Coast 2050 Region 4

EAST MUD LAKE MARSH MANAGEMENT (C/S-20)
C/S-20-MSPR-597-2
PROGRESS REPORT No. 2
for the period
May 1, 1996 to May 5, 1997

Project Status

The following data collection and analysis activities have been conducted since the previous progress report.

The 6-mo evaluation of the vegetative plantings was conducted December 4, 1996. Sediment erosion tables (SET) measurements were taken and cryogenic coring of feldspar plots was conducted December 9–11, 1996. Fisheries monitoring was conducted October 9–11, 1996 and March 3–5, 1997. The SET, water level, and fisheries data collected during this period will be presented in a future progress report.

Project Description

The East Mud Lake Marsh Management project area consists of 8,054 acres located in the Calcasieu/Sabine Basin in Cameron Parish, Louisiana. The project is bounded by the southern FINA property line to the south, La. Hwy. 27 to the west, the property line north of Magnolia Road to the north, and an existing step levee and property line near Oyster Bayou to the east (figure 1).

The Calcasieu-Sabine Basin suffers from human-induced hydrologic changes to the system (U.S. Department of Agriculture Soil Conservation Service [USDA/SCS] 1993), which have led to the deterioration of the marsh since 1953. The Calcasieu Ship Channel (CSC), which is 1 mi east of the project area, was first constructed in 1874 and redredged in 1951 and 1968 to a final width of 400 ft and a depth of 40 ft (USDA/SCS 1993). The CSC provides an avenue for extreme salinities (4–32 ppt) and rapid water movement into the East Mud Lake project area via West Cove, Oyster Bayou, and Mud Bayou (figure 1). These connections facilitate increases in turbidity and scouring within the project area. Analysis of aerial photos of the project area indicate a marsh loss rate of 76 acres per year from 1953 to 1983 (USDA/SCS 1992). Excluding Mud Lake, the land to open-water ratio has deteriorated from 99:1 in 1953 to 70:30 in 1983.

Another problem associated with the project area is excessive water levels over the surface of the marsh for prolonged time periods. The construction of La. Hwy. 27 to the west and La. Hwy. 82 to the south have decreased avenues for drainage from the western and southern areas of the project. This has lead to prolonged periods of sustained high water levels and "ponding," which has resulted in the deterioration of the vegetation (USDA-SCS 1994). The East Mud Lake project addresses these problems by increasing the total number of outlets for the area. Subsidence and sea level rise have also exacerbated the problem, resulting in a relative water level increase of 0.25 in./yr from 1942 to 1988 (Penland et al. 1989).

The project area has been divided into two Conservation Treatment Units (CTU) that are separated hydrologically and will be managed independently (figure 1). CTU #1 contains Mud Lake and will be managed passively. Structures and features present in CTU #1 consist of vegetative plantings, earthen plugs, culverts with flap gates and variable-crest culverts. CTU #2 will be actively managed and will have drawdown capabilities in order to encourage shallow areas to revert to emergent vegetation. Structures and features present in CTU #2 consist of vegetative plantings, variable-crest culverts with flap gates, a gated culvert, and a variable-crest box structure (figure 1).

The main project objectives are to (1) prevent wetland degradation by reducing vegetative stress, thereby increasing the abundance of emergent and submergent vegetation and (2) stabilize the shoreline of Mud Lake through vegetative plantings.

Specific goals are to (1) decrease rate of marsh loss, (2) increase vegetative cover along shoreline of East Mud Lake, (3) increase percent cover of emergent vegetation in shallow open-water areas, (4) increase abundance of vegetation in presently vegetated portions of project area, (5) reduce water-level and salinity fluctuations to within 15 ppt salinity and 6 in below marsh level to 2 in above marsh level for water levels, (6) decrease duration and frequency of flooding over marsh, (7) decrease mean salinity in Conservation Treatment Unit #2, and (8) increase sediment accretion in Conservation Treatment Unit #2. Maintaining fisheries abundance is not a specific goal as addressed in the project documentation. However, due to concerns regarding potential fishery impacts, it has been included in the monitoring plan.

The area east of the project area is CTU #2, between the Calcasieu Ship Channel and Oyster Lake and Mud Bayou (reference area #1, figure 1) was selected as the best reference area for the evaluation of the water-level, salinity, and fisheries monitoring elements. Both the project area and this reference area are classified as brackish marsh (Chabreck and Linscombe 1988) and contain mainly the organic Bancker and Creole soils (USDA-NRCS 1995). Both the project and the reference areas are directly influenced hydrologically by the CSC and are dominated by *Spartina patens* (Ait.) Muhl. (marshhay cordgrass).

The area north of Magnolia Road (reference area #2 figure 1) is a suitable reference area for the evaluation of the vegetative, accretion, water-level, salinity, fisheries, and soil monitoring elements. This reference area is also classified as brackish marsh (Chabreck and Linscombe 1988) and contains mainly the organic Bancker and Creole soils (USDA-NRCS 1995). This area and the project area are influenced hydrologically by the CSC and Calcasieu Lake through West Cove Canal.

Monitoring Design

Color-infrared, aerial photography (1:12,000 scale) will be used to document changes in marsh loss rates over time. Photography will be obtained during preconstruction and at years 5, 11, and 17 ± 3 yr postconstruction.

Vegetative plantings were conducted by the Department of Natural Resources vegetative planting program June 5 through July 8, 1995. A total of 7200 *Spartina alterniflora* Loisel. (smooth cordgrass) plugs were planted along the step levee in CTU #2. Due to the cut bank configuration of most of the Mud Lake shoreline, only areas adjacent to structures #17, #13, and the earthen plug west of #17 were planted, for a total of 480 plants. To document vegetative planting success, 5% of the plants along the step levee and 5% of the plants along the East Mud Lake shoreline were sampled at 1 mo and 6 mo postplanting, and will be sampled 1 yr after planting and every 3 yr until plants become indistinguishable. Thirty-five plots along the step levee and 4 plots along the shoreline, consisting of 10 plants spaced 5 ft apart, were sampled for percent survival of planted vegetation, species composition of encroaching vegetation, and percent cover for each species present. The monitoring stations were selected through the vegetative program to have 1 plot every 1,000 ft.

Sites to monitor existing vegetation were selected using a systematic transect pattern in which five transect lines were drawn in a northwest to southeast configuration from the Calcasieu Lake/West Cove shoreline in the project area and reference area #2. Five stations were chosen uniformly across each transect line, for a total of 25 stations in the project area and 20 stations in reference area #2, to obtain an even distribution of stations throughout the marsh (figure 2). Percent cover, heights of dominant plants, and species composition will be initially documented during preconstruction, in 1.0-m^2 plots marked with 2 PVC poles. These vegetation sites will be visited every 2 yr to document change over time.

