.74
TAM1	0.00	0.00	0.03	0.00	0.02
TAM2	0.00	0.00	0.03	0.00	0.02
HYDRO2 and TAM2	0.41	0.09	0.82	0.56	0.49
EROSION1	5.46	0.33	3.16	0.00	1.74
EROSION 2	5.46	0.33	3.16	0.00	1.74
NEST1	5.46	0.33	0.03	0.00	0.18
NER Plan	0.41	0.09	0.82	0.56	0.45
All Measures	0.41	0.09	0.82	0.56	0.49

* GE nesting habitat is only included in the Average AAHU of DFW6, which is only created when both HYDRO2 and TAM2 are implemented

Table B-3d. Summary of FWOP and FWP Area and AAHU of DSSW Habitats

Plan	Acres	ST	EC	YW	Average	ILT	Total
No Action	23.66	1.55	18.10	9.34	9.66	0.00	9.66
HYDRO1	23.66	1.55	18.14	9.52	9.73	0.00	9.73
HYDRO2	27.96	4.12	28.52	15.89	16.18	0.00	16.18
DRAIN 1	23.66	1.55	18.10	9.34	9.66	0.00	9.66
DEPTH1	23.66	1.55	18.10	9.34	9.66	0.00	9.66
SHORE1	23.66	1.55	18.10	9.34	9.66	0.00	9.66
CANE1	23.66	1.55	20.69	9.34	10.53	0.00	10.53
CANE2	23.66	1.55	20.69	9.53	10.59	0.00	10.59
TAM1	29.10	1.55	24.76	12.82	13.04	0.00	13.04
TAM2	29.10	1.55	25.90	14.26	13.90	0.00	13.90
HYDRO2 and TAM2	27.96	4.12	28.43	15.89	16.14	0.00	16.14
EROSION1	23.66	1.55	18.10	9.34	9.66	0.00	9.66
EROSION 2	23.66	1.55	18.10	9.34	9.66	0.00	9.66
NEST1	23.66	1.55	18.08	9.33	9.66	0.07	9.72
NER Plan	27.96	4.12	31.11	20.00	18.41	0.07	18.48
All Measures	27.96	4.12	31.11	20.18	18.47	0.07	18.54

* ILT nesting habitat is added to the average AAHU of other DSSW because the nests will be created on top of L/HW habitat, but will not detract from L/HW habitat

Table B-3e. Summary of FWOP and FWP Area and AAHU of DSS Habitats

Plan	Area	EC
No Action	33.57	33.22
HYDRO1	33.57	33.22
HYDRO2	33.40	33.08
DRAIN 1	33.57	33.22
DEPTH1	33.57	33.22
SHORE1	33.57	33.22
CANE1	33.57	33.22
CANE2	33.57	33.22
TAM1	33.57	33.22
TAM2	33.57	33.22
HYDRO2 and TAM2	33.40	33.08
EROSION1	35.07	34.71
EROSION 2	35.17	34.80
NEST1	33.57	33.22
NER Plan	35.00	34.66
All Measures	35.00	34.66

APPENDIX C
BIOLOGICAL OPINION AND LISTED SPECIES OF WEBB COUNTY, TEXAS

Biological Opinion will be included in the Final DPR/EA.

WEBB COUNTY

BIRDS		Federal Status	State Status
American Peregrine Falcon	*Falco peregrinus anatum*	DL	T

year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in US and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Arctic Peregrine Falcon *Falco peregrinus tundrius* DL

migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Audubon's Oriole *Icterus graduacauda audubonii*

scrub, mesquite; nests in dense trees, or thickets, usually along water courses

Baird's Sparrow *Ammodramus bairdii*

shortgrass prairie with scattered low bushes and matted vegetation; mostly migratory in western half of State, though winters in Mexico and just across Rio Grande into Texas from Brewster through Hudspeth counties

Common Black-Hawk *Buteogallus anthracinus* T

cottonwood-lined rivers and streams; willow tree groves on the lower Rio Grande floodplain; formerly bred in south Texas

Interior Least Tern *Sterna antillarum athalassos* LE E

subspecies is listed only when inland (more than 50 miles from a coastline); nests along sand and gravel bars within braided streams, rivers; also know to nest on man-made structures (inland beaches, wastewater treatment plants, gravel mines, etc); eats small fish and crustaceans, when breeding forages within a few hundred feet of colony

Mexican Hooded Oriole *Icterus cucullatus cucullatus*

scrub, mesquite; nests in dense trees, or thickets, usually along water courses

Mountain Plover *Charadrius montanus*

breeding: nests on high plains or shortgrass prairie, on ground in shallow depression; nonbreeding: shortgrass plains and bare, dirt (plowed) fields; primarily insectivorous

Peregrine Falcon *Falco peregrinus* DL T

both subspecies migrate across the state from more northern breeding areas in US and Canada to winter along coast and farther south; subspecies (F. p. anatum) is also a resident breeder in west Texas; the two subspecies' listing statuses differ, F.p. tundrius is no longer listed in Texas; but because the subspecies are not easily distinguishable at a distance, reference is generally made only to the species level; see subspecies for habitat.

WEBB COUNTY

BIRDS		Federal Status	State Status
Sennett's Hooded Oriole	*Icterus cucullatus sennetti*		

often builds nests in and of Spanish moss (Tillandsia unioides); feeds on invertebrates, fruit, and nectar; breeding March to August

Sprague's Pipit	*Anthus spragueii*	C	

only in Texas during migration and winter, mid September to early April; short to medium distance, diurnal migrant; strongly tied to native upland prairie, can be locally common in coastal grasslands, uncommon to rare further west; sensitive to patch size and avoids edges.

Western Burrowing Owl	*Athene cunicularia hypugaea*		

open grasslands, especially prairie, plains, and savanna, sometimes in open areas such as vacant lots near human habitation or airports; nests and roosts in abandoned burrows

Wood Stork	*Mycteria americana*		T

forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960

FISHES		Federal Status	State Status
Blue sucker	*Cycleptus elongatus*		T

larger portions of major rivers in Texas; usually in channels and flowing pools with a moderate current; bottom type usually of exposed bedrock, perhaps in combination with hard clay, sand, and gravel; adults winter in deep pools and move upstream in spring to spawn on riffles

Headwater catfish	*Ictalurus lupus*		

originally throughout streams of the Edwards Plateau and the Rio Grande basin, currently limited to Rio Grande drainage, including Pecos River basin; springs, and sandy and rocky riffles, runs, and pools of clear creeks and small rivers

Rio Grande darter	*Etheostoma grahami*		T

Rio Grande and lower Pecos River basins; gravel and rubble riffles of creeks and small rivers; spawns in the winter

Rio Grande shiner	*Notropis jemezanus*		

Rio Grande and upper Pecos River basins; large, open, weedless rivers or large creeks with bottom of rubble, gravel and sand, often overlain with silt

Rio Grande silvery minnow	*Hybognathus amarus*	LE	E

extirpated; historically Rio Grande and Pecos River systems and canals; reintroduced in Big Bend area; pools and backwaters of medium to large streams with low or moderate gradient in mud, sand, or gravel bottom; ingests mud and bottom ooze for algae and other organic matter; probably spawns on silt substrates of quiet coves

WEBB COUNTY

INSECTS		Federal Status	State Status
Neojuvenile tiger beetle	*Cicindela obsoleta neojuvenilis*		

bare or sparsely vegetated, dry, hard-packed soil; typically in previously disturbed areas; peak adult activity in Jul

MAMMALS		Federal Status	State Status
Black bear	*Ursus americanus*	T/SA;NL	T

bottomland hardwoods and large tracts of inaccessible forested areas; due to field characteristics similar to Louisiana Black Bear (LT, T), treat all east Texas black bears as federal and state listed Threatened

Cave myotis bat *Myotis velifer*

colonial and cave-dwelling; also roosts in rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (Hirundo pyrrhonota) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum cave of Panhandle during winter; opportunistic insectivore

Davis pocket gopher *Geomys personatus davisi*

burrows in sandy soils in southern Texas

Ghost-faced bat *Mormoops megalophylla*

colonially roosts in caves, crevices, abandoned mines, and buildings; insectivorous; breeds late winter-early spring; single offspring born per year

Gray wolf *Canis lupus* LE E

extirpated; formerly known throughout the western two-thirds of the state in forests, brushlands, or grasslands

Jaguarundi *Herpailurus yaguarondi* LE E

thick brushlands, near water favored; 60 to 75 day gestation, young born sometimes twice per year in March and August, elsewhere the beginning of the rainy season and end of the dry season

Ocelot *Leopardus pardalis* LE E

dense chaparral thickets; mesquite-thorn scrub and live oak mottes; avoids open areas; breeds and raises young June-November

Plains spotted skunk *Spilogale putorius interrupta*

catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie

White-nosed coati *Nasua narica* T

woodlands, riparian corridors and canyons; most individuals in Texas probably transients from Mexico; diurnal and crepuscular; very sociable; forages on ground and in trees; omnivorous; may be susceptible to hunting, trapping, and pet trade

WEBB COUNTY

MAMMALS		Federal Status	State Status
Yuma myotis bat	*Myotis yumanensis*		

desert regions; most commonly found in lowland habitats near open water, where forages; roosts in caves, abandoned mine tunnels, and buildings; season of partus is May to early July; usually only one young born to each female

MOLLUSKS		Federal Status	State Status
False spike mussel	*Quadrula mitchelli*		T

possibly extirpated in Texas; probably medium to large rivers; substrates varying from mud through mixtures of sand, gravel and cobble; one study indicated water lilies were present at the site; Rio Grande, Brazos, Colorado, and Guadalupe (historic) river basins

Mexican fawnsfoot mussel	*Truncilla cognata*		T

largely unknown; possibly intolerant of impoundment; possibly needs flowing streams and rivers with sand or gravel bottoms based on related species needs; Rio Grande basin

Salina mucket	*Potamilus metnecktayi*		T

lotic waters; submerged soft sediment (clay and silt) along river bank; other habitat requirements are poorly understood; Rio Grande Basin

Texas hornshell	*Popenaias popeii*	C	T

both ends of narrow shallow runs over bedrock, in areas where small-grained materials collect in crevices, along river banks, and at the base of boulders; not known from impoundments; Rio Grande Basin and several rivers in Mexico

REPTILES		Federal Status	State Status
Reticulate collared lizard	*Crotaphytus reticulatus*		T

requires open brush-grasslands; thorn-scrub vegetation, usually on well-drained rolling terrain of shallow gravel, caliche, or sandy soils; often on scattered flat rocks below escarpments or isolated rock outcrops among scattered clumps of prickly pear and mesquite

Spot-tailed earless lizard	*Holbrookia lacerata*		

central and southern Texas and adjacent Mexico; moderately open prairie-brushland; fairly flat areas free of vegetation or other obstructions, including disturbed areas; eats small invertebrates; eggs laid underground

Texas horned lizard	*Phrynosoma cornutum*		T

open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September

Texas indigo snake	*Drymarchon melanurus erebennus*		T

Texas south of the Guadalupe River and Balcones Escarpment; thornbush-chaparral woodlands of south Texas, in particular dense riparian corridors; can do well in suburban and irrigated croplands if not molested or indirectly poisoned; requires moist microhabitats, such as rodent burrows, for shelter

WEBB COUNTY

REPTILES		Federal Status	State Status
Texas tortoise	*Gopherus berlandieri*		T

open brush with a grass understory is preferred; open grass and bare ground are avoided; when inactive occupies shallow depressions at base of bush or cactus, sometimes in underground burrows or under objects; longevity greater than 50 years; active March-November; breeds April-November

PLANTS		Federal Status	State Status
Ashy dogweed	*Thymophylla tephroleuca*	LE	E

Texas endemic; grasslands with scattered shrubs; most sites on sands or sandy loams on level or very gently rolling topography over Eocene strata of the Laredo Formation; flowering March-May depending to some extent on rainfall

Johnston's frankenia *Frankenia johnstonii* LE-PDL E

dwarf shrublands on strongly saline, highly alkaline, calcareous or gypseous, clayey to sandy soils of valley flats or rocky slopes; mapped soils at many sites are of the Catarina and/or Maverick Series, other mapped soils include Copita, Brennan, Zapata, and Montell series; most sites are underlain by Eocene sandstones and clays of the Jackson Group or the Yegua and Laredo formations; a few are underlain by El Pico clay or the Catahoula and Frio formations shrublands; flowering throughout the growing season depending upon rainfall

Kleberg saltbush *Atriplex klebergorum*

Texas endemic; usually occurs in sparsely vegetated saline areas, including flats and draws; in light sandy or clayey loam soils with other halophytes; occasionally observed on scraped oil pad sites; observed flowering in late August-early September, but may vary with rainfall, fruits are usually present in fall; because of its annual nature, populations fluctuate widely from year to year

McCart's whitlow-wort *Paronychia maccartii*

Texas endemic; known only from the type specimen, habitat poorly understood; substrate for type location described as 'very hard-packed red sand', possibly the Cuevita-Randado Complex, probably occurring in thorn shrubland plant community; based on type specimen's presence of flowers and collection date, flowers in March, possibly also in other months and in response to rainfall

Nickel's cory cactus *Coryphantha nickelsiae*

Limestone outcrops and nearby alluvial or gravelly soils on hills or plains in grasslands or shrublands at low elevations; known sites in Mexico have been described as Chihuahuan Desert scrub; flowering August through September

APPENDIX D
PROGRAMMATIC AGREEMENT AND CULTURAL RESOURCES SURVEY DATA

A Programmatic Agreement is being coordinated with the SHPO. A copy of the Final Programmatic Agreement will be included in the Final Report.

Resources Recorded During Neighborhood Surveys within 1-mile of the Restoration Project Area

Serial Number	Name	Recorder	Date Recorded	Designate
NRS79_1956	Webb Co. Courthouse	M Johnson and C. Kennedy	03/1973	NRHP
NRS79_1057	Church at Southwest corner Victoria and Davis	Kathy London	05/13/1981	NRHP
NRS79_1058	Urbahn Elem. School	Kathy London	05/13/1981	NRHP
NRS79_1059	Commercial Structure at Northeast corner of Victoria and San Eduardo	Kathy London	05/14/1981	NRHP
NRS79_1062	Residence at 919 Victoria	Ellen Beasley	05/16/1981	NRHP
NRS79_1063	Residence at 12(05) Victoria	Ellen Beasley	05/16/1981	NRHP
NRS79_1064	Residence at 1302 Victoria	Kathy London	05/15/1981	NRHP
NRS79_1065	Residence at 1317 Victoria	Ellen Beasley	05/16/1981	NRHP
NRS79_1066	Residence at 1416 Victoria	Ellen Beasley	05/16/1981	NRHP
NRS79_1067	Residence at 1600-04 Victoria	Kathy London	05/12/1981	NRHP
NRS79_1068	Residence at 1608 Victoria	Kathy London	05/12/1981	NRHP
NRS79_1069	Residence at 1612 Victoria	Kathy London	05/13/1981	NRHP
NRS79_1070	Residence at 1614 victorian (Victoria?)	Kathy London	05/13/1981	NRHP
NRS79_21033	Residence at 1220 Juarez Street	Kathy London	05/15/1981	NA

NRS79_21034	Residence at 1317 Juarez Street	Kathy London	05/15/1981	NA
NRS79_21035	Residence at 1320 Juarez Street	Kathy London	05/15/1981	NA
NRS79_21036	Residence at 1501 Juarez Street	Kathy London	05/15/1981	NA
NRS79_21037	Residence at 1516 Juarez Street	Kathy London	05/15/1981	NA
NRS79_21038	Residence at 1518 Juarez Street	Kathy London	05/15/1981	NA
NRS79_21039	Residence at 1519 Juarez Street	Kathy London	05/15/1981	NA
NRS79_21088	Commercial Structure at 806 Houston	Ellen Beasley	05/16/1981	NA
NRS79_21089	Webb County Jail	Ellen Beasley	05/15/1981	NA
NRS79_21090	Residence at 1106 Houston	Ellen Beasley	05/16/1981	NA
NRS79_21091	Residence at 1510 Houston	Gayle Alder	05/12/1981	NA
NRS70_21092	Residence at 1520 Houston	Gayle Alder	05/12/1981	NA
NRS79_21093	Residence at 1604 Houston	Gayle Alder	05/12/1981	NA
NRS79_21094	Residence at 1612 Houston	Gayle Alder	05/12/1981	NA
NRS79_21095	Residence at 1618 Houston	Gayle Adler	05/12/1981	NA
NRS79_21096	Law Offices at 1703 Houston	Gayle Adler	05/12/1981	NA
NRS79_21097	Residence at 1714 Houston	Gale Alder	05/12/1981	NA
NRS79_21098	Title I Instructional Program	Gayle Adler	05/12/1981	NA
NRS79_21099	Residence at 1718 Houston	Gale Alder	05/12/1981	NA
NRS79_21100	Residence at 1801 Houston	Gale Alder	05/12/1981	NA
NRS79_21101	Residence at 1802 Houston	Gayle Alder	05/12/1981	NA
NRS79_21102	Residence at 1812 Houston	Gale Alder	05/12/1981	NA
NRS79_21103	Residence at 1815 Houston	Gale Alder	05/12/1981	NA

NRS79_21104	Christian Science Society	Gale Alder	05/12/1981	NA
NRS79_21105	Residence at 1820 Houston	Gale Alder	05/12/1981	NA
NRS79_21121	Laredo Auto Supply	Ellen Beasley	05/14/1981	NA
NRS79_21122	Grande Distributing Co.	Ellen Beasley	05/14/1981	NA
NRS79_21123	Baptist Church	Gayle Alder	05/12/1981	NA
NRS79_21124	Hamilton Hotel (North Block)	Gale Alder	05/14/1981	NA
NRS79_21127	Residence at 607 Houston Street	Kathy London	05/14/1981	NA
NRS79_21128	Residence at 619 Houston Street	Kathy London	05/14/1981	NA
NRS79_21129	Hirsch Hosue	Hume Jackson et al.	08/15/1972	NA
NRS79_21161	Residence at 1018 Flores	Ellen Beasley	05/15/1981	NA
NRS79_21162	Residence at 1501 Flores Street	Kathy London	05/15/1981	NA
NRS79_21163	Residence at 1505 Flores Street	Kathy London	05/15/1981	NA
NRS79_21164	Residence at 1520 Flores Street	Kathy London	05/14/1981	NA
NRS79_21170	Residence at 602-604 Garcia Street	Kathy London	05/15/1981	NA
NRS79_21171	Residence at 1517 Garcia Street	Kathy London	05/15/1981	NA
NRS79_21187	Residence at Southwest corner of Benavides and Salinas Street	Kathy London	05/15/1981	NA
NRS79_21189	Residence at 1102 Benavides Street	Kathy London	05/15/1981	NA
NRS79_21190	Residence at 1004 Callaghan	Kathy London	05/15/1981	NA

