# FINAL

# ENVIRONMENTAL ASSESSMENT

# EAST SABINE LAKE HYDROLOGIC RESTORATION PROJECT CONSTRUCTION UNIT 1

# (CS-32)

## CAMERON PARISH, LOUISIANA


**U.S. FISH AND WILDLIFE SERVICE**

**ECOLOGICAL SERVICES**

**LAFAYETTE, LOUISIANA**



**November 2004**

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**Cameron Parish, Louisiana**

**Prepared by:**
**Darryl Clark**
**Senior Fish and Wildlife Biologist**
**and**
**Joyce Mazourek**
**Fish and Wildlife Biologist**

**U.S. Fish and Wildlife Service**
**Ecological Services**
**646 Cajundome Blvd.**
**Suite 400**
**Lafayette, Louisiana 70506**

**Phone: (337) 291-3100**
**Fax: (337) 291-3139**

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**Cameron Parish, Louisiana**

# SECTION 1.0 PURPOSE AND NEED FOR PROPOSED ACTION

The purpose of the proposed action is to protect a major portion of the brackish and intermediate marshes east of Sabine Lake, on the Sabine National Wildlife Refuge (NWR), from deterioration and conversion to open water caused by altered hydrology, saltwater intrusion, subsidence and wave action. The proposed project is being funded through the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) as part of the 10th Priority Project List, and was authorized on January 10, 2001, for detailed engineering and design by the Louisiana Coastal Wetlands Conservation and Restoration Task Force.

## SECTION 1.1 INTRODUCTION

The rapid conversion of Louisiana's coastal marshes to open water has been reported by Gagliano et al. (1981), Gosselink (1984), Turner and Cahoon (1987), Britsch and Kemp (1990), Dunbar et al. (1992), and others. Since the 1950s, the average loss rate for those wetlands has been 25 to 35 square miles (16,000 to 22,400 acres) per year. That loss is of national concern; an estimated 69 percent of the coastal marshes adjacent to the Gulf of Mexico occur in Louisiana (West 1977).

Coastal Louisiana includes nine hydrologic basins (Louisiana Coastal Wetlands Conservation and Restoration Task Force 1993*a*); two of those basins (i.e., the Calcasieu-Sabine Basin and the Mermentau Basin) comprise the Louisiana portion of the Chenier Plain. The Calcasieu-Sabine Basin (Figure 1), located in southwestern Louisiana, consists of two interconnected hydrologic units (i.e., the Calcasieu Subbasin and the Sabine Subbasin), and extends from Sabine Lake eastward to Louisiana Highway 27 east of Calcasieu Lake. The major sources of freshwater inflow occur along a north-south gradient through the Calcasieu and Sabine rivers and from the northwest via the Neches River into Sabine Lake. Construction of the Gulf Intracoastal Waterway (GIWW) and interior marsh canals provided an east-west connection between the Calcasieu and Sabine river systems (Louisiana Coastal Wetlands Conservation and Restoration Task Force 1993*a*).

## SECTION 1.2 PROJECT AREA

The project area is located in the western portion of the Sabine Subbasin on the Sabine NWR. The Burton Sutton Canal and the Sabine NWR Pool 3 comprise the eastern project area boundary; it is bounded on the south by the Starks South Canal, on the west by the eastern shoreline of Sabine Lake and on the north by roughly the Sabine NWR northern boundary. The

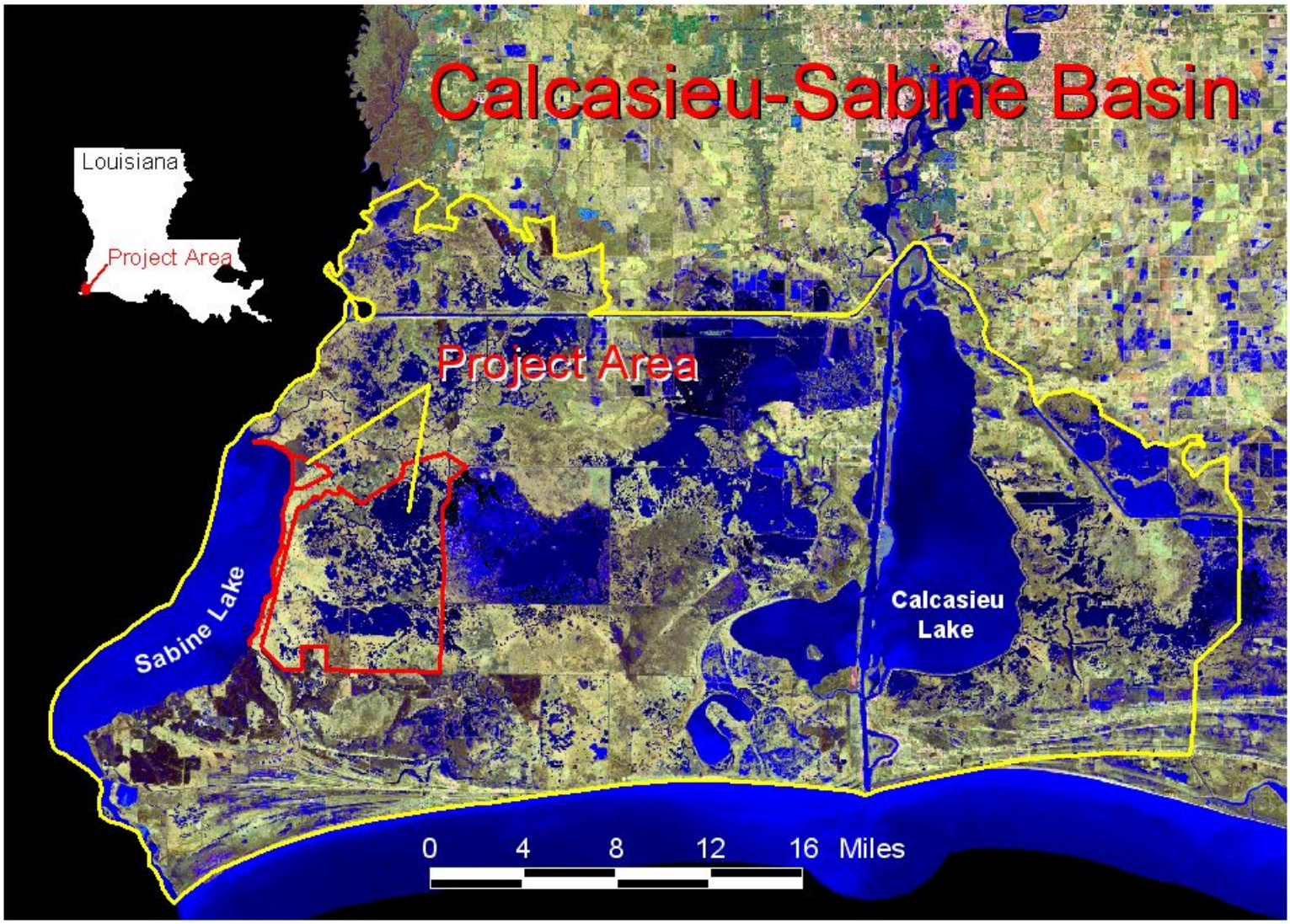


Figure 1. Calcasieu-Sabine Basin Including the Project Area

project area is approximately 14 miles east of Port Arthur, Texas, and lies entirely within Cameron Parish, Louisiana (Figure 1). The total project area (CUs 1 and 2) encompasses 36,272 acres, consisting of 17,415 acres, 3,850 acres, and 15,355 acres of intermediate marsh, brackish marsh and open water, respectively. The area also consists of small amounts of bottomland forest (13 acres), upland forest (15 acres), bottomland shrub/scrub (3 acres), upland shrub/scrub (48 acres) and agriculture pasture (69 acres) habitats (USGS 2000, Appendix Table A.1). Construction Unit 1 consists of 2,094 acres, 52 acres and 4224 acres of intermediate marsh, brackish marsh and open water respectively (Clark 2004).

## SECTION 1.3 PURPOSE OF PROPOSED ACTION

This Environmental Assessment (EA) evaluates alternatives to address the conversion of marsh to open water along the eastern shoreline of Sabine Lake and within the interior marshes between Sabine Lake and Pool 3 of the Sabine NWR, especially in the Greens Bayou area. The project goals are to reduce shoreline and interior marsh erosion, to restore marsh and associated submerged aquatic vegetation previously converted to open water, and to partially restore altered wetland hydrology. As shown in Figure 2, the project is designed to: 1) restore emergent wetlands; 2) restore altered hydrology in three specific areas (Pines Ridge Bayou, Bridge Bayou and Section 16); 3) reduce some elevated salinities within intermediate marshes; 4) reduce marsh loss, and; 5) encourage the growth of submerged aquatic vegetation.

## SECTION 1.4 NEED FOR PROPOSED ACTION

The conversion of marsh to open water habitat is detrimental to commercially, recreationally, and legislatively important species and biologic communities. Major hydrological changes in the Sabine Subbasin occurred with the construction of the Sabine-Neches Waterway (SNWW) and the Toledo Bend Reservoir. Historically, all of the inflow from the Sabine and Neches rivers entered Sabine Lake. Construction of the SNWW and deepening of the Sabine and Neches Rivers caused saltwater intrusion into the historically low-salinity Sabine Lake estuary, accelerated freshwater flows to the Gulf (thus reducing inflows into adjacent marshes), and increased tidal amplitude. Additionally, freshwater is retained in Toledo Bend Reservoir during the spring when freshwater inflows are highest, and released in the summer for generation of electricity and for municipal, industrial and agricultural uses.

Elevated salinities are thought to be the leading cause of wetland loss in the Sabine Subbasin. Three potential hydrologic changes threaten to increase salinity levels in Sabine Lake and adjacent marshes, and allow saltwater intrusion to penetrate further northward in the estuary. Those threats include the Texas Water Plan (Senate Bill 1), the proposed Sabine-Neches Waterway Enlargement Project, and the recently constructed Neches River Saltwater Barrier. The Texas Water Plan could reduce Sabine River flows to that estuary by as much as 50 percent. The Sabine-Neches Waterway Enlargement Project could elevate salinities via the proposed deepening and widening of that channel. The recently constructed Neches River Saltwater Barrier could reduce freshwater inflows to Sabine Lake and facilitate upstream

withdrawals for municipal, industrial and agricultural uses.

Historically, the Calcasieu-Sabine Basin and project area have experienced coastal wetland losses of over 30 percent from 1932 to 1990; thus there is a need to reduce the ongoing conversion of marsh to open water that has resulted from human hydrologic alterations and natural causes (i.e., wave action and subsidence). The 630,000-acre Calcasieu-Sabine Basin contained 435,600 acres of coastal wetlands in 1932 (Louisiana Coastal Wetlands Conservation and Restoration Task Force 1993b). Since then, that basin has experienced a loss of over 122,000 acres (28 percent) of marsh (Dunbar et al. 1992). The 318,000-acre Sabine Subbasin lost over 84,000 acres of marsh (38.5 percent) since 1932 due to human-induced (i.e., channelization) and natural causes. Another 38,400 acres of Sabine Subbasin marsh (12.1 percent) are projected to be lost by 2050, for a total projected loss of 160,382 acres from 1932 to 2050 (Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority 1998). The existing and predicted loss represents losses of over 50 percent of the original 220,000-acre Sabine Subbasin marshes.

Within the 39,539-acre East Sabine Project area, marsh losses were 42.6, 5.0, and 1.4 percent for the periods 1956 to 1974, 1974 to 1983, and 1983 to 1990, respectively, for a total of 49 percent wetland loss within that area from 1932 to 1990 (Table 2; Appendix A). Project-area 1983 to 1990 land loss rates were 0.2 percent/year (Dunbar et al. 1992). If this modest rate is projected to the year 2050, another 2,552 acres (12 percent) could be lost from the project area (a 61 percent loss from 1932 to 2050; Table 2). Sabine Lake shoreline erosion rates are estimated to be 10 feet per year (Midkiff 2000).

Table 1: Sabine Subbasin Marsh Loss Rates from 1932 to 1990

| Period | Acres Lost | Period Percent Loss | Annual Percent Loss |
|---|---|---|---|
| 1932-1955 | 1,498 | 0.66 | 0.03 |
| 1955-1974 | 73,260 | 31.5 | 1.7 |
| 1974-1983 | 7,780 | 4.9 | 0.54 |
| 1983-1990 | 2,206 | 1.5 | 0.21 |
| Total (1932-1990) | 84,744 | 38.53 | 0.68 |

Note : The Sabine subbasin totals 318,000 acres; Sabine subbasin marsh area totaled 135,199 acres in 1990. (modified from Dunbar et al. 1992)

Table 2: East Sabine Hydrologic Restoration Project Area Marsh Loss from 1932 to 2050

| **Category/Year Period** | **1932-1956** | **1956-1974** | **1974-1983** | **1983-1990** | **Total 1932-1990** | **1990-2050** |
|---|---|---|---|---|---|---|
| Marsh (acres) | *39,539 | 22,710 (1974) | 21,560 (1983) | 21,265 (1990) | | 18,713 (2050) |
| Marsh Loss (acres) | 0 | 16,829 | 1,150 | 295 | 18,274 | 2,552 |
| Percent Loss | 0 | 42.6 | 5.0 | 1.4 | 49 | 12 |
| Annual Percent Loss | 0 | 2.4 | 0.56 | 0.2 | 0.80 | 0.2 |

(*Modified from Dunbar et al. 1992. Note the total marsh area is different from USGS 2000 data.)

## SECTION 1.5 REQUIRED DECISIONS

The lead Federal project sponsor, the U.S. Fish and Wildlife Service, in coordination with the Natural Resources Conservation Service and Louisiana Department of Natural Resources co-sponsors, has ensured that the final preferred alternative selection was made after a thorough public review of the project design and Section 404 Clean Water Act permit application, and after fully considering all comments on the draft Environmental Assessment.

## SECTION 1.6 COORDINATION AND CONSULTATION

This project was coordinated with the Louisiana Coastal Wetlands Conservation and Restoration Task Force (Task Force) agencies, the Louisiana Department of Natural Resources, the Cameron Parish government, and affected landowners. Project implementation would partially fulfill a regional strategy (salinity control along the eastern shoreline of Sabine Lake) recommended for the Calcasieu-Sabine Basin in the Coast 2050 Plan, which was developed by the Task Force and the Wetlands Conservation and Restoration Authority (Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority 1998).

