Coast 2050 Region 1

BAYOU LA BRANCHE WETLAND (PO-17)
PO-17-MSPR-0497-4
PROGRESS REPORT No. 4
for the period
April 1, 1994 to April 7, 1997

Project Status

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

Two continuous recorders have been collecting data in the area since April 1996. One recorder (station 43) is located in the project area at the z-wall between Pond A and Pond B (figure 1). The reference area recorder (station 44R, figure 1) is located in the large open-water area southeast of the containment levee. In January 1997, staff gauges set to North American Vertical Datum (NAVD) were established at both continuous recorder stations. Readings from the staff gauges have been used to convert the continuous recorder water level data into feet NAVD. However, due to inconsistencies in the results from this conversion, the accuracy of the water level data cannot be guaranteed. The errors associated with the water level data are likely a result of changes in atmospheric pressure, which is not compensated for by the recording devices. Therefore, the variability between water levels in the project and reference areas will not be determined in this report.

Two rudimentary structures have been built and several other structures have been modified in the project area since the previous progress report. All construction or modifications were performed without the consent of the federal or state project manager. The largest structure (weir 4, figure 1) was built to close the breach in the southwestern project levee; north of the La Branche duck camp. This weir is constructed of four 2-in. steel pipes, driven into the soil, with 2x10 cross members. The wings of this weir are supported with sand bags, placed in the area in 1994 by the U.S. Army Corps of Engineers (USACE) in an unsuccessful attempt to keep the containment levee from breaching. In Pond B, plywood and 2x4's have been used to block the drainage pipes located along the east containment levee. An additional structure (weir 3, figure 1) has been constructed to close the breach at the southern end of the east levee. According to Allen Ensminger, the land manager for the property owner, the La Branche duck club is responsible for the construction of the structures (Ensminger 1996). It is presumed that the structures were built to hold water in the project area in order to create a more desirable habitat for wintering waterfowl.

Project Description

The Bayou La Branche Wetland project (PO-17) encompasses a 436-acre area located in St. Charles Parish on the southwestern shore of Lake Pontchartrain (figure 1). Historically, this area was classified as a brackish marsh (Chabreck and Linscombe 1968) that served as a nursery ground for commercial and recreational finfish species (Hinchee 1977; Cramer 1978). A failed attempt at agriculture in the early 1900s caused subsidence of the interior marsh, which led to the formation of a large open-water pond. The pond has progressively increased in size, leaving just a narrow band of marsh on the Lake Pontchartrain shoreline. Lake Pontchartrain shoreline retreat between 1955 and 1972 was estimated to be 9.5 ft/yr (Coastal Environments, Inc. 1984), threatening to breach the shoreline and expose the pond to damage from greater wave energy.

The purpose of this project is to create new vegetated wetlands in the open-water pond area of the Bayou La Branche wetlands utilizing dredged sediment. The specific measurable project goals are to create approximately 305 acres of shallow-water habitat conducive to the natural succession of emergent wetland vegetation and to establish a ratio in the project area of 70% emergent marsh and 30% open-water within 5 yr following project completion.

Project components include an earthen containment berm surrounding the pond area and approximately 2.7 million yds^3 of sediment dredged from the nearby Lake Pontchartrain water bottom. The project is divided into two areas: Pond A and Pond B (figure 1). The barrier between the ponds consists of a spoil ridge with a sheet pile z-wall closure and a concrete weir (weir 1, figure 1). The removal of several segments of the z-wall and the opening of the weir has allowed for the exchange of water between Pond A and Pond B. Exterior weirs (weirs 2 and 3, figure 1) on the eastern berm of Pond B allow excess water to flow out of the project area, and provide for ingress and egress of marine species during periods of high water.

The sediment was pumped from Lake Pontchartrain into the project area between February and April of 1994. In July 1994, the dredged material was aerially seeded with *Echinochloa crusgalli* (L) Beauv. var., *frumentacea,* (Japanese millet) to enhance volunteer plant growth and reduce aeolian transport of sediment. Sediments are expected to consolidate to an elevation of 0.65–1.62 ft NAVD 5 yr after construction (Cottone 1996). Once the sediment has consolidated completely, *Taxodium distichum* (bald cypress) and undetermined brackish marsh plant species will be planted.