Discrete hydrologic variables are monitored monthly and are available from October 11, 1994, to present. Hydrologic variables include salinity, specific conductivity, and water temperature at 16 stations throughout the project area. Continuous data are logged hourly by YSI 6000 datasondes at four stations in the project area and two stations in the reference areas (figure 3). Monthly staff gage readings from 18 locations are available from May 21,1996, to present (figure 4).

Feldspar platforms were constructed August 1995 at 20 stations in the project area and 20 stations in reference area #2 along the same transect lines as the vegetation stations to detect changes in sediment accretion (figure 2). Feldspar was placed in 0.5-m^2 plots marked with 2 PVC poles at opposite corners for locating the feldspar over time (Knauss and Cahoon 1990). Due to low water levels in the area at the time of initial placement, feldspar plots were established at only 15 of the 20 stations in the project area and 17 of the 20 stations in the reference area. The remaining plots were established in subsequent field trips in July and December 1996. The feldspar plots will be sampled by cryogenic core to determine vertical accretion every 6 mo. Additional feldspar will be placed after 2 yr or earlier, if needed.

SET were established in August 1995 at 12 of the 32 feldspar stations to detect changes in elevation due to subsidence and accretion/erosion combined (figure 2). Three SET stations were located in each of the Bancker and Creole soil types for a total of 6 stations each in the project area and reference area #2. Nine measurements were taken in four directions at each of the stations. Detailed procedures for the SET are documented in Steyer et al. 1995. Initial SET measurements were taken prior to the beginning of construction, December 11–14, 1995. Measurements were obtained again after the completion of construction, July 8–12, 1996. Due to low water levels, only 10 of the 12 SET stations were accessible for the first 2 measurements. The remaining stations were established in subsequent field trips in December 1996. Additional measurements will be conducted every 6 mo to coincide with the monitoring of the feldspar plots.

A three-way analysis of variance (ANOVA) will be performed on SET data. Because the initial settings of SET values were different between the areas and among different stations, only the time-related sources of variance will be utilized for detecting elevation changes between the time periods.

Soil samples will be collected and analyzed to determine grain size, percent organic, bulk density, and soil salinity. Initial soil samples were collected at the existing vegetation stations within CTU #2 and reference area #2 from July 8–12, 1996. Additional soil samples will be collected at years 5, 11 and 17 ±3 yr.

Fisheries monitoring is conducted to estimate abundance and species composition, for both project and reference areas. Initially, twenty-five samples were collected from each the project and reference areas #1 and #2 during each sampling period using a 1-m^2 throw trap (Kushlan 1981) with additional samples collected randomly using a 20-ft minnow seine (3/16" mesh) to compensate for any deficiency of the throw traps for species composition. A minimum of three seine pulls will be conducted for each the project area and the reference area for the first three sampling periods to determine if the throw traps adequately depict species composition of the area. Thirty throw trap samples will be collected from the project and reference areas to quantify biomass and abundance. Abundance is recorded as catch per unit effort (CPUE; number of individuals per sample) and total biomass is recorded as dry weight (in grams). Species composition is represented by number of species per sample and their ecological affinity is defined as estuarine, fresh water, estuarine dependent, or marine. Sampling locations are randomly chosen from a grid pattern for each sampling trip.

Throw trap sampling is conducted 3 times prior to construction and 3 times a year postconstruction for the first 2 yr of drawdown. A successful drawdown was achieved in 1996. Sampling is conducted prior to the closing of the gates for the drawdown (February), late spring, and in the fall at the times when the water level is at or below marsh elevation, to determine whether fisheries access is limited by the project features.

Results/Discussion

Structure Operations: The permit for the project requires a drawdown twice in the first 5 yr following the end of construction. At the end of construction, May 5, 1996, structural drawdown was initiated because of optimum weather conditions. The drawdown was terminated July 17, 1996, as stop logs were set in place and flaps were opened.

A second drawdown was initiated March 3, 1997, as weather conditions favorable to lower water levels predominated. The project is in the drawdown phase at present.

Habitat mapping: Color-infrared aerial photography was obtained on December 26, 1994 and will serve as preconstruction photography. Ground control for the photography has been completed using a Global Positioning System (GPS), and photo mosaicking and georectification are currently being conducted. Habitat interpretation will be included in future progress reports.

Vegetative Plantings: Forty 10-plant sampling plots were randomly selected and delineated for use in monitoring. The 1-mo and 6-mo postplanting sampling of *S. alterniflora* was conducted in July and December 1996, respectively. The plantings were divided into three land types due to different stress factors from boat wakes, wave energy, and herbivory. The canal plantings, located on a long, straight canal in CTU #2 (figure 1) are subject to herbivory from cattle year-round. The step levee plantings are located in CTU #2 on short canals, while the shoreline plantings are located on the shoreline of East Mud Lake in CTU #1. Planting survival was evaluated in terms of four variables (Harper 1977), which are defined and calculated as follows:

survival frequency = number of live plants inside plot at timepoint x

$$\text{survivorship } (l_x) = \text{probability (at planting time) of surviving until age } x = \frac{\text{no. live plants inside plot at timepoint } x}{\text{original no. plants inside plot}}$$

$$\text{mortality } (d_x) = \text{probability (at planting time) of dying during age interval } x, x+1 = l_x - l_{x+1}$$

$$\text{mortality rate } (q_x) = \text{probability of a planting at age } x \text{ dying before the age of } x+1 = \frac{l_x - l_{x+1}}{l_x} = \frac{d_x}{l_x}$$

Survival rate was high at 1 mo at 98.2% for the canal, 99.0% for the step levee and 100% for the lake shoreline (figure 5). The average percent cover of *S. alterniflora* in the sampling plots was 10.2% for the canal plantings, 9.2% for the step levee plantings, and 4.65% for the shoreline plantings at 1 mo (figure 6). Survival decreased slightly at 6 mo, with mortality rate increasing from 0.014 at 1 mo to 0.026 at 6 mo (table 1), however percent cover increased over the same period (figure 6). Native species colonizing the step levee and shoreline include *Distichlis spicata* (L.) (saltgrass), *Spartina patens* (Ait.) (marshhay cordgrass), *Heliotropium currassivicum* L. (seaside heliotrope), *Lycium carolinianum* Walt. (salt matrimony-vine) and *Salicornia bigelovii* Torr. (glasswort).

Existing Vegetation: Baseline data from existing vegetation plots in the marsh interior was obtained on June 20, 1995 and are presented in table 2. There was a total percent coverage of 84.4% (standard deviation [SD] = 22.3) live *S. patens* for the project area and 88.0% (SD = 14.8) for the reference area. The project area exhibited higher diversity with the additional species occurring in sparse amounts throughout the project area. This could be a reflection of slightly higher elevations and/or lower salinity spikes within the project area. *Baccharis halimifolia* L. (Baccharis), *Iva frutescens* (salt marsh elder), *Aster tenuifolius* var. *aphyllus* R. W. Long (salt marsh aster), *Spartina cynosuroides* (L.) Roth (hogcane), and *Spartina spartinae* (Trin.) Hitchc. (gulf cordgrass) all colonize higher elevations, such as ridges or levees. *S. spartinae* was observed in the reference area along a ridge at the northern portion, however, there was no occurrence in any of the plots.