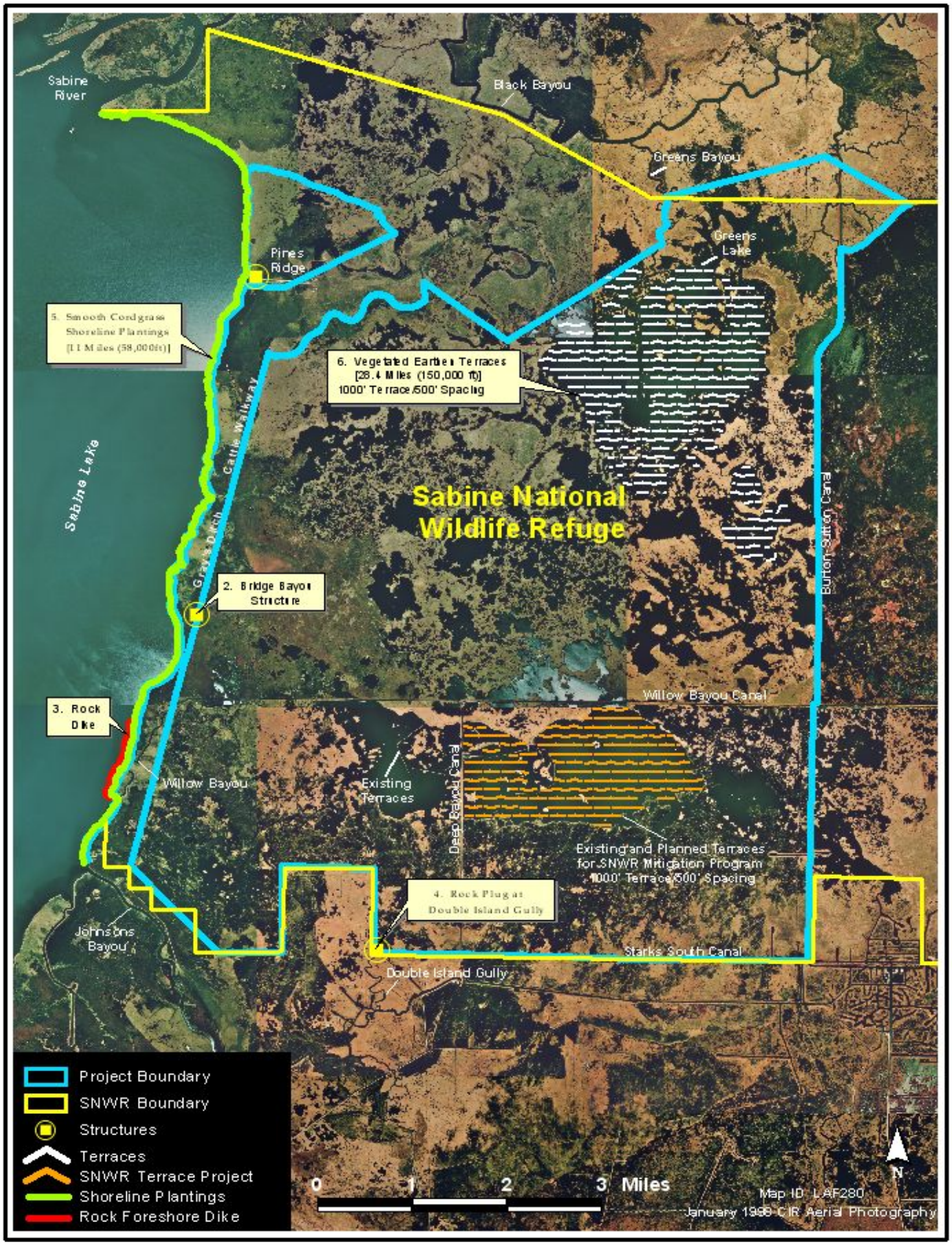


Figure 2. General Features of the East Sabine Hydrologic Restoration Project

# SECTION 2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

## SECTION 2.1 ALTERNATIVE 1 - NO ACTION

Under this alternative, no action would be taken to reduce elevated salinities and shoreline and interior marsh erosion other than the current Sabine NWR management and mitigation activities.

## SECTION 2.2 ALTERNATIVE 2 - PREFERRED ALTERNATIVE

The preferred alternative for the East Sabine Lake Hydrologic Restoration Construction Unit 1 Project would reduce shoreline erosion, slow interior marsh loss and restore/create marsh in the western portion of the Sabine NWR and restore hydrology to marshes north of Pines Ridge. The preferred alternative for Construction Unit 1 would include the installation and maintenance of the following features as shown on Figure 2.

1. Install a 40-foot-wide rock weir at Pines Ridge Bayou at the intersection of that bayou and the northern spoil bank of an east-west oil and gas canal (weir height 1 foot below average water level; Appendix B-2).

2. Install an active water control structure (3, 24-inch-diameter culverts with stop logs and flapgates) at the intersection of Bridge Bayou, the cattle walkway and Gray's Ditch (Appendix B-3). Dredged material has been placed across Bridge Bayou to install the existing cattle walkway and an existing 24 inch-diameter open culvert.

3. Install a rock plug, with a crown elevation set at 2.0 feet above marsh elevation [+3.0 feet North American Vertical Datum 1988 (NAVD (88)], at the levee break near Double Island Gully at the southeastern portion of Section 16 and the Starks South Canal (Appendix B-4).

4. Excavate a 6.0-foot-deep by 70-to-80-foot-wide barge access canal 40 to 50 feet lakeward of and parallel to, the foreshore dike described below. Dredged material for access channel construction will be used to restore approximately 3.4 acres of marsh along 3,000 feet of the shoreline between the rock foreshore dike and the existing shoreline (Appendix B-5).

5. Install a 3,000 linear foot rock foreshore dike at the Sabine Lake shoreline from the mouth of Willow Bayou northward (Appendix B-5).

6. Install approximately 32.4 miles (171,000 linear feet) of "duck wing" vegetated earthen terraces to restore 98 acres of shallow open water areas in the Greens Lake area on the Sabine NWR (Appendix B-6). Those terraces would be 40-feet-wide at their bases, crown widths would be 15 feet, and the settled crown elevation would be at marsh level [1.3 feet NAVD (88)]. One row of smooth cordgrass (*Spartina alterniflora*) bare-root plugs would be planted on 2.5-foot centers on each side slope

(approximately 142,500 plants).

## SECTION 2.3 OTHER ALTERNATIVES CONSIDERED

Control Structures

1. One alternative to the proposed Pines Ridge Bayou rock weir was a rock plug. A field investigation and inspection of USGS quadrangle maps and historic aerial photographs indicated that Pines Ridge Bayou historically continued southward of the east-west Pines Ridge canal and entered Sabine Lake. Placement of a rock plug at Pines Ridge Bayou would stop all water flow from Pines Ridge Bayou to Sabine Lake, and would reduce estuarine fisheries and shellfish access to viable brackish marshes north of Pines Ridge from the south. There is also existing limited access to Pines Ridge marshes from Black Bayou to the north.

2. An alternative to the Bridge Bayou structure considered involved placing 2, 36-inch-diameter culverts instead of 3, 24-inch-diameter culverts. The preferred alternative was recommended because the existing bayou depths are 1.0 foot deep or less at the intersection of the bayou and cattle walkway. The structure's purpose is to restore Bridge Bayou hydrology impacted by that bayou being plugged by the cattle walkway.

3. The alternatives considered for the Section 16 Sabine NWR levee break repair included a rock weir at marsh elevation, or a rock plug. The rock plug was selected by the project management team, due to engineering considerations and the fact that fisheries access into the area was not significant. The existing levee break is less than 20 feet-wide by 4-feet-deep.

Sabine Lake Shoreline Stabilization

1. 11 miles (58,000 linear feet) of shoreline plantings of smooth cordgrass (*Spartina alterniflora*) along the eastern Sabine Lake shoreline was included as a project component beginning 1,000 feet north of Johnston's Bayou to near the mouth of the Sabine River north of Pines Ridge. This component was eliminated due to poor growth and survival results from the 7,500 linear foot shoreline test planting conducted by the State Soil and Water Conservation District in May 2004. Steyer (2004) recommended, in a report of that test planting, that the shoreline vegetative plantings be removed as a project component.

2. An 11-mile-long rock foreshore dike was considered as an alternative to vegetative shoreline plantings. That alternative was not recommended due to its relatively high cost compared to the moderate shoreline erosion rates. Vegetative shoreline plantings were recommended because they were substantially more cost effective than rock stabilization.

3. An alternative to the 3,000 foot Willow Bayou foreshore dike was a shorter, 1,500 linear foot dike; however, the benefits of increasing the original length of rock protection in this area substantially outweighed the additional costs. The Willow Bayou shoreline is about 20 to 25 feet (8 m) from the Sabine Lake shoreline in this area and vegetative shoreline plantings would not be sufficient to prevent Sabine Lake from eroding into Willow Bayou there.

Earthen Terraces

Several terrace designs were evaluated, including straight linear rows orientated east to west, a modified "V" or "duck-wing," and checkerboard configurations. The "duck wing" or "V-shaped" terrace design was used successfully in restoring marsh in a recent terracing project installed east of Calcasieu Lake by Ducks Unlimited, the Service, DNR, Miami Corporation and others. The existing Sabine NWR terraces located east of Deep Bayou Canal and south of the Willow Bayou Canal (within the boundary of the East Sabine Lake Project) are also of the successful "duck-wing" design. Alternative terrace dimensions are possible that include top widths ranging from 4-feet to 15-feet; terrace heights ranging from settled marsh level height [1.3 feet NAVD (88)] to 2.2 feet above marsh level [2.5 feet NAVD (88)]. The 15-foot-wide top width was recommended because it is less likely to erode, provides a greater marsh platform, and has been implemented successfully. The preferred marsh level settled terrace height was also selected because the design has been used successfully by Sabine NWR, and it provides a lower wetland elevation for better fish and wildlife access and increased productivity.

# SECTION 3.0 AFFECTED ENVIRONMENT

## SECTION 3.1 PHYSICAL ENVIRONMENT

### A. Regional Hydrology

Construction of navigation channels in the late 1800s and early 1900s significantly altered the hydrology of the Calcasieu-Sabine Basin. Historically, the Calcasieu and Sabine Subbasins were separated by the Gum Cove Ridge and little water exchange between the basins occurred. Drainage was predominantly in a north-south direction through the Sabine and Calcasieu Rivers, and the Neches River drained into Sabine Lake from the northwest. The construction and gradual deepening and expansion of the Calcasieu Ship Channel and SNWW permitted saltwater intrusion into the historically low-salinity estuaries; funneled freshwater flows directly to the Gulf, bypassing adjacent marshes; and increased tidal amplitude.

Construction of the east-west GIWW bisected the Gum Cove Ridge and connected the river basins by linking the Calcasieu Ship Channel to the SNWW. That connection reduced both historic over-marsh sheet flows and the north-south flows of natural bayous; thus, that connection diverted freshwater east and west, partially bypassing the marshes. Waterflow and

salinity patterns in one basin now affect those in the other to some extent.

Another important hydrologic influence in the Sabine Subbasin is the Toledo Bend Reservoir, located 90 miles north of Sabine Lake. Historically, all of the water from the Sabine and Neches Rivers drained directly into Sabine Lake. Operation of Toledo Bend reservoir for industrial and agricultural uses has altered the timing of freshwater flows. Water is now retained in the reservoir during the spring when freshwater inflows are traditionally highest, and released in the summer when inflow is low and electric generation needs are greatest. Canals and levees constructed for flood control, agriculture, and oil and gas exploration activities have also disrupted the natural basin hydrology.

Current project-area hydrologic conditions are influenced by Sabine NWR water management efforts. That 195-square mile (124,511-acre) NWR is comprised of 7 management units containing fresh, intermediate, brackish, and saline marsh. Refuge hydrologic management is focused primarily on controlling salinity and minimizing tidal fluctuations through the construction and operation of levees, weirs, and gated structures. Managers strive to achieve a balance between reducing wetland plant waterlogging and saltwater intrusion stresses, and providing access for estuarine fish and shellfish organisms to interior marshes during critical life-cycle events.

## B. Water Quality

As part of its surface water quality monitoring program, the Louisiana Department of Environmental Quality (LDEQ) routinely monitors several parameters (Table 3) on a monthly basis at numerous sites. Although there are several long-term sites on larger water bodies throughout the State, sites are currently monitored intensively for 1 and 5-year cycles (LDEQ 2002). Based upon those data and fish tissue contaminants data, complaint investigations, and spill reports, etc., LDEQ has assessed water quality fitness for the following uses: agriculture, primary contact recreation (swimming), secondary contact recreation (boating and fishing), fish and wildlife propagation, and drinking water supply (LDEQ 2002). Based on existing data and more subjective information, water quality is determined to either fully, partially, or not support those uses. Water quality in the Sabine River from the Toledo Bend Dam to Sabine Lake is considered by the LDEQ to fully support primary and secondary contact recreation, but does not support fish and wildlife propagation (LDEQ 2002). No data exist to assess the water quality of the river from Sabine Lake to the Gulf of Mexico or the associated estuary.

Table 3. Parameters Monitored for LDEQ's Monthly Ambient Surface Water Quality Network

| | | | |
|---|---|---|---|
| pH and temperature | field conductivity | total suspended solids | lead* |
| dissolved oxygen | specific conductance | arsenic* | total Kjeldahl nitrogen |
| salinity | sodium | cadmium* | nitrate and nitrite |
| alkalinity | chlorides | chromium* | ammonium nitrogen |
| hardness | true color | copper* | total phosphorus |
| Secchi Disk | sulfates | nickel* | total organic carbon |
| turbidity | total dissolved solids | mercury* | coliform bacteria |

* Metals sampling and analysis is done quarterly.

Salinity is an important factor affecting marsh habitat types in Louisiana. The Hydrologic Investigation of the Louisiana Chenier Plain report (LA Department of Natural Resources 2003) analyzed regional salinities. That report indicates that the Sabine River, more than the Calcasieu River, is the primary influence on salinity levels in the Sabine NWR and throughout the Calcasieu-Sabine Basin. Basin salinity regimes vary spatially and temporally, exhibiting seasonal, annual, and multi-year shifts.

The 2003 DNR hydrologic investigation found few long-term salinity trends at stations within the Sabine NWR; however, salinities at the Burton Sutton Canal at Starks (BUS) station significantly increased [from 1 parts per thousand (ppt) to 4 ppt] between 1990 and 1999. Five other stations in the eastern portion of the refuge also had significant salinity increases due to the Calcasieu Ship Channel. The greatest increase occurred at the Browns Lake station (B2), on Sabine NWR, which increased from 7.6 ppt to 14.2 ppt between 1990 and 1999. The Calcasieu Ship Channel affects salinities in the western portion of Sabine NWR, but that effect was minimized by completion and operation of the Sabine Structures CWPPRA Project in December 2001.