NRS79_21191	Residence at 1704 Callaghan	Kathy London	05/15/1981	NA
NRS79_21192	Residence at 1818 Callaghan Street	Kathy London	05/15/1981	NA
NRS79_21201	Residence at 1417 and 1419 Convent Street	Kathy London	05/15/1981	NA
NRS79_21202	Residence at 1602 Convent Street (1206 Garcia)	Kathy London	05/15/1981	NA
NRS79_21216	El Castillo	Kathy London	05/15/1981	NA
NRS79_30204	De la Garza House	Kathy London	05/12/1981	NRHP
NRS79_30205	Residence at 1709 Victoria	Kathy London	05/15/1981	NRHP
NRS79_30206	Residence at 17(11) Victoria	Kathy London	05/12/1981	NRHP
NRS79_30207	Residence at 1718 Victoria	Kathy London	05/12/1981	NRHP
NRS79_30208	Residence at 18(20) Victoria	Kathy London	05/12/1981	NRHP
NRS79_30209	Residence at 1903 Victoria	Kathy London	05/12/1981	NRHP
NRS79_30210	Residence at 1904 Victoria	Kathy London	05/12/1981	NRHP
NRS79_30211	Residence at 1912 Victoria	Kathy London	05/12/1981	NRHP
NRS79_30212	Residence at 1919 Victoria	Kathy London	05/12/1981	NRHP
NRS79_30213	Residence at 1920 Victoria	Kathy London	05/12/1981	NRHP
NRS79_30214	Residence at 2003 Victoria	Kathy London	05/12/1981	NRHP
NRS79_30216	Residence at Northwest corner Victoria and >> cont.	Kathy London	05/12/1981	NRHP

NRS79_30217	Residence at Southwest corner Victoria and Vidaurri faceslatter	Kathy London	05/12/1981	NRHP
NRS79_30219	Residence at Northwest corner Washington and Juarez	Ellen Beasley	05/16/1981	NRHP
NRS79_30220	Residence at Southwest corner of Washington and Sta. Rita	Gale Adler	05/14/1981	NRHP
NRS79_30222	Residence at 1602 Washington	GSA	05/14/1981	NRHP
NRS79_30223	Residence at 1616 Washington	-	-	NRHP
NRS79_30224	Residence at 1620 Washington	-	-	NRHP
NRS79_30225	Residence at 1801 Washington	Gale Adler	05/14/1981	NRHP
NRS79_30227	Residence at 1820 Washington Northeast corner >> cont.	Gale Adler	05/14/1981	NRHP
NRS79_30265	Webb County Courthouse Annex	Ellen Beasley	05/16/1981	NRHP
NRS79_30267	Texas Harvest Hat Factory	Kathy London	05/15/1981	NRHP
NRS79_30268	Residence at 1114 San Augustin	Kathy London	05/16/1981	NRHP
NRS79_30269	Structure at 1120 San Augustin	Ellen Beasley	05/16/1981	NRHP
NRS79_30270	Residence at 1307 San Augustin	Kathy London	05/14/1981	NRHP
NRS79_30271	Residence at 1502 San Augustin	Kathy London	05/14/1981	NRHP
NRS79_30272	Residence at 1508 San Augustin	Kathy London	05/14/1981	NRHP
NRS79_30273	Residence at 1510 San Augustin	Kathy London	05/14/1981	NRHP
NRS79_30278	Commercial Structure at 1420 San Bernardo	Kathy London	05/15/1981	NRHP
NRS79_30279	Residence at 1005 San Dario	Hume Jackson et al.	08/1972	NRHP

NRS79_30281	Residence at 1311-15 San Eduardo Street	Kathy London	05/14/1981	NRHP
NRS79_30288	Residence at 1119 San Francisco Street	Kathy London	05/14/1981	NRHP
NRS79_30289	Residence at 1320 San Francisco Street	Kathy London	05/14/1981	NRHP
NRS79_30290	Residence at 1616-18 San Francisco Street	Kathy London	05/14/1981	NRHP
NRS79_30293	Residence at West side of San Ignacio, North of Scott	Kathy London	05/15/1981	NRHP
NRS79_30313	Residence at 1720 Santa Cleotide	Kathy London	05/15/1981	NRHP
NRS79_30324	Residence at 1116 Santa Rita	Gale Adler	05/14/1981	NRHP
NRS79_30326	Residence at 1618 Santa Maria Street	Kathy London	05/15/1981	NRHP
NRS79_30327	Residence at 19 (11) Santa Maria Street	Kathy London	05/15/1981	NRHP
NRS79_30328	Residence at 918 Scott Street	Kathy London	05/15/1981	NRHP
NRS79_30329	Residence at 1704 Scott Street	Kathy London	05/15/1981	NRHP
NRS79_30352	Boys Club of Laredo	Kathy London	05/14/1981	NA
NRS79_30425	Residence at 1420 Santa Maria Street	Kathy London	05/15/1981	NRHP
NRS79_30442	Holy Redeemer Catholic Church	Kathy London	05/15/1981	NRHP
NRS79_30443	Temple B’Nai Israel	Ellen Beasley	05/13/1981	NRHP
NRS79_30452	Residence at 1020 Main	Ellen Beasley	05/13/1981	NRHP
NRS79_30453	Residence at 1108 Main	Ellen Beasley	05/13/1981	NRHP
NRS79_30454	Residence at 1115 Main	Ellen	05/13/1981	NRHP

		Beasley		
NRS79_30455	Residence at 1119 Main	-	05/14/1981	NRHP
NRS79_30456	Residence at 1312 Main Street	Kathy London	05/15/1981	NRHP
NRS79_30457	Residence at 1402 Main Street	Kathy London	05/15/1981	NRHP
NRS79_30458	Residence at 1604 Main Street	Kathy London	05/15/1981	NRHP
NRS79_30462	Residence at 1905 Houston (originally Fronted Santa Rita)	Ellen Beasley	05/11/1981	NRHP
NRS79_30463	Residence at 1906 Houston	Gale Alder	05/11/1981	NRHP
NRS79_30464	Residence at 1909 Houston	Gale Alder	05/11/1981	NRHP
NRS79_30482	Residence at 1401 Main Street	Kathy London	05/11/1981	NRHP
NRS79_30493	St. Anthony Hotel	Ellen Beasley	05/15/1981	NRHP
NRS79_30495	Residence at 916 Salinas	Ellen Beasley	05/15/1981	NRHP
NRS79_30496	Residence at 12 (14) Salinas Street	Kathy London	05/15/1981	NRHP
NRS79_30497	Residence at 1402 Salinas Street	Kathy London	05/15/1981	NRHP
NRS79_30498	Residence at 1620 Salinas Street	Kathy London	05/15/1981	NRHP
NRS79_30542	Residence at 1018 Davis	GSA	05/14/1981	NRHP
NRS79_30543	El Castillo Apartments	Hume Jackson et al	08/1972	NRHP
NRS79_30544	Residence at 1319 Davis Street	Kathy London	05/15/1981	NRHP

Source: *Texas Archeological Sites Atlas*

Historic Markers within 1-mile of the Restoration Project Area

Marker Number	Marker Title	Marker Text
495	Biggio-Kowalski-De La Garza House	Chester C. Biggio, a railroad official and the city's first fire chief, had this home built in 1909 for his family. He died in 1923, and in 1938 his widow Laura Blossman Biggio sold the house to Louis and Dorothy Kowalski. They lived here with their six children until 1948. Leonor de La Garza bought the house in 1965; her sister Fidela inherited it in 1973. The house is a good example of the American foursquare form. Recorded Texas Historic Landmark - 1996
544	Bruni Plaza	When Juan Fernando de Palacios, Governor of Nuevo Santander, New Spain, designated Laredo as a villa in 1767, he laid out a central plaza as an integral part of the city's plan. During the era of Spanish colonization, the plaza functioned as a place for public meetings, readings of decrees, and corrals for cattle roundups. The land for this park was set aside in city plats by the Laredo City Council in 1870, and designated as a public plaza. From about 1900, it was known locally as Juarez Plaza, named for the organization Sociedad Mutualista Hijos de Juarez that met west of this block. In 1931 the plaza was renamed Bruni Plaza in tribute to prominent Laredo citizen Antonio Mateo Bruni. Born in Italy in 1856, Bruni came to Laredo in 1877 and established a mercantile business. A civic leader, Bruni was elected to the City Council in 1886, and to the County Commission in 1894. His other enterprises included holdings in real estate and ranching. Bruni contributed to the beautification of the plaza, and after his death in 1931, his will provided funds for its care. The site continues to serve as a community gathering place. (1997)
5435	The Texas Mexican Railway	Leading merchants in Corpus Christi began planning the Corpus Christi and Rio Grande Railroad in the 1850s to boost the south Gulf Coast as a center for commerce. Lack of funding and an economic slump prevented progress until 1875 when Uriah Lott became president of the railroad. Lott recruited major investors such as Richard King and Robert Kleberg to finance the construction of a narrow gauge rail line from Corpus Christi to San Diego. The lucrative valley market was sought by other rail companies who were vying for its control. Lott engineered the sale of the Corpus Christi and Rio Grande Railroad to a syndicate in the 1880s. The new owners were granted a charter with the name of the Texas-Mexican Railway Company. Laredo emerged as a major rail trading center and its population tripled in the 1880s. Over time the Texas Mexican Railway remained competitive by upgrading its system. Improvements included converting to standard gauge track by 1902, switching its locomotives to diesel electric in 1939, placing trailer on flatcars in the 1950s, and expanding operations into Houston and Beaumont in 1996. (1997)

APPENDIX E
CERTIFIED COSTS, PLANNING COSTS, AND ABBREVIATED COST RISK ANALYSIS

Cost Certification information is being developed by Fort Worth District.

Table E-1. Average Annual Cost Unit (AACU) by Measure

	HYDRO1	HYDRO2	DRAIN	DEPTH	SHORE	CANE1	CANE2
LERRDS							
	$ 16,335	**$ 124,926**	**$ 8,379**	**$ 560**	**$ 43,629**	**$ 30,855**	**$ 30,855**
General Construction							
Initial Construction	$ 25,967	$ 338,174	$ 86,478	$ 171,881	$ 75,957	$ 149,592	$ 213,884
3-year Establishment Period	$ 4,902	$ 23,202	$ 2,240	$ -	$ 8,350	$ 18,759	$ 26,701
subtotal	$ 30,869	$ 361,375	$ 88,718	$ 171,881	$ 84,307	$ 168,350	$ 240,585
Contingency (%)	7.54%	14.44%	5.82%	5.82%	9.14%	4.00%	7.31%
Contingency Value	$ 2,327	$ 52,179	$ 5,164	$ 10,004	$ 7,701	$ 6,734	$ 17,597
Subtotal	**$ 33,196**	**$ 413,554**	**$ 93,882**	**$ 181,885**	**$ 92,008**	**$ 175,084**	**$ 258,183**
Planning, Engineering, and Design (PED)							
PED (10%)	$ 3,087	$ 36,138	$ 8,872	$ 17,188	$ 8,431	$ 16,835.05	$ 24,058.51
PED Contingency (19.67%)	$ 607.33	$ 7,109.88	$ 1,745.48	$ 3,381.67	$ 1,658.69	$ 3,312.21	$ 4,733.39
Subtotal	**$ 3,694**	**$ 43,247**	**$ 10,617**	**$ 20,570**	**$ 10,089**	**$ 20,147**	**$ 28,792**
Construction Management							
Construction Management (10%)	$ 3,087	$ 36,138	$ 8,872	$ 17,188	$ 8,431	$ 16,835	$ 24,059
Construction Management Contingency (10.94%)	$ 338	$ 3,953	$ 970	$ 1,880	$ 922	$ 1,841	$ 2,632
Subtotal	**$ 3,425**	**$ 40,090**	**$ 9,842**	**$ 19,068**	**$ 9,353**	**$ 18,677**	**$ 26,690**
Subtotal First Cost	**$ 56,650**	**$ 621,818**	**$ 122,720**	**$ 222,083**	**$ 155,079**	**$ 244,763**	**$ 344,519**
Profit (10%)	$ 5,665	$ 62,182	$ 12,272	$ 22,208	$ 15,508	$ 24,476	$ 34,452
TOTAL FIRST COST	**$ 62,315**	**$ 683,999**	**$ 134,992**	**$ 244,291**	**$ 170,587**	**$ 269,239**	**$ 378,971**
Interest During Construction	$ 3,538	$ 38,831	$ 7,664	$ 13,869	$ 9,684	$ 15,285	$ 21,514
INVESTMENT COST	**$ 65,853**	**$ 722,830**	**$ 142,655**	**$ 258,160**	**$ 180,272**	**$ 284,524**	**$ 400,486**
Interest	$ 2,469	$ 27,106	$ 5,350	$ 9,681	$ 6,760	$ 10,670	$ 15,018
Amortization	$ 466	$ 5,113	$ 1,009	$ 1,826	$ 1,275	$ 2,013	$ 2,833
Annual Operations, Maintenance, Repair, Rehabilitation, and Replacements (OMRR&R)	$ 889	$ 1,735	$ 2,024	$ 2,467	$ 1,979	$ 1,996	$ 1,996
Average Annual Cost Unit (AACU)	**$ 3,824**	**$ 33,955**	**$ 8,382**	**$ 13,975**	**$ 10,015**	**$ 14,678**	**$ 19,847**

*cut material would be used as on-site fill material

ANNUAL INTEREST RATE (decimal)	**$ 0.03750**
PROJECT LIFE (years)	**$ 50**
CONSTRUCTION PERIOD (months)	**$ 36**
COST PER ACRE	**$ 5,600**

Table E-1. Average Annual Cost Unit (AACU) by Measure (continued)

	TAM1	TAM2	TAM and HYDRO2	ERODE1	ERODE2	NEST	NEST
LERRDS							
	$ 26,711	**$ 26,711**	**$ 151,636**	**$ 194,806**	**$ 194,806**	**$ -**	**$ -**
General Construction							
Initial Construction	$ 26,803	$ 71,312	$ 6,724	$ 26,252	$ 33,703	$ 535,592	$ 6,724
3-year Establishment Period	$ 13,018	$ 18,174	$ 4,064	$ 3,840	$ 9,139	$ 1,920	$ 4,064
subtotal	$ 39,822	$ 89,486	$ 10,788	$ 30,092	$ 42,842	$ 537,512	$ 10,788
Contingency (%)	6.09%	9.41%	9.41%	4.00%	9.73%	10.94%	9.41%
Contingency Value	$ 2,426	$ 8,417	$ 1,015	$ 1,204	$ 4,170	$ 58,795	$ 1,015
Subtotal	**$ 42,247**	**$ 97,902**	**$ 11,803**	**$ 31,296**	**$ 47,012**	**$ 596,307**	**$ 11,803**
Planning, Engineering, and Design (PED)							
PED (10%)	$ 3,982	$ 8,949	$ 1,079	$ 3,009	$ 4,284	$ 53,751	$ 1,079
PED Contingency (19.67%)	$ 783.47	$ 1,760.59	$ 212.25	$ 592.05	$ 842.90	$ 10,575.28	$ 212.25
Subtotal	**$ 4,766**	**$ 10,709**	**$ 1,291**	**$ 3,601**	**$ 5,127**	**$ 64,326**	**$ 1,291**
Construction Management							
Construction Management (10%)	$ 3,982	$ 8,949	$ 1,079	$ 3,009	$ 4,284	$ 53,751	$ 1,079
Construction Management Contingency (10.94%)	$ 436	$ 979	$ 118	$ 329	$ 469	$ 5,879	$ 118
Subtotal	**$ 4,418**	**$ 9,927**	**$ 1,197**	**$ 3,338**	**$ 4,753**	**$ 59,631**	**$ 1,197**
Subtotal First Cost	**$ 78,141**	**$ 145,250**	**$ 165,927**	**$ 233,041**	**$ 251,697**	**$ 720,264**	**$ 14,290**
Profit (10%)	$ 7,814	$ 14,525	$ 16,593	$ 23,304	$ 25,170	$ 72,026	$ 1,429
TOTAL FIRST COST	**$ 85,956**	**$ 159,775**	**$ 182,519**	**$ 256,345**	**$ 276,867**	**$ 792,291**	**$ 15,719**
Interest During Construction	$ 4,880	$ 9,070	$ 10,362	$ 14,553	$ 15,718	$ 44,979	$ 892
INVESTMENT COST	**$ 90,835**	**$ 168,845**	**$ 192,881**	**$ 270,898**	**$ 292,585**	**$ 837,269**	**$ 16,612**
Interest	$ 3,406	$ 6,332	$ 7,233	$ 10,159	$ 10,972	$ 31,398	$ 623
Amortization	$ 643	$ 1,194	$ 1,364	$ 1,916	$ 2,070	$ 5,923	$ 118
Annual Operations, Maintenance, Repair, Rehabilitation, and Replacements (OMRR&R)	$ 1,385	$ 1,385	$ 1,385	$ -	$ 769	$ 706	$ -
Average Annual Cost Unit (AACU)	**$ 5,434**	**$ 8,911**	**$ 9,982**	**$ 12,075**	**$ 13,811**	**$ 38,027**	**$ 740**

*cut material would be used as on-site fill material

ANNUAL INTEREST RATE (decimal)	**$ 0.03750**
PROJECT LIFE (years)	**$ 50**
CONSTRUCTION PERIOD (months)	**$ 36**
COST PER ACRE	**$ 5,600**

**** All costs are based on areas calculated using Excel. Costs for materials are based on area. Although rounding errors appear throughout the cost workbooks, this allows revisions of the HEP workbooks to be tracked in the cost workbooks without manual entry of areas. ****

Table E-2a. Initial Construction Costs for HYDRO1 (TY0-1)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Excavation and Contouring	1.40	AC								$ -
bobcat or mini-excavator (40 hr/ac)	56	HR	56	$ 80.00	$ 4,472.22	$ 50.00	$ 2,795.14			$ 7,267.36
soil cut / disposal (0.5' depth)	1127	CY						$ 10.00	$ 11,273.73	$ 11,273.73
2) Planting (50% excavation area) (60 hr/ac)	0.70	AC	42	$ 60.00	$ 2,515.62					$ 2,515.62
native seed mix (20 lb/ac)	14	LB						$ 50.00	$ 698.78	$ 698.78
poles bundles / wattles (100 bundle/ac)	70	Bundle						$ 12.00	$ 838.54	$ 838.54
3) Best Management Practices (1 hr/100 LF)	937	LF	9	$ 60.00	$ 562.22					$ 562.22
mats, bales, silt-fence, etc. (50% perimeter of polygons)	937	LF						$ 3.00	$ 2,811.08	$ 2,811.08
TOTAL THIS SHEET			**107**		**$ 7,550.06**		**$ 2,795.14**		**$ 15,622.14**	**$ 25,967.34**