As a result of low water levels due to drawdown, and drought conditions in the spring and summer of 1996, *Paspalum vaginatum* (seashore paspalum), a perennial edge species, spread from pond edges ranging from 2–15 ft into the interior of many ponds in CTU #2. To allow this species to become firmly established, the second drawdown was initiated the following year as conditions became favorable.

Water Level: Mean monthly marsh inundation data from the four constant recorders from June 1995 show a similar pattern between the project area and the reference area (figure 7). Two additional recorders were deployed in June 1996. Water level was variable, as indicated by monthly standard deviation, in project area (SD = 0.32) and reference areas (SD = 0.40). Although structural drawdown did not begin until May 5, 1996, water levels were maintained below marsh level for the project and reference areas beginning in December 1995. Low rainfall held water levels low providing conditions that exhibited an early drawdown effect. The parish experienced mild to moderate drought conditions from February through July 1996 (table 3). Cumulative statewide precipitation totaled less than two-thirds of the normal level from January to May 1996, ranking as the fifth driest January to May total in the last century (Louisiana Office of State Climatology [LOSC] 1996). The project went out of the drawdown mode in July 1996, although water levels did not return to normal until October. Postconstruction water-level data will be presented in a future report.

Salinity: Mean monthly salinity calculated from the four continuous data recorders illustrated similar salinity trends inside the project area and in the reference areas (figure 8). Preconstruction salinity data show highest salinity levels occurring in the early fall (Sept. 1995) and spring (Mar. 1996), with the lowest salinity levels occurring in the winter (Jan. 1996) and summer (July 1995) months. Average monthly salinity variability was higher in the reference areas (SD = 5.05) and lower in the project area (SD = 2.38) since salinity in the reference areas was more directly influenced by the CSC. Discrete salinity data indicates that the highest salinity levels were recorded at the structures that are linked to the CSC through West Cove of Calcasieu Lake, Mud Bayou, and Oyster Bayou. Salinity decreases westward into the marsh and towards Mud Lake.

Postconstruction salinity data indicate prolonged salinities of >12 ppt in both the project and reference areas (figure 9) for the duration of the drought (May-October). Average monthly salinity variability (SD = 1.50) was lower in the project area from lack of water exchange due to drawdown and little to no precipitation. In future reports the Magnolia Road and Oyster Bayou reference areas will be presented separately to more accurately depict variability (SD) in the two areas.

Accretion: The results of an ANOVA on the SET data indicate a significant overall decrease ($p<0.05$) of 2.04 cm in elevation between December 1995 and July 1996 from both the project area and reference area #2 (table 4). The nonsignificant interaction ($p>0.05$) between area and time period indicated that the rates of elevation change were same for both project area and reference area #2 (table 5). The decrease in elevation between visits for both the project and reference areas could reflect compaction of the soil surface due to the low water levels in the region (LOSC 1995). Due to extreme weather patterns and low rainfall, water levels in the area were dropping at approximately the time of the first SET sampling. This condition simulated the effects of a drawdown by keeping the water levels low throughout most of the spring prior to the second SET sampling period that occurred during drawdown.

Fisheries: In order to conduct baseline comparison between the project area and reference areas, preconstruction sampling was conducted in June 1995, October 1995, and April 1996. On May 5, 1996, all structures for access into the area were closed for the initiation of the first drawdown. However, there was little to no water flow into the project area previous to that date due to low water conditions, which had occurred since December 1995 (figure 7).

Thirty species of fish and shrimp were collected in both throw trap and seine samples and were categorized as either estuarine resident (13 species), fresh water (2 species), estuarine-dependent (11 species), or marine (4 species). Six of the 11 estuarine dependent species collected in the preconstruction samples were found in both the project and the reference areas. Due to seasonal changes in abundance, total weight (table 6) and the CPUE (table 7) varied between the different sampling periods. Total CPUE and total weight were greater for the reference area in June 1995 and April 1996, but were greater for the project area in October 1995. Access into the project area is limited to small canals and culvert openings, whereas access to the reference areas are directly linked to the CSC, which is open to the Gulf of Mexico through major bayous and canals. Although no postconstruction fisheries data have been analyzed, the April 1996 data reflect a time of very limited fisheries access to the project area. The April 1996 sampling period was preceded by low water levels (LOSC 1995), leading to limited fishery access. However, of the 13 species collected in April 1996, 8 were present in the project area samples. The National Marine Fisheries Service (NMFS) reviewed the throw trap and seine data and determined that throw traps adequately depict species composition of the area and that seines should be discontinued.

References

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Monitoring Implementation	October 1, 1994	
Construction Start:	January 1, 1996	
Construction End:	May 1, 1996	