Monitoring Design

Emergent vegetation is monitored to quantify species composition and relative abundance, using the Braun-Blanquet method (Mueller-Dombois and Ellenberg 1974). A total of 41 stations are located at 440-ft intervals along 6 transect lines (figure 2). Duplicate samples are taken within 1-m^2 plots, creating a sample size of 82 plots. In order to generate mean percent coverage for each vegetation type, solitary and trace occurrences are assigned percentages of 1 and 3, respectively. Sampling is conducted during periods of peak vegetation biomass (April-August). Vegetation was monitored

once before project construction (February 1994), at year 1 following project completion (May 1996), and will be monitored at years 2, 3, and 4, and every 3 yr thereafter.

Elevation surveys are conducted to coincide with vegetation sampling and are used to document the settling rate of the dredged sediment. Nineteen staff gauges (figure 2), surveyed to NAVD, are monitored at intervals of 6 weeks to quantify the rate of consolidation of the dredged sediment. When the sediment surface at the staff gauge is flooded, both sediment and water elevations are recorded. Sediment elevations are determined by measuring the distance from the sediment surface to the water surface and subtracting this distance from the water level.

Water level and salinity are collected hourly using continuous recorders located in the project area (station 43) and in the reference area (station 44R) (figure 1). Water levels and the salinity values in the project and reference areas are compared using individual two-sample t-tests.

To characterize sediment composition, duplicate 10-cm soil samples are collected at 23 stations using a Swenson corer (Swenson 1982). Soil core sampling will coincide with the vegetation monitoring; once preconstruction and following construction at years 2, 3, and 4, and every 3 yr thereafter. Laboratory analysis will be performed to determine percent organic matter, bulk density, salinity, and water content.

Near-vertical, color-infrared aerial photography (1:12,000 scale) will be taken before project construction and at least four times following project completion at years 1994, 1996, 1998, and 2016. The photography will be georectified, photo interpreted, mapped, and analyzed with a Geographic Information System (GIS) to measure marsh-to-water ratios and to document the marsh loss rate for the project and reference areas.

Results/Discussion

Preconstruction vegetation and sediment sampling was performed on February 4, 1994. The only emergent vegetation sampled was *Eleocharis parvula* (R. & S.) Link (dwarf spikerush), which occurred around the edges of shallow ponds (table 1). Submerged aquatic vegetation was abundant in the ponds with dominate species being *Myriophyllum spicatum* L. (water-milfoil) and *Ceratophyllum demersum* L. (coontail grass).

On May 6–7, 1996, the initial postconstruction vegetation sampling was performed. The dominant vegetation in the project area was *Solidago sempervirens* L. (seaside goldenrod) and *Ranunculus sp.* (buttercup) (table 1). *S. sempervirens* was present in 64 of the 82 plots sampled. This species was found throughout the project area (mean coverage = 21.24%), but appeared to be more abundant at sample sites in Pond A (mean coverage = 27.71%) than Pond B (mean coverage = 3.30%). The percent cover of *S. sempervirens* in Pond A was significantly different than pond B ($p < 0.05$).

Ranunculus sp. occurred in 63 of the 82 plots sampled and had a mean percent cover of 20.18% (table 1). Mean percent cover of *Ranunculus sp.* in Pond A (16.65%) was significantly lower than mean percent cover in Pond B (33.15%) ($p < 0.05$). *E. parvula* and *Baccharis halimifolia* L. (groundsel bush) were each found in 23 plots, having a mean coverage of 7.31% and 5.32%, respectively.

These four vegetation species are frequently categorized as colonizing species. The majority of these species have become established since spring 1995, following the die off of the aerial seeded annual *E. crusgalli* (Cambre 1995). As the sediment in the project area continues to consolidate, the colonizing vegetation types are expected to be supplanted by more wetland-specific species.