Table E-2b. Initial Construction Costs for HYDRO2 (TY0-1)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Excavation and Contouring	7.33	AC								$ -
barge (purchase, delivery, disposal)	1	#				$ 80,000.00	$ 80,000.00			$ 80,000.00
excavator (40 hr/ac)	293	HR	293	$ 80.00	$ 23,459.58	$ 50.00	$ 14,662.24			$ 38,121.82
soil cut / disposal (1' to 2' depth)	13440	CY						$ 10.00	$ 134,397.93	$ 134,397.93
2) Planting Native Vegetation (60hr/ac)	5.72	AC	343	$ 60.00	$ 20,589.81					$ 20,589.81
native seed mix (20 lb/ac)	114	LB						$ 65.00	$ 7,435.21	$ 7,435.21
containerized woody plants (250/ac)	1,430	GAL						$ 10.00	$ 14,298.48	$ 14,298.48
poles bundles / wattles (100 bundle/ac)	572	Bundle						$ 12.00	$ 6,863.27	$ 6,863.27
3) Best Management Practices (1 hr/100 LF)	2917	LF	29	$ 60.00	$ 1,750.00					$ 1,750.00
mats, bales, silt-fence, etc. (50% perimeter of polygons)	2917	LF						$ 3.00	$ 8,749.99	$ 8,749.99
TOTAL THIS SHEET			**666**		**$ 45,799.39**		**$ 94,662.24**		**$ 171,744.88**	**$ 312,206.51**

Table E2c. 3-Year Establishment Costs for HYDRO1 (TY1-3)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Surveys (8 hr/ac) x 2 yr	1.40	AC	22	$ 60.00	$ 1,341.67					$ 1,341.67
2) Plant Replacement (5 hr/ac) x 2 yr	0.70	AC	7	$ 60.00	$ 419.27					$ 419.27
poles bundles / wattles (20% installation) x 2 yr	21	pole			$ -			$ 12.00	$ 251.56	$ 251.56
3) Control Exotics (5 hr/ac) x 2 yr	0.70	AC	7	$ 60.00	$ 419.27					$ 419.27
follow-up herbicide (1 gal/ac) x 2 yr	1	GAL			$ -			$ 50.00	$ 69.88	$ 69.88
4) Monitoring (data reporting) x 2 yr	1.40	AC	40	$ 60.00	$ 2,400.00					$ 2,400.00
TOTAL THIS SHEET			**76**		**$ 4,580.21**				**$ 321.44**	**$ 4,901.65**

Table E-2d. 3-Year Establishment Costs for HYDRO2 (TY1-3)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Surveys (8 hr/ac) x 2 yr	7.33	AC								**$ -**
2) Plant Replacement (5 hr/ac) x 2 yr	5.72	AC	57	$ 60.00	$ 3,431.64					$ 3,431.64
containerized woody plants (20% installation) x 2 yr	572	GAL			$ -			$ 10.00	$ 5,719.39	$ 5,719.39
poles bundles / wattles (20% installation) x 2 yr	229	Bundle			$ -			$ 12.00	$ 2,745.31	$ 2,745.31
3) Herbicide Application (5 hr/ac) x 2 yr	5.72	AC	57	$ 60.00	$ 3,431.64					$ 3,431.64
follow-up herbicide (1 gal/ac) x 2 yr	11	GAL			$ -			$ 50.00	$ 571.94	$ 571.94
4) Monitoring (data reporting) x 2 yr	2	#	40	$ 60.00	$ 2,400.00					$ 2,400.00
TOTAL THIS SHEET			**154**		**$ 9,263.27**		**$ -**		**$ 9,036.64**	**$ 18,299.91**

Table E-2e. Operation and Maintenance Costs for HYDRO1 (TY3-50)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Surveys (8 hr/ac) x 10 yr	1.40	AC	112	$ 60.00	$ 6,708.33					$ 6,708.33
2) Clear Obstructions (50% Installation Area) x 5 yr	0.70	AC								$ -
bobcat or mini-excavator (40 hr/ac) x 5 yr	140	HR	140	$ 80.00	$ 11,180.55	$ 50.00	$ 6,987.85			$ 18,168.40
3) Herbicide Application (5 hr/ac) x 10 yr	1.40	AC	70	$ 60.00	$ 4,192.71					$ 4,192.71
follow-up herbicide (1 gal/ac) x 10 yr	14	GAL						$ 50.00	$ 698.78	$ 698.78
4) Monitoring (data reporting) x 10 yr	10	#	200	$ 60.00	$ 12,000.00					$ 12,000.00
TOTAL THIS SHEET			**521**		**$ 34,081.60**		**$ 6,987.85**		**698.78**	**$ 41,768.23**

Table E-2f. Operation and Maintenance Costs for HYDRO2 (TY3-50)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Surveys (8 hr/ac) x 10 yr	7.33	AC	586	$ 60.00	$ 35,189.38					$ 35,189.38
2) Clear Obstructions (10% Installation Area) x 5 yr	0.73	AC								$ -
bobcat or mini-excavator (40 hr/ac) x 5 yr	147	HR	147	$ 80.00	$ 11,729.79	$ 50.00	$ 7,331.12			$ 19,060.91
3) Herbicide Application (5 hr/ac) x 10 yr	0.73	AC	37	$ 60.00	$ 2,199.34					$ 2,199.34
follow-up herbicide (1 gal/ac) x 10 yr	7	GAL			$ -			$ 150.00	$ 1,099.67	$ 1,099.67
4) Monitoring (data reporting) x 10 yr	10	#	400	$ 60.00	$ 24,000.00				$ -	$ 24,000.00
TOTAL THIS SHEET			**583**		**$ 73,118.51**		**$ 7,331.12**		**$ 1,099.67**	**$ 81,549.29**

Table E-3a. Initial Construction Costs for DRAIN (TY0-1)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Demolition and Disposal of LWC	2	#								$ -
backhoe	40	HR	40	$ 80.00	$ 3,200.00	$ 50.00	$ 2,000.00			$ 5,200.00
concrete recycling	237	CY						$ 12.50	$ 2,962.96	$ 2,962.96
2) Install 24" Culvert	1	#								$ -
CMP (6@ 24" X 20')	120	LF						$ 170.00	$ 20,400.00	$ 20,400.00
backhoe	80	HR	80	$ 80.00	$ 6,400.00	$ 50.00	$ 4,000.00			$ 10,400.00
inlet/outlet treatment area	4	CY	40	$ 60.00	$ 2,400.00			$ 350.00	$ 1,322.22	$ 3,722.22
aggregate	25	CY						$ 10.00	$ 251.85	$ 251.85
3) Install 36" Culvert	1	#								$ -
CMP (6@ 36" X 20')	120	LF						$ 220.00	$ 26,400.00	$ 26,400.00
backhoe	80	HR	80	$ 80.00	$ 6,400.00	$ 50.00	$ 4,000.00			$ 10,400.00
inlet/outlet treatment area (4@ 17' X 3')	5	CY	40	$ 60.00	$ 2,400.00			$ 350.00	$ 1,762.96	$ 4,162.96
aggregate	38	CY						$ 10.00	$ 377.78	$ 377.78
4) Best Management Practices (1 hr/100 LF)			20	$ 60.00	$ 1,200.00					$ 1,200.00
fencing, bales, mats, etc.	100	LF						$ 10.00	$ 1,000.00	$ 1,000.00
TOTAL THIS SHEET			**300**		**$ 22,000.00**		**$ 10,000.00**		**$ 54,477.78**	**$ 86,477.78**

Table E-3b. Operations and Maintenance Costs for DRAIN (TY1-3)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Survey x 2 yr	2	#	16	$ 60.00	$ 960.00					$ 960.00
2) Clear Culverts of Obstructions x 1 yr	2	#								$ -
bobcat or backhoe (4 hr / culvert) x 1 yr	8	HR	8	$ 80.00	$ 640.00	$ 50.00	$ 400.00			$ 1,040.00
3) Monitoring (data reporting) x 2 yr	2	#	4	$ 60.00	$ 240.00					$ 240.00
TOTAL THIS SHEET			**28**		**$ 1,840.00**		**$ 400.00**		**$ -**	**$ 2,240.00**

Table E-3c. Replacement and Repair Costs for DRAIN (TY3-50)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Survey x 10 yr	10	#	80	$ 60.00	$ 4,800.00					$ 4,800.00
2) Clear Obstructions x 5 yr	2	#								$ -
bobcat or backhoe (10 hr / culvert) x 5 yr	100	HR	100	$ 80.00	$ 8,000.00	$ 50.00	$ 5,000.00			$ 13,000.00
3) Repair/Replace 24" Culvert	1	#						$ 34,774.07	$ 34,774.07	$ 34,774.07
4) Repair/Replace 36" Culvert	1	#						$ 41,340.74	$ 41,340.74	$ 41,340.74
5) Monitoring (data reporting) x 10 yr	10	#	20	$ 60.00	$ 1,200.00					$ 1,200.00
TOTAL THIS SHEET			**200**		**14,000.00**		**5,000.00**		**76,115**	**$ 95,114.81**

Table E-4a. Initial Construction Costs for DEPTH (TY0-1)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Dredge (3' depth)	1.68	AC	80	$ 80.00	$ 6,400.00					$ 6,400.00
excavator	80	HR				$ 50.00	$ 4,000.00			$ 4,000.00
barge (purchase, deliver, disposal)	1	#				$ 80,000.00	$ 80,000.00			$ 80,000.00
soil disposal	8148	CY						$ 10.00	$ 81,480.62	$ 81,480.62
TOTAL THIS SHEET			**80**		**$ 6,400.00**		**$ 84,000.00**		**$ 81,480.62**	**$ 171,880.62**

Table E-4b. Operation and Maintenance Cost for DEPTH (TY3-50)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Dredge (1' depth)	1.68	AC	80	$ 80.00	$ 6,400.00				$ -	$ 6,400.00
excavator	1	#				$ 30.00	$ 2,400.00			$ 2,400.00
barge (purchase, deliver, disposal)	1	#				$ 80,000.00	$ 80,000.00			$ 80,000.00
soil disposal	2716	CY			$ -		$ -	$ 10.00	$ 27,160.21	$ 27,160.21
TOTAL THIS SHEET			**80**		**$ 6,400.00**		**$ 82,400.00**		**$ 27,160.21**	**$ 115,960.21**

Table E-5a. Initial Construction Costs for SHORE (TY0-1)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Contouring and Stabilization	1.05	AC								$ -
excavator (80 hr/ac)	84.40	HR	84	$ 80.00	$ 6,751.89	$ 50.00	$ 4,219.93			$ 10,971.83
soil fill (2' depth)	3404	CY						$ 10.00	$ 34,040.79	$ 34,040.79
bobcat or mini-excavator (80 hr/ac)	84	HR	84	$ 80.00	$ 6,751.89	$ 50.00	$ 4,219.93			$ 10,971.83
aggregate (10% of fill volume)	340	CY						$ 15.00	$ 5,106.12	$ 5,106.12
2) Plant Native Vegetation (60 hr/ac)	1.05	AC	63	$ 60.00	$ 3,797.94					$ 3,797.94
native seed mix (5 lb/ac)	5.3	LB						$ 50.00	$ 263.75	$ 263.75
bare root/ rhizomes (500/ac)	527	GAL						$ 7.00	$ 3,692.44	$ 3,692.44
containerized herbaceous plants (250/ac)	264	GAL						$ 5.00	$ 1,318.73	$ 1,318.73
containerized woody plants (250/ac)	264	GAL						$ 10.00	$ 2,637.46	$ 2,637.46
poles bundles / wattles (100 bundle/ac)	105	Bundle						$ 12.00	$ 1,265.98	$ 1,265.98
3) Best Management Practices (1 hr/100 LF)	525	LF	5	$ 60.00	$ 314.94					$ 314.94
mats, bales, silt-fence, etc. (50% perimeter of polygons)	525	LF						$ 3.00	$ 1,574.72	$ 1,574.72
TOTAL THIS SHEET					**$ 17,616.67**		**$ 8,439.87**		**$ 49,899.99**	**$ 75,956.52**

Table E-5b. 3-Year Establishment Costs for SHORE (TY1-3)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Surveys (8hr/ac) x 2 yr	1.05	AC	17	$ 60.00	$ 1,012.78					$ 1,012.78
2) Plant Replacement (5 hr/ac) x 2 yr	1.05	AC	11	$ 60.00	$ 632.99					$ 632.99
bare root/ rhizomes (20% installation) x 2 yr	211	GAL						$ 7.00	$ 1,476.98	$ 1,476.98
containerized herbaceous plants (20% installation) x 2 yr	105	GAL						$ 5.00	$ 527.49	$ 527.49
containerized woody plants (20% installation) x 2 yr	105	GAL						$ 10.00	$ 1,054.98	$ 1,054.98
poles bundles / wattles (20% installation) x 2 yr	42	Bundle						$ 12.00	$ 506.39	$ 506.39
3) Control Exotics (5 hr/ac) x 2 yr	1.05	AC	11	$ 60.00	$ 632.99					$ 632.99
follow-up herbicide (1 gal/ac)	2.1	GAL						$ 50.00	$ 105.50	$ 105.50
4) Monitoring (data reporting) x 2 yr	2	#	40	$ 60.00	$ 2,400.00					$ 2,400.00
TOTAL THIS SHEET			**78**		**$ 4,678.76**				**$ 3,671.34**	**$ 8,350.11**

Table E-5c. Operation and Maintenance Costs for SHORE (TY3-50)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Surveys (8hr/ac) x 10 yr	1.05	AC	84	$ 60.00	$ 5,063.92					$ 5,063.92
2) Maintain and Repair Wetland Benches (100% installation)	1.00	#						$ 75,956.52	$ 75,956.52	$ 75,956.52
3) Monitoring (data reporting) x 10 yr	10	#	200	$ 60.00	$ 12,000.00					$ 12,000.00
TOTAL THIS SHEET					**$ 17,063.92**				**$ 75,956.52**	**$ 93,020.44**

Table E-6a. Initial Construction Costs for CANE1 (TY0-1)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Removal, chip, and spray (20 hr/ac)	5.93	AC								$ -
initial application herbicide (4 gal/ac)	24	GAL	119	$ 60.00	$ 7,112.54			$ 150.00	$ 3,556.27	$ 10,668.80
front-end loader, track-hoe, etc (120 hr/ac)	711	HR	711	$ 60.00	$ 42,675.21	$ 50.00	$ 35,562.68			$ 78,237.89
chipper (80 hr/ac)	474	HR	474	$ 60.00	$ 28,450.14	$ 50.00	$ 23,708.45			$ 52,158.59
2) Best Management Practices (1 hr/100 LF)	2368	LF	24	$ 60.00	$ 1,421.06					$ 1,421.06
mats, bales, silt-fence, etc. (50% perimeter of polygons)	2368	LF						$ 3.00	$ 7,105.29	$ 7,105.29
TOTAL THIS SHEET			**1,328**		**$ 79,658.95**		**$ 59,271.13**		**$ 10,661.56**	**$ 149,591.63**

Table E-6b. Initial Construction Costs for CANE2 (TY0-1)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Removal, chip, and spray (20 hr/ac)	5.93	AC								$ -
initial application herbicide (4 gal/ac)	24	GAL	119	$ 60.00	$ 7,112.54			$ 150.00	$ 3,556.27	$ 10,668.80
front-end loader, track-hoe, etc (120 hr/ac)	711	HR	711	$ 60.00	$ 42,675.21	$ 50.00	$ 35,562.68			$ 78,237.89
chipper (80 hr/ac)	474	HR	474	$ 60.00	$ 28,450.14	$ 50.00	$ 23,708.45			$ 52,158.59
2) Planting Native Vegetation (60 hr/ac)	5.93	AC	356	$ 60.00	$ 21,337.61					$ 21,337.61
bobcat with post-hole digger (10 hr/ac)	59	HR				$ 50.00	$ 2,963.56			$ 2,963.56
native seed mix (5 lb/ac)	30	LB						$ 50.00	$ 1,481.78	$ 1,481.78
containerized woody plants (250 /ac)	1,482	GAL						$ 10.00	$ 14,817.78	$ 14,817.78
poles bundles / wattles (100 bundle/ac)	593	Bundle						$ 12.00	$ 7,112.54	$ 7,112.54
3) Best Management Practices (1 hr/100 LF)	2368	LF	24	$ 60.00	$ 1,421.06					$ 1,421.06
mats, bales, silt-fence, etc. (50% perimeter of polygons)	2368	LF						$ 10.00	$ 23,684.30	$ 23,684.30
TOTAL THIS SHEET*			**1,683**		**$ 100,996.55**		**$ 62,234.69**		**$ 50,652.66**	**$ 213,883.90**

Table E-6c. 3-Year Establishment Costs for CANE1 (TY1-3)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Surveys (8 hr/ac) x 2 yr	5.93	AC	95	$ 60.00	$ 5,690.03					$ 5,690.03
2) Control Exotics (10 hr/ac) x 2 yr	5.93	AC	119	$ 60.00	$ 7,112.54					$ 7,112.54
follow-up herbicide (2 gal/ac) x 2 yr	24	GAL						$ 150.00	$ 3,556.27	$ 3,556.27
3) Monitoring (data reporting) x 2 yr	2	#	40	$ 60.00	$ 2,400.00					$ 2,400.00
TOTAL THIS SHEET			**159**		**$ 15,202.56**		**$ -**		**$ 3,556.27**	**$ 18,758.83**

Table E-6d. 3-year Establishment Costs for CANE2 (TY1-3)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Surveys (8 hr/ac) x 2 yr	5.93	AC	95	$ 60.00	$ 5,690.03					$ 5,690.03
2) Control Exotics (10 hr/ac) x 2 yr	5.93	AC	119	$ 60.00	$ 7,112.54					$ 7,112.54
follow-up herbicide (2 gal/ac) x 2 yr	24	GAL						$ 150.00	$ 3,556.27	$ 3,556.27
3) Plant Replacement (5 hr/ac) x 2 yr	5.93	AC	59	$ 60.00	$ 3,556.27					$ 3,556.27
containerized woody plants (20% installation) x 2 yr	296	GAL						$ 10.00	$ 2,963.56	$ 2,963.56
poles bundles / wattles (20% installation) x 2 yr	119	Bundle						$ 12.00	$ 1,422.51	$ 1,422.51
4) Monitoring (data reporting) x 2 yr	2	#	40	$ 60.00	$ 2,400.00					$ 2,400.00
TOTAL THIS SHEET			**313**		**$ 18,758.83**		**$ -**		**$ 7,942.33**	**$ 26,701.16**