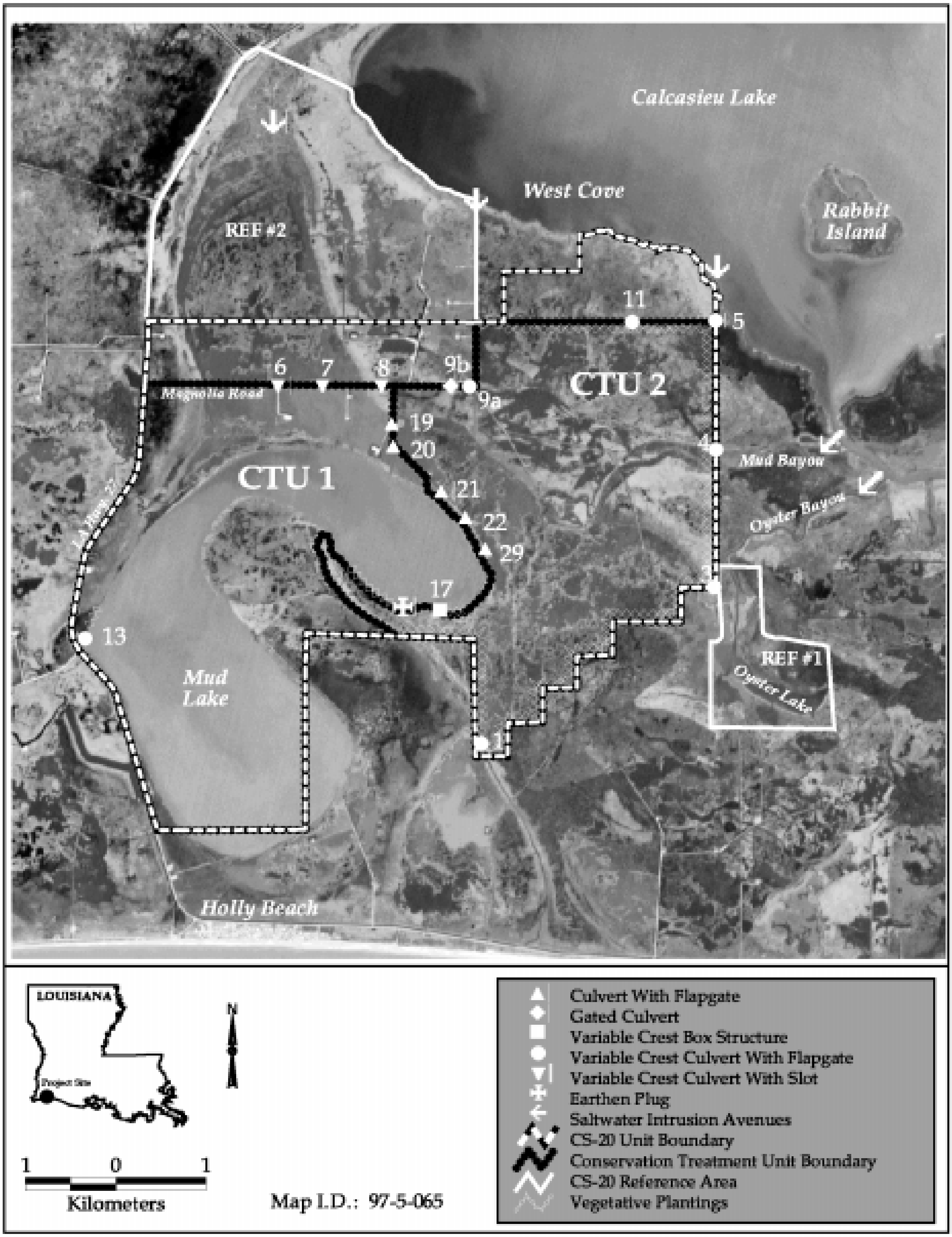

Figure 1. East Mud Lake project area with structures and numbered labels.

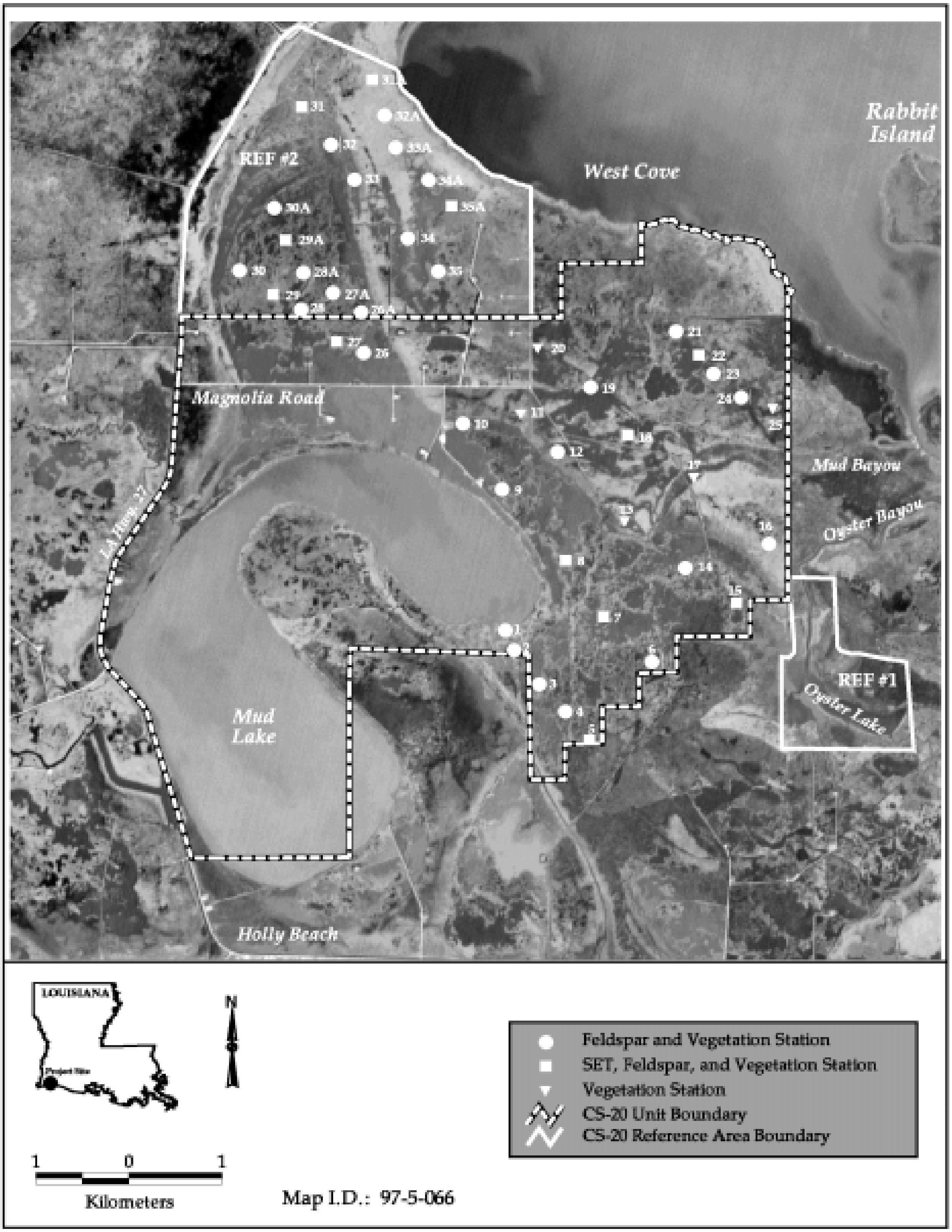

Figure 2. Location of vegetation, feldspar, and SET monitoring stations.