## C. Wetland Loss

Historic wetland loss (Table 2) in the East Sabine Lake total (CUs 1 and 2) project area from the 1950s to 1990 was 18,274 acres, or approximately 530 acres per year. The majority of that loss [1,150 acres (5.0 percent)] occurred from 1950 to 1974, as a result of altered hydrology, increased salinity levels, shoreline erosion, and subsidence. More recent erosion rates indicate that marsh loss has slowed to 0.2 to 0.4 percent per year. During the 16-year period from 1974 to 1990, approximately 90 acres of marsh were lost annually for a total of 1,445 acres lost. Between 1983 and 1990, 295 acres of marsh were lost at a rate of 0.2 percent per year (Table 2, modified from Dunbar et al. 1992). Shoreline erosion rates along eastern Sabine Lake are estimated at a moderate 10 feet per year (calculations from aerial and infrared photos from 1949, 1953, 1963, 1978, 1989, and 1994 by Clay Midkiff, NRCS, personal communication 2000). Subsidence rates in this area are estimated to range from 0 to 1 foot per century

(averaging 0.12 inches per year) (Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority 1999).

## SECTION 3.2 BIOLOGICAL RESOURCES

### A. Plant Communities

Salinity is an important factor affecting historic trends in marsh habitat types within the project area over time. Project-area marsh type shifts occurred as salinity regimes varied spatially and temporally. Since 1949, East Sabine Lake Project area habitats have shifted between brackish and intermediate marsh types with prevailing salinity levels (Table 4; Appendix A). Intermediate marshes begin to convert to brackish marshes as the average annual salinity level increases to 4 to 5 ppt (Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority 1998). These habitat shifts were due to human and natural changes in salinity regimes. Natural salinity changes occurred due to rainfall and river discharge fluctuations. Human salinity changes were due to hydrologic alterations within the Sabine Basin and in southeastern Texas, consisting of the Sabine-Neches Waterway, other navigation channels, levees, the Neches River saltwater barrier, and freshwater withdrawals from the Sabine and Neches rivers.

Table 4: Habitat Trends from 1949 to 2001 within the East Sabine Lake Project Area

| Year | Habitat Description |
|---|---|
| 1949 | Intermediate marsh area is greater than that of brackish marshes. Brackish marshes occur along the Sabine Lake shore (O'Neil 1949). |
| 1968 | More Saline Period - Brackish marshes "advance" eastward to and south of Pool 3; only "islands" of intermediate marsh occurs between Pool 3 and Sabine Lake (Chabreck et al. 1968). |
| 1978 | Freshening Period - Slight brackish marsh retreat and intermediate marsh advance toward Sabine Lake. Brackish marsh zone south of Pool 3 retreats westward with intermediate marshes occurring south and north of Pool 3 (Chabreck and Linscombe 1978). |
| 1988 | More Saline Period - Brackish marsh advance eastward to Pool 3. Intermediate marsh remains north and south of Pool 3 (Chabreck and Linscombe 1988). |
| **Year** | **Habitat Description** |

| | |
|---|---|
| 1997 | Freshening Period - Brackish marshes retreat to Sabine Lake occupying only the southwestern portion of the project area adjacent to Gray's Ditch and Stark's South Canal, about 1 to 2 miles east of Sabine Lake shoreline (Chabreck and Linscombe 1997). 1997 represents the freshest habitat types since 1949. |
| 2001 | Stable Period - Brackish marsh is present only in the area between the Sabine Lake shoreline and Gray's ditch extending north of Pines Ridge and in the vicinity of Right Prong Black Bayou at the northeastern part of the project area (Chabreck and Linscombe 2001). |

Existing project-area vegetative communities consist of fresh, intermediate, and brackish marshes and open water. The CU 1 project area is divided into two subareas, Area A (predominantly intermediate marsh) and Area B (predominantly brackish marsh), containing 6,313 acres and 57 acres respectively, for a total of 6,370 acres. Area A is located in the central and eastern part of the project area, and is comprised of intermediate marsh (2,143 acres), bottomland forest (15 acres), and open-water habitats (4,155 acres). Area B, located in the western portion of the project area adjacent to the Sabine Lake shoreline, is comprised of brackish marsh (52 acres) and open-water habitats (5 acres). The open-water habitats average 1.5 feet deep or less, except for deeper canals and historic lakes.

Both subareas are dominated by marshhay cordgrass (*Spartina patens*), Olney's three square (*Scirpus olneyi*), and leafy three square (*Scirpus maritimus*). Tables 5 and A2 (Appendix A) list the percent coverage of dominant vegetation observed in the East Sabine Lake project area during field trips held in June and July 2000. Those percent coverages were grouped to determine dominant species within the respective marsh types. Table A3 (Appendix A) compares vegetation listed for the intermediate and brackish portion of the project area with Chabreck's (1972) percent composition for those marsh types.

Table 5. Dominant Vegetation Within the East Sabine Lake CU 1 Project Area

**Intermediate Marsh (Area A) Dominant Vegetation**

| Species | Percent Cover |
|---|---|
| Marshhay Cordgrass (*Spartina patens*) | 43.0 |
| Olney's Three Square (*Scirpus olneyi*) | 32.0 |
| **Species** | **Percent Cover** |
| Leafy Three Square (*Scirpus maritimus*) | 7.5 |
| Roseau Cane (*Phragmites australis*) | 5.3 |

| | |
|---|---|
| Cattail (*Typha* spp.) | 3.0 |
| **Total Intermediate Marsh Dominant Species** | **90.5** |

**Brackish Marsh (Area B) Dominant Vegetation**

| Species | Percent Cover |
|---|---|
| Marshhay Cordgrass (*Spartina patens*) | 29.0 |
| Olney's Three Square (*Scirpus olneyi*) | 26.0 |
| Roseau Cane (*Phragmites australis*) | 11.0 |
| Leafy Three-Square (*Scirpus maritimus*) | 10.0 |
| Black Needlerush (*Juncus roemerianus*) | 10.0 |
| Hogcane (*Spartina cynosuroides*) | 3.0 |
| Cattail (*Typha spp.*) | 2.0 |
| Saltmarsh Grass (*Distichlis spicata*) | 2.0 |
| Bullwhip (*Scirpus californicus*) | 0.5 |
| **Total Brackish Marsh Dominant Species** | **93.5** |

## B. Fish and Shellfish Habitat

Project-area marshes and associated open-water habitats provide important habitat (i.e., nursery, escape cover, feeding grounds) for a variety of freshwater and estuarine-dependent fish and shellfish. Most of the economically important saltwater fishes and crustaceans harvested in Louisiana spawn offshore, and then use estuarine areas for nursery habitat (Herke 1995). Nekton use of estuaries is largely governed by the seasons (Day et al. 1989). Different species use the same locations in different seasons, and different life stages of the same species use different locations. Aquatic species diversity peaks in the spring and summer, and is typically low in the winter. Some marine species which use estuaries as nursery habitat also have estuarine-dependent life stages, typically larvae and juveniles. Larvae or juveniles immigrate into the project area during incoming tides and take advantage of the high productivity of the estuary.

Species typical of low-salinity areas include largemouth bass, crappie, bluegill, gar, and blue catfish. Species found in higher salinity areas, such as the project area, include Atlantic croaker, spot, Gulf menhaden, bay anchovy, red drum, black drum, southern flounder, blue crab, Gulf stone crab, brown shrimp, and white shrimp (Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority 1999).

## C. Essential Fish Habitat

The proposed project is located within an area identified as Essential Fish Habitat (EFH) for postlarval, juvenile, and sub-adult life stages of white shrimp, brown shrimp, and red drum. The project area contains quality EFH habitats that are accessible to the above referenced fisheries species. EFH requirements vary depending upon species and life stage (Table 6). Categories of EFH in the project area include estuarine emergent wetlands, marsh edge, estuarine water column, tidal creeks, ponds, submerged aquatic vegetation, and estuarine water bottoms. Detailed information on Federally managed fisheries and their EFH is provided in the 1998 generic amendment of the Fishery Management Plans for the Gulf of Mexico prepared by the Gulf of Mexico Fishery Management Council (GMFMC). That generic amendment was prepared as required by the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA).

Table 6. Essential Fish Habitat for Federally Managed Species in the Project Area

| **Species** | **Life Stage** | **EFH** |
|---|---|---|
| brown shrimp | post larval/juvenile | marsh edge, submerged aquatic vegetation, tidal creeks, inner marsh |
| | subadult | same as post larval/juvenile |
| white shrimp | post larval/juvenile | marsh edge and ponds, submerged aquatic vegetation, inner marsh |
| | subadult | same as post larval/juvenile |
| red drum | post larval/juvenile | submerged aquatic vegetation, estuarine mud bottoms, marsh/water interface |
| | subadult | mud bottoms, oyster reefs |

In addition to being designated as EFH for white shrimp, brown shrimp, and red drum, aquatic habitats to be affected by this project provide valuable nursery and foraging habitats for other economically important fishery species including Atlantic croaker, striped mullet, Gulf menhaden, and blue crab. Those estuarine-dependent species serve as prey for other species managed under the MSFCMA by the GMFMC (e.g., red drum, mackerels, snappers and groupers) and highly migratory species (e.g., billfishes and sharks) managed by the National Marine Fisheries Service (NMFS).

## D. Wildlife Habitat

The majority of the project area occurs on the Sabine NWR. That refuge is the largest on the

Gulf coast (124,511 acres, 195 square miles) and was established in 1937 to provide habitat for migratory birds and other wildlife, including Federally listed threatened and endangered species. The Sabine NWR provides habitat for more than 250 species of birds, 132 fishes, 36 reptiles and amphibians, and 28 kinds of mammals (Walter 1999).

The refuge (and the project-area marshes) are located at the termini of the Mississippi and Central Flyways, and provide wintering habitat for 26 species of waterfowl. Dabbling ducks, such as mallard, gadwall, American widgeon, pintail, northern shoveler, green-winged teal, and blue-winged teal, utilize marsh and shallow-water habitats within the project area. Diving ducks such as lesser scaup, ring-necked duck, and several species of mergansers, utilize larger ponds and open-water areas. Large populations of wintering white-fronted and snow geese (with occasional Canada and Ross' geese) seasonally inhabit the refuge and surrounding marshes. The Sabine NWR also provides breeding and brood-rearing habitat for resident mottled ducks and blue-winged teal.

The project area also provides feeding and nesting habitat for numerous other migratory birds such as American coots, rails, gallinules, bitterns, little blue heron, great blue heron, green-backed heron, yellow-crowned night heron, black-crowned night heron, great egret, snowy egret, white-faced ibis and white ibis. Other nongame birds such as the boat-tailed grackle, red-winged blackbird, eastern kingbird, cormorants, anhinga, northern harrier, belted kingfisher and white pelican also use the project-area marshes.

Reptiles and amphibian species found in the project area include American alligator, western cottonmouth, red-eared turtle, common snapping turtle, softshell turtle, treefrogs, bullfrog and pig frog.

Mammals that inhabit project-area habitats include nutria, muskrat, raccoon, river otter, mink, swamp rabbit, coyote, and white-tailed deer.

### E. Threatened and Endangered Species

The endangered brown pelican (*Pelecanus occidentalis*) occurs within or adjacent to the proposed project area, however that species is not known to nest within the project area. The closest known pelican nesting colony is on Rabbit Island in southwestern Calcasieu Lake, 16 miles east of the project area. Pelicans feed in shallow estuarine waters in coastal Louisiana and may use the project area for feeding and/or loafing. Major threats to this species include chemical pollutants, colony site erosion, disease, and human disturbance.

## SECTION 3.3 CULTURAL AND RECREATIONAL RESOURCES

Various cultural resources, including both prehistoric and historic sites, occur throughout the Louisiana coastal zone. The Louisiana Department of Culture, Recreation and Tourism maintains catalogues of numerous cultural resource sites, but many areas remain unsurveyed, so their significance or eligibility for inclusion if the National Register of Historic Places has not

been determined. The Service requested the Louisiana Office of Cultural Development, Division of Archeology to perform a Section 106 cultural resources evaluation of the project features on August 18, 2003, and received no response. The Galveston District Corps of Engineers, during the Clean Water Act, Section 404 permit review, noted that the Louisiana State Historic Preservation Officer did not require an inventory for the presence of eligible historic properties, nor did the Galveston District staff archeologist detect any historic cultural resources information within the project area (Bennett 2004). The Service therefore concludes that there are no cultural resources within the project scope of work.

## SECTION 3.4 ECONOMIC RESOURCES

### A. Commercial Fish and Wildlife Resources, and Related Land Use/Management

Sabine Lake and its associated water bodies and marshes support a significant commercial harvest of catfish, brown and white shrimp, and blue crab. The marshes of the Calcasieu-Sabine Basin also provide high-quality wintering habitat for an abundance of migratory waterfowl important to sport hunters and the hunting-related economy of the region. Alligator and furbearer harvests are also extensive in that basin. Numerous private landowners and leaseholders have made substantial investments to implement plans to maintain and enhance waterfowl habitat values, and landowners obtain substantial revenues from hunting and fishing leases.

### B. Oil and Gas Activity

The marshes within and adjacent to the project area contain more than 300 active oil and natural gas production facilities (Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority 1999) and over 30 miles of oil and gas pipelines. Oil and gas production plays a substantial part in the local economy. The project-area marshes provide important protection of these facilities from storm-associated wind and wave energy.

## SECTION 4.0 ENVIRONMENTAL CONSEQUENCES

## SECTION 4.1 ALTERNATIVE 1 - NO ACTION

### A. Physical Environment

Under the No Action scenario, shoreline erosion, interior marsh loss, salt-water intrusion and tidal amplitude would continue and/or increase. At current loss rates (0.2 percent/year), another 2,552 acres of wetland loss would occur in the total project area by 2050 (Table 2); the CU 1 project area would loose 97 acres over the next 20 years (Clark 2004). Sabine Lake shorelines would continue to erode from wind and wave action. With continued shoreline retreat, the interior marshes would be exposed to greater wave energies and erosive forces, accelerating their deterioration. Saltwater intrusion would increase with approval and implementation of the Texas Water Plan, the Sabine-Neches Waterway Enlargement Project, and the Neches River saltwater barrier. The Texas Water Plan could reduce the freshwater flow of the Sabine River by as much as 50 percent; the Sabine-Neches Waterway Enlargement Project could result in increased salinities due to the deepening and widening of that channel; and, the Neches River Saltwater Barrier could limit freshwater flows into Sabine Lake. Any increases in salinity levels will result in accelerated deterioration and loss of coastal marsh.