Table E-6e. Operations and Maintenance Costs for CANE1 (TY3-50)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Surveys (8 hr/ac) x 10 yr	5.93	AC	474	$ 60.00	$ 28,450.14					$ 28,450.14
2) Control Exotics (10 hr/ac) x 10 yr	5.93	AC	593	$ 60.00	$ 35,562.68					$ 35,562.68
follow-up herbicide (2 gal/ac) x 10 yr	119	GAL			$ -			$ 150.00	$ 17,781.34	$ 17,781.34
3) Monitoring (data reporting) x 10 yr	10	#	200	$ 60.00	$ 12,000.00					$ 12,000.00
TOTAL THIS SHEET			**1,267**		**$ 76,012.82**		**$ -**		**$ 17,781.34**	**$ 93,794.16**

Table E-6f. Operation and Maintenance Costs for CANE2 (TY3-50)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Surveys (8 hr/ac) x 10 yr	5.93	AC	474	$ 60.00	$ 28,450.14					$ 28,450.14
2) Control Exotics (10 hr/ac) x 10 yr	5.93	AC	593	$ 60.00	$ 35,562.68					$ 35,562.68
follow-up herbicide (2 gal/ac) x 10 yr	119	GAL			$ -			$ 150.00	$ 17,781.34	$ 17,781.34
3) Monitoring (data reporting) x 10 yr	10	#	200	$ 60.00	$ 12,000.00					$ 12,000.00
TOTAL THIS SHEET			**1,267**		**$ 76,012.82**		**$ -**		**$ 17,781.34**	**$ 93,794.16**

Table E-7a. Initial Construction Costs for TAM1 (TY0-1)

TASK DESCRIPTION	QUANTITY					EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Cut, Chip, and Spray (40 hr/ac)	3.85	AC	154	$ 60.00	$ 9,233.27					$ 9,233.27
chipper	154	HR				$ 50.00	$ 7,694.39			$ 7,694.39
saws (blades, fuel, oil, repairs, ppe)	154	HR				$ 5.00	$ 769.44			$ 769.44
initial herbicide (4 gal/ac)	8	GAL			$ -			$ 150.00	$ 1,154.16	$ 1,154.16
2) Best Management Practices (1 hr/100 LF)	2209	LF	22	$ 60.00	$ 1,325.35					$ 1,325.35
mats, bales, silt-fence, etc. (50% perimeter of polygons)	2209	LF						$ 3.00	$ 6,626.76	$ 6,626.76
TOTAL THIS SHEET			**176**		**$ 10,558.62**		**$ 8,463.83**		**$ 7,780.92**	**$ 26,803.38**

Table E-7b. Initial Construction Costs for TAM2 (TY0-1)

TASK DESCRIPTION	QUANTITY					EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Cut, Chip, and Spray (40 hr/ac)	3.85	AC	154	$ 60.00	$ 9,233.27					$ 9,233.27
chipper	154	HR				$ 50.00	$ 7,694.39			$ 7,694.39
saws (blades, fuel, oil, repairs, ppe)	154	HR				$ 5.00	$ 769.44			$ 769.44
initial herbicide (4 gal/ac)	8	GAL			$ -			$ 150.00	$ 1,154.16	$ 1,154.16
2) Planting Native Vegetation (60 hr/ac)	3.85	AC	231	$ 60.00	$ 13,849.91					$ 13,849.91
native seed mix (5 lb/ac)	19	LB						$ 50.00	$ 961.80	$ 961.80
containerized woody plants (250 /ac)	962	GAL						$ 10.00	$ 9,617.99	$ 9,617.99
poles bundles / wattles (100 bundle/ac)	385	Bundle						$ 12.00	$ 4,616.64	$ 4,616.64
3) Best Management Practices (1 hr/100 LF)	2209	LF	22	$ 60.00	$ 1,325.35					$ 1,325.35
mats, bales, silt-fence, etc. (50% perimeter of polygons)	2209	LF						$ 10.00	$ 22,089.21	$ 22,089.21
TOTAL THIS SHEET*			**407**		**$ 24,408.53**		**$ 8,463.83**		**$ 38,439.79**	**$ 71,312.16**

Table E-7c. 3-Year Establishment Period Costs for TAM1 (TY1-3)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Surveys (8 hr/ac) x 2 yr	3.85	AC	62	$ 60.00	$ 3,693.31					$ 3,693.31
2) Control Exotics (10 hr/ac) x 2 yr	3.85	AC	77	$ 60.00	$ 4,616.64					$ 4,616.64
follow-up herbicide (2 gal/ac) x 2 yr	15	GAL						$ 150.00	$ 2,308.32	$ 2,308.32
3) Monitoring (data reporting) x 2 yr	2	#	40	$ 60.00	$ 2,400.00					$ 2,400.00
TOTAL THIS SHEET			**178**		**$ 10,709.94**		**$ -**		**2,308**	**$ 13,018.26**

Table E-7d. 3-Year Establishment Period Costs for TAM2 (TY1-3)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Surveys (8 hr/ac) x 2 yr	3.85	AC	62	$ 60.00	$ 3,693.31					$ 3,693.31
2) Control Exotics (10 hr/ac) x 2 yr	3.85	AC	77	$ 60.00	$ 4,616.64					$ 4,616.64
follow-up herbicide (2 gal/ac) x 2 yr	15	GAL						$ 150.00	$ 2,308.32	$ 2,308.32
3) Plant Replacement (5 hr/ac) x 2 yr	3.85	AC	38	$ 60.00	$ 2,308.32					$ 2,308.32
containerized woody plants (20% installation) x 2 yr	192	GAL						$ 10.00	$ 1,923.60	$ 1,923.60
poles bundles / wattles (20% installation) x 2 yr	77	Bundle						$ 12.00	$ 923.33	$ 923.33
4) Monitoring (data reporting) x 2 yr	2	#	40	$ 60.00	$ 2,400.00					$ 2,400.00
TOTAL THIS SHEET			**217**		**$ 13,018.26**		**$ -**		**$ 5,155.24**	**$ 18,173.50**

Table E-7e. Operation and Maintenance Costs for TAM1 (TY3-50)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Surveys (8 hr/ac) x 10 yr	3.85	AC	308	$ 60.00	$ 18,466.54					$ 18,466.54
2) Control Exotics (10 hr/ac) x 10 yr	3.85	AC	385	$ 60.00	$ 23,083.18					$ 23,083.18
follow-up herbicide (2 gal/ac) x 10 yr	77	GAL			$ -			$ 150.00	$ 11,541.59	$ 11,541.59
3) Monitoring (data reporting) x 10 yr	10	#	200	$ 60.00	$ 12,000.00					$ 12,000.00
TOTAL THIS SHEET			**892**		**$ 53,549.72**		**$ -**		**$ 11,541.59**	**$ 65,091.31**

Table E-7f. Operation and Maintenance Costs for TAM2 (TY3-50)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Surveys (8 hr/ac) x 10 yr	3.85	AC	308	$ 60.00	$ 18,466.54					$ 18,466.54
2) Control Exotics (10 hr/ac) x 10 yr	3.85	AC	385	$ 60.00	$ 23,083.18					$ 23,083.18
follow-up herbicide (2 gal/ac) x 10 yr	77	GAL			$ -			$ 150.00	$ 11,541.59	$ 11,541.59
3) Monitoring (data reporting) x 10 yr	10	#	200	$ 60.00	$ 12,000.00					$ 12,000.00
TOTAL THIS SHEET			**892**		**$ 53,549.72**		**$ -**		**$ 11,541.59**	**$ 65,091.31**

Table E-7g. Initial Construction Costs for TAM2 if HYDRO2 is Implemented (TY0-1)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Cut, Chip, and Spray (40 hr/ac)	0.41	AC	16	$ 60.00	$ 973.94					$ 973.94
chipper	16	HR				$ 50.00	$ 811.62			$ 811.62
saws (blades, fuel, oil, repairs, ppe)	16	HR				$ 5.00	$ 81.16			$ 81.16
initial herbicide (4 gal/ac)	1	GAL			$ -			$ 150.00	$ 121.74	$ 121.74
2) Planting Native Vegetation (60 hr/ac)	0.41	AC	24	$ 60.00	$ 1,460.91					$ 1,460.91
native seed mix (5 lb/ac)	2	LB						$ 50.00	$ 101.45	$ 101.45
containerized woody plants (250/ac)	101	GAL						$ 10.00	$ 1,014.52	$ 1,014.52
poles bundles / wattles (100 bundle/ac)	41	Bundle						$ 12.00	$ 486.97	$ 486.97
3) Best Management Practices (1 hr/100 LF)	158	LF	2	$ 60.00	$ 94.63					$ 94.63
mats, bales, silt-fence, etc. (50% perimeter of polygons)	158	LF						$ 10.00	$ 1,577.12	$ 1,577.12
TOTAL THIS SHEET			**42**		**$ 2,529.48**		**$ 892.78**		**$ 3,301.81**	**$ 6,724.06**

Table E-7h. 3-Year Establishment Period Costs for TAM if HYDRO2 is Implemented (TY1-3)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Surveys (8 hr/ac) x 2 yr	0.41	AC	6	$ 60.00	$ 389.58					$ 389.58
2) Control Exotics (10 hr/ac) x 2 yr	0.41	AC	8	$ 60.00	$ 486.97					$ 486.97
follow-up herbicide (2 gal/ac) x 2 yr	2	GAL						$ 150.00	$ 243.49	$ 243.49
3) Plant Replacement (5 hr/ac) x 2 yr	0.41	AC	4	$ 60.00	$ 243.49					$ 243.49
containerized woody plants (20% installation) x 2 yr	20	GAL						$ 10.00	$ 202.90	$ 202.90
poles bundles / wattles (20% installation) x 2 yr	8	Bundle						$ 12.00	$ 97.39	$ 97.39
4) Monitoring (data reporting) x 2 yr	2	#	40	$ 60.00	$ 2,400.00					$ 2,400.00
TOTAL THIS SHEET			**59**		**$ 3,520.03**		**$ -**		**$ 543.78**	**$ 4,063.81**

Table E-7i. Operation and Maintenance Costs for TAM if HYDRO2 is Implemented (TY3-50)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Surveys (8 hr/ac) x 10 yr	0.41	AC	32	$ 60.00	$ 1,947.88					$ 1,947.88
2) Control Exotics (10 hr/ac) x 10 yr	0.41	AC	41	$ 60.00	$ 2,434.85					$ 2,434.85
follow-up herbicide (2 gal/ac) x 10 yr	8	GAL			$ -			$ 150.00	$ 1,217.43	$ 1,217.43
3) Monitoring (data reporting) x 10 yr	10	#	200	$ 60.00	$ 12,000.00					$ 12,000.00
TOTAL THIS SHEET			**273**		**$ 16,382.73**		**$ -**		**$ 1,217.43**	**$ 17,600.16**

Table E-8a. Initial Construction Costs for ERODE1 (TY0-1)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Disc Roads (10 hr/ac)	1.5	AC								$ -
tractor and disc	15	HR	15	$ 60.00	$ 900.00	$ 50.00	$ 750.00			$ 1,650.00
2) Pipe Gates	5	#	25	$ 60.00	$ 1,500.00			$ 700.00	$ 3,500.00	$ 5,000.00
3) Erosion Control (50% road length) (1 hr/ 100 LF)	5445	LF	54	$ 60.00	$ 3,267.00					$ 3,267.00
fencing, bales, mats, rocks	5445	LF						$ 3.00	$ 16,335.00	$ 16,335.00
TOTAL THIS SHEET			**94**		**$ 5,667.00**		**$ 750.00**		**$ 19,835.00**	**$ 26,252.00**

Table E-8b. Initial Construction Costs for ERODE2 (TY0-1)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Contouring and Stabilization	0.1	AC								$ -
excavator	40	HR	40	$ 80.00	$ 3,200.00	$ 50.00	$ 2,000.00			$ 5,200.00
2" to 4" aggregate (30% area) (1' depth)	48	CY						$ 15.00	$ 726.00	$ 726.00
poles bundles / wattles	20	Bundle						$ 12.00	$ 240.00	$ 240.00
2) Planting Native Vegetation (60 hr/ac)	0.1	AC	6	$ 60.00	$ 360.00					$ 360.00
native seed mix (5 lb/ac)	1	LB						$ 50.00	$ 25.00	$ 25.00
containerized woody plants (250/ac)	25	GAL						$ 10.00	$ 250.00	$ 250.00
poles bundles / wattles (100 bundle/ac)	10	Bundle						$ 12.00	$ 120.00	$ 120.00
3) Best Management Practices (1 hr/100 LF)	50	LF	1	$ 60.00	$ 30.00					$ 30.00
mats, bales, silt-fence, etc.	50	LF						$ 10.00	$ 500.00	$ 500.00
TOTAL THIS SHEET			**46**		**$ 3,590.00**		**$ 2,000.00**		**$ 1,861.00**	**$ 7,451.00**

Table E-8c. 3-year Establishment Period Costs for ERODE1 (TY1-3)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Surveys (8 hr/ac) x 2 yr	1.50	AC	24	$ 60.00	$ 1,440.00					$ 1,440.00
2) Monitoring (data reporting) x 2 yr	2	#	40	$ 60.00	$ 2,400.00					$ 2,400.00
TOTAL THIS SHEET			**64**		**$ 3,840.00**		**$ -**		**$ -**	**$ 3,840.00**

Table E-8d 3-year Establishment Period Costs for ERODE2 (TY1-3)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Surveys (8 hr/ac) x 2 yr	0.1	AC	2	$ 60.00	$ 96.00					$ 96.00
2) Contouring and Stabilization x 2 yr	0.1	AC								$ -
excavator x 2 yr	40	HR	40	$ 80.00	$ 3,200.00	$ 50.00	$ 2,000.00			$ 5,200.00
2" to 4" aggregate (10% installation) x 2 yr	10	CY						$ 15.00	$ 145.20	$ 145.20
poles bundles / wattles (20% installation) x 2 yr	2	Bundle						$ 12.00	$ 24.00	$ 24.00
3) Plant Replacement (5hr/ac) x 2 yr	0.1	#	0	$ 60.00	$ 6.00				$ -	$ 6.00
containerized woody plants (20% installation) x 2 yr	10	GAL						$ 10.00	$ 100.00	$ 100.00
poles bundles / wattles (20% installation) x 2 yr	4	Bundle						$ 12.00	$ 48.00	$ 48.00
4) Best Management Practices (1 hr/100 LF) x 2 yr	100	LF	2	$ 60.00	$ 120.00					$ 120.00
mats, bales, silt-fence, etc. x 2 yr	100	LF						$ 10.00	$ 1,000.00	$ 1,000.00
5) Monitoring (data reporting) x 2 yr	2	#	40	$ 60.00	$ 2,400.00					$ 2,400.00
TOTAL THIS SHEET			**84**		**$ 5,822.00**		**$ 2,000.00**		**$ 1,317.20**	**$ 9,139.20**

Table E-8e. Operations and Maintenance Costs if ERODE2 is implemented (TY3-50)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Surveys (8 hr/ac) x 5 yr	0.1	AC	4	$ 60.00	$ 240.00					$ 240.00
2) Contouring and Stabilization x 5 yr	0.1	AC								$ -
excavator x 5 yr	200	HR	200	$ 80.00	$ 16,000.00	$ 50.00	$ 10,000.00			$ 26,000.00
2" to 4" aggregate (10% installation) x 5 yr	24	CY						$ 15.00	$ 363.00	$ 363.00
poles bundles / wattles (20% installation) x 5 yr	20	Bundle						$ 12.00	$ 240.00	$ 240.00
3) Plant Replacement (5 hr/ac) 5 yr	0.1	AC	3	$ 60.00	$ 150.00				$ -	$ 150.00
containerized woody plants (20% installation) x 5 yr	25	GAL						$ 10.00	$ 250.00	$ 250.00
poles bundles / wattles (20% installation) 5 yr	10	Bundle						$ 12.00	$ 120.00	$ 120.00
4) Best Management Practices (1 hr/100 LF) x 5 yr	250	LF	5	$ 60.00	$ 300.00					$ 300.00
mats, bales, silt-fence, etc. x 5 yr	250	LF						$ 10.00	$ 2,500.00	$ 2,500.00
5) Monitoring (data reporting) x 5 yr	5	#	100	$ 60.00	$ 6,000.00					$ 6,000.00
TOTAL THIS SHEET			**312**		**$ 22,690.00**		**$ 10,000.00**		**$ 3,473.00**	**$ 36,163.00**

Table E-9a. Initial Construction Costs for NEST1 (TY0-1)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Install Pylons (4 hr/pylon)	12	#	48	$ 80.00	$ 3,840.00			$ 200.00	$ 2,400.00	$ 6,240.00
pile driver	1	#				$ 50.00	$ 2,400.00			$ 2,400.00
7" diameter, marine-grade piling 50' length	12	#						$ 2,000.00	$ 24,000.00	$ 24,000.00
2) Install and Modify Barges (8 hr/unit)	6	#	48	$ 60.00	$ 2,880.00					$ 2,880.00
modular spud barge (24'X48'X4') (purchase, transport, dispose)	6	#						$ 80,000.00	$ 480,000.00	$ 480,000.00
stick welder and generator (5 min / angle)	72	HR	72	$ 80.00	$ 5,760.00	$ 25.00	$ 1,800.00	$ 25.00	$ 1,800.00	$ 9,360.00
hot rolled mild steel angle A36 (1' x 1" x 0.25") cut to 12" length	864	#						$ 3.00	$ 2,592.00	$ 2,592.00
mild steel 1018 cold finish (0.125" x 5" x 864")	12	#						$ 650.00	$ 7,800.00	$ 7,800.00
aggregate (50% sand and 50% pea gravel)	32	CY						$ 10.00	$ 320.00	$ 320.00
TOTAL THIS SHEET			**96**		**$ 12,480.00**		**$ 4,200.00**		**$ 518,912.00**	**$ 535,592.00**

Table E-9b. 3-year Establishment Period Costs for NEST1 (TY1-3)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Survey (2 hr/barge) X 2 yr	6	#	12	$ 60.00	$ 720.00					$ 720.00
2) Monitor (data reporting) x 2 yr	2.00	#	20	$ 60.00	$ 1,200.00					$ 1,200.00
TOTAL THIS SHEET			**32**		**$ 1,920.00**		**$ -**		**$ -**	**$ 1,920.00**

Table E-9c. Rehabilitation, Repair, and Replacement Costs for NEST1 (TY3-50)

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Survey (2 hr/barge) x 5 yr	6	#	60	$ 60.00	$ 3,600.00					$ 3,600.00
2) Barge Maintenance and Repairs (10% installation) x 5 yr	6	#			$ 6,240.00		$ 2,100.00		$ 19,456.00	$ 27,796.00
3) Monitoring (data reporting) x 5 yr	6	#	30	$ 60.00	$ 1,800.00					$ 1,800.00
TOTAL THIS SHEET			**30**		**$ 11,640.00**		**$ 2,100.00**		**$ 19,456.00**	**$ 33,196.00**

Table E-10a. Construction Costs for Recreational Components

TASK DESCRIPTION	QUANTITY		LABOR			EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
1) Trail Improvement										
mobilization	1	#				$ 5,000.00	$ 5,000.00			$ 5,000
general items (i.e., site clearing and swales)	1	#				$ 1,515.00	$ 1,515.00	$ 10,000.00	$ 10,000.00	$ 11,515
exavation (8 inches)	593	CY						$ 4.50	$ 2,668.50	$ 2,669
subgrade preparation	2667	SY					$ -	$ 1.50	$ 4,000.50	$ 4,001
geogrid	2667	SY					$ -	$ 5.00	$ 13,335.00	$ 13,335
caliche	2668	SY					$ -	$ 8.33	$ 22,224.44	$ 22,224
concrete	24000	SF					$ -	$ 5.00	$ 120,000.00	$ 120,000
rock filter dam	500	LF					$ -	$ 20.00	$ 10,000.00	$ 10,000
sw3p construction entrance	2	#						$1,500.00	$3,000.00	$ 3,000
silt fence	4000	LF						$5.00	$20,000.00	$ 20,000
revegetation	2300	LF						$2.00	$4,600.00	$ 4,600
Subtotal										$ 216,343
Contingency (10%)										$ 21,634
Total										**$ 237,978**
2) Trash recepticles	8	#						$ 250.00	$ 2,000.00	$ 2,000
3) Bird Watching Stations	6	#						$ 550.00	$ 3,300.00	$ 3,300
4) Picnic Tables	3	#						$ 900.00	$ 2,700.00	$ 2,700
5) Pavilion (20 ft X 20 ft)	1	#						$ 12,000.00	$ 12,000.00	$ 12,000
6) Labor			240	$ 25.00	$ 6,000.00					$ 6,000
TOTAL THIS SHEET			**-**		**$ -**		**$ 6,515.00**		**$ 229,828.44**	**$ 263,978**

Abbreviated Risk Analysis

Laredo 206

Feasibility (Recommended Plan)

Meeting Date: 7-Mar-13

PDT Members

Note: PDT involvement is commensurate with project size and involvement.