Nineteen staff gauges were established in the project area in May 1996 to determine the extent of sediment consolidation. Sediment elevation data from these staff gauges were monitored at approximately 6-week intervals from May 1996 through March 1997 (table 2). The elevation of the sediment decreased at all staff gauge locations, with the greatest reduction occurring at stations 2 and 38 (-0.30 ft). The mean elevation change in the project area over the 11-mo period was -0.16 ft. The target elevation for the dredged material, following 5 yr of settlement, is estimated between 0.65 and 1.62 ft NAVD (Cottone 1996). The sediment at 18 of the 19 staff gauges has settled to elevations within this range (mean elevation is 1.26 ft NAVD). However, it is apparent from the vegetation survey that the upper range of this target elevation may not be suitable for the establishment of marsh vegetation. The placement of weirs in the containment levees in October 1996 allowed water to cover much of the project area. Therefore, when present at the staff gauges, water elevations were recorded and are presented here. During the next 3 yr, staff gauge data and elevation surveys will be used to determine the extent of sediment consolidation and to help evaluate the short-term effectiveness of the project. If after 5 yr the sediment has not consolidated to an elevation conducive to the development of wetland vegetation, additional project features may be considered to facilitate the growth of such species, while maintaining the desired marsh-to-water ratios.

Continuous recorders collected hourly salinity data in the project (station 43) and reference areas (station 44R) (figure 1) from April 1996 to March 1997. During this period, mean salinity in the project area and reference area was 4.02 ppt and 3.90 ppt respectively. Results from a two-sample t-test show a high degree of significant difference between salinity values in the project area compared to those from the reference area ($p < 0.01$). Although the results indicate this difference, the ecological effect of this 0.12 ppt difference in salinity cannot be distinguished. The discrepancy should not effect the types of vegetation or wildlife that can inhabit the areas. Mean salinity in the reference area was 3.33 ppt from April through September 1996, but increased to 4.6 ppt for the winter months of October 1996 to March 1997. During the same time period, mean salinity in the project area remained constant at 4.0 ppt. These results indicate that the salinity in the project area is not substantially influenced by outside factors such as winds and tides. Unlike the reference area, where tide cycles introduce water from Lake Pontchartrain, the majority of the project area is protected by the original containment levees. Precipitation appears to be the main contributor of water to the project area.

Soil cores were collected in the project area in February 1994 (preconstruction) and May 1996 (postconstruction). Soil analyses determined the percent organic material, soil salinity, bulk density and percent water of each sample. Results from the May 1996 samples indicate that the mean organic content of the postconstruction sediment was 2.2% less than that of the samples collected in February 1994: 5.6% total carbon vs. 7.8%, respectively (table 3). However, mean soil salinity varied only slightly between the two sample periods: 4.2 ppt preconstruction compared to 4.5 ppt postconstruction. Pre- and postconstruction bulk density and percent water data cannot be accurately compared because of inherent differences in sampling. The February 1994 samples have a higher mean percentage of water (52.9%) than May 1995 samples (29.5%) because the preconstruction cores were collected in an open-water pond. Consequently, the mean bulk density of the preconstruction samples (0.9 g/cc) is lower than that of the postconstruction samples (1.6 g/cc). Following the collection of soil cores in 1997, a comparison will be made between the newly sampled cores and the May 1996 samples. This analysis will provide a greater understanding of the soil conditions in the project area.

Preconstruction aerial photographs were taken on November 7, 1993, and the first postconstruction photos were taken on December 19, 1994. The National Wetlands Research Center analyzed the 1993 and 1994 aerial photography using GIS and estimated that the 436-acre project area had 404 acres of vegetation and 32 acres of open water (figure 3). The vegetated area consisted of 342 acres of new vegetation and 62 acres of previously existing marsh (figure 3). These data translate to a ratio of 94% marsh to 6% open water. The 342 acres of new vegetation exceeds the amount needed to achieve the project goal of 70% marsh to 30% open water. However, sediment elevations in the project area appear to be declining, thus the 70:30 ratio may still be reached as the area continues to settle.