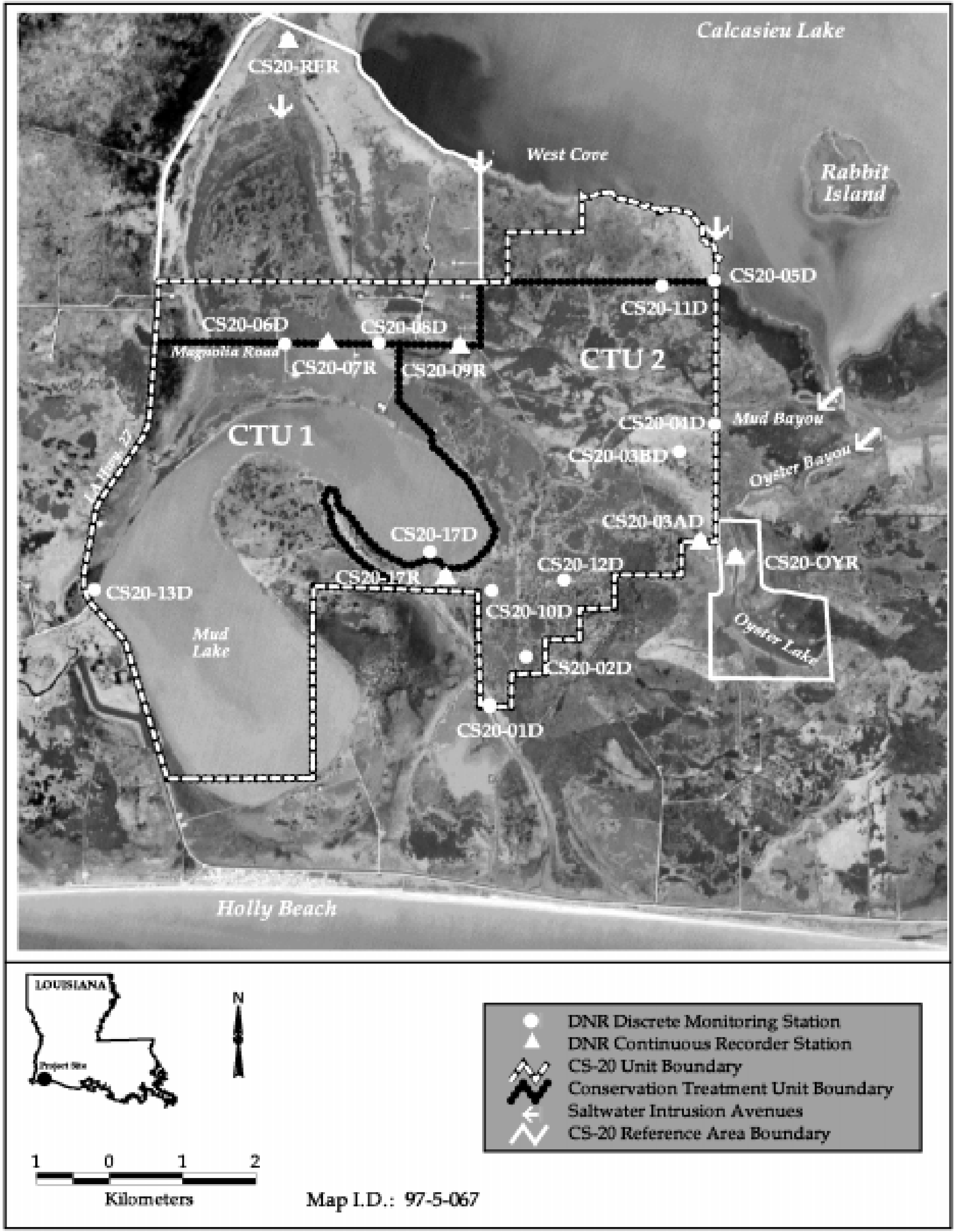

Figure 3. Location of discrete and continuous hydrologic stations at East Mud Lake.

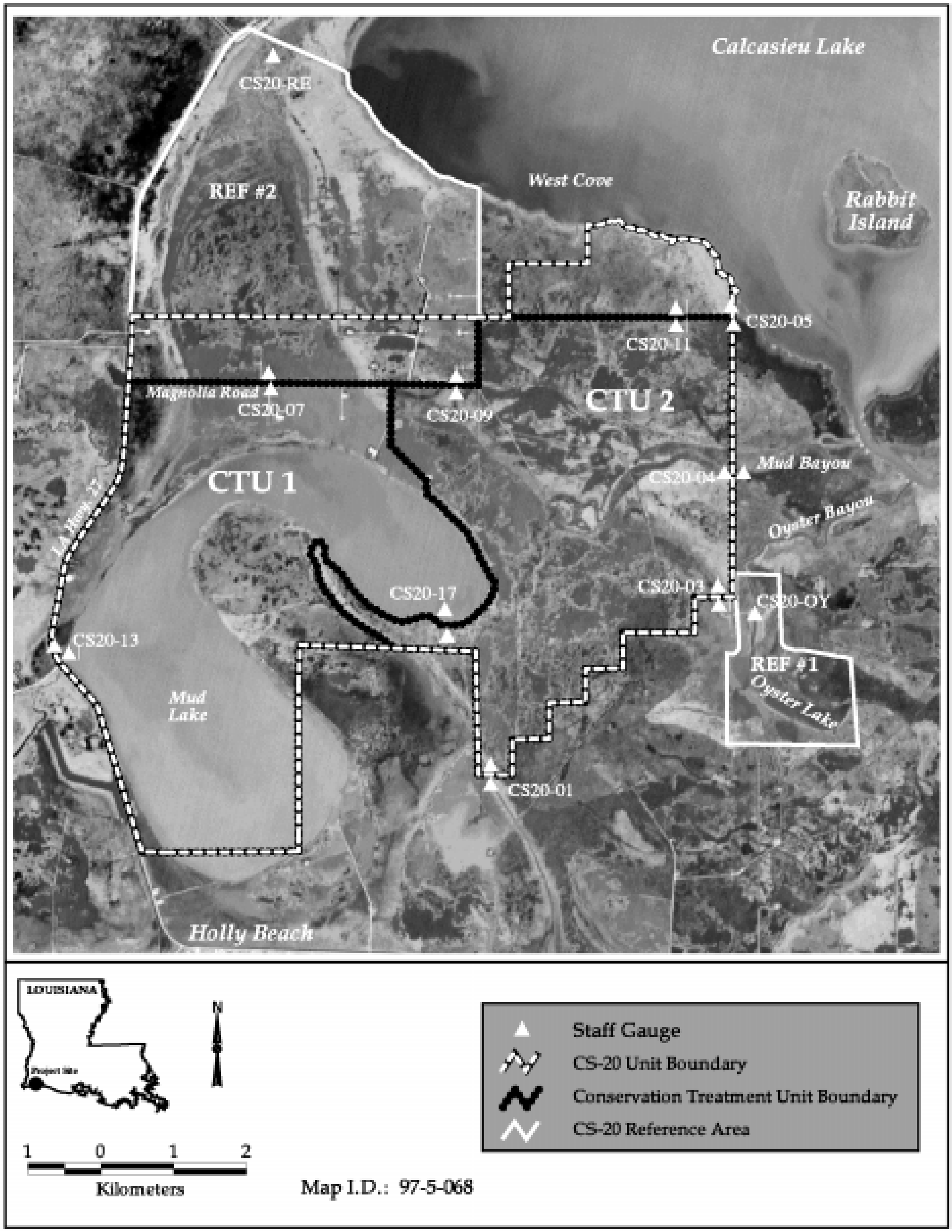

Figure 4. Staff gauge locations at East Mud Lake.