Project Management:	Hope Pollmann
Planner:	NAME
Study Manager:	NAME
Contracting:	NAME
Real Estate:	NAME
Relocations:	NAME
OTHER:	Ann Guissinger (AE)
Engineering & Design:	NAME
Technical Lead:	NAME
Geotech:	NAME
Hydrology:	NAME
Civil:	Efren Martinez
Structural:	NAME
Mechanical:	NAME
Electrical:	NAME
Cost Engineering:	Ninfa Taggart (SWF) Michael Hodson (AE)
Construction:	NAME
Operations:	NAME

Abbreviated Risk Analysis

Project (less than $40M): **Laredo 206**
Project Development Stage: **Feasibility (Recommended Plan)**
Risk Category: **Low: Simple-No Life Safety**

Total Construction Contract Cost = **$ 1,896,626**

	WBS	Potential Risk Areas	Contract Cost	% Contingency	$ Contingency	Total
1	06 FISH AND WILDLIFE FACILITIES	HYDRO1	$ 30,869	7.54%	$ 2,327	$ 33,196.31
2	06 FISH AND WILDLIFE FACILITIES	HYDRO2	$ 361,375	14.44%	$ 52,179	$ 413,554.25
3	06 FISH AND WILDLIFE FACILITIES	DRAIN	$ 88,718	5.82%	$ 5,164	$ 93,881.65
4	06 FISH AND WILDLIFE FACILITIES	DEPTH	$ 171,881	5.82%	$ 10,004	$ 181,885.04
5	06 FISH AND WILDLIFE FACILITIES	SHORE	$ 84,307	9.14%	$ 7,701	$ 92,008.06
6	06 FISH AND WILDLIFE FACILITIES	CANE1	$ 168,350	4.00%	$ 6,734	$ 175,084.48
7	06 FISH AND WILDLIFE FACILITIES	CANE2	$ 240,585	7.31%	$ 17,597	$ 258,182.55
8	06 FISH AND WILDLIFE FACILITIES	TAM1	$ 39,822	6.09%	$ 2,426	$ 42,247.29
9	06 FISH AND WILDLIFE FACILITIES	TAM2	$ 89,486	9.41%	$ 8,417	$ 97,902.44
10	06 FISH AND WILDLIFE FACILITIES	TAM2 and HYDRO2	$ 10,788	9.41%	$ 1,015	$ 11,802.55
11	06 FISH AND WILDLIFE FACILITIES	ERODE1	$ 30,092	4.00%	$ 1,204	$ 31,295.68
12	06 FISH AND WILDLIFE FACILITIES	ERODE2	$ 42,842	9.73%	$ 4,170	$ 47,011.78
13	06 FISH AND WILDLIFE FACILITIES	NEST1	$ 537,512	10.94%	$ 58,795	$ 596,306.96
14	30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	$ 189,663	19.67%	$ 37,315	$ 226,977.81
15	31 CONSTRUCTION MANAGEMENT	Construction Management	$ 189,663	10.94%	$ 20,746	$ 210,408.60

Totals	Contract Cost	% Contingency	$ Contingency	Total
Total Construction Estimate	$ 1,896,626	9.37%	$ 177,733	$ 2,074,359
Total Planning, Engineering & Design	$ 189,663	19.67%	$ 37,315	$ 226,978
Total Construction Management	$ 189,663	10.94%	$ 20,746	$ 210,409
Total	$ 2,275,952		$ 235,794	$ 2,511,745

Laredo 206

Feasibility (Recommended Plan)

Abbreviated Risk Analysis

Meeting Date: 7-Mar-13

Risk Level

	Negligible	Marginal	Significant	Critical	Crisis
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Element	Potential Risk Areas	Concerns Pull Down Tab (ENABLE MACROS THRU TRUST CENTER) (Choose ALL that apply)	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level	
Project Scope Growth								
						Max Potential Cost Growth	40%	
PS-1	HYDRO1	• Potential for scope growth, added features and quantities?	There are no concerns.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible	0	0.00%
PS-2	HYDRO2	• Potential for scope growth, added features and quantities?	Could Require mitigation for impacts of endangered species.	Could increase construction duration and cost once level of effort is determined.	Possible	Marginal	1	2.09%
PS-3	DRAIN	• Potential for scope growth, added features and quantities?	There are no concerns.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible	0	0.00%
PS-4	DEPTH	• Potential for scope growth, added features and quantities?	There are no concerns.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible	0	0.00%
PS-5	SHORE	• Potential for scope growth, added features and quantities?	There are no concerns.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible	0	0.00%
PS-6	CANE1	• Potential for scope growth, added features and quantities?	There are no concerns.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible	0	0.00%
PS-7	CANE2	• Potential for scope growth, added features and quantities?	There are no concerns.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible	0	0.00%
PS-8	TAM1	• Potential for scope growth, added features and quantities?	Could Require mitigation for impacts of endangered species.	Could increase construction duration and cost once level of effort is determined.	Possible	Marginal	1	2.09%
PS-9	TAM2	• Potential for scope growth, added features and quantities?	Could Require mitigation for impacts of endangered species.	Could increase construction duration and cost once level of effort is determined.	Possible	Marginal	1	2.09%
PS-10	TAM2 and HYDRO2	• Potential for scope growth, added features and quantities?	Could Require mitigation for impacts of endangered species.	Could increase construction duration and cost once level of effort is determined.	Possible	Marginal	1	2.09%
PS-11	ERODE1	• Potential for scope growth, added features and quantities?	There are no concerns.	The PDT feels there are no concerns for this piece.	Possible	Negligible	0	0.00%
PS-12	ERODE2	• Potential for scope growth, added features and quantities?	Design is conceptual and could change based on PED determination.	This is likely but will have minimal impact on the cost.	Likely	Negligible	1	2.09%
PS-13	NEST1	• Potential for scope growth, added features and quantities?	There are no concerns.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible	0	0.00%
PS-14	Planning, Engineering, & Design	• Potential for scope growth, added features and quantities?	Currently no officially selected plan, and plans are conceptual.	It is unlikely that more design would be required than anticipated, but if there is then it could slightly increase the cost.	Unlikely	Negligible	0	
PS-15	Construction Management	• Potential for scope growth, added features and quantities?	Cultural Resources could be identified.	If identified the project could be delayed and increase cost.	Unlikely	Significant	1	

Acquisition Strategy

						Max Potential Cost Growth	30%	
AS-1	HYDRO1	• Contracting plan firmly established?	There are no concerns.	There is a path forward for small business set aside and the estiamte is based off of that assumption.	Unlikely	Negligible	0	0.00%
AS-2	HYDRO2	• Contracting plan firmly established?	There are no concerns.	There is a path forward for small business set aside and the estiamte is based off of that assumption.	Unlikely	Negligible	0	0.00%
AS-3	DRAIN	• Contracting plan firmly established?	There are no concerns.	There is a path forward for small business set aside and the estiamte is based off of that assumption.	Unlikely	Negligible	0	0.00%
AS-4	DEPTH	• Contracting plan firmly established?	There are no concerns.	There is a path forward for small business set aside and the estiamte is based off of that assumption.	Unlikely	Negligible	0	0.00%
AS-5	SHORE	• Contracting plan firmly established?	There are no concerns.	There is a path forward for small business set aside and the estiamte is based off of that assumption.	Unlikely	Negligible	0	0.00%
AS-6	CANE1	• Contracting plan firmly established?	There are no concerns.	There is a path forward for small business set aside and the estiamte is based off of that assumption.	Unlikely	Negligible	0	0.00%
AS-7	CANE2	• Contracting plan firmly established?	There are no concerns.	There is a path forward for small business set aside and the estiamte is based off of that assumption.	Unlikely	Negligible	0	0.00%
AS-8	TAM1	• Contracting plan firmly established?	There are no concerns.	There is a path forward for small business set aside and the estiamte is based off of that assumption.	Unlikely	Negligible	0	0.00%
AS-9	TAM2	• Contracting plan firmly established?	There are no concerns.	There is a path forward for small business set aside and the estiamte is based off of that assumption.	Unlikely	Negligible	0	0.00%
AS-10	TAM2 and HYDRO2	• Contracting plan firmly established?	There are no concerns.	There is a path forward for small business set aside and the estiamte is based off of that assumption.	Unlikely	Negligible	0	0.00%
AS-11	ERODE1	• Contracting plan firmly established?	There are no concerns.	There is a path forward for small business set aside and the estiamte is based off of that assumption.	Unlikely	Negligible	0	0.00%
AS-12	ERODE2	• Contracting plan firmly established?	There are no concerns.	There is a path forward for small business set aside and the estiamte is based off of that assumption.	Unlikely	Negligible	0	0.00%
AS-13	NEST1	• Contracting plan firmly established?	There are no concerns.	There is a path forward for small business set aside and the estiamte is based off of that assumption.	Unlikely	Negligible	0	0.00%
AS-14	Planning, Engineering, & Design	• Contracting plan firmly established?	There are no concerns.	There is a path forward for small business set aside and the estiamte is based off of that assumption.	Unlikely	Negligible	0	0.00%
AS-15	Construction Management	• Contracting plan firmly established?	There are no concerns.	There is a path forward for small business set aside and the estiamte is based off of that assumption.	Unlikely	Negligible	0	0.00%

Construction Elements

							Max Potential Cost Growth	15%
CE-1	HYDRO1	• Accelerated schedule or harsh weather schedule?	No detailed topographic analysis done for this area.	May need to modify designs based on H&H recommendations.	Likely	Negligible	1	5.72%
CE-2	HYDRO2	• Accelerated schedule or harsh weather schedule?	No detailed topographic analysis done for this area.	May need to modify designs based on H&H recommendations.	Likely	Negligible	1	5.72%
CE-3	DRAIN	• Accelerated schedule or harsh weather schedule?	No concerns for this measure.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible	0	4.00%
CE-4	DEPTH	• Accelerated schedule or harsh weather schedule?	No concerns for this measure.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible	0	4.00%
CE-5	SHORE	• Accelerated schedule or harsh weather schedule?	No concerns for this measure.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible	0	4.00%
CE-6	CANE1	• Accelerated schedule or harsh weather schedule?	No concerns for this measure.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible	0	4.00%
CE-7	CANE2	• Accelerated schedule or harsh weather schedule?	No concerns for this measure.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible	0	4.00%
CE-8	TAM1	• Accelerated schedule or harsh weather schedule?	No concerns for this measure.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible	0	4.00%
CE-9	TAM2	• Accelerated schedule or harsh weather schedule?	No concerns for this measure.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible	0	4.00%
CE-10	TAM2 and HYDRO2	• Accelerated schedule or harsh weather schedule?	No concerns for this measure.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible	0	4.00%
CE-11	ERODE1	• Accelerated schedule or harsh weather schedule?	No concerns for this measure.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible	0	4.00%
CE-12	ERODE2	• Accelerated schedule or harsh weather schedule?	No concerns for this measure.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible	0	4.00%
CE-13	NEST1	• High risk or complex construction elements, site access, in-water?	Constructability of the barges in the river and acceptale staging area for the contractor.	of the river bed and there is a staging area available. This should have no affect on the cost.	Unlikely	Negligible	0	4.00%
CE-14	Planning, Engineering, & Design	• Accelerated schedule or harsh weather schedule?	There are no concerns.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible	0	4.00%
CE-15	Construction Management	• Accelerated schedule or harsh weather schedule?	There are no concerns.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible	0	4.00%

Quantities for Current Scope

						Max Potential Cost Growth		**20%**	
Q-1	HYDRO1	• Level of confidence based on design and assumptions?	Could change as a result of H&H comments.	This could increase or decrease the quantity.	Likely	Negligible		1	1.82%
Q-2	HYDRO2	• Level of confidence based on design and assumptions?	Could change as a result of H&H comments.	This could increase or decrease the quantity.	Likely	Marginal		2	3.31%
Q-3	DRAIN	• Level of confidence based on design and assumptions?	No concerns for this measure.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible		0	0.00%
Q-4	DEPTH	• Level of confidence based on design and assumptions?	Volume is based on bathymetric survey.	Due to low resolution of survey in large area of excavation, quantities could increase or decrease	Likely	Negligible		1	1.82%
Q-5	SHORE	• Level of confidence based on design and assumptions?	May change as a result of PED	Size and location of wetland benches is conceptual.	Likely	Negligible		1	1.82%
Q-6	CANE1	• Level of confidence based on design and assumptions?	No concerns for this measure.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible		0	0.00%
Q-7	CANE2	• Level of confidence based on design and assumptions?	No concerns for this measure.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible		0	0.00%
Q-8	TAM1	• Level of confidence based on design and assumptions?	No concerns for this measure.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible		0	0.00%
Q-9	TAM2	• Level of confidence based on design and assumptions?	No concerns for this measure.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible		0	0.00%
Q-10	TAM2 and HYDRO2	• Level of confidence based on design and assumptions?	No concerns for this measure.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible		0	0.00%
Q-11	ERODE1	• Level of confidence based on design and assumptions?	No concerns for this measure.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible		0	0.00%
Q-12	ERODE2	• Level of confidence based on design and assumptions?	The quantities used to determine the headwalls could change during PED.	This is likely but will have minimal impact on the cost.	Likely	Negligible		1	1.82%
Q-13	NEST1	• Level of confidence based on design and assumptions?	No concerns for this measure.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible		0	0.00%
Q-14	Planning, Engineering, & Design	• Level of confidence based on design and assumptions?	No concerns for this measure.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible		0	0.00%
Q-15	Construction Management	• Level of confidence based on design and assumptions?	No concerns for this measure.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible		0	0.00%

Specialty Fabrication or Equipment

						Max Potential Cost Growth		50%
FE-1	HYDRO1	• Unusual parts, material or equipment manufactured or installed?	No concerns for this measure.	There is minimal work being done with this option and nothing is being fabricated or installed.	Unlikely	Negligible	0	0.00%
FE-2	HYDRO2	• Unusual parts, material or equipment manufactured or installed?	No concerns for this measure.	There is nothing being fabricated or installed in this option.	Unlikely	Negligible	0	0.00%
FE-3	DRAIN	• Unusual parts, material or equipment manufactured or installed?	No concerns for this measure.	Corp has built many culverts and is not a concern.	Unlikely	Negligible	0	0.00%
FE-4	DEPTH	• Unusual parts, material or equipment manufactured or installed?	No concerns for this measure.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible	0	0.00%
FE-5	SHORE	• Unusual parts, material or equipment manufactured or installed?	No concerns for this measure.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible	0	0.00%
FE-6	CANE1	• Unusual parts, material or equipment manufactured or installed?	No concerns for this measure.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible	0	0.00%
FE-7	CANE2	• Unusual parts, material or equipment manufactured or installed?	No concerns for this measure.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible	0	0.00%
FE-8	TAM1	• Unusual parts, material or equipment manufactured or installed?	No concerns for this measure.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible	0	0.00%
FE-9	TAM2	• Unusual parts, material or equipment manufactured or installed?	No concerns for this measure.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible	0	0.00%
FE-10	TAM2 and HYDRO2	• Unusual parts, material or equipment manufactured or installed?	No concerns for this measure.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible	0	0.00%
FE-11	ERODE1	• Unusual parts, material or equipment manufactured or installed?	No concerns for this measure.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible	0	0.00%
FE-12	ERODE2	• Unusual parts, material or equipment manufactured or installed?	No concerns for this measure.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible	0	0.00%
FE-13	NEST1	• Unusual parts, material or equipment manufactured or installed?	Transportation of barge to site.	Depending on the size of the needed barge it may be difficult to deliver it in one piece increasing the cost of this item.	Likely	Significant	3	10.46%
FE-14	Planning, Engineering, & Design	• Unusual parts, material or equipment manufactured or installed?	No concerns for this measure.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible	0	0.00%
FE-15	Construction Management	• Unusual parts, material or equipment manufactured or installed?	No concerns for this measure.	The PDT feels there are no concerns for this piece.	Unlikely	Negligible	0	0.00%