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Construction Start:	January 5, 1994	
Construction End:	April 1, 1994	

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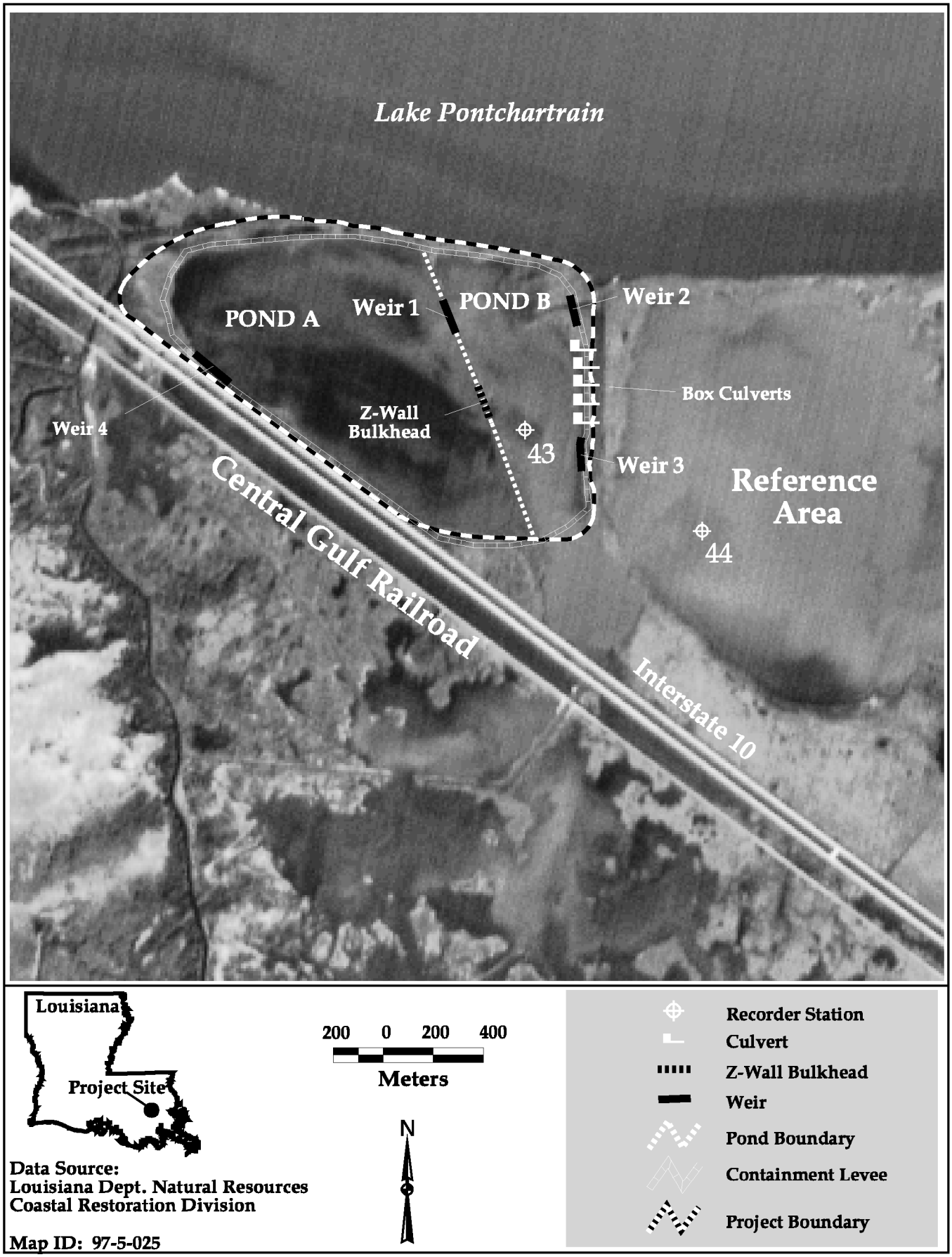


Figure 1. Bayou La Branche Wetland Restoration (PO-17) project features.