### B. Biological Resources

#### Plant Communities

Shoreline erosion and interior marsh loss from saltwater intrusion and wave energy would continue and probably increase within the project area, especially if the Texas Water Plan and SNWW Enlargement project are implemented in the future. Approximately 97 acres of CU 1 project-area marshes are projected to be lost over the next 20 years (Clark 2004), and thus acreage of shallow open water would increase without the two proposed Texas projects. Increased salinity and turbidity levels, due to increased wind fetch and wave action, would inhibit growth of submerged aquatic vegetation. Existing fresh and intermediate marsh vegetative communities may become dominated by brackish marsh species.

#### Fisheries

With the No-Action scenario (without the proposed Texas projects), 97 acres of existing marsh would be transformed to shallow unvegetated lake bottom within 20 years (Clark 2004). Although shallow unvegetated open water areas can function as nursery habitat for freshwater and estuarine-dependent fish species, the productivity of those waters is substantially less than marsh ponds or marsh. Increasing salinity levels and turbidity would reduce the growth of submerged aquatic vegetation and reduce overall project-area fishery habitat values and aquatic production.

#### Essential Fish Habitat

Under the No Action alternative, shoreline erosion and marsh loss would continue. As existing marsh becomes more fragmented, increased marsh edge would temporarily maintain managed

fish species (i.e., post larval/juvenile and subadult brown and white shrimp and post larval/juvenile red drum). An eventual decline in those species/life stages, however, is expected to occur with no action as approximately 97 acres of CU 1 project-area marshes continue to convert to estuarine open water which is a less productive habitat. The prey base supporting managed fish species would also decline with habitat productivity, and reduce fish populations.

**Wildlife**
With the No-Action alternative, the continued loss of marsh would reduce habitat values for a variety of wildlife species. The migratory and resident ducks and other wetland-associated birds that currently utilize the marsh and shallow-water habitats for food and cover would be negatively impacted, as would game mammals, fur animals, reptiles and amphibians. This loss is viewed as especially significant from the standpoint of waterfowl wintering habitat, in light of the major importance of the project area marshes to ducks and geese, especially because the Sabine NWR was expressly established as a wintering waterfowl preserve.

**Threatened and Endangered Species**
Under the No-Action alternative, continued loss of marsh would reduce the value of the area as foraging habitat for the endangered brown pelican.

### C. Cultural and Recreational Resources

Existing archeological sites and shell deposits (possibly middens) located along the eastern shoreline of Sabine Lake and interior marshes would face continued erosion threats under the No-Action alternative, because existing shoreline and interior marsh erosion rates would continue or increase.

### D. Economic Resources

The continued loss of emergent vegetation in the project area would contribute to the decline of recreational hunting and fishing activities, as well as trapping, alligator harvest and commercial fish and shellfish production that currently occur in the project area. Protection of oil and gas facilities from storm-associated wind and wave energy would also be reduced as marshes deteriorate.

## SECTION 4.2 ALTERNATIVE 2 - PREFERRED ALTERNATIVE

### A. Physical Environment

Under the Preferred Alternative, sedentary benthic organisms that may be in the immediate vicinity of the rock and dredged material dredging and deposition areas would be impacted. There will also be a temporary, localized increase in turbidity associated with dredging; that increase will have minimal effect on emergent marsh and submerged aquatic vegetation.

The installation of the foreshore dike, along with the associated dredged material deposition,

will stop erosion along the southeastern Sabine Lake shoreline by dampening wind-induced waves and trapping some sediment. The placement of dredged material to construct the rock dike access channel will initially restore approximately 3.4 acres of marsh and will aid in the accretion of a moderate amount of additional marsh over time (Table 7).

Implementation of the Preferred Alternative is expected to convert 101.4 acres of shallow water to marsh via terraces and shoreline marsh creation, convert 1.4 acres of shallow water to aerially exposed rock foreshore dike, convert 1.4 acres of shallow water to submerged rock foreshore dike, and create 39 acres of shallower water via terrace construction (Table 7). The foreshore dike will cover 2.8 acres of shallow water bottoms, but 1.4 acres of that dike will be submerged. The submerged rock will provide habitat and attachment sites for brackish water estuarine (moderate salinity-tolerant) aquatic organisms (i.e., algae, bryozoans, mussels, other invertebrates, and fishes). Hard substrates are not common in Louisiana's freshwater and low-salinity lakes. The Preferred Alternative is also expected to deepen an additional 5.5 acres of shallow water to a depth of 6 feet for Sabine Lake foreshore dike access channel construction. With project implementation, an additional 157 acres of shallow water would be deepened 4.5 to 5.0 feet via terrace construction. A total of 163 acres of shallow water would be significantly deepened by the project.

In contrast, the Preferred Alternative will protect approximately 26 acres of intermediate and brackish marsh, and will restore 101.4 acres of intermediate and brackish marsh by depositing dredged material in shallow water to construct earthen terraces and shoreline marsh restoration. Those actions would also facilitate sediment accretion. A total of 127.4 acres of wetlands would be protected and restored by the proposed project. The Preferred Alternative is, therefore, self-mitigating; the benefits of protecting and restoring 127.4 acres of intermediate to brackish marsh far outweigh the impacts of converting 101.4 acres of shallow open water to marsh, filling 1.4 acres via the rock foreshore dike, and of deepening 163 acres of open water areas (total 265.8 acres) (Table 7). The preferred alternative will not impact emergent marsh. The emergent marsh protected and restored by the project is a higher quality habitat for fish and wildlife than shallow open water. Most of the areas where marsh is to be either created or accreted in shallow water was intermediate to brackish marsh 15 to 20 years ago, but those habitats were lost to wave erosion, saltwater intrusion and subsidence. Thousands of acres of emergent marsh in the Louisiana coastal zone are converting to shallow open water at the rate of 24 square miles per year (15,360 acres/year) (Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority 1998). Temporary and long term impacts will occur to benthic habitats by filling and deepening 265.8 acres of shallow open water. Shallow water habitats deepened by the project features will partially fill with sediment and be re-colonized by benthic organisms shortly after construction. The 101.4 acres of shallow water filled for marsh creation will be converted to emergent marsh, a higher quality habitat.

Table 7. Comparison of Preferred Alternative Shallow Water Impacts and Overall Wetland Benefits

| Project Component | Impacts to Shallow Water Habitats | Project Wetland Benefits |
|---|---|---|
| East Sabine Lake Shoreline | 3.4 acres filled by spoil for marsh creation<br><br>0.8 acres filled by subaqueous foreshore rock dike<br><br>0.6 acres filled by dike but submerged<br><br>**Subtotal = 4.8 acres of shallow water filled** | 14 wetland acres protected<br><br>3.4 acres marsh creation<br><br>**Subtotal = 17.4 wetland acres protected or restored** |
| Water Control Structures | Pines Ridge Weir, plug, and Bridge Bayou structure | **Subtotal = 12 acres protected** |
| Greens Lake Area Terraces | 98 acres filled for marsh creation via terraces<br><br>39 acres of shallower water created<br><br>**Subtotal = 137 acres of shallow water to marsh or shallower water** | 98 acres marsh creation<br><br>**Subtotal = 98 wetland acres restored** |
| Total Shallow Water Deepened | 5.5 acres deepened in Sabine Lake (via access channel)<br>157 acres deepened in Greens Lake Area (via terrace borrow)<br>**Subtotal = 163 acres deepened** | |
| **Total Protected** | | **26 wetland acres** |
| **Total Created/Restored** | | **101.4 wetland acres** |
| **Project Component** | **Impacts to Shallow Water Habitats** | **Project Benefits** |

Table 7. (Continued)

| | | |
|---|---|---|
| **Total Effects/Benefits** | **101.4 acres converted from shallow water to marsh**<br>**1.4 acres filled by rock dike**<br>**163 acres of shallow water deepened**<br><br>**Total = 265.8 acres shallow water filled or deepened** | <br><br><br><br>**127.4 wetland acres protected and restored** |

## B. Biological Resources

### Plant Communities

If implemented, the Preferred Alternative would stop shoreline erosion along 3,000 feet of the southeastern shoreline of Sabine Lake and 14 acres of brackish marsh along the Sabine Lake shoreline would be protected. An additional 98 acres of intermediate to brackish marsh would be created or restored due to the terrace construction and subsequent sediment accretion between the terrace rows. In all, a net increase of 127.4 acres of intermediate and brackish marsh would result from reduced erosion and marsh establishment over the 20-year project life, compared with the No-Action alternative. Submerged and floating-leaved aquatic vegetation coverage is expected to increase from 25 percent to 40 percent (a 60 percent increase) during the project life, due to decreased turbidity in the shallow waters between the restored and existing marshes (Clark et al. 2000).

Vegetative plantings on the slopes of the proposed Greens Lake-area terraces would help stabilize terrace material and accelerate marsh establishment. Those terraces would reduce wave energy; thus, they will protect the surrounding edges of interior fringing fresh marsh, and would facilitate additional marsh establishment by enhancing accretion of sediments. Because existing turbidity levels will be reduced in the areas protected by the terraces, growth of submerged aquatic vegetation in adjacent shallow open-water areas would also increase.

### Fisheries

Because vegetated habitats contain higher densities of fish and crustaceans than unvegetated habitats (Castellanos and Rozas 2001), fisheries production would benefit from the net protection associated with the projected increase of intermediate and brackish marsh (127.4 acres) compared to taking no action. Terrace construction on the Sabine NWF has increased sediment deposition, reduced turbidity, increased marsh-edge habitat, increased overall primary and secondary productivity, while not decreasing fish and shellfish access to area marshes (Underwood et al. 1991, LDNR 1993). Areas with similar constructed terraces have been shown to support higher standing crops of most fishery species compared to shallow marsh ponds of similar size (Rozas and Minello 2001). Sabine Lake access channel construction would deepen the bottom elevation by 2 to 3 feet over an 80-foot wide area (5.5 acres), and borrow excavation for Greens Lake terrace construction will deepen the bottom elevation by 3 to 4 feet within an area 40 feet wide (157 acres). We do not anticipate that these excavated areas would either become anoxic, or produce significantly reduced dissolved oxygen levels

than surrounding areas because: 1) Sabine Lake and the Greens Lake area are well-mixed due to wave action and shallow depths; 2) salinity-related stratification of the borrow areas is unlikely, 3) the decrease in bottom-elevation would be relatively small (less than 4 feet); and, 4) the borrow areas would fill with sediment from the water column and erosion of the borrow area side slopes.

The preferred alternative will not impact emergent marsh. The emergent marsh protected and restored by project features is a higher quality habitat for fisheries than shallow open water habitats if that habitat remains accessible to fisheries. The areas where marsh is to be restored in shallow water was intermediate to brackish marsh 15 to 20 years ago, but those habitats were lost to wave erosion, saltwater intrusion and subsidence. Thousands of acres of emergent marsh in the Louisiana coastal zone are converting to shallow open water at the rate of 24 square miles per year (15,360 acres/year) (Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority 1998). Shallow water habitats deepened by the project features will partially fill with sediment and be re-colonized by benthic organisms shortly after construction.

**Essential Fish Habitat**

Under the Preferred Alternative, a net increase in high quality fish and shellfish nursery habitats would result from shoreline protection and marsh restoration. The preferred alternative is expected to slow or stop the loss of emergent marsh due to shoreline erosion and interior marsh loss, while maintaining fish and shellfish access to shoreline and interior marshes. Some water bottom and estuarine water column would be replaced with more productive essential fish habitat (i.e., 101.4 acres of restored emergent marsh). Further impacts to the estuarine water column include temporary increases in turbidity during construction activities. Some water bottoms would be deepened during dredging of flotation canals and borrow material. In all, the Preferred Alternative would protect and restore a net 127 acres of emergent marsh over the 20-year project life. The acreage of submerged aquatic vegetation in the Greens Lake area would increase by 60 percent as a result of reduced wave energy and turbidity with the project. The preferred alternative would provide long-term benefits to managed fish species (i.e., post larval/juvenile and subadult brown and white shrimp and post larval/juvenile/subadult red drum) that use emergent marsh, submerged aquatic vegetation, and associated habitats, including marsh edge, tidal creeks, inner marsh, and marsh/water interface.

The project features are not expected to adversely impact existing marsh or submerged aquatic vegetation, however it will adversely impact some shallow open water and benthic habitats. Shallow water habitats deepened by the project features will partially fill with sediment and be re-colonized by benthic organisms shortly after construction. The 101.4 acres of shallow water filled for marsh creation will be converted to emergent marsh, a higher quality EFH habitat. The installation of three additional 24 inch-diameter flapgated culverts at the Bridge Bayou water control structure would result in a net increase in cross sectional area open for fish and shellfish access to protected marsh and shallow waters. That structure would be open at all times except when the salinity target level of 10 ppt is exceeded. At that target level, the Bridge Bayou structure flap gates would be closed to prevent higher salinity water from entering the marshes east of the cattle walkway. The existing 24-inch open culvert at Bridge Bayou would

remain in place and in the open position at all times with the preferred alternative.

Discrete salinity data taken every two weeks at Three Bayou, located north of Bridge Bayou, from January 1999 to August 2000 (a drought year), had a mean salinity of 7.5 ppt and a range of 0.6 ppt to 15.4 ppt. Salinities exceeded 10 ppt 36 percent of the time during that drought period. In 1999 alone, the beginning of the drought, salinities exceeded 10 ppt 20 percent of the time. During normal rainfall years, based on existing salinity data, it is estimated that the Bridge Bayou structure would be in the open position 100 percent of the time (U.S. Fish and Wildlife Service 2000).

The Pines Ridge Bayou weir sill height would be set to 1.0 foot lower than average water elevations resulting in a net decrease in cross sectional area that likely would reduce fishery access into the Pines Ridge area. However, additional tidal exchange off of Black Bayou would not be affected with project implementation. Historically, little to no tidal connection occurred from Johnsons Bayou across the refuge boundary at Section 16. Since the early 1990s, marsh erosion and plug deterioration has increasingly allowed tidal connection and estuarine fishery access in this area. Installation of a plug at that location would eliminate localized access, but is not expected to have a net adverse impact on fishery productivity. Finally, the earthen terraces are designed with 100 foot-wide gaps between each terrace segment and 500 foot-wide spacings between terrace rows, and additional gaps would be constructed where terrace segments are close to existing marsh. Terrace construction would convert/restore 98 acres of existing water bottom and estuarine water column to higher quality estuarine marsh. Fisheries access would be maintained via earthen terrace construction.