Cost Estimate Assumptions

							Max Potential Cost Growth	25%	
CT-1	HYDRO1	• Reliability and number of key quotes?	There are no concerns.	Estimate is based on past projects in the region and historical knowledge.	Unlikely	Negligible		0	0.00%
CT-2	HYDRO2	• Reliability and number of key quotes?	There are no concerns.	Estimate is based on past projects in the region and historical knowledge.	Unlikely	Negligible		0	0.00%
CT-3	DRAIN	• Reliability and number of key quotes?	There are no concerns.	Estimate is based on past projects in the region and historical knowledge.	Unlikely	Negligible		0	0.00%
CT-4	DEPTH	• Reliability and number of key quotes?	There are no concerns.	Estimate is based on past projects in the region and historical knowledge.	Unlikely	Negligible		0	0.00%
CT-5	SHORE	• Reliability and number of key quotes?	There are no concerns.	Estimate is based on past projects in the region and historical knowledge.	Unlikely	Negligible		0	0.00%
CT-6	CANE1	• Reliability and number of key quotes?	There are no concerns.	Estimate is based on past projects in the region and historical knowledge.	Unlikely	Negligible		0	0.00%
CT-7	CANE2	• Reliability and number of key quotes?	There are no concerns.	Estimate is based on past projects in the region and historical knowledge.	Unlikely	Negligible		0	0.00%
CT-8	TAM1	• Reliability and number of key quotes?	There are no concerns.	Estimate is based on past projects in the region and historical knowledge.	Unlikely	Negligible		0	0.00%
CT-9	TAM2	• Reliability and number of key quotes?	There are no concerns.	Estimate is based on past projects in the region and historical knowledge.	Unlikely	Negligible		0	0.00%
CT-10	TAM2 and HYDRO2	• Reliability and number of key quotes?	There are no concerns.	Estimate is based on past projects in the region and historical knowledge.	Unlikely	Negligible		0	0.00%
CT-10	ERODE1	• Reliability and number of key quotes?	There are no concerns.	Estimate is based on past projects in the region and historical knowledge.	Unlikely	Negligible		0	0.00%
CT-11	ERODE2	• Reliability and number of key quotes?	There are no concerns.	Estimate is based on past projects in the region and historical knowledge.	Unlikely	Negligible		0	0.00%
CT-12	NEST1	• Reliability and number of key quotes?	Cost and availabilty of barges.	Information is based on pricing from online sources, this could change based on supply and demand	Likely	Marginal		2	3.62%
CT-13	Planning, Engineering, & Design	• Reliability and number of key quotes?	It is assumed that PED will be 10% of the construction cost of the selected plan.	Actual PED costs could be higher if the design is more difficult than anticipated. It is unlikely but if it is the impact would be marginal.	Possible	Marginal		1	1.90%
CT-14	Construction Management	• Reliability and number of key quotes?	Currently assumed that all work will be completed by Prime contractor.	There a couple of specialty items that may need to be completed by a subcontractor, if it does it could potentially increase the cost slightly.	Likely	Marginal		2	3.62%

External Project Risks

						Max Potential Cost Growth	20%	
EX-1	HYDRO1	• Potential for severe adverse weather?	Possibilty of flooding	Flooding could increase cost due to schedule or equipment being lost, but chances of a flood are unlikely	Unlikely	Negligible	0	0.00%
EX-2	HYDRO2	• Potential for severe adverse weather?	Possibilty of flooding	Flooding could increase cost due to schedule or equipment being lost, but chances of a flood are unlikely	Possible	Significant	2	3.31%
EX-3	DRAIN	• Potential for severe adverse weather?	Lack of funding	This project may not be able to be constructed if funding is not appropriated in a timely manner.	Likely	Negligible	1	1.82%
EX-4	DEPTH	• Potential for severe adverse weather?	Lack of funding	This project may not be able to be constructed if funding is not appropriated in a timely manner.	Possible	Negligible	0	0.00%
EX-5	SHORE	• Potential for severe adverse weather?	Plant establishment.	Estimate includes the cost to have to go back and replant up to 20% so this should be sufficient.	Likely	Marginal	2	3.31%
EX-6	CANE1	• Potential for severe adverse weather?	Lack of funding	Estimate includes the cost to have to go back and replant up to 20% so this should be sufficient.	Possible	Negligible	0	0.00%
EX-7	CANE2	• Potential for severe adverse weather?	Plant establishment.	This project may not be able to be constructed if funding is not appropriated in a timely manner.	Likely	Marginal	2	3.31%
EX-8	TAM1	• Potential for severe adverse weather?	Lack of funding	This project may not be able to be constructed if funding is not appropriated in a timely manner.	Possible	Negligible	0	0.00%
EX-9	TAM2	• Potential for severe adverse weather?	Plant establishment.	The public may not be on board with either of the possible options and cause the PDT to develop a different method.	Likely	Marginal	2	3.31%
EX-10	TAM2 and HYDRO2	• Potential for severe adverse weather?	Plant establishment.	The public may not be on board with either of the possible options and cause the PDT to develop a different method.	Likely	Marginal	2	3.31%
EX-11	ERODE1	• Potential for severe adverse weather?	Lack of funding	This project may not be able to be constructed if funding is not appropriated in a timely manner.	Possible	Negligible	0	0.00%
EX-12	ERODE2	• Potential for severe adverse weather?	Lack of funding	This project may not be able to be constructed if funding is not appropriated in a timely manner.	Likely	Negligible	1	1.82%
EX-13	NEST1	• Potential for severe adverse weather?	Lack of funding	This project may not be able to be constructed if funding is not appropriated in a timely manner.	Likely	Marginal	2	3.31%
EX-14	Planning, Engineering, & Design	• Potential for severe adverse weather?	Lack of funding	This project may not be able to be constructed if funding is not appropriated in a timely manner.	Likely	Marginal	2	3.31%
EX-15	Construction Management	• Potential for severe adverse weather?	Lack of funding	This project may not be able to be constructed if funding is not appropriated in a timely manner.	Likely	Marginal	2	3.31%

Laredo 206
Feasibility (Recommended Plan)
Abbreviated Risk Analysis

Typical Risk Elements	Potential Risk Areas														
	HYDRO1	HYDRO2	DRAIN	DEPTH	SHORE	CANE1	CANE2	TAM1	TAM2	TAM2 and HYDRO2	ERODE1	ERODE2	NEST1	Planning, Engineering, & Design	Construction Management
Project Scope Growth	-	1	-	-	-	-	-	1	1	1	-	1	-	-	1
Acquisition Strategy	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Construction Elements	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Quantities for Current Scope	1	2	-	1	1	-	-	-	-	-	-	1	-	-	-
Specialty Fabrication or Equipment	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-
Cost Estimate Assumptions	-	-	-	-	-	-	-	-	-	-	-	-	2	1	2
External Project Risks	-	2	1	-	2	-	2	-	2	2	-	1	2	2	2
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

APPENDIX F
INCREMENTAL COST ANALYSIS/IWR PLAN

Total and Average Cost

4/2/2013 12:33:10PM

Cost Effective Plan Alternatives

Planning Set: Laredo 2apr13

Counter	Name	Output HU	Cost $1000	Average Cost
1	No Action Plan	48.06	0.00	0.00
2	HY1DR0DP0SH0CA0TA0ER0N0	48.47	3,824.04	78.89
3	HY0DR0DP0SH0CA0TA1ER0N0	49.71	5,433.84	109.31
4	HY0DR0DP0SH0CA0TA2ER0N0	50.58	8,911.07	176.18
5	HY1DR0DP0SH0CA0TA2ER0N0	51.32	12,735.10	248.15
6	HY0DR0DP0SH1CA0TA1ER0N0	51.82	15,448.46	298.12
7	HY1DR0DP0SH1CA0TA1ER0N0	52.20	17,728.05	339.62
8	HY0DR0DP0SH1CA0TA2ER0N0	52.69	18,925.69	359.19
9	HY1DR0DP0SH1CA0TA2ER0N0	53.39	21,205.28	397.18
10	HY0DR0DP1SH1CA0TA2ER0N0	53.43	22,894.33	428.49
11	HY1DR0DP1SH1CA0TA2ER0N0	54.13	26,718.37	493.60
12	HY0DR0DP0SH1CA0TA2ER1N0	54.17	28,908.14	533.66
13	HY0DR0DP0SH1CA0TA2ER2N0	54.27	31,000.74	571.23
14	HY1DR0DP0SH1CA0TA2ER1N0	54.87	31,187.73	568.39
15	HY0DR0DP1SH1CA0TA2ER1N0	55.24	32,876.78	595.16
16	HY2DR0DP0SH0CA0TA0ER0N0	56.27	33,954.69	603.42
17	HY2DR0DP0SH1CA0TA0ER0N0	57.62	33,963.45	589.44
18	HY2DR0DP1SH1CA0TA0ER0N0	58.48	42,595.52	728.38
19	HY2DR0DP0SH1CA0TA0ER1N0	59.07	43,945.89	743.96
20	HY2DR0DP0SH1CA0TA0ER2N0	59.17	46,038.50	778.07
21	HY2DR0DP0SH1CA1TA0ER0N0	59.42	48,641.51	818.61
22	HY2DR0DP1SH1CA0TA0ER1N0	59.93	52,577.97	877.32
23	HY2DR0DP1SH1CA0TA0ER2N0	60.04	54,670.58	910.57
24	HY2DR0DP1SH1CA1TA0ER0N0	60.29	57,273.59	949.97
25	HY2DR0DP0SH1CA1TA0ER1N0	60.88	58,623.96	962.94
26	HY2DR0DP0SH1CA1TA0ER2N0	61.01	60,716.56	995.19
27	HY2DR0DP0SH1CA2TA0ER1N0	61.36	63,792.85	1,039.65
28	HY2DR0DP0SH1CA2TA0ER2N0	61.50	65,885.45	1,071.31
29	HY2DR0DP1SH1CA1TA0ER1N0	61.74	67,256.04	1,089.34
30	HY2DR0DP1SH1CA1TA0ER2N0	61.87	69,348.64	1,120.88
31	HY2DR0DP1SH1CA2TA0ER1N0	62.23	72,424.93	1,163.83
32	HY2DR0DP1SH1CA2TA0ER2N0	62.36	74,517.53	1,194.96
33	HY2DR0DP1SH1CA2TA2ER1N0	62.65	81,335.99	1,298.26
34	HY2DR0DP1SH1CA2TA2ER2N0	62.78	83,428.60	1,328.90
35	HY2DR0DP1SH1CA2TA2ER2N1	62.84	95,503.65	1,519.79
36	HY2DR1DP1SH1CA2TA2ER2N1	62.85	103,886.12	1,652.92

Incremental Cost of Best Buy Plan Combinations (Ordered By Output)

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Planning Set: Laredo 2apr13

Counter	Plan Alternative	Output (HU)	Cost ($1000)	Average Cost ($1000 / HU)	Incremental Cost ($1000)	Inc. Output (HU)	Inc. Cost Per Output
1	No Action Plan	48.06	0.00	0.0000			
2	HY0DR0DP0SH0CA0TA1E R0N0	49.71	5,433.84	109.3108	5,433.8400	1.6500	3,293.2364
3	HY2DR0DP0SH1CA0TA0E R0N0	57.62	33,963.45	589.4386	28,529.6100	7.9100	3,606.7775
4	HY2DR0DP0SH1CA0TA0E R1N0	59.07	43,945.89	743.9629	9,982.4400	1.4500	6,884.4414
5	HY2DR0DP0SH1CA1TA0E R1N0	60.88	58,623.96	962.9428	14,678.0700	1.8100	8,109.4309
6	HY2DR0DP1SH1CA1TA0E R1N0	61.74	67,256.04	1,089.3431	8,632.0800	0.8600	10,037.3023
7	HY2DR0DP1SH1CA2TA0E R1N0	62.23	72,424.93	1,163.8266	5,168.8900	0.4900	10,548.7551
8	HY2DR0DP1SH1CA2TA0E R2N0	62.36	74,517.53	1,194.9572	2,092.6000	0.1300	16,096.9231
9	HY2DR0DP1SH1CA2TA2E R2N0	62.78	83,428.60	1,328.9041	8,911.0700	0.4200	21,216.8333
10	HY2DR0DP1SH1CA2TA2E R2N1	62.84	95,503.65	1,519.7907	12,075.0500	0.0600	201,250.8333
11	HY2DR1DP1SH1CA2TA2E R2N1	62.85	103,886.12	1,652.9216	8,382.4700	0.0100	838,247.0000

Figure F-1. Cost (AACU) and Output (AAHU)

All Plan Alternatives Differentiated by Cost Effectiveness

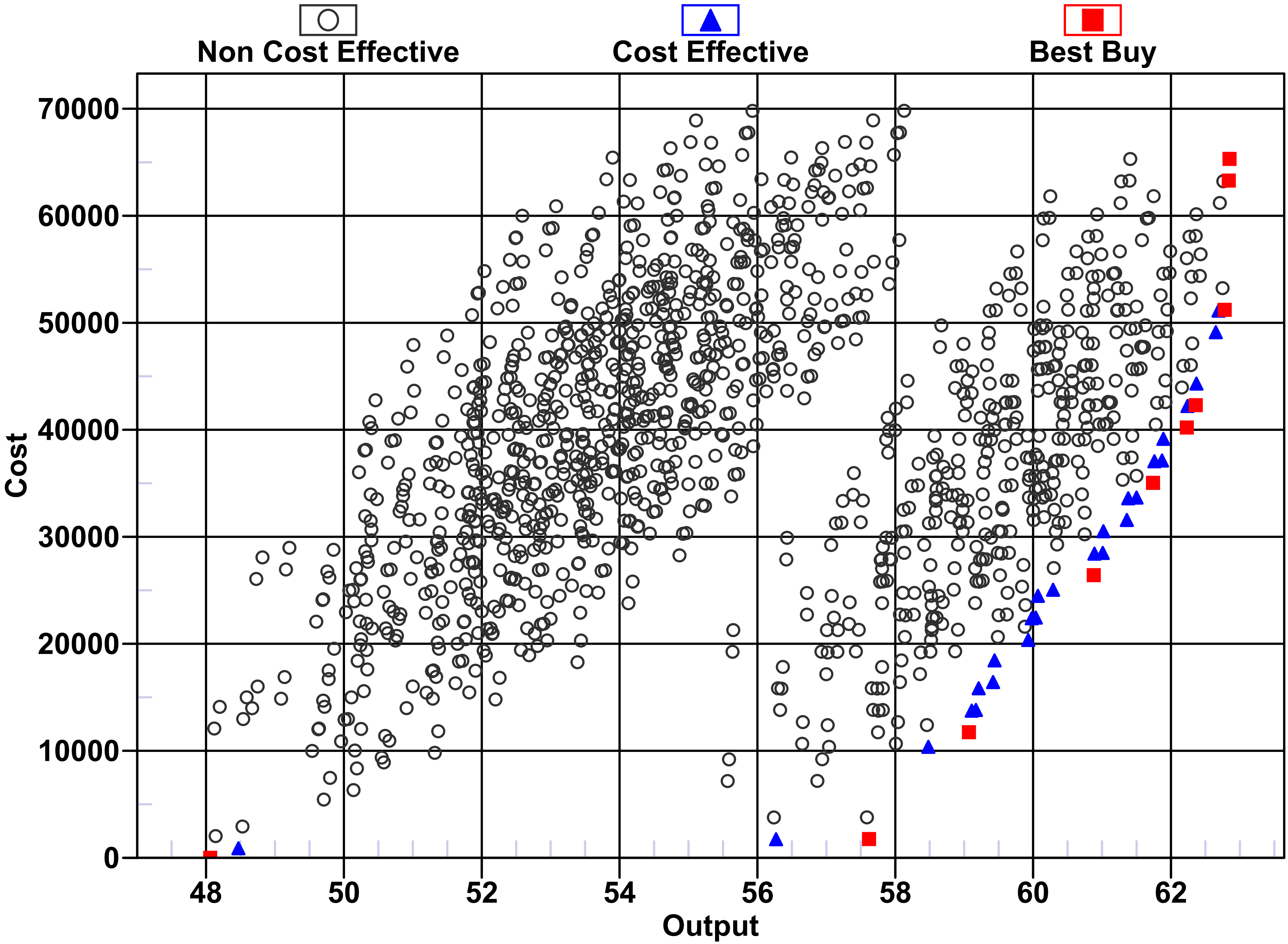
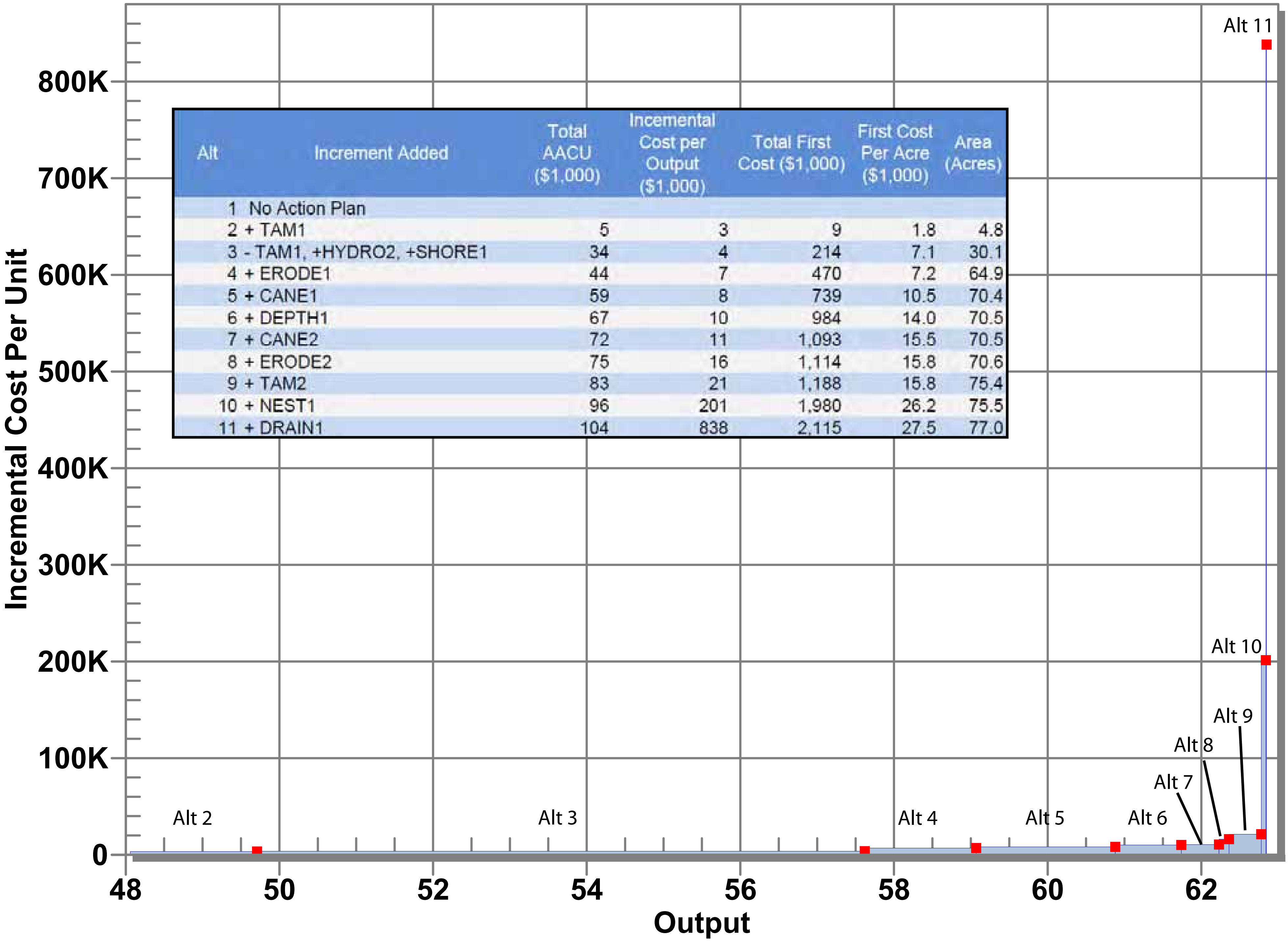