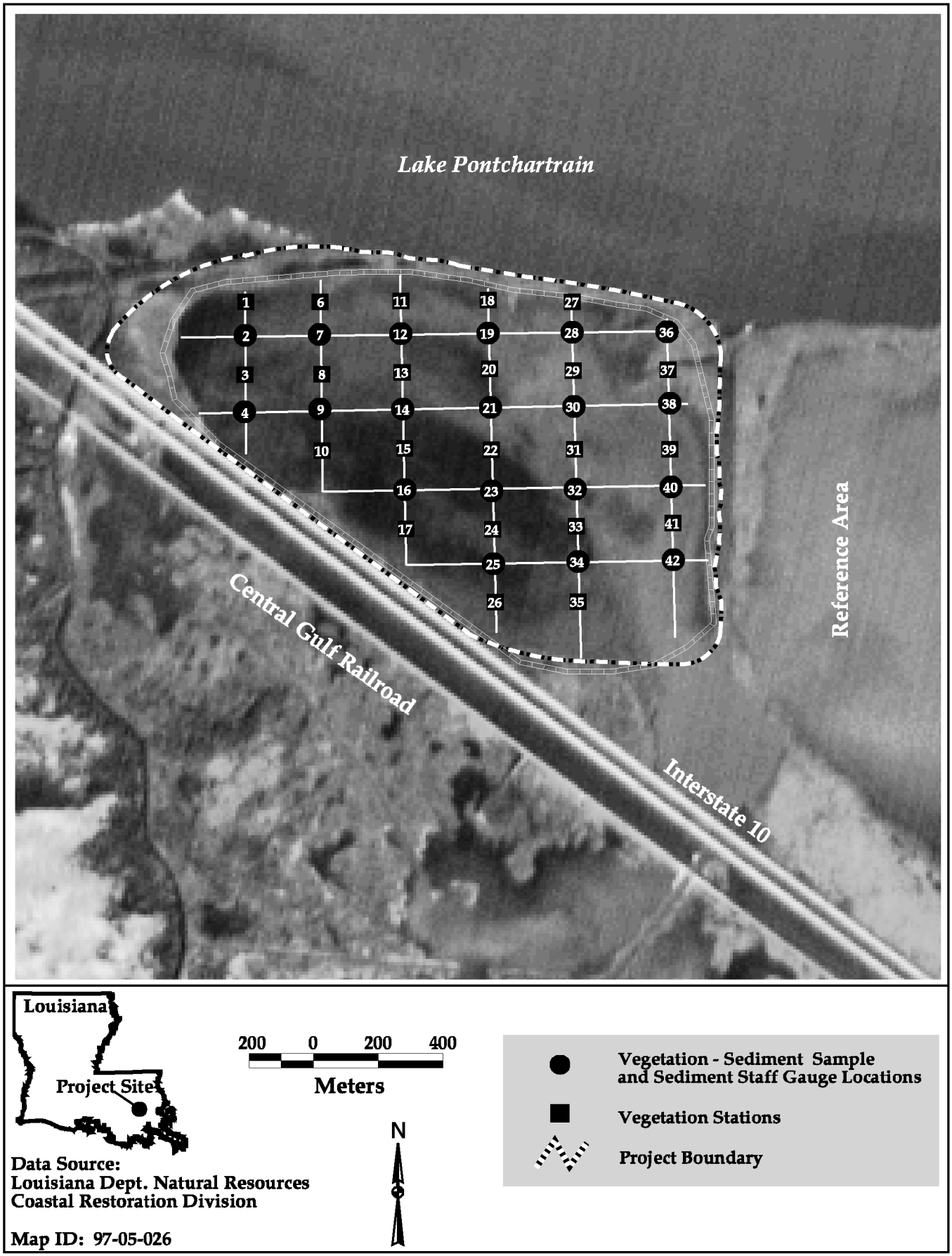
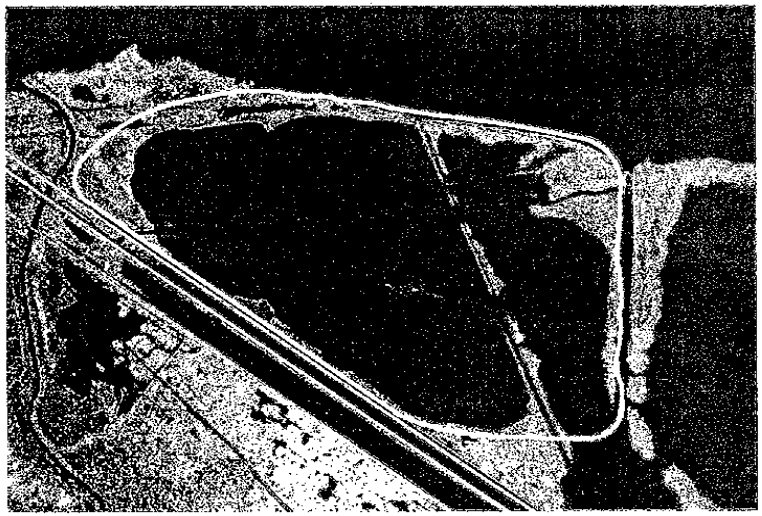
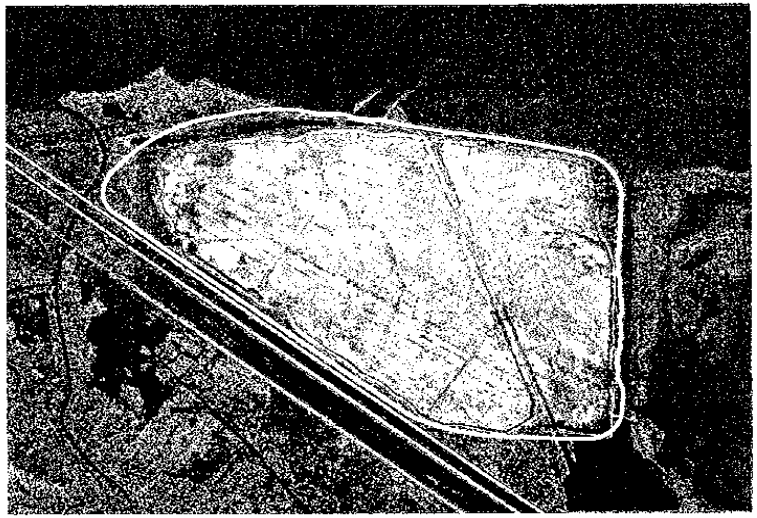