Additionally, 2.8 acres of water bottom and estuarine water column would be filled by the foreshore rock dike along the Sabine Lake shoreline and another 3.4 acres would be filled with dredged material to restore marsh between that dike and shoreline. The net loss of water bottom available to subadult red drum in Sabine Lake would be small and would not significantly impact that population. Construction of the dike would protect higher quality estuarine marsh used by other managed species/life stages (i.e., post larval/juvenile and subadult brown and white shrimp and post larval/juvenile/subadult red drum) from wind and wave induced erosion, and the marsh restoration would those other species/life stages.

**Wildlife**

Implementing the Preferred Alternative will result in a net improvement in habitat for numerous species of wildlife, including migratory and resident waterfowl, wading birds, alligators, game mammals, and furbearers. As noted above, implementing that alternative will lead to a net increase of 127.4 acres of intermediate to brackish marsh, and submerged aquatic vegetation is expected to increase by 60 percent. Migratory waterfowl will benefit from a greater food supply from restored marsh and increased submerged aquatic vegetation. The seeds and tubers of marsh plants provide important foods for puddle ducks including mottled duck, mallard, pintail, blue-winged teal, and green-winged teal. The Preferred Alternative is also expected to increase preferred waterfowl food plants such as Walter's millet, fall panicum, and various

species of sedges and rushes. Submerged aquatic vegetation expected to increase due to the project are important food sources for gadwall, American wigeon and northern shoveler (Chabreck et al. 1989). The terraces will provide from 98 acres of additional mottled duck nesting and brood-rearing habitat within protected shallow water and submerged vegetation between the terraces and the shoreline.

Protected shallow water and increased marsh edge habitats will provide increased foraging opportunities for wading birds and, shore birds, but there will be less shallow water area available due to filling and deepening 265.8 acres of that habitat (Table 7). The Preferred Alternative will increase marsh edge habitat by 360,000 linear feet (68 miles). Marsh edge and submerged aquatic vegetation support greater densities of prey items for wading birds such as the great blue heron, little blue heron, roseate spoonbill, great egret, black-crowned night heron, great egret and snowy egret. Mixed open water and vegetated habitats contain higher densities of fish and crustaceans, important as prey for wading birds, than do unvegetated open water habitats (Castellanos and Rozas 2001).

Furbearers such as muskrat, which feed on wetland vegetation, will benefit from the net increase in intermediate and brackish marsh. Mink, muskrat, river otter, and raccoon have a diverse diet and feed on a variety of fishes and crustaceans. They feed along vegetated shorelines that provide cover for many prey species. American alligators will likewise benefit from the net increase in intermediate and brackish marsh and shallow protected open water habitats behind the terrace and shoreline protection features, where prey species will be more abundant.

**Threatened and Endangered Species**

Brown pelican populations are expected to benefit from the additional marsh and associated shallow water habitat acreage that will provide increased fisheries populations upon which this species depends for food. The Service completed an intra-service Section 7 Endangered Species Act consultation prior to issuing the FONSI and Final EA and determined that the project would not adversely affect any threatened or endangered species within or adjacent to the project area.

**C. Cultural and Recreational Resources**

The project would provide wave protection to the Sabine Lake archeological sites and other sites within the project area should they exist; however those sites would continue to experience moderate shoreline and interior marsh erosion. The Service requested the Louisiana Office of Cultural Development, Division of Archeology to perform a Section 106 cultural resources evaluation of the project features on August 18, 2003, and received no response. The Galveston District Corps of Engineers, during the Clean Water Act, Section 404 permit review, noted that the Louisiana State Historic Preservation Officer did not require an inventory for the presence of eligible historic properties, nor did the Galveston District staff archeologist detect any historic cultural resources information within the project area (Bennett 2004). The Service therefore concludes that there are no cultural resources within the project scope of work.

Recreational activities within the project area, such as fishing and hunting, should increase due to the project, because of marsh establishment and reduced turbidity between the terraces and existing marsh shoreline. The increased acreage of marsh and lower-turbidity, shallow open water will sustain greater fish and wildlife use of the area, thereby increasing opportunities for related recreational activities.

### D. Economic Resources

Implementation of the Preferred Alternative will help to maintain and, perhaps, increase the economically important recreational and commercial activities dependent on fish and wildlife resources. The net project-related increase in fish and wildlife habitat should enable marshes in the area to continue to support existing hunting and fishing activities, and waterfowl hunting and freshwater fishing opportunities should experience net increases. The protected and newly established intermediate and brackish marshes will also help to buffer and protect hunting and fishing camps, and oil and gas infrastructure from storm-driven waves. There are no land reclamation issues with the preferred alternative because all land rights documents have been completed, including an agreement with the Louisiana Office of State Lands that administers State-owned lands.

## SECTION 5.0 DISCUSSION OF ALTERNATIVES

The project management team considered as alternatives two types of control structures for the proposed Pines Ridge Bayou structure: a plug and a weir. Some engineers recommend placement of a plug at least 2 feet above marsh level at that location. Since Pines Ridge Bayou was historically connected to Sabine Lake and that it is currently connected to Black Bayou, a weir was preferred over a plug to maintain fish and shellfish access.

An alternative considered for the Bridge Bayou control structure at the cattle walkway was to construct two 36 inch-diameter culverts versus the preferred three 24 inch-diameter culverts alternative. The Preferred Alternative more closely matches the shallowness of Bridge Bayou near the proposed structure location (0.5 to 1.0 foot). Bridge Bayou is 30 feet wide and 1.0 foot deep or less at its intersection with the cattle walkway, and historically provided an avenue for estuarine fish and shellfish organism movement into and out of western Sabine NWR marshes prior to cattle walkway construction. A structure in the bayou at its intersection with the cattle walkway would help to return normal hydrology to western refuge marshes east of the cattle walkway.

An alternative for the Section 16 levee break plug was a weir set at marsh elevation [1.3 feet NAVD (88)] across a minor (less than 20 feet wide) opening in the southeastern portion of the Section 16 levee. There was no historic hydrologic connection between Sabine NWR marshes and Double Island Gully at that location, which is consistent with a plug design. Double Island Gully, south of this levee break, is hydrologically connected to Deep Bayou which in turn connects to Johnsons Bayou to the south where it enters Section 16. There may be a danger of higher salinity waters from Johnsons Bayou penetrating Sabine NWR at this break. Therefore a component to repair this opening is part of the preferred alternative.

The original foreshore dike alternative was to construct a 1,500 linear foot foreshore dike, with no marsh restoration, along the Sabine Lake shoreline near Willow Bayou. The Preferred Alternative includes 3,000 linear feet of foreshore dike and 3.4 acres of marsh restoration between the dike and the existing shoreline with material dredged from access channel construction.

Planting 58,000 linear feet of eastern Sabine Lake shoreline with smooth cordgrass to reduce shoreline erosion was originally part of the preferred alternative. Planting smooth cordgrass, if successful, could help stabilize the shoreline and would increase this species range northward so that, if salinities rise in the future, salt tolerant shoreline vegetation will be in place to withstand these salinity increases. However, a 7,500 linear-foot test planting on northeastern Sabine Lake shoreline was conducted by the State Department of Agriculture Soil and Water Conservation Committee in June of 2003. Results of a May 2004 field inspection of the test plantings indicated that those plantings were not successful. Two out of the three test sections were devoid of plants, and growth in the third section was much lower than expected (Steyer 2004). The shoreline planting component was eliminated from the project features as a result of these investigations.

Some agency engineers expressed concern about the suitability of the existing bottom sediments in Sabine Lake for supporting the foreshore dike and terrace construction. NRCS design engineers stated that existing soils are mineral to plastic clays with a possibility of 1 to 1.5 feet of settlement. The NRCS has completed soil boring analyses and included soil profiles in the revised project plans. NRCS engineering experience with Chenier Plain rock foreshore dikes suggests that post-construction subsidence is minimal. The NRCS design engineers determined that geotechnical investigations would be unnecessary for the Greens Lake terrace construction because of past experience construction terraces in the Louisiana Chenier Plain.

Various terrace designs (e. g., square, linear, duck-wing), top widths and heights were also considered. Top widths of 4 feet to 20 feet-wide were proposed by the project team. Terrace heights of marsh level [1.3 feet NAVD (88)] to 1.5 feet above marsh level [2.8 feet NAVD (88)] were also proposed. The preferred alternative design (i.e., “V” shaped or “duck-wing” shaped) placed in east-west rows with 15 foot-wide top widths at a settled marsh level elevation is considered the most sound, and Sabine NWR prefers, and is experienced, with that design.

## SECTION 6.0 RATIONALE FOR SELECTING THE PREFERRED ALTERNATIVE

The Preferred Alternative would protect and restore 127 acres of intermediate to brackish marsh over the 20-year project life, and would increase the coverage of submerged aquatic vegetation by 60 percent. That alternative would substantially address the threats of Sabine Lake eroding into Willow Bayou, and marsh loss in interior marshes east of that lake.

The preferred alternative is supported by several local entities, including the Cameron Parish Police Jury, Cameron Parish Wetlands Advisory Committee, Sabine NWR, and several private landowners within the project area. Support of this project has also been received from several

natural resource agencies, including project co-sponsors, the LDNR and the Natural Resource Conservation Service, and the Louisiana Coastal Wetlands Conservation and Restoration Task Force.

## SECTION 7.0 COMPATIBILITY WITH COASTAL WETLANDS PLANNING PROTECTION AND RESTORATION ACT AND COMMUNITY OBJECTIVES

The Louisiana Coastal Wetlands Conservation and Restoration Task Force authorized project construction in November 2003. Implementing the proposed action would help to achieve CWPPRA objectives for protection and restoration of Louisiana's coastal wetlands. Salinity control on the east shoreline of Sabine Lake was identified by the Coast 2050 Plan as a regional ecosystem strategy (Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority 1998). Community and socioeconomic objectives would likely be enhanced by implementing the proposed project, because it would help sustain fishing, crabbing, and hunting opportunities important to the region's economy and culture. The general public also supports wetland restoration and conservation of fish and wildlife habitat, and for recreational, esthetic, and other consumptive and nonconsumptive uses sustained by coastal wetlands.

## SECTION 8.0 COMPLIANCE WITH LAWS, REGULATIONS AND POLICIES

This Environmental Assessment was prepared in accordance with the National Environmental Policy Act of 1969. It is consistent with the policy contained in the Service's manual (550 FW 3), and employs a systematic, interdisciplinary approach. The proposed action involves disposal of fill material into waters of the United States; therefore, authorization is required by Section 404 of the Clean Water Act of 1977, as amended, as is a State water quality certification under Section 401 of that Act. The Section 404 permit was received from the Galveston District Corps of Engineers on March 4, 2004 (No. 23200). The state water quality certification (No. CER20030001) was received on December 11, 2003, from the Louisiana Department of Environmental Quality.

Under the MSFCMA, the Service has evaluated project-related impacts to essential fish habitat. The proposed action would have minor adverse impacts to some essential fish habitat, but such impacts will be adequately offset by restoration and protection of estuarine emergent wetlands. A concurrence letter from NOAA Fisheries is included in Appendix C.

The proposed action is located within the Louisiana Coastal Zone, but involves no construction activities that would result in significant direct, indirect, or cumulative adverse impacts to coastal waters or wetlands. The Service received a Coastal Zone Consistency Determination from the LDNR on December 11, 2003 (No. C20030513). The Service considers the proposed action to be consistent, to the maximum extent practicable, with Louisiana's Coastal Resources Program and the Federal Coastal Zone Management Act.

Other Federal and state issues reviewed for compliance for the proposed action include, but are not limited to, the Endangered Species Act of 1973, as amended; Archeological and Historic

Preservation Act of 1974; National Historic Preservation Act of 1966, as amended; Executive Order 11988 (Floodplain Management); and Executive Order 11990 (Protection of Wetlands). Pursuant to Executive Order 12898 (Environmental Justice for Minority Populations), the Service has determined that the Preferred Alternative will not result in disproportionately high and adverse human health or environmental impacts on minority and low-income populations.

Full compliance with relevant laws and regulations has been achieved upon review of the Draft Environmental Assessment by appropriate agencies and interested parties, and the signing of a Finding of No Significant Impact and Environmental Action Statement.

## SECTION 9.0 PREPARERS

This Environmental Assessment was prepared by Darryl Clark, Senior Fish and Wildlife Biologist and Joyce Mazourek, Fish and Wildlife Biologist, of the Service's Louisiana Field Office.