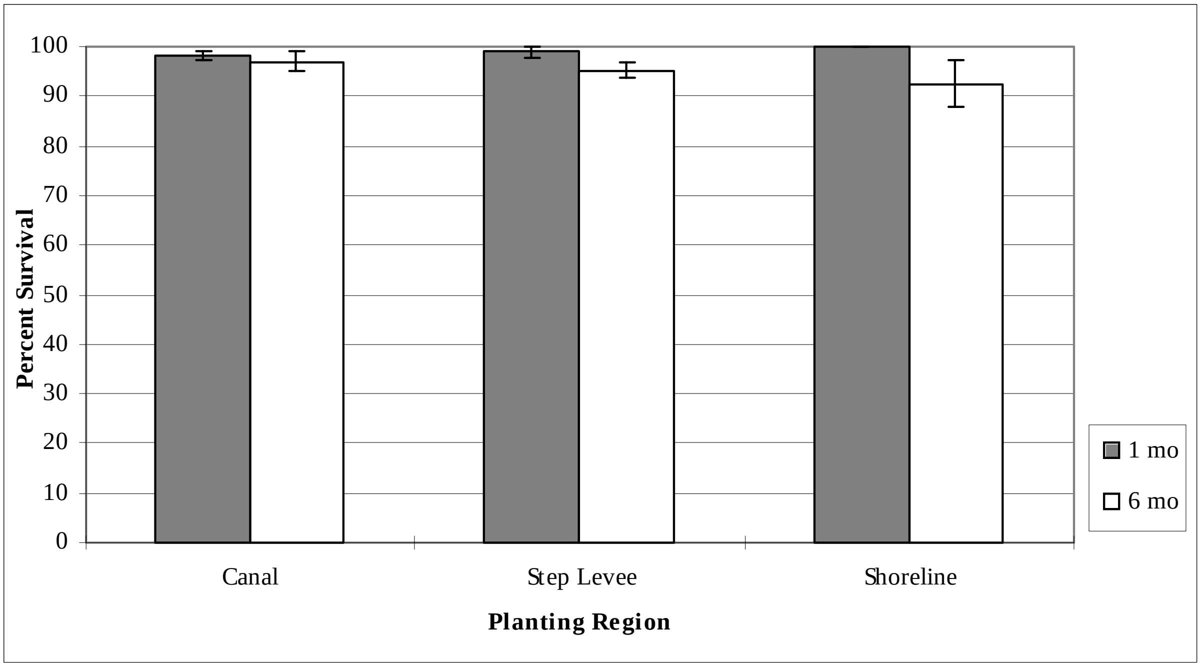

Figure 5. Average percent survival of *Spartina alterniflora* plantings in the East Mud Lake (C/S-20) project area.

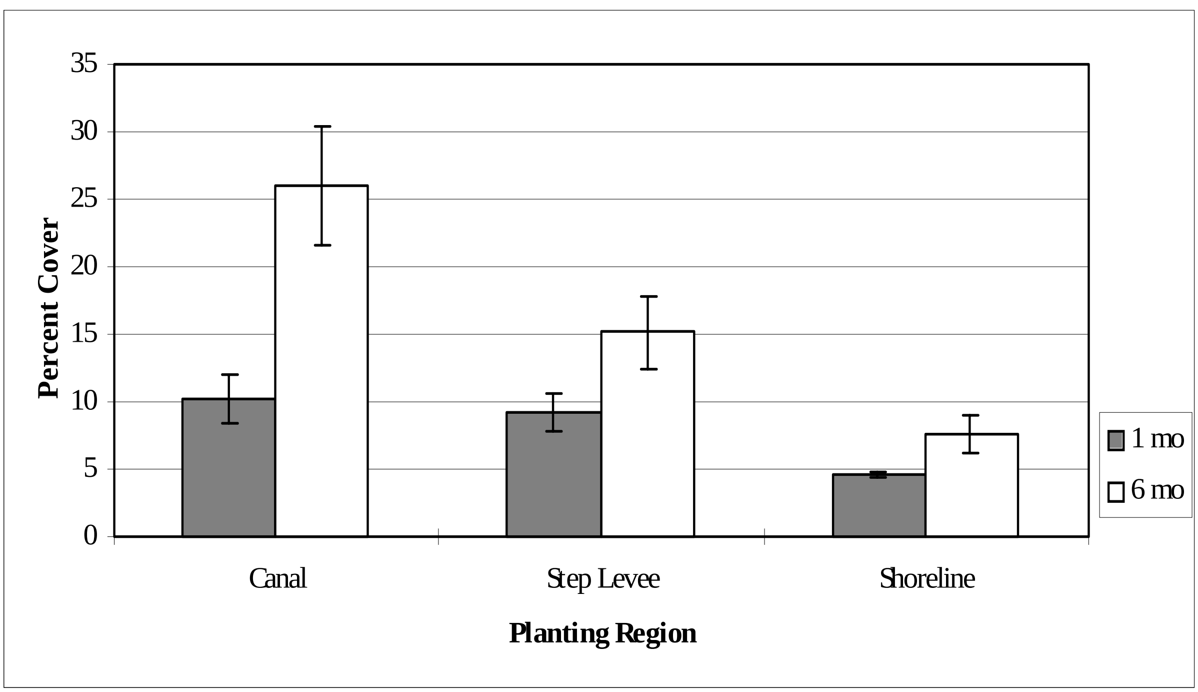

Figure 6. Average percent cover of *Spartina alterniflora* plantings in the East Mud Lake (C/S-20) project area.