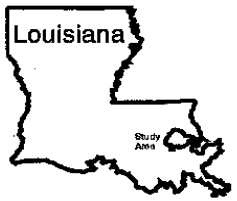
Figure 2. Bayou La Branche Wetland Restoration (PO-17) project vegetation stations, sediment stations, sediment staff gauges, and elevation survey transects.

Bayou La Branche Wetland Restoration





PRE-CONSTRUCTION
November 7, 1993



Project Boundary

Acreage Summary

Habitat	Acres
Existing Vegetation	62
Open Water	374
	436

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POST-CONSTRUCTION
December 19, 1994

Acreage Summary

Habitat	Acres
Restored Vegetation	342
Existing Vegetation	62
Open Water	32
	436

95-02-002

Figure 3. Bayou La Branche Wetland (PO-17), GIS Analysis of Pre-Construction and Post-Construction Aerial Photography.

Table 1. Results of vegetation sampling conducted in February 1994 and May 1996 at Bayou LaBranche (PO-17).

	Algae spp.	*Ceratophyllum demersum*	*Myriophyllum spicatum*	*Najas guadalupensis*	*Ruppia maritima*	*Eleocharis parvula*	*Solidago semipervirens*	*Ranunculus sp.*	*Baccharis halimifolia*	*Other Species*
	% cover	**% cover**	**% cover**	**% cover**	**% cover**	**% cover**	**% cover**	**% cover**	**% cover**	**% cover**
Feb-1994										
Total Project Area (n=41)										
Mean	6.65	22.13	21.54	14.15	5.87	8.11	0	0	0	0
Standard Dev.	22.27	29.56	24.76	23.34	18.86	21.55	0	0	0	0
Pond A (n=31)										
Mean	8.71	28.06	26.79	18.63	0.82	0	0	0	0	0
Standard Dev.	25.35	31.45	25.02	25.31	3.63	0	0	0	0	0
Pond B (n=10)										
Mean	0.25	3.75	5.25	0.25	33.25	36.94	0	0	0	0
Standard Dev.	0.79	9.52	15.74	0.79	33.69	33.51	0	0	0	0
May-1996										
Total Project Area (n=82)										
Mean	0	0	0	0	0	7.31	21.24	20.18	5.32	8.99
Standard Dev.	0	0	0	0	0	17.88	25.96	26.62	12.54	18.51
Pond A (n=62)										
Mean	0	0	0	0	0	9.73	27.71	16.65	2.94	7.94
Standard Dev.	0	0	0	0	0	20.08	27.24	21.80	7.64	17.12
Pond B (n=20)										
Mean	0	0	0	0	0	0.55	3.30	33.15	13.25	13.15
Standard Dev.	0	0	0	0	0	1.39	4.09	35.75	19.95	22.34