# SECTION 10.0 LITERATURE CITED


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# Appendix A

# East Sabine Lake Project Habitat and Vegetation Analysis

**Table A1: East Sabine Lake Hydrologic Restoration Project Area 1988-1990 Habitat Analysis**

| Habitat Type | Acres | Hectares | Percent |
|---|---|---|---|
| Water | 14,875 | 6,022 | 40 |
| Intermediate Marsh | 17,435 | 7,059 | 48 |
| Brackish Marsh | 3,814 | 1,544 | 10 |
| Bottomland Forest | 13 | 5 | < 1 |
| Upland Forest | 15 | 6 | < 1 |
| Bottomland Shrub/Scrub | 3 | 1 | < 1 |
| Upland Shrub/Scrub | 48 | 20 | < 1 |
| Agriculture/Pasture | 69 | 28 | < 1 |
| **Total** | 36,272 | 14,685 | 100 |

**Table A2: East Sabine Lake Hydrologic Restoration Project Vegetative Species Percent Cover**

| | Intermediate Marsh | | | | | | | | | Brackish Marsh | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Species/Stations** | **1a** | **1b** | **1c** | **2a** | **2b** | **9a** | **9b** | **12** | **Avg Intermediate** | **3** | **4** | **5** | **6** | **7a** | **7b** | **8** | **9c** | **10** | **11** | **Avg Brackish** | **Avg All Sta** |
| Marshhay Cordgrass (*Spartina patens*) | 85 | 75 | 20 | 20 | 40 | 50 | 55 | 50 | 43 | 25 | 25 | | 30 | 20 | 60 | 25 | 60 | 30 | 15 | 29 | 40 |
| Three Square (*Scirpus maritimus*) | 5 | p | | | 50 | | 5 | | 7.5 | 20 | 10 | 10 | 25 | 25 | | 5 | | | 5 | 10 | 15 |
| Olney's Three Square (*Scirpus olneyi*) | 10 | p | 75 | 70 | | 30 | 40 | 30 | 32 | 10 | 60 | | 30 | 20 | 15 | | 35 | 60 | 25 | 26 | 34 |
| Roseau Cane (*Phragmites australis*) | 5 | 5 | p | 5 | p | 20 | | 5 | 5.3 | 10 | 5 | | | 10 | 5 | 45 | p | p | 35 | 11 | 9 |
| Cattail (*Thypha* spp.) | 5 | 5 | 5 | | 5 | | | 5 | 3 | | | | 15 | p | 5 | | | p | | 2 | 3 |
| Bullwhip (*Scirpus californicus*) | p | p | | | | | | | p | | | | | | | | 5 | | | .5 | 1 |
| Marsh Mallow (*Kosteletskia virginica*) | p | p | p | | | | p | | p | | | | | | | | | | | 0 | p |
| Hibiscus (*Hibiscus lasiocarpus*) | p | p | p | | | | | | p | | | | | | | | | | | 0 | p |
| Eastern Baccharis (*Baccharis halimifolia*) | p | p | | | | | | p | p | | | | | | | | p | | | p | p |

**Table A2: Continued**

| Species/Stations | 1a | 1b | 1c | 2a | 2b | 9a | 9b | 12 | Avg Intermediate | 3 | 4 | 5 | 6 | 7a | 7b | 8 | 9c | 10 | 11 | Avg Brackish | Avg All Sta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sawgrass (*Cladium jamaicense*) | p | p | | | | p | | p | p | | | | | | | | | | | 0 | p |
| Hogcane (*Spartina cynosuroides*) | p | | | p | | | | p | p | 10 | p | 10 | | p | p | p | | p | p | 3 | 1 |
| Smooth Cordgrass (*Spartina alterniflora*) | | | | | | | | | 0 | p | | | | p | | 5 | | | 5 | 1 | p |
| Gulf Cordgrass (*Spartina spartinae*) | | | | | | | | | p | | | | | | | | p | | | p | p |
| Black Needlerush (*Juncus roemerianus*) | | | p | | | | | | p | 35 | | | 5 | | | 25 | | 10 | 25 | 10 | 6 |
| Sea Ox-eye Daisy (*Borrichia frutescens*) | | | | | | | | | p | | | | | | | | p | | | p | p |
| Morning Glory (*Ipomea sagittata*) | p | p | p | p | | | | p | p | | | | p | | | p | p | p | p | p | p |
| Deer Pea (*Vigna luteola*) | p | | p | | | | | | p | | | | | | | | | | | 0 | p |
| Saltmarsh Grass (*Distichlis spicata*) | | | | | | | | | 0 | | | | | | | 10 | | | 10 | 2 | 1 |

(Note: numbers are percentages; “p” denotes presence.)

**Table A2 (Continued): East Sabine Lake Hydrologic Restoration Project Vegetative Species Percent Cover**

**Notes and Station Descriptions**

Note: Observations made on June 20 and July 18, 2000.

| Stations | Station Locations/Descriptions |
|---|---|
| 1a. | Central Canal Area south of Pool 3 to the SE of project area |
| 1b. | Burton Sutton Canal from Stark's South Canal to north of Central Canal |
| 1c. | Right Prong Black Bayou at Sabine NWR boundary and at Black Bayou. |
| 2a. | Greens Bayou at Black Bayou. |
| 2b. | Northern shore of Black Bayou at Greens Bayou |
| 3. | Bayou north of Location Canal at Pines Ridge. |
| 4. | Three Bayou; marshes to west of Gray's Ditch and at mouth of Three Bayou at Sabine Lake. |
| 5. | Plug location in Gray's Ditch south of Three Bayou. |
| 6. | Bridge Bayou at Gray's Ditch |
| 7a. | Willow Bayou at Gray's Ditch; marshes west of ditch. |
| 7b. | Willow Bayou at Gray's Ditch; marsh east of ditch. |
| 8. | Sabine Lake narrow shore section at Willow Bayou |
| 9a. | Northern portion of School Board Section 16. |
| 9b. | North of School Board Section 16 on Refuge |
| 9c. | Stark's South Canal west of Sect. 16 |
| 10. | East of Gray's Ditch south of Willow Bayou |
| 11. | Sabine Lake Shoreline from Willow Bayou north. |
| 12. | North and south of Willow Bayou Canal. |

**Table A3: Comparison of East Sabine Lake Dominant Vegetation by Marsh Type**

| Species | Intermediate Observed[1] (%) | Intermediate Chabreck[2] (1972)(%) | Brackish Observed[1] (%) | Brackish Chabreck[2] (1972) (%) | Salinity Range[2] (ppt) |
|---|---|---|---|---|---|
| Marshhay Cordgrass (*Spartina patens*) | 43 | 34.01 | 29 | 55.22 | 2.2-14.9 |
| Three Square (*Scirpus maritimus*) | 7.5 | 0.68 | 10 | 1.76 | 3.6-14.2 |
| Olney's Three Square (*Scirpus olneyi*) | 32 | 3.26 | 26 | 4.97 | 2.1-12.3 |
| Roseau Cane (*Phragmites australis*) | 5.3 | 2.5 | 11.2 | 6.6 | 0-7.3 |
| Cattail (*Thypha* spp.) | 3 | | 2.2 | | 0-8 |
| Black Needlerush (*Juncus roemerianus*) | p | 0.72 | 10 | 3.9 | 5.6-22.2 |
| Hogcane (*Spartina cynosuroides*) | p | 1.19 | 2.6 | 0.89 | 3.8-13.7 |
| Sawgrass (*Cladium jamaicense*) | p | 0 | 0 | 0 | 1.4-6.5 |
| Saltmarsh Grass (*Distichlis spicata*) | 0 | 0.36 | 2 | 13.3 | 6.6-20 |
| Bullwhip (*Scirpus californicus*) | p | 1.83 | 0.5 | 0 | 0.4-2.9 |
| Smooth Cordgrass (*Spartina alterniflora*) | 0 | 0.86 | 1.2 | 4.77 | 7.4-23 |
| Deer Pea (*Vigna luteola*) | p | 3.84 | 0 | 1.2 | 0-8 |
| Morning Glory (*Ipomea sagittata*) | p | 0.84 | p | 0.13 | 0.2-9.62 |

[1] Note: Data from:

[1] Clark, D. R., J. Mazourek, and K. Roy. 2000. East Sabine Lake hydrologic restoration project wetland value assessment, U. S. Fish and Wildlife Service, Lafayette, Louisiana. 31 pp.

[2] Chabreck, R. H. 1972. Vegetation, water and soil characteristics of the Louisiana coastal region. LSU Agriculture Experiment Station Bulletin 664, Louisiana State University. Baton Rouge, LA.