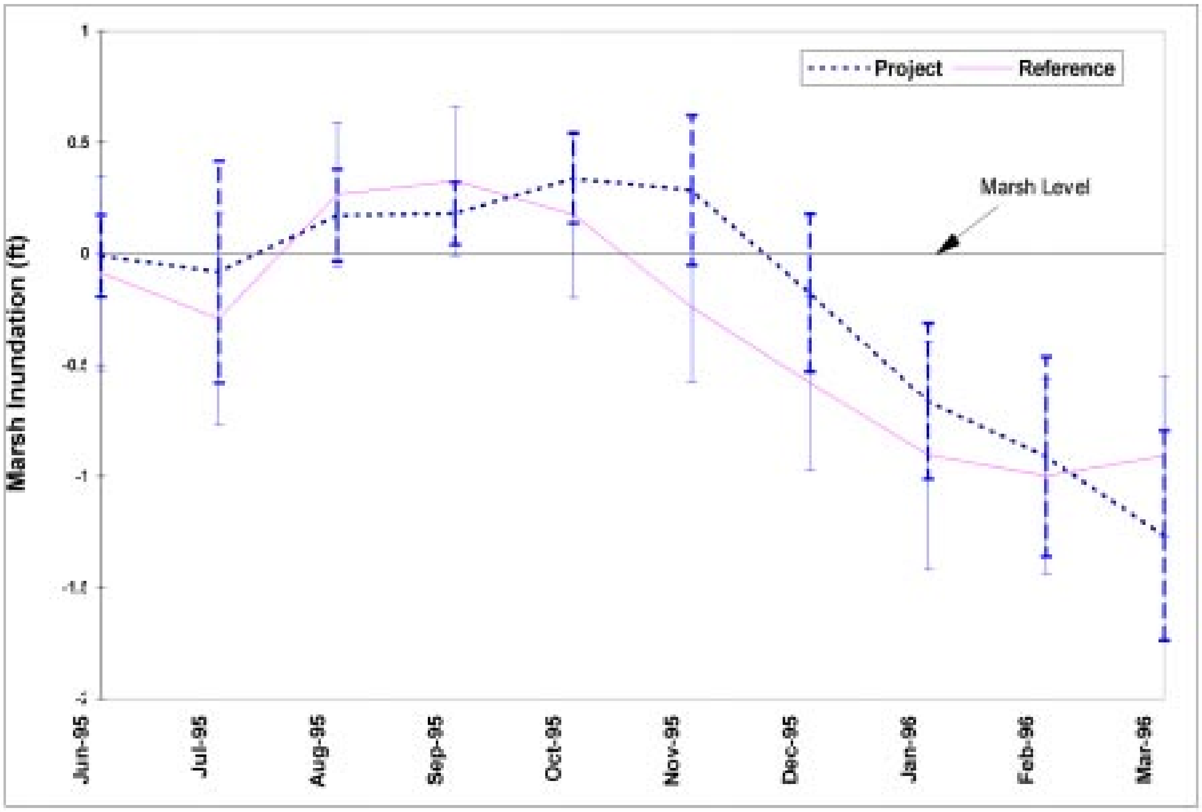

Figure 7. Mean marsh inundation (± SD) for the East Mud Lake project and reference areas preconstruction.

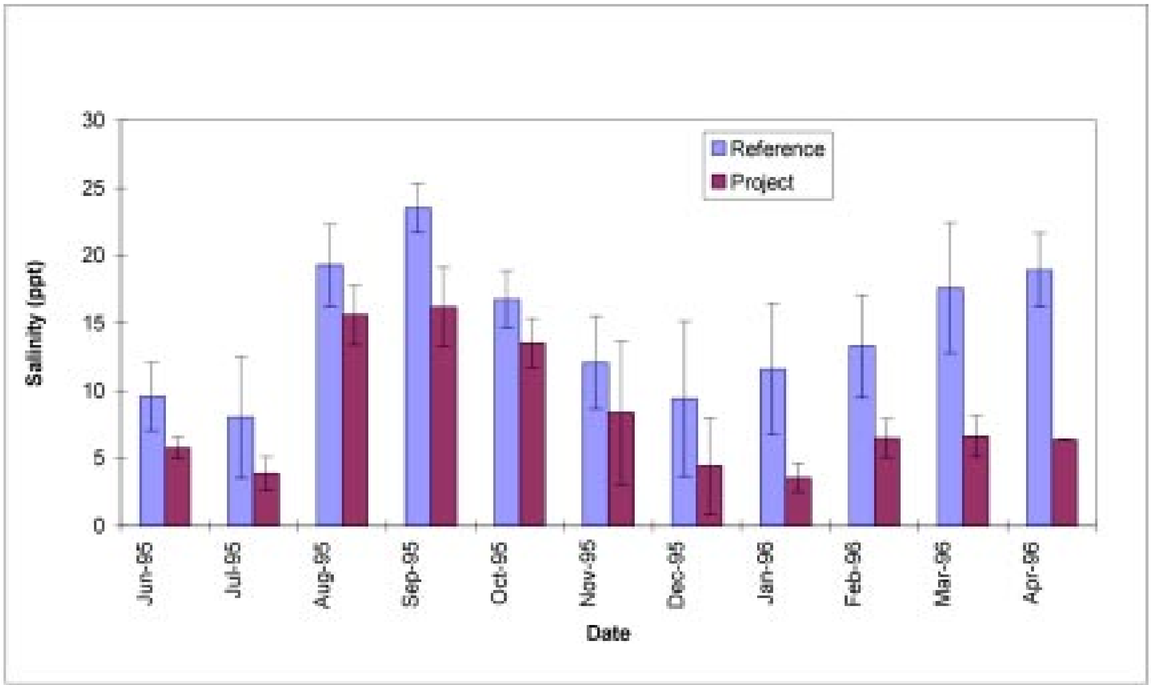

Figure 8. Monthly mean salinity (±SD) for the East Mud Lake project and reference areas preconstruction.

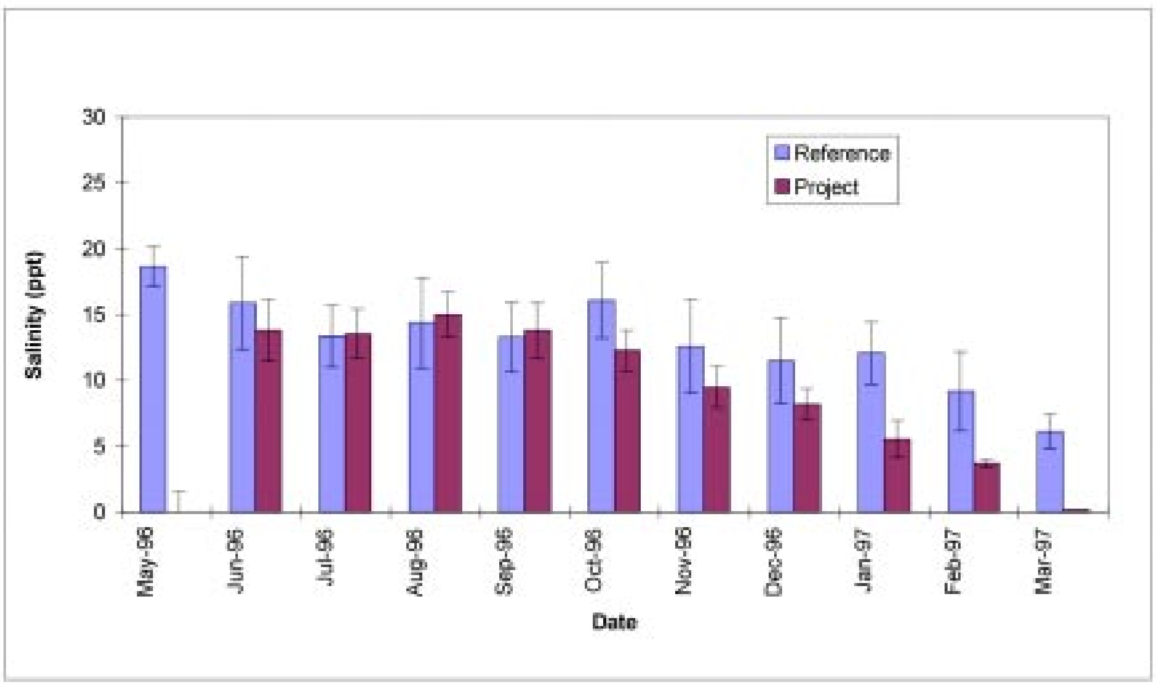

Figure 9. Monthly mean salinity (±SD) for the East Mud Lake project and reference areas postconstruction.