Table 2. Bayou La Branche (PO-17) sediment staff gauge elevations from May through August 1996.

Station	Elevation May '96	Elevation	Oct. '96	Elevation	Nov. '96	Elevation	Jan. '97	Elevation	Mar. '97	Sediment Elev. Change May '96-Mar. '97
	Sediment	Sediment	Water	Sediment	Water	Sediment	Water	Sediment	Water	
2	1.60	1.30	2.00	1.40	1.70	1.38	1.50	1.30	1.60	-0.30
4	1.10	1.00	1.90	1.10	1.70	1.10	1.50	1.00	1.55	-0.10
7	1.80	1.60	2.00	1.60	1.70	1.60		1.60		-0.20
9	1.60	1.30	1.90	1.55	1.75	1.50		1.50	1.60	-0.10
12	1.80	1.50	2.00	1.50	1.70	1.65		1.55	1.65	-0.25
14	1.55	1.35	2.00	1.40	1.75	1.30	1.55	1.30	1.60	-0.25
16	1.45	1.30	2.00	1.20	1.75	1.30	1.50	1.30	1.60	-0.15
19	1.50	1.20	1.90	1.35	1.70	1.30	1.50	1.30	1.60	-0.20
21	1.30	1.20	2.00	1.30	1.70	1.15	1.55	1.20	1.60	-0.10
23	1.30	1.15	2.00	1.10	1.75	1.15	1.55	1.15	1.65	-0.15
25	1.10	1.05	2.00	1.15	1.80	1.10	1.55	0.90	1.60	-0.20
28	1.90	1.75	2.00	1.75	1.80	1.80		1.80		-0.10
30	1.25	1.00	2.00	1.30	1.80	1.25	1.60	1.10	1.65	-0.15
32	1.20	1.00	2.00	1.20	1.80	1.10	1.60	1.10	1.60	-0.10
34	1.40	1.15	2.00	1.30	1.80	1.27	1.57	1.20	1.60	-0.20
36	1.50	1.55	2.00	1.50	1.70	1.45	1.55	1.40	1.60	-0.10
38	1.50	1.40	2.00	1.40	1.80	1.40	1.60	1.20	1.70	-0.30
40	1.10	1.00	2.00	1.00	1.75	1.03	1.58	1.05	1.75	-0.05
42	1.00	0.75	2.00	0.95	1.75	0.95	1.55	0.90	1.60	-0.10
Mean	**1.42**	**1.24**	**1.98**	**1.32**	**1.75**	**1.30**	**1.55**	**1.26**	**1.62**	**-0.16**
S. D.	**0.3**	**0.3**	**0.0**	**0.2**	**0.0**	**0.2**	**0.0**	**0.2**	**0.0**	**0.1**

Table 3. Results of sediment sampling conducted in February 1994 and May 1996 at Bayou La Branche (PO-17) .

	Organic Matter	**Soil Salinity**	**Bulk Density oven dry**	**Percent Water**
Sample Period	(%)	(ppt)	(g/cc)	(%)
Feb. 1994 (n = 44)				
Mean	7.8	4.2	0.9	52.9
Standard Dev.	2.5	1.0	0.2	6.7
May 1996 (n = 46)				
Mean	5.6	4.5	1.6	29.5
Standard Dev.	1.7	1.2	0.2	4.5