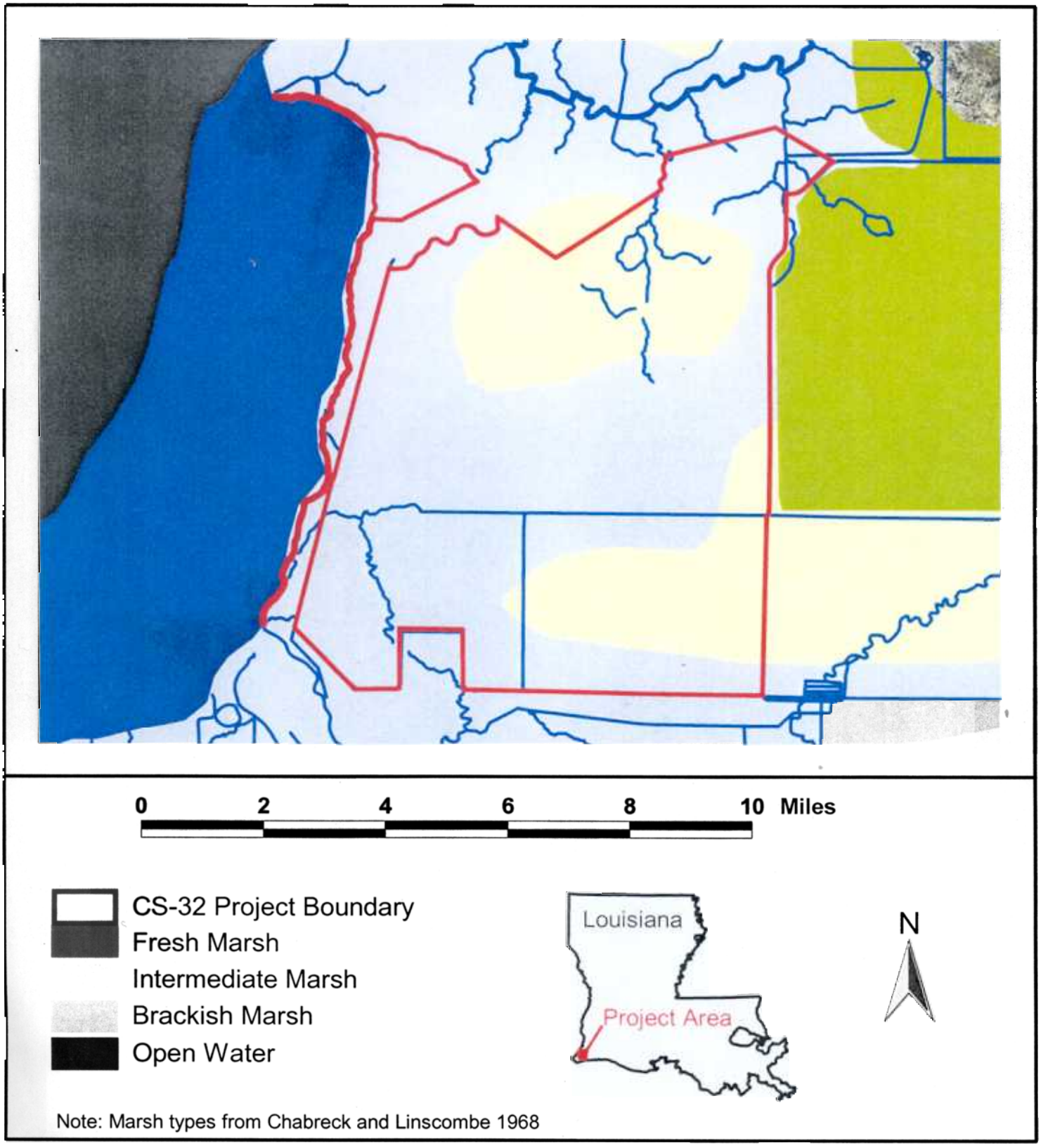



Figure A-1. East Sabine Lake Hydrologic Restoration Project 1968 Habitat Map

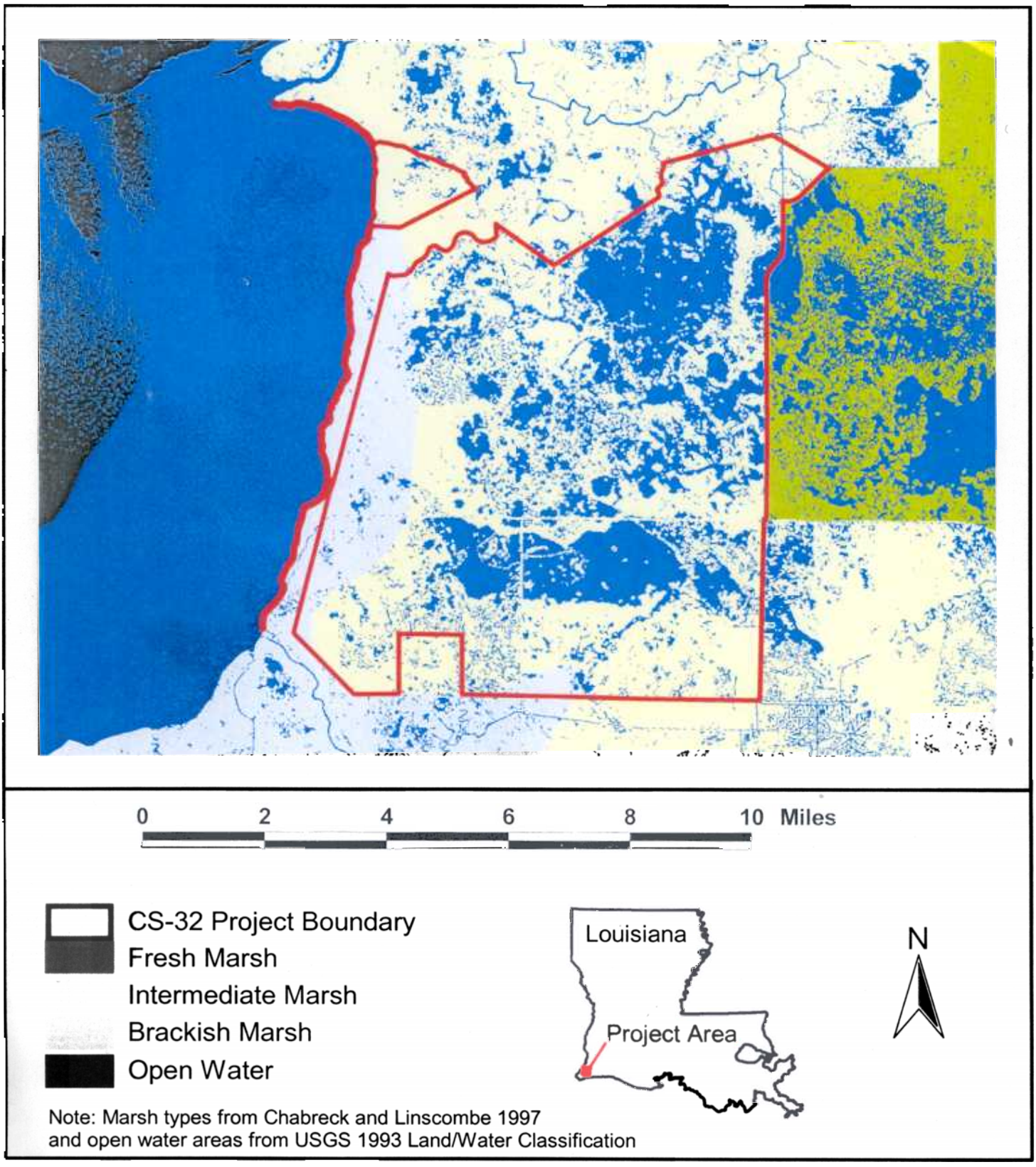



Figure A-2. East Sabine Lake Hydrologic Restoration Project 1997 Habitat Map

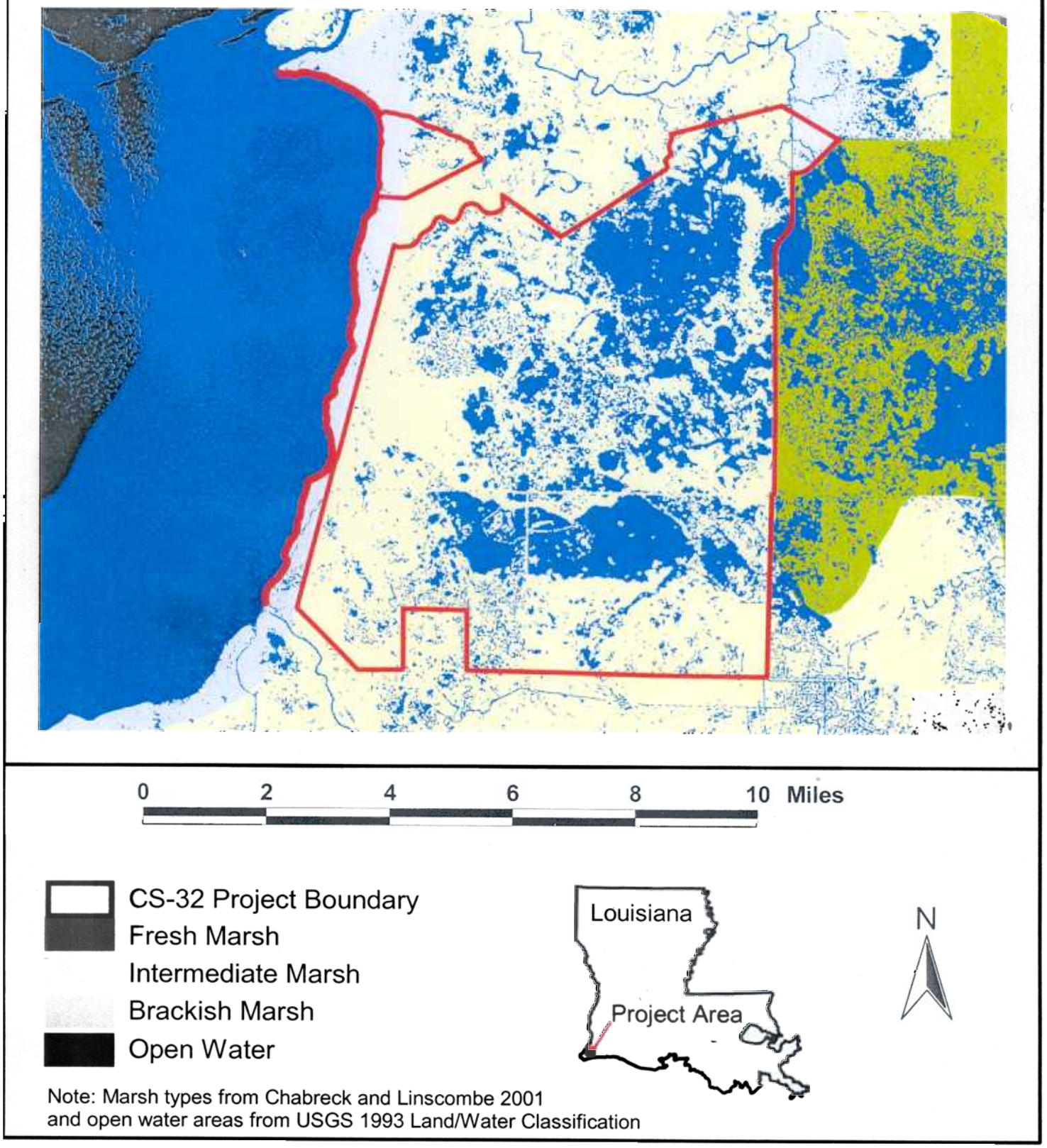
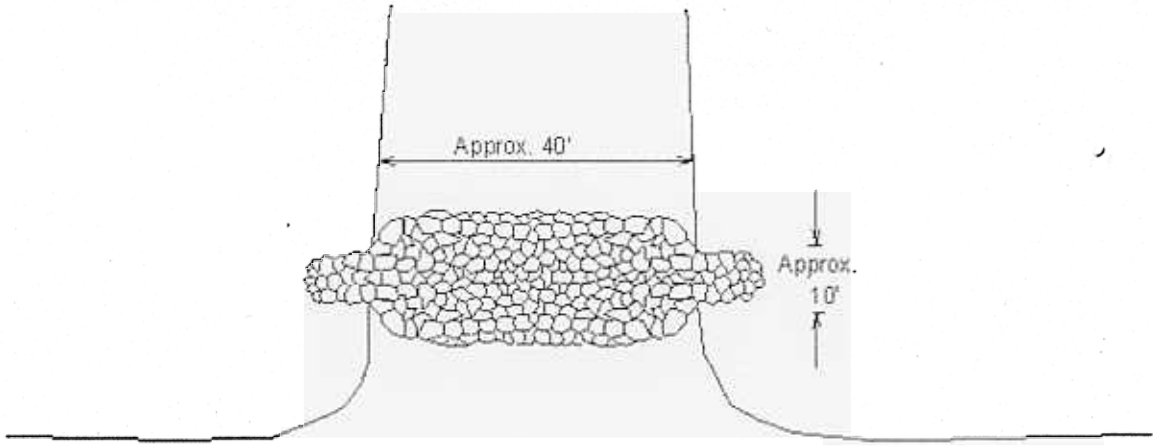


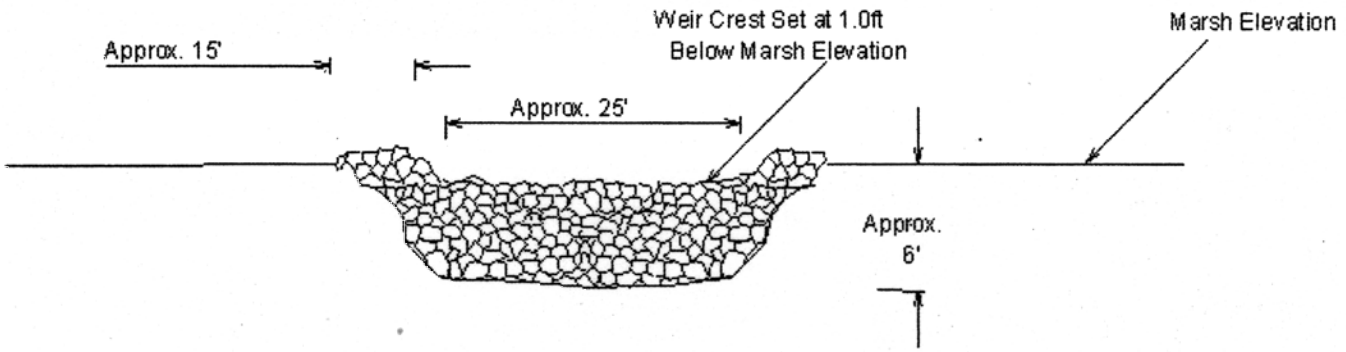

Figure A-3. East Sabine Lake Hydrologic Restoration Project 2001 Habitat Map

# Appendix B

# Preferred Alternative Project Features




PLAN VIEW
Not to Scale

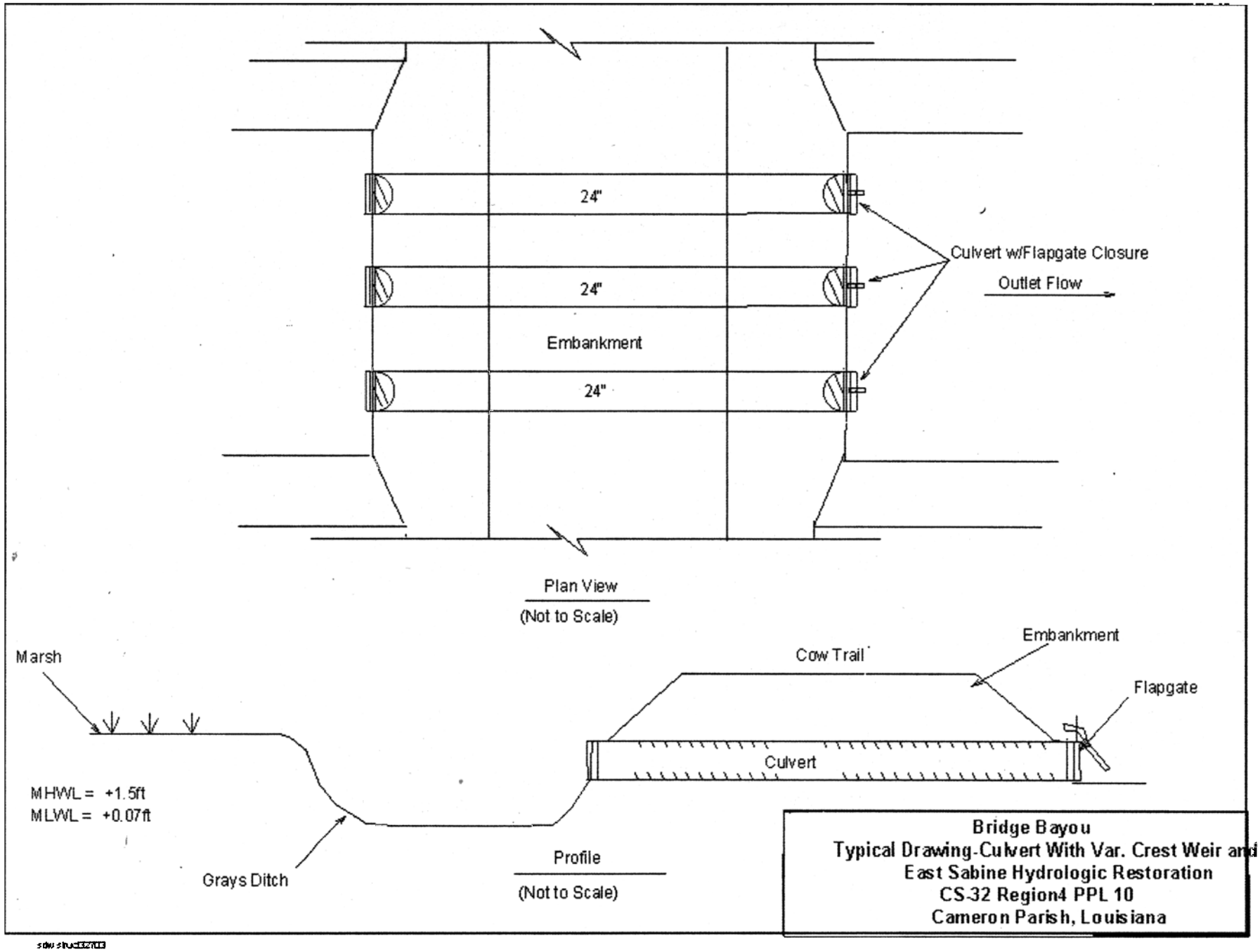


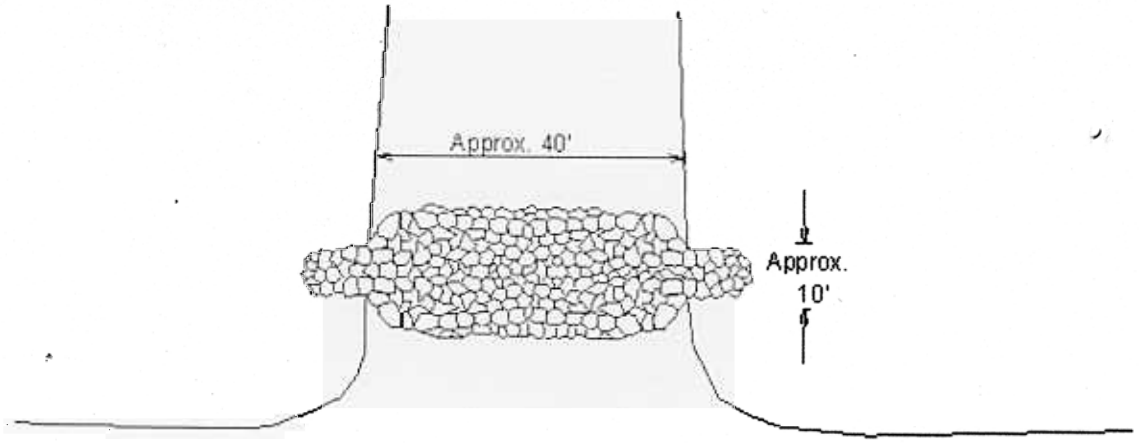

MHWL = +1.5ft
MLWL = +0.07ft

NOTE:
Rock Weir with vinyl sheetpile
or earthen core.