Table 1. Partial life table of smooth cordgrass (*Spartina alterniflora*) plantings in the East Mud Lake (C/S-20) project area, based on means of data collected from forty 10-plant sampling plots, from July 1996 to December 1996, at 1 and 6 mo postplanting.

Age (mo)	Survival Frequency (n)	Survivorship	Mortality	Mortality Rate
0	10	1.0	0.014	0.014
1	9.86	0.986	0.026	0.026
6	9.6	0.96		

n = mean number of plants living per plot

Table 2. Vegetative species composition, percent cover and heights of dominant plants (SD[1]) averaged from 25 plots in the project area and 10 plots in the reference area at East Mud Lake (C/S-20) in Cameron Parish, collected July 30, 1996.

	Project Area	Reference Area
Average canopy height (ft)	3.64 (0.69)	4.08 (0.73)
Spartina patens	84.4 (22.3)	87.5 (14.8)
Spartina patens (dead)	8.0 (23.9)	16.5 (22.5)
Spartina spartinae	3.0 (15.0)	
Scirpus americanus	2.0 (10.0)	
Spartina cynosuroides	1.44 (0.99)	
Scirpus robustus	1.0 (0.0)	
Spartina alterniflora	0.6 (3.0)	
Distichlis sp.	0.2 (1.0)	
Baccharis sp.	TR	
Ruppia maritima	TR	
Aster tenuifolius	TR	
Paspalum fluitans	TR	
Scirpus olneyi	TR	

[1]SD = standard deviation

Table 3. Monthly and cumulative climate data from December 1995 through October 1996 for the southwestern Louisiana division (Allen, Beauregard, Calcasieu, Cameron, and Jefferson Davis parishes).

Month	Monthly Mean Precipitation (inches)	Cumulative Departure From Normal (inches)	Monthly Palmer Drought Severity Index	Monthly Predominant Wind Directions
Dec 95	7.79	+13.38	Moist Spell	S, SW, SE, NE
Jan 96	3.33	-1.75	±Normal	S, N, SW, NW
Feb 96	1.51	-4.41	Mild	SW, S, N, NE
Mar 96	1.58	-6.97	Mild	S, SW, NW, N
Apr 96	3.22	-7.54	Mild	S, SW, SE
May 96	1.38	-11.52[a]	Moderate	S, SW, SE
Jun 96	6.01	-10.75	Mild	S, SW, SE
Jul 96	4.98	-11.81	Moderate	SW, SE
Aug 96	8.77	-8.89	±Normal	NE, E, SE, S
Sep 96	7.33	-6.77	Moist Spell	NE, E, SE, S, N
Oct 96	8.79	-1.92	Very Moist Spell	SE, NE

Source: Data from Louisiana Office of State Climatology (1996).
[a] Indicates highest May departure on record for the southwestern Louisiana division.

Table 4. ANOVA results of SET measurements at 10 stations in the project area and the two reference areas at East Mud Lake in Cameron Parish, collected December 1995 and July 1996.

SOURCE	DF	F-VALUE
Area	1	15.23[a]
Station	4	2.93 ns
Area x Station	4	44.61[b]
TP	1	10.87[a]
Area x TP	1	0.00 ns
Station x TP	4	1.67 ns
Area x Station x TP	4	2.30 ns

TP = time period; ns = nonsignificant ; [a] significant ($p < 0.05$);
[b] highly significant ($p < 0.01$).

Table 5. Means and standard deviation of SET measurement between December 95 and July 96 from both project and reference areas at East Mud Lake in Cameron Parish.

Area	Time Period of measurement	Numbers of Points measured	Means (cm)	SD[a]	Elevation Change
Project	1	180	30.65	7.23	
Project	2	180	28.61	7.79	2.04
Reference	1	180	18.21	8.02	
Reference	2	180	16.17	7.57	2.04

[a]SD = standard deviation

Table 6. Total weight (g) for fisheries sampling for project and reference areas for dominant species at East Mud Lake in Cameron Parish, collected with 1-m[2] throw traps.

			Ecological	Jun-95		Oct-95		Apr-96	
Family	Species	Common Name	Affinity	Project	Reference	Project	Reference	Project	Reference
Atherinidae	*Menidia beryllina*	Tidewater silverside	ES	13.44	2.11	32.67	6.32	10.35	0.95
Cyprinodontidae	*Cyprinodon variegatus*	Sheepshead minnow	ES	0.99	16.55	28.00		1.00	1.32
Palaemonidae	*Palaemonetes* sp.	Grass shrimp	ES	7.87	6.08	16.64	3.25	43.18	28.35
Poeciliidae	*Gambusia affinis*	Mosquitofish	FW	2.31	26.45	47.85	0.19	11.55	0.68
Poeciliidae	*Poecilia latipinna*	Sailfin molly	FW	0.36	108.67	5.36		1.18	
Clupeidae	*Brevoortia patronus*	Menhaden	ESD		1.29			0.25	89.01
Portunidae	*Callinectes sapidus*	Blue crab	ESD				0.12	0.34	8.06
Sciaenidae	*Leiostamus xanthurus*	Spot	ESD	9.31	13.36				2.19
Cynoglossidae	*Symphurus plagiusa*	Blackcheek tonguefish	MA		1.04		1.39		0.53
Engraulidae	*Anchoa mitchilli*	Bay anchovy	ESD		3.34	0.51	6.76		
Cyprinodontidae	*Fundulus pulvereus*	Bayou killifish	ES	0.22	15.40			0.77	
Penaeidae	*Penaeus aztecus*	Brown shrimp	ESD	7.42	31.29				
Penaeidae	*Penaeus setiferus*	White shrimp	ESD			3.23	24.13		
Syngnathidae	*Syngnathus*	Pipefish	ES	0.21	0.04				
Gobiidae	Gobiidae fam	Goby	ES			2.10	0.98		

ES= estuarine resident; FW= fresh water; ESD= estuarine dependent; MA= marine

Table 7. Total CPUE (Number organisms/samples) and total weight (g) for throw traps from all three fisheries sampling events at East Mud Lake in Cameron Parish.

Sampling Date	Total CPUE		Total Weight	
	Project	Reference	Project	Reference
June 1995	9.17	19.4	52.29	279.18
October 1995	37.52	3.92	136.36	44.36
April 1996	22.76	35.12	73.3	210.19