Figure F-2. Incremental Cost per INcremental Output (AACU/AAHU) and Output (AAHU)

Best Buy Plans



Alt	Increment Added	Total AACU ($1,000)	Incemental Cost per Output ($1,000)	Total First Cost ($1,000)	First Cost Per Acre ($1,000)	Area (Acres)
1	No Action Plan					
2	+ TAM1	5	3	9	1.8	4.8
3	- TAM1, +HYDRO2, +SHORE1	34	4	214	7.1	30.1
4	+ ERODE1	44	7	470	7.2	64.9
5	+ CANE1	59	8	739	10.5	70.4
6	+ DEPTH1	67	10	984	14.0	70.5
7	+ CANE2	72	11	1,093	15.5	70.5
8	+ ERODE2	75	16	1,114	15.8	70.6
9	+ TAM2	83	21	1,188	15.8	75.4
10	+ NEST1	96	201	1,980	26.2	75.5
11	+ DRAIN1	104	838	2,115	27.5	77.0

APPENDIX G
MONITORING AND ADAPTIVE MANAGEMENT PLAN

Monitoring and Adaptive Management Plan
Laredo River Bend
Section 206 Aquatic Ecosystem Restoration Project

A National Ecosystem Restoration (NER) Plan has been selected for the Laredo River Bend Section 206 Aquatic Ecosystem Restoration Project. This Adaptive Management Plan provides a schedule and description of monitoring and maintenance activities, as well as success criteria and potential adaptive management strategies.

Monitoring is included for each measure included in the NER Plan (Table 1), and reporting would occur by December 31 of each Target Year (TY) during which monitoring occurs. All monitoring reports would be submitted to U.S. Army Corps of Engineers, Fort Worth District (CESWF). It is assumed that all restoration measures would be sustainable with minimal maintenance following the 3-year establishment period. Monitoring of all restoration measures, except dredging of the two largest ponds (DEPTH), would occur during each year of the establishment period to quantify and report the status of success criteria. The restoration of hydrology (HYDRO), restoration of shorelines (SHORE), control of tamarisk (*Tamarix* sp.), (TAM), and control of Carrizo cane (*Arundo donax*) (CANE) would each be monitored at 5-year intervals following successful establishment. Removal of roads and restoration of head cut (ERODE) and placement of artificial nesting habitat (NEST) would be monitored at 10-year intervals. DEPTH would be monitored once during TY25.

Table 1. Monitoring Schedule for Restoration Measures Included in the NER Plan

Measure	Monitoring Year*										
	TY1 to TY3	TY5	TY10	TY15	TY20	TY25	TY30	TY35	TY40	TY45	TY50
HYDRO2	Annual	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
DEPTH	None					yes					
SHORE	Annual	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
CANE	Annual	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
TAM	Annual	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
ERODE	Annual		yes		yes		yes		yes		yes
NEST	Annual		yes		yes		yes		yes		yes

*Additional monitoring years may be required where success criteria are not met.

The findings of the monitoring reports would be used to determine the sustainability of restoration measures. Annual monitoring would continue until all success criteria are met or coordination with resource agencies determines that the measures are self-sustaining. If success criteria are not met, adaptive management measures would be implemented as described below for each restoration measure.

HYDRO2

HYDRO2 would be implemented such that all initial soil preparation, planting, and temporary best management practices (BMPs) would be completed during TY1. Restoration would be conducted at discrete sites defined by a contiguous area of disturbance. The following information would be reported for each restoration site at the end of TY1:

- qualitative description of the restoration sites with photographs
- number of plantings by species
- qualitative and quantitative description of any temporary BMPs installed

Monitoring would occur at each restoration site during TY2 and TY3, and the following information would be reported:

- percent cover of woody plants by species, as quantified using one 10-meter line-intercept transect situated perpendicular to the nearest shoreline and passing through the widest part of the restoration site; at least one line-intercept transect would be surveyed for every 100 meters (or part thereof) of the restoration site (as measured parallel to the river)
- percent mortality of planted trees and shrubs, as quantified by enumerating up to 50 live and dead specimens following a wandering transect within the restoration site
- percent cover of herbaceous plants by species, as quantified using three randomly located 1-square-meter quadrats within every 0.5 acre of restoration site or any part thereof
- qualitative and quantitative description of any evidence of erosion occurring within or downslope of the restoration site

The success of HYDRO2 would be evaluated at the end of TY3. TY3 success criteria required for HYDRO2 is:

- percent cover of native woody plants exceeds 50 percent
- percent cover of exotic woody plants is less than 20 percent

- percent mortality of planted shrubs and trees is less than 20 percent
- percent cover of native herbaceous plants exceeds 20 percent
- all drains functioning properly and no evidence of uncontrolled erosion

If percent cover of native woody plants is less than 50 percent at TY3, additional plantings would be made. Additional plantings would also be made to replace planted shrubs and trees and to fill in any gaps in the canopy. Plantings would be selected from those species with the greatest percent cover at the site. All exotic plants would be removed by hand where feasible, and an herbicide would be applied to exotic plants where establishment is pervasive. Any uncontrolled erosion would be addressed by implementing additional temporary BMPs. If uncontrolled erosion continues for more than 1 year, additional long-term measures would be considered, such as contouring and stabilizing using aggregate, wattles, or other native plants, or implementing other measures appropriate for the situation.

Following successful establishment, the restoration sites would be monitored at 5-year intervals. The restoration sites would be established at this time and only maintenance of exotic plants or erosion would be required. Any evidence of uncontrolled erosion would require remediation and annual monitoring until the erosion is stabilized. The following information would be reported every 5 years:

- percent cover of plants by species, as quantified using one 10-meter line-intercept transect situated perpendicular to the nearest shoreline and passing through the widest part of the restoration site; at least one line-intercept transect would be surveyed for every 100 meters (or part thereof) of restoration site (as measured parallel to the shore)
- percent cover of exotic woody plants
- volume, location, and area of herbicide application, as recorded using GPS
- qualitative and quantitative description of any evidence of erosion occurring within or downslope of the restoration site and any remediation measures implemented

DEPTH

DEPTH would be completed in TY1 and no reporting would be required. DEPTH would be monitored once in TY25. A bathymetric survey of the two largest ponds would be used to determine the need for additional dredging. If depths are less than 4 feet, dredging to a depth of 4 feet would occur.

SHORE

SHORE would be completed in TY1. Restoration would be conducted at discrete sites defined by a contiguous area of disturbance. The following information would be reported for each restoration site at the end of TY1:

- qualitative description of the restoration sites with photographs
- number of plantings by species
- qualitative and quantitative description of any temporary BMPs installed

Monitoring would occur at each restoration site during TY2 and TY3, and the following information would be reported:

- percent cover of plants by species, as quantified using three randomly located 1-square-meter quadrats within every 0.5 acre of the restoration site or any part thereof
- qualitative and quantitative description of any evidence of erosion occurring within or downslope of the restoration site

The success of SHORE would be evaluated at the end of TY2 and TY3. TY2 and TY3 success criteria required for SHORE is:

- percent cover of plants exceeds 80 percent
- all wetland benches are functioning properly and no evidence of uncontrolled erosion

If percent cover of plants is less than 80 percent at TY3, additional plantings would be made. Plantings would be selected from those species with the greatest percent cover at the site. All exotic plants would be removed by hand where feasible, and an herbicide would be applied to exotic plants where establishment is pervasive. Any uncontrolled erosion would be addressed by implementing additional temporary BMPs. If uncontrolled erosion continues for more than 1 year, additional long-term measures would be considered, such as contouring and stabilizing using aggregate, wattles, or other native plants, or implementing other measures appropriate for the situation.

Following successful establishment, the restoration sites would be monitored at 5-year intervals. The restoration sites would be established at this time and only maintenance of exotic plants or erosion would be required. Any evidence of uncontrolled erosion would require remediation and annual monitoring until the erosion is stabilized. The following information would be reported every 5 years:

- percent cover of plants by species, as quantified using three randomly located 1-square-meter quadrats within every 0.5 acre of restoration site or any part thereof
- qualitative and quantitative description of any evidence of erosion occurring within or downslope of the restoration site and any remediation measures implemented

CANE AND TAM

CANE and TAM would be implemented such that all initial soil preparation, planting, and temporary BMPs would be completed during TY1. The area of CANE and the area of TAM would each be identified as a single restoration site. The following information would be reported for each restoration site at the end of TY1:

- qualitative description of the restoration sites with photographs
- number of plantings by species
- qualitative and quantitative description of any temporary BMPs installed

Monitoring would occur during TY2 and TY3, and the following information would be reported:

- percent cover of plants by species, as quantified using one line-intercept transect situated through the longest axis of the restoration site
- percent mortality of planted trees and shrubs, as quantified by enumerating up to 50 live and dead specimens following a wandering transect within the restoration site
- qualitative and quantitative description of any evidence of erosion occurring within or downslope of the restoration site

The success of CANE and TAM would be evaluated at the end of TY3. TY3 success criteria required for CANE is:

- percent cover of native woody plants exceeds 50 percent
- percent cover of exotic woody plants is less than 20 percent
- percent mortality of planted shrubs and trees is less than 20 percent
- all drains functioning properly and no evidence of uncontrolled erosion

If percent cover of native woody plants is less than 50 percent at TY3, additional plantings would be made. Additional plantings would also be made to replace planted shrubs and trees and to fill in any gaps in the canopy. Plantings would generally be selected from those species with the greatest percent cover at the site. At the TAM restoration site, species providing potential roosting opportunities would be favored over other replacement plants. All exotic plants would be removed by hand where feasible, and an herbicide would be applied to exotic plants where establishment is pervasive. Any uncontrolled erosion would be addressed by implementing additional temporary BMPs. If uncontrolled erosion continues for more than 1 year, additional long-term measures would be considered, such as contouring and stabilizing using aggregate, wattles, or other native plants, or implementing other measures appropriate for the situation.

Following successful establishment, the restoration sites would be monitored at 5-year intervals. The restoration sites would be established at this time and only maintenance of exotic plants or erosion would be required. Any evidence of uncontrolled erosion would require remediation and annual monitoring until the erosion is stabilized. The following information would be reported every 5 years:

- percent cover of plants by species, as quantified using one line-intercept transect situated perpendicular to the nearest shoreline and passing through the widest part of the restoration site; at least one line-intercept transect would be surveyed for every 100 yards (or part thereof) of the restoration site (as measured parallel to the shore)
- percent cover of exotic woody plants
- volume, location, and area of herbicide application, as recorded using GPS
- qualitative and quantitative description of any evidence of erosion occurring within or downslope of the restoration site and any remediation measures implemented

ERODE

ERODE would be completed in TY1. Each road/trail segment (from intersection to intersection) and the head cut would each be identified as a discrete restoration site. The following information would be recorded for each road/trail restoration site at the end of TY1:

- length, width, and average depth of grading, as recorded using a GPS
- qualitative and quantitative description of any temporary BMPs installed

The following information would be recorded for the head cut restoration site at the end of TY1:

- area of soil disturbance
- number of plantings by species
- qualitative and quantitative description of any temporary BMPs installed

Monitoring would occur at each restoration site during TY2 and TY3, and the following information would be reported:

- percent cover of plants by species, as quantified using three randomly located 1-square-meter quadrats within every 0.5 acre of restoration site or any part thereof
- qualitative and quantitative description of any evidence of erosion occurring within or downslope of the restoration site

The success of ERODE would be evaluated at the end of TY2 and TY3. TY2 and TY3 success criteria required for SHORE is:

- percent cover of plants exceeds 80 percent
- all wetland benches and drains functioning properly and no evidence of uncontrolled erosion

If percent cover of native woody plants is less than 80 percent at TY3, additional plantings would be made. Additional plantings would also be made to replace planted shrubs and trees and to fill in any gaps in the canopy. Plantings would generally be selected from those species with the greatest percent cover at the site. All exotic plants would be removed by hand where feasible, and an herbicide would be applied to exotic plants where establishment is pervasive. Any uncontrolled erosion would be addressed by implementing additional temporary BMPs. If uncontrolled erosion continues for more than 1 year, additional long-term measures would be considered, such as contouring and stabilizing using aggregate, wattles, or other native plants, or implementing other measures appropriate for the situation.

Following successful establishment, the restoration sites would be monitored at 5-year intervals. The restoration sites would be established at this time and only maintenance of exotic plants or erosion would be required. Any evidence of uncontrolled erosion would require remediation and annual monitoring until the erosion is stabilized. The following information would be reported every 5 years:

- percent cover of plants by species, as quantified using one 10-meter line-intercept transect situated along the centerline of road/trail restoration sites beginning at the downslope end; at least one line-intercept transect would be surveyed for every 100 meters (or part thereof) of restoration site (as measured parallel to the shore)
- percent cover of exotic woody plants
- volume, location, and area of herbicide application, as recorded using GPS
- qualitative and quantitative description of any evidence of erosion occurring within or downslope of the restoration site and any remediation measures implemented

NEST

NEST would be completed in TY1 and no reporting would be required. Each artificial nesting substrate would be identified as a restoration area. No planting or temporary BMPs would be implemented as part of NEST; thus, no reporting would be required during TY1.

Monitoring would occur during TY2 and TY3, and the following information would be reported:

- qualitative and quantitative description of restoration site functionality (attachment to and freedom of movement on spuds, retention of substrates, and evidence of excessive rust on the barges
- percent cover and average height of plants, as measured using ocular estimation

The success of NEST would be evaluated at the end of TY3. TY3 success criteria required for NEST is:

- percent cover of plants is less than 25 percent
- average height of plants is less than 4 inches
- artificial nesting is functioning as designed

If percent cover of plants is greater than 25 percent or the height of plants is greater than 4 inches, a closer inspection of the artificial nesting would be required. Design deficiencies, such as excessive accumulation of organic material or insufficient drainage, would be remediated. All plants would be removed by hand where feasible, and herbicide would be applied where establishment is pervasive.

APPENDIX H
REAL ESTATE PLAN

**The Real Estate Plan is currently under review by USACE Southwestern Division.
A copy of the Real Estate Plan will be included in the Final EA.**

APPENDIX I
AIR QUALITY CALCULATIONS

CALCULATION SHEET-COMBUSTION EMISSIONS-CONSTRUCTION

Assumptions for Combustion Emissions					
Type of Construction Equipment	Num. of Units	HP Rated	Hrs/day	Days/yr	Total hp-hrs
Water Truck	1	300	8	130	312,000
Diesel Road Compactors	1	100	8	15	12,000
Diesel Dump Truck	1	300	8	15	36,000
Diesel Excavator	1	300	8	15	36,000
Diesel Hole Trenchers	1	175	8	60	84,000
Diesel Bore/Drill Rigs	1	300	8	60	144,000
Diesel Cement & Mortar Mixers	1	300	8	60	144,000
Diesel Cranes	1	175	8	130	182,000
Diesel Graders	1	300	8	15	36,000
Diesel Tractors/Loaders/Backhoes	1	100	8	90	72,000
Diesel Bulldozers	2	300	8	15	72,000
Diesel Front-End Loaders	2	300	8	60	288,000
Diesel Forklifts	2	100	8	130	208,000
Diesel Generator Set	2	40	8	130	83,200

Emission Factors[1]							
Type of Construction Equipment	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	PM-10 g/hp-hr	PM-2.5 g/hp-hr	SO2 g/hp-hr	CO2 g/hp-hr
Water Truck	0.440	2.070	5.490	0.410	0.400	0.740	536.000
Diesel Road Compactors	0.370	1.480	4.900	0.340	0.330	0.740	536.200
Diesel Dump Truck	0.440	2.070	5.490	0.410	0.400	0.740	536.000
Diesel Excavator	0.340	1.300	4.600	0.320	0.310	0.740	536.300
Diesel Trenchers	0.510	2.440	5.810	0.460	0.440	0.740	535.800
Diesel Bore/Drill Rigs	0.600	2.290	7.150	0.500	0.490	0.730	529.700
Diesel Cement & Mortar Mixers	0.610	2.320	7.280	0.480	0.470	0.730	529.700
Diesel Cranes	0.440	1.300	5.720	0.340	0.330	0.730	530.200
Diesel Graders	0.350	1.360	4.730	0.330	0.320	0.740	536.300
Diesel Tractors/Loaders/Backhoes	1.850	8.210	7.220	1.370	1.330	0.950	691.100
Diesel Bulldozers	0.360	1.380	4.760	0.330	0.320	0.740	536.300
Diesel Front-end Loaders	0.380	1.550	5.000	0.350	0.340	0.740	536.200
Diesel Forklifts	1.980	7.760	8.560	1.390	1.350	0.950	690.800
Diesel Generator Set	1.210	3.760	5.970	0.730	0.710	0.810	587.300

CALCULATION SHEET-COMBUSTION EMISSIONS-CONSTRUCTION

1. Emission factors (EF) were generated using USEPA's preferred model for nonroad sources, the NONROAD2008 model. Emmisions were modeled for the 2007 calendar year. The VOC EFs include exhaust and evaporative emissions. The VOC evaporative components included in the NONROAD2008 model are diurnal, hotsoak, running loss, tank permeation, hose permeation, displacement, and spillage. The construction equipment age distribution in the NONROAD2008 model is based on the population in U.S. for the 2007 calendar year.