PROFILE
Not to Scale

Pines Ridge Site
Typical Drawing - Rock Weir
East Sabine Hydrologic Restoration
CS-32 Region 4 PPL10
Cameron Parish, Louisiana


24"
24"
Embankment
24"
Culvert w/Flapgate Closure
Outlet Flow
Plan View
(Not to Scale)
Marsh
Cow Trail
Embankment
Flapgate
Culvert
MHWL = +1.5ft
MLWL = +0.07ft
Grays Ditch
Profile
(Not to Scale)
Bridge Bayou
Typical Drawing-Culvert With Var. Crest Weir and Fl
East Sabine Hydrologic Restoration
CS-32 Region4 PPL 10
Cameron Parish, Louisiana




PLAN VIEW
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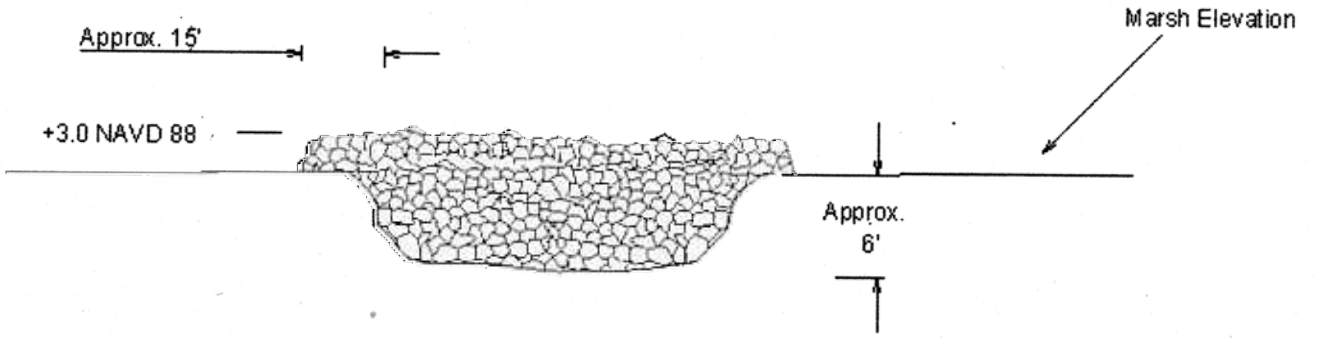
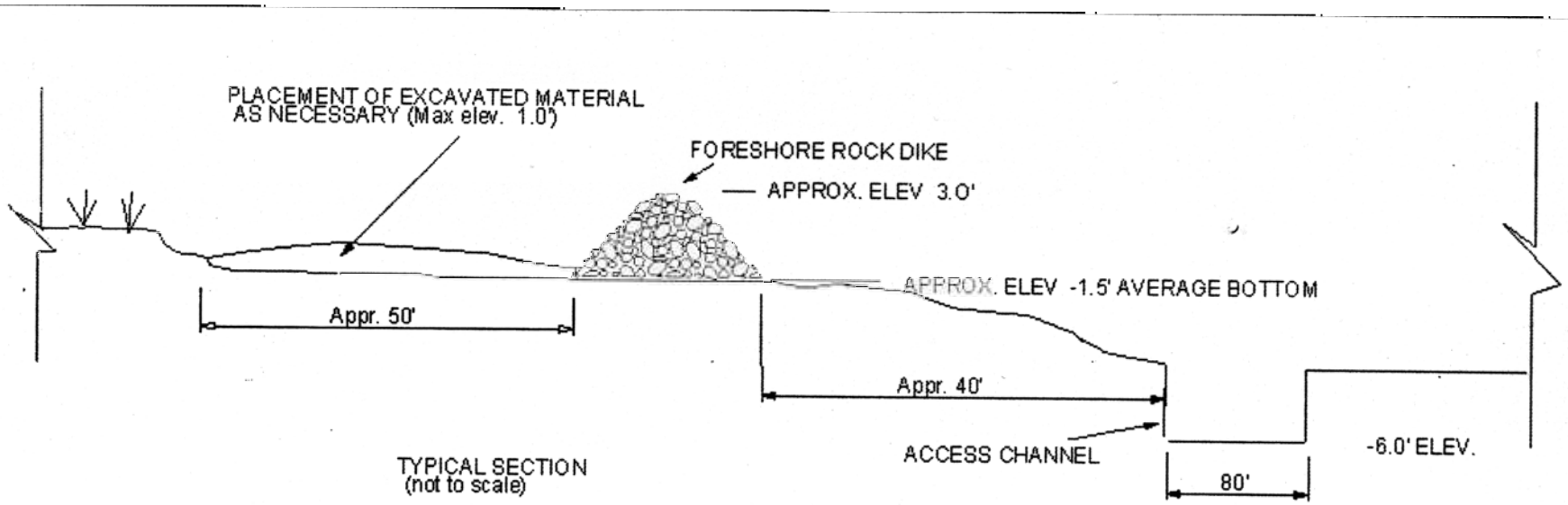


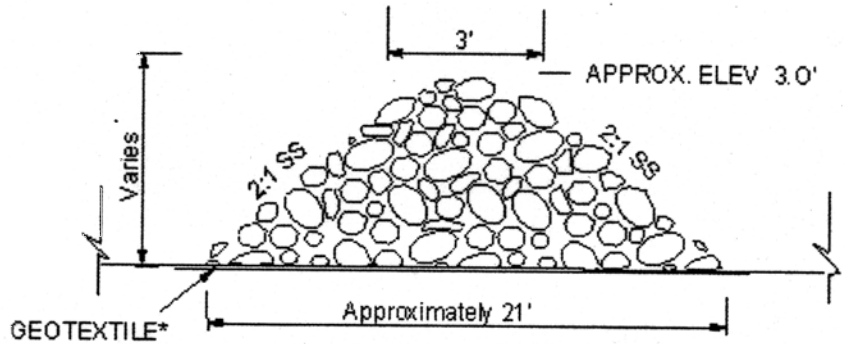

MHWL = +1.5ft
MLWL = +0.07ft

PROFILE
Not to Scale

Double Island Gully
Typical Drawing - Rock Plug
East Sabine Hydrologic Restoration
CS-32 Region 4 PPL10
Cameron Parish, Louisiana




TYPICAL SECTION
(not to scale)




TYPICAL DETAIL
(not to scale)

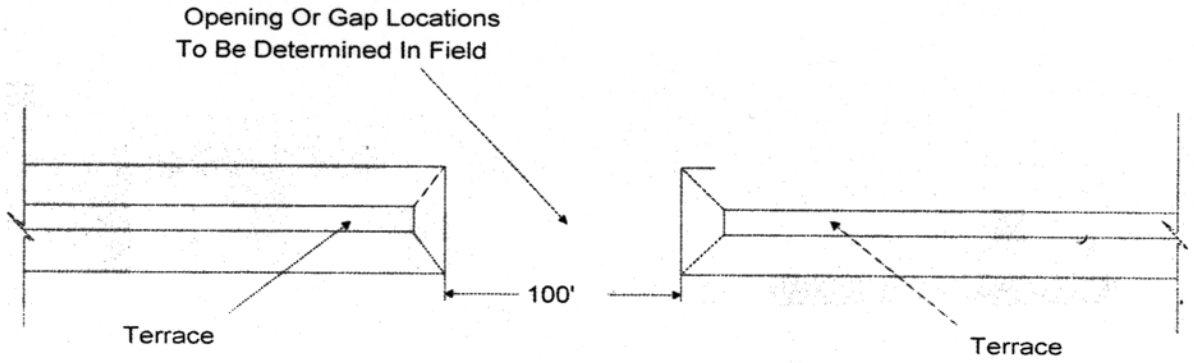
* As Needed

NOTES:

1. All elevations shown in NAVD88.
2. Total length to be determined.
3. Excavated material will be placed in open water areas (not on existing emergent marsh).
4. MHWL = +1.5ft. MLWL = +0.07

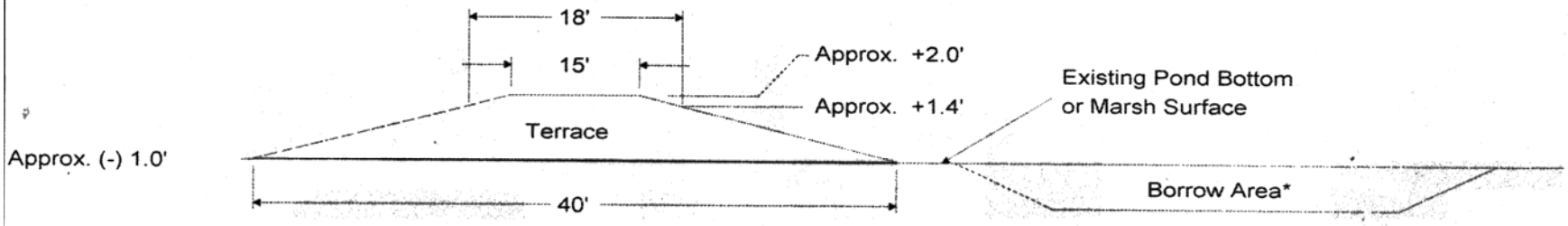
USDA-NRCS-WRS
Alexandria, Louisiana

Typical Foreshore Rock Dike
East Sabine Hydrologic Restoration
CS-32 Region 4 PPL 10
Cameron Parish, Louisiana




PLAN

Not To Scale




PROFILE

Not To Scale

NOTES:
Terrace to be in "Duck Wing" configuration.
Length = 1000' Spacing = 500'

Two rows of vegetative plantings to be placed on side slopes.

MHWL = +1.5ft MLWL = +0.07ft

*Borrow channel will be discontinuous to avoid water circulation.

Typical Terrace Drawing
East Sabine Hydrologic Restoration
CS-32 Region 4 PPL10
Cameron Parish, Louisiana

sdw terr32703

# Appendix C - Letters of Comment

**UNITED STATES DEPARTMENT OF COMMERCE**
**National Oceanic and Atmospheric Administration**
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
9721 Executive Center Drive North
St. Petersburg, Florida 33702

October 9, 2003 F/SER44/RH:jk
225/389-0508



Mr. Darryl Clark
Louisiana Field Office
U.S. Fish and Wildlife Service
646 Cajundome Blvd., Suite 400
Lafayette, Louisiana 70506

Dear Mr. Clark:

The National Marine Fisheries Service (NOAA Fisheries) has received the draft Environmental Assessment (EA) for the East Sabine Lake Hydrologic Restoration Project, Construction Unit 1 (CS-32) transmitted for our review and comment by a letter from the U.S. Fish and Wildlife Service (FWS) dated September 18, 2003. The draft EA describes the anticipated environmental impacts associated with constructing terraces in shallow water areas, planting smooth cordgrass along a portion of the bank of Sabine Lake, and installing three water control structures to manage the hydrology of more than 36,000 acres of wetlands and water bottoms adjacent to Sabine Lake in Cameron Parish, Louisiana. Engineering and design for this project is funded under the auspices of the Coastal Wetlands Planning, Protection and Restoration Act with the FWS acting as the Federal sponsor.

NOAA Fisheries has reviewed the draft EA and finds it to be well prepared. However, we have the following general and specific comments regarding information provided in the draft EA.

General Comments

We are concerned that the projections of project benefits which are summarized in the draft EA do not match the most recent assessment of project benefits undertaken by the FWS which is dated September 17, 2003. While we understand that those benefits are currently under review by the Environmental Work Group (EWG) and are subject to change, the Final EA should not be issued until such a review is completed and the assessed benefits can be revised to match those determined by the EWG.

Specific Comments

3.0 AFFECTED ENVIRONMENT
3.2 Biological Resources
C. Essential Fish Habitat

Page 14, paragraph 3. The project area should be considered as Essential Fish Habitat (EFH) for subadult red drum. As such, the first sentence should be rewritten as follows: "The proposed project is ... postlarval, juvenile and sub-adult life stages of white shrimp, brown shrimp, and red drum."

Page 15, paragraph 1. A sentence in this paragraph indicates the project area provides "limited-value" nursery and foraging habitat for other economically important marine fishery species. It is unclear what

is mean by the term "limited-value." As wetlands in the project area provide valuable nursery and foraging habitat for a variety of marine fishery species, we recommend the term "limited-value" be deleted from this paragraph.

4.0 ENVIRONMENTAL CONSEQUENCES
4.1 Alternative 1 - No Action
B. Biological Resources
Essential Fish Habitat

Page 18, paragraph 1. According to the draft EA, the no action alternative would result in the loss of 924 acres of marsh. The Wetland Value Assessment (WVA) for this project dated September 17, 2003, indicates that the no action alternative would result in the loss of 1,087 acres of marsh. Information in the draft EA or the WVA should be revised to ensure consistency of assessments.

4.2 Alternative 2 - Preferred Alternative
Essential Fish Habitat

Page 22, paragraphs 1 and 3. These paragraphs should be revised to indicate that sub-adult life stages of red drum also would benefit from project implementation.

Page 22, paragraph 2. According to information in this section of the document, the Bridge Bayou water control structure would remain open until salinity exceeds 10 parts per thousand (ppt). It is not clear from the document whether this reference to a structure is to the existing culvert at that location, or the additional three culverts proposed for installation. This issue should be clarified in the Final EA. Furthermore, no information is provided indicating how the 10 ppt closure criterion might affect structural opening. Data should be provided, if available, to indicate the likely frequency of closure during an annual period of normal rainfall.

We appreciate the opportunity to comment on this draft EA. Considering the potential positive benefits to marine fishery resources and EFH which could result from the implementation of Construction Unit 1 of this project, NOAA Fisheries supports project implementation and has no EFH Conservation Recommendations to provide. If you have any questions concerning our comments, please contact Richard Hartman at (225) 389-0508.

Sincerely,

Richard Hartman

for Miles M. Croom
Assistant Regional Administrator
Habitat Conservation Division

c:
COE, NOD, Planning - Constance
FWS, Lafayette- Clark
EPA, Dallas - McQuiddy
LA DNR, Consistency
NRCS, Alexandria - Paul
F/SER4
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**Comments from Ken Derickson, Corps of Engineers**
**October 6, 2003** (via e-mail)

Although the Corps Regulatory staff will review this EA for the 404 permit, as the Corps representative to the CWPPRA Environmental and Technical Advisory Work Groups, I have also reviewed the EA for consistency with NEPA requirements and to offer any comments regarding required clarifications or modifications.

Overall, the EA covers the relevant NEPA issues and all the proposed project features. There are a number of minor inconsistencies in marsh and freshwater acreage numbers, and the numbers in some of the tables do not total correctly. The major problem I found in my review of the EA, is the tendency to gloss over the impacts from the dredging and disposal activities. Significant acreages of shallow water and benthic habitat will be eliminated and destroyed with the construction of the earthen terraces and foreshore dike. However, there is very little discussion of the significance of this loss, rather the focus of the discussion is on the benefits of these project features. In other words, it is not clear that the overall benefits of the project exceed the overall impacts. I don't see this as a problem with respect to the project, since most of the open water areas, and associated benthic habitats, did not exist in the past in the project area. It is important to fully address these impacts in the EA and put them in their proper perspective, since NEPA requires a full and open assessment and comparison of all the benefits and impacts.

Based on the information in the EA, I am not clear on whether maintaining the current proportion of intermediate to brackish marsh is in line with the original pattern for the project area. It appears that this area has fluctuated over the past 70 years between being predominantly brackish marsh to being predominantly intermediate marsh. The project will maintain the current state of predominantly intermediate marsh and may further reduce the amount of brackish marsh over the project life. If this historical fluctuation was due to human-induced events, then this should be made clear. If this fluctuation was due to natural events, then a justification is needed for changing this natural pattern.

Section 3.2E, on federally and state listed species, did not convert from Word Perfect to Microsoft Word, although there was a discussion of impacts to the brown pelican later in the EA. I presume that this was the only listed species identified in the project area.

I have attached a copy of the EA with my comments noted in blue.

Ken Derickson, Ph.D.
Ecological Planning and Restoration Section
Planning Programs and Project Management Division US Army Corps of Engineers P.O. Box 0267 New Orleans, LA 70160-0267

Phone: (504) 862-2533
Fax: (504) 862-1892