Emission Calculations							
Type of Construction Equipment	VOC tons/yr	CO tons/yr	NOx tons/yr	PM-10 tons/yr	PM-2.5 tons/yr	SO_2 tons/yr	CO_2 tons/yr
Water Truck	0.151	0.712	1.888	0.141	0.138	0.254	184.290
Diesel Road Paver	0.005	0.020	0.065	0.004	0.004	0.010	7.091
Diesel Dump Truck	0.017	0.082	0.218	0.016	0.016	0.029	21.264
Diesel Excavator	0.013	0.052	0.182	0.013	0.012	0.029	21.276
Diesel Hole Cleaners\Trenchers	0.047	0.226	0.538	0.043	0.041	0.069	49.598
Diesel Bore/Drill Rigs	0.095	0.363	1.135	0.079	0.078	0.116	84.057
Diesel Cement & Mortar Mixers	0.097	0.368	1.155	0.076	0.075	0.116	84.057
Diesel Cranes	0.088	0.261	1.147	0.068	0.066	0.146	106.339
Diesel Graders	0.014	0.054	0.188	0.013	0.013	0.029	21.276
Diesel Tractors/Loaders/Backhoes	0.147	0.651	0.573	0.109	0.106	0.075	54.835
Diesel Bulldozers	0.029	0.109	0.378	0.026	0.025	0.059	42.552
Diesel Front-end Loaders	0.121	0.492	1.587	0.111	0.108	0.235	170.177
Diesel Forklift	0.454	1.779	1.962	0.319	0.309	0.218	158.342
Diesel Generator Set	0.111	0.345	0.547	0.067	0.065	0.074	53.847
Total Emissions	**1.389**	**5.513**	**11.562**	**1.085**	**1.055**	**1.460**	**1059.001**

Conversion factors	
Grams to tons	1.102E-06

MOVES2010a MODEL ON-ROAD TRANSPORTATION AIR EMISSIONS-
DELIVERY MATERIALS AND COMMUTING DURING CONSTRUCTION ACTIVITIES

MOVES 2010a					
Source	**Fuel type**	**Number of vehicles**	**Miles traveled per day**	**Days of travel per year**	**Miles traveled per year**
Passenger cars	Gasoline	20	20	260	104,000
Passenger truck	Gasoline	20	20	260	104,000
Light commercial truck	Diesel	2	20	260	10,400
Short-haul truck	Diesel	4	120	260	124,800
Long-haul truck	Diesel	1	80	260	20,800

Emission Factors (MOVES 2010a Emission Rates)[1]							
Source	**VOC (g/mile)**	**CO (g/mile)**	**NOx (g/mile)**	**PM-10 (g/mile)**	**PM-2.5 (g/mile)**	**SO_2 (g/mile)**	**CO_2 and CO_2 Equivalents (g/mile)**
Passenger cars	8.497	2.892	0.576	0.019	0.018	0.005	320
Passenger truck	3.645	5.449	1.168	0.027	0.025	0.007	439
Light commercial truck	4.460	2.158	2.986	0.164	0.190	0.005	609
Short-haul truck	2.438	2.273	6.095	0.270	0.313	0.007	929
Long-haul truck	2.519	3.610	14.776	0.625	0.726	0.016	2,020

Total Emission for On-Road Construction Activities (tons/year)							
Source	**VOC**	**CO**	**NOx**	**PM-10**	**PM-2.5**	**SO_2**	**CO_2 and CO_2 Equivalents**
Passenger cars	0.974	0.331	0.066	0.002	0.002	0.001	37
Passenger truck	0.418	0.624	0.134	0.003	0.003	0.001	50
Light commercial truck	0.051	0.025	0.034	0.002	0.002	0.000	7
Short-haul truck	0.335	0.313	0.838	0.037	0.043	0.001	128
Long-haul truck	0.058	0.083	0.339	0.014	0.017	0.000	46
Total	**1.836**	**1.376**	**1.411**	**0.059**	**0.067**	**0.003**	**268**

Key:

Short-haul trucks category includes trucks such as dump trucks and cement trucks.
Long-haul trucks category includes trucks such as semi-trailers (18-wheelers).

1. Emission factors were generated by the USEPA preferred model MOVES2010a. MOVES simulates daily motor vehicle operations and produces

MOVES2010a MODEL ON-ROAD TRANSPORTATION AIR EMISSIONS- ONGOING OPERATIONS

MOVES 2010a					
Source	**Fuel type**	**Number of vehicles**	**Miles traveled per day**	**Days of travel per year**	**Miles traveled per year**
Passenger cars	Gasoline	1	20	240	4,800
Passenger truck	Gasoline	1	20	240	4,800
Light commercial truck	Diesel	1	20	240	4,800
Short-haul truck	Diesel	1	20	240	4,800
Long-haul truck	Diesel	1	20	240	4,800

Emission Factors (MOVES 2010a Emission Rates)[1]							
Source	**VOC (g/mile)**	**CO (g/mile)**	**NOx (g/mile)**	**PM-10 (g/mile)**	**PM-2.5 (g/mile)**	**SO_2 (g/mile)**	**CO_2 and CO_2 Equivalents (g/mile)**
Passenger cars	8.497	2.892	0.576	0.019	0.018	0.005	320
Passenger truck	3.645	5.449	1.168	0.027	0.025	0.007	439
Light commercial truck	4.460	2.158	2.986	0.164	0.190	0.005	609
Short-haul truck	2.438	2.273	6.095	0.270	0.313	0.007	929
Long-haul truck	2.519	3.610	14.776	0.625	0.726	0.016	2,020

Total Emission for On-Road Commuter Activities (tons/year)							
Source	**VOC**	**CO**	**NOx**	**PM-10**	**PM-2.5**	**SO_2**	**CO_2 and CO_2 Equivalents**
Passenger cars	0.04	0.02	0.00	0.00	0.00	0.00	2
Passenger truck	0.02	0.03	0.01	0.00	0.00	0.00	2
Light commercial truck	0.02	0.01	0.02	0.00	0.00	0.00	3
Short-haul truck	0.01	0.01	0.03	0.00	0.00	0.00	5
Long-haul truck	0.01	0.02	0.08	0.00	0.00	0.00	11
Total	0.11	0.09	0.14	0.01	0.01	0.00	23

Key:

Short-haul trucks category includes trucks such as dump trucks and cement trucks.
Long-haul trucks category includes trucks such as semi-trailers (18-wheelers).

1. Emission factors were generated by the USEPA preferred model MOVES2010a. MOVES simulates daily motor vehicle operations and produces emission rates. MOVES emission rates include sources from engine combustion, tire wear, brake wear, evaporative fuel permiation, vapor venting and leaking (running and parking), and crankcase loss. Emission rates are daily averages for each of the criteria pollutants. The averages are from a combination of vehicle operations such as stop and go, highway travel, acceleration at on-ramps, parking, start-up, extended idle, etc.

CALCULATION SHEET-FUGITIVE DUST-CONSTRUCTION

Assumptions for Combustion Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
General Construction Activities	0.19	ton PM-10/acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM-10/acre-month	MRI 1996; EPA 2001; EPA 2006
PM-2.5 Emissions			
PM-2.5 Multiplier	0.10	(10% of PM-10 emissions assumed to be PM-2.5)	EPA 2001; EPA 2006
Control Efficiency	0.50	(assume 50% control efficiency for PM-10 and PM-2.5 emissions)	EPA 2001; EPA 2006

Project Assumptions

Construction Area (0.19 ton PM-10/acre-month)

Duration of Soil Disturbance in Projec	12	months
Length	0	miles
Length (converted)	0	feet
Width	0	feet
Area	22.00	acres

Conversion Factors

0.000022957	acres per feet
5280	feet per mile

Staging Areas

Duration of Construction Project	12	months
Length		miles
Length (converted)		feet
Width		feet
Area	2.00	acres

	Project Emissions (tons/year)			
	PM-10 uncontrolled	**PM-10 controlled**	**PM-2.5 uncontrolled**	**PM-2.5 controlled**
Construction Area (0.19 ton PM-10/a	50.16	25.08	5.02	2.51
Staging Areas	0.38	0.19	0.04	0.02
Total	**50.54**	**25.27**	**5.05**	**2.53**

References:

USEPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999.* EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

USEPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants.* Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1).* Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Assumptions for Fugitive Emissions

General Construction Activities Emission Factor

0.19 ton PM-10/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM-10/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM-10/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions from Construction Operations, calculated the 0.19 ton PM-10/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM-10/acre-month) and 75% of the average emission factor (0.11 ton PM-10/acre-month).

The 0.19 ton PM-10/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM-10/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particle (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District and the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM-10 and PM-2.5 in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM-10/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM-10/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM-10/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM-2.5 Multiplier **0.10**

PM-2.5 emissions are estimated by applying a particle size multiplier of 0.10 to PM-10 emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM-10 and PM-2.5 **0.50**

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM-10 and PM-2.5 in PM nonattainment areas. Wetting controls will be applied during project construction (EPA 2006).

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999.* EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants.* Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1).* Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

CALCULATION SHEET-SUMMARY OF EMISSIONS

Summary of Emissions (tons/year)									
Emission Source	VOC	CO	NOx	PM-10	PM-2.5	SO_2	CO_2	CO_2 Equivalents	Total CO_2
Combustion Emissions	1.39	5.51	11.56	1.09	1.06	1.46	1059.00	3,631	4,690
Construction Site-Fugitive PM-10	NA	NA	NA	25.27	2.53	NA	NA	NA	NA
Construction Workers Commuter & Trucking	1.84	1.38	1.41	0.06	0.07	0.00	NA	268	268
Total Emissions-CONSTRUCTION	**3.22**	**6.89**	**12.97**	**26.41**	**3.65**	**1.46**	**1059**	**3,899**	**4,958**
De minimis Threshold (1)	100	100	100	100	100	100	NA	NA	27,557

1. Note that Webb County is in attainment for NAAQS (USEPA 2013b).

Carbon Equivalents	Conversion Factor
N_2O or NOx	311
Methane or VOCs	25

Source: EPA 2010 Reference, Tables and Conversions, Inventory of U.S. Greenhouse Gas Emissions and Sinks; http://www.epa.gov/climatechange/emissions/usinventoryreport.html

APPENDIX J
DRAFT PROJECT COOPERATION AGREEMENT

Project Cooperation Agreement will be included in the Final DPR/EA.

APPENDIX K
CORRESPONDENCE AND COMMENTS

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DEPARTMENT OF THE ARMY
FORT WORTH DISTRICT, CORPS OF ENGINEERS
P. 0. BOX 17300
FORT WORTH, TEXAS 76102-0300
July 10,2013
Planning, Environmental, and Regulatory Division

REFERENCE: PUBLIC MEETING NOTICE LAREDO RIVERBEND CONTINUING AUTHORITIES PROGRAM SECTION 206 AQUATIC ECOSYSTEM RESTORATION FEASIBILITY STUDY

The U.S. Army Corps of Engineers (USACE), Fort Worth District, in partnership with the City of Laredo, is currently conducting a feasibility study for aquatic ecosystem restoration in Laredo, Texas. The study area includes a former sand and gravel mining operation along a sharp bend in the Rio Grande in the southwest comer of the city, this area is commonly referred to as the Laredo Riverbend area. This aquatic ecosystem restoration study was conducted under the authority of the Continuing Authorities Program Section 206 of the Water Resources Development Act of 1996 (Public Law 104-33).

During the formulation process of the feasibility study, problems and opportunities for aquatic ecosystem restoration were identified based upon the ongoing degradation of the ecosystem within the study area. The following study objectives were established to improve the aquatic ecosystem: a) Restore the quality and/or quantity of aquatic, wetland, and riparian habitats, b) Improve habitat suitability of aquatic, wetland, and riparian habitats, c) Improve hydrological connectivity with surrounding water bodies and reduce seasonal inundation, d) Improve water quality and reduce erosion, e) Improve vegetative structure to increase habitat quality and improve structural diversity, and f) Increase the habitat quality of the restoration area as part of a migration, foraging, and breeding corridor for common native wildlife and federally protected species. Numerous aquatic restoration measures were identified based upon their ability to restore the aquatic ecosystem and to meet the study objectives. Through the formulation process, a tentatively selected, National Ecosystem Restoration (NER) Plan consisting of multiple aquatic restoration measures was identified. These measures include excavation of the two largest ponds, excavation of channels and shorelines, creation of shallow wetland benches and points, planting native vegetation, removal and control of nonnative and invasive vegetation species, removal of trails and roads, and creation of nesting habitat in the two largest ponds at various locations within the study area.

We would like to invite you to a public meeting addressing the tentatively selected plan. The public meeting, which will be conducted in an open house format, will occur from 5:30p.m. to 7:00p.m. on July I 0, 2013, and will be held at the following location:

Environmental Services Department
619 Reynolds Street
Laredo, Texas 78040

We look forward to receiving your comments as we move forward. Please address any comments to Mrs. Hope Pollmann, CESWF-PER-EE, 819 Taylor Street, Room 3A12, Fort Worth, Texas 76102 or email hope.l.pollmann@usace.army.mil. Thank you for your interest and cooperation.

L-65

9am-

CITATION BY PUBLICATION

CLERK OF THE COURT:
Esther Degollado
1110 Victoria St., Suite 203
Laredo, Texas 78040

PLAINTIFF'S ATTORNEY:
The Law Office of H.L. Blomquist III, P. C.
P.O. Box 700826
San Antonio, Texas 78270-0826

THE STATE OF TEXAS

NOTICE TO DEFENDANTS: "You have been
may employ an attorney. If you or your attorne
a written answer with the clerk who issued thi
10:00 a.m. on the Monday next following the
forty-two (42) days after the date of issuance of
and petition, a default judgment may be taken a

TO: T. J. WREN and L. W. SMITH, IF LIVI
DECEASED, THEIR KNOWN AND UNKNOV
EXECUTORS, ADMINISTRATORS, SUCCES
ASSIGNS, Defendants in the cause herein desc
You and each of you are hereby commande
and answer before the 341st Judicial District Co
County, Texas, in the Courthouse located in Lare
or before 10:00 a.m. on the first Monday after th
of forty-two (42) days from the date of issua
being at or before 10:00 a.m. on Monday, the
2013, then and there to answer the petition of E
RESOURCES II, LLC in Cause No. 2012CV
styled ESCONDIDO RESOURCES II, LLC v. T. J.
L. W. SMITH, in which ESCONDIDO RESOURC
Plaintiff and the above named are Defendants.
filed on the 10th day of June, 2013, discloses th
of the suit is as follows:

An action under Section 64.091, Texas Civil
Remedies Code, to authorize the execution
covering the mineral interest of the particular
(being undivided interests therein), such lease
that the Plaintiff will be the lessee and authorized
leases to explore for and produce oil and gas
provided. The tract of land pertaining to the a
Defendants is described as follows:

180 acres of land, more or less, situated in S
Abstract 554, Certificate 849, Webb County,
being more particularly described in a Mineral
July 16, 1920, from Antonio Carvajal de C
husband, Victoriano Chavez, to L.W. Smith and
recorded at Volume 75, Page 377 of the Deed
Webb County, Texas. Said lands are limited to d
100' below the base of the stratigraphic equivale
Escondido Sand INSOFAR AND ONLY INSOFA
acres, more or less, described as Tract No. 7 in
Partial Release of Oil and Gas Lease from Segur
Drilling, Ltd., and Lewis Petro Properties, Inc., to
Jr. and wife, recorded at Volume 1042, Page
Official Public Records of Webb County, Texas.

If this citation is not served within ninety (90) d
issuance, it shall be returned unserved.

Issued and given under my hand and seal of sa
this 13th day of June, 2013, at Laredo, Webb Co

L-38

the Laredo Independent School District is accepting sealed bids for
eal properties:
pted until 4:00pm(CST) July 18, 2013 for Request for Sealed Bids
perty by which time the bids will be received at the:

ess	Approximate Sq. Ft.	Minimum Bid	Legal Description

Aviso de Reunión Pública
Departamento de Transporte de Texa
Desarrollo del Programa de Transporte Unific
El Departamento de Transporte de Texas (TxD
siglas en ingles) llevará a cabo una reunión
WebEx para solicitar comentarios públicos y

ATTENDEE SIGN-IN SHEET
Laredo Riverbend Section 206 Aquatic Ecosystem Restoration Project
Public Meeting – July 10, 2013

Name	Affiliation (if any)	Address
Xavier Rothofsky	LareDOS	1820 Houston St.
Nora Stewart	LCC	West End Washington
(A)DC Dion Ethell	US Border Patrol	Laredo Sector – Del Mar
(A)ACPA Dustin Taylor	US Border Patrol	Laredo Sector – Del Mar
Jorge Dominguez	Member CED.	151 Knuth Ave
Julie Castillo	CAEC	1031 Cuervo Drive
Julio C. Sosa	CAEC	2202 Gustavus
[illegible]	CAEC	428 Hill Top
[illegible]	CAEC	5204 South Lake Dr
John Porter	COL-ESD	619 Reynolds St.
Tom Vaughan	TAMIU-RGISC	1105 Beverly
Adrian Gause	City of Laredo GIS	1120 San Bernardo Ave

Laredo Riverbend Section 206 Aquatic Ecosystem Restoration Project
Public Meeting – July 10, 2013
Comment Card

Name: Julio Sosa Affiliation: CAEC

Address: 2202 Gustavus

City: Laredo State: TX Zip Code:

Phone: 956 ~~72~~ 3342442 Email: gloria_s000@hotmail.com

Comments:

Very good presentation and a great project. I hope it can be completed + funded soon. Keep up the good work

Please mail comments to:

Hope Pollmann
Environmental Resources Planner
U.S. Army Corps of Engineers
PO Box 17300
Fort Worth, Texas 76102

Or email comments to: Hope.L.Pollmann@usace.army.mil

Laredo Riverbend Section 206 Aquatic Ecosystem Restoration Project
Public Meeting – July 10, 2013
Comment Card

Name: PETER VENEGAS Affiliation: CAEC

Address: 426 Hill Top

City: LAREDO TX State: TX. Zip Code: 78045

Phone: 956 7260284 Email: PVENEGAS a STWS oboy.COM.

Comments:

Please mail comments to:

Hope Pollmann
Environmental Resources Planner
U.S. Army Corps of Engineers
PO Box 17300
Fort Worth, Texas 76102

Or email comments to: Hope.L.Pollmann@usace.army.mil