

Coast 2050 Region 4

FRESHWATER BAYOU WETLANDS (ME-04) PHASE 1¹

ME-04-MSPR-0197-3

PROGRESS REPORT NO. 3

for the period

January 31, 1995 to January 6, 1997

Project Status

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

Shoreline movement: Change in shoreline position relative to the shoreline markers established along the project and reference area shorelines in 1995 was reevaluated in July 1996. Results of statistical tests performed on these data are provided.

Project Description

The Freshwater Bayou Wetlands (ME-04) project encompasses approximately 37,000 acres of fresh-to-intermediate wetlands located between La. Hwy. 82 and Freshwater Bayou Canal, approximately 5 mi east of White Lake, Louisiana (figure 1). Boat wake-induced shoreline erosion, which averaged 12.5 ft/yr along each bank of Freshwater Bayou Canal between 1968 and 1992 (Brown & Root 1992), has deteriorated the spoil banks along the channel, allowing multiple breaches to form, and tidal scour of the organic soils in the adjacent wetlands to ensue. Between 1968 and 1990, the bank width of this navigation canal increased almost fourfold, resulting in the loss of 768 acres of coastal wetlands (Good et al. 1995).

The objective of phase 1 of this project is to prevent further widening of the Freshwater Bayou Canal channel into the project area, thereby protecting existing emergent wetlands along the west bank of the canal from further deterioration caused by shoreline erosion and tidal scour. The specific goal of the project is to decrease the rate of erosion and wetland loss along the west bank of Freshwater

¹ The ME-04 wetland restoration project encompasses work that is being implemented in two phases. An emergency authorization to dismantle the Wax Lake Outlet weir in 1994 allowed for phase 1, the construction of 28,000 ft of rock dike along the canal's west bank, which was completed in January 1995. Phase 2, which involves the construction of eight water control structures to increase water management capabilities within the project area wetlands, is tentatively scheduled for implementation in 1998.

Bayou Canal using a rock dike. Construction of approximately 28,000 linear ft of free-standing, continuous rock dike along the west bank of the canal was completed in January 1995.

Monitoring Design

To document land and water areas, marsh loss rates, and interannual shoreline movement, color-infrared aerial photographs (1:24,000 scale) will be taken, georectified, photointerpreted, mapped, and analyzed with Geographic Information System (GIS) methodology once preconstruction and three times postconstruction. To document shoreline movement, 27 shoreline markers denoting the edge of the perennial vegetation were established in June 1995 at 1000-ft intervals along the west bank of the canal in the project area. In April 1995, three shoreline markers were also established along the east bank of the canal within each of the two reference areas. Each marker is referenced to a settlement plate located on the rock dike. Shoreline position relative to the shoreline markers will be monitored annually by direct measurement.

Results/Discussion

Habitat mapping: Due to an emergency authorization to construct the Phase 1 rock dike well in advance of schedule, it was not possible to schedule an aerial photography flight over the project area prior to construction. Therefore, the aerial photography taken in December 1996 will serve as the preconstruction photography for phases 1 and 2 of the project.

Shoreline changes: Shoreline position relative to the shoreline markers established along the reference areas in April 1995 and along the project area in June 1995 was reevaluated in July 1996 by direct measurement. Shoreline position was delineated using either the vegetated edge of the bank (VEB) or the vertical face of the escarpment along the bank. At prograding sites adjacent to intact spoil banks, the VEB consisted of marsh vegetation growing along the high water line on the slope below the toe of an escarpment. At prograding sites adjacent to eroded spoil banks, the VEB consisted of marsh vegetation growing on the remaining spoil material along the bank and on mudflats along the high water line. Common species observed on the VEB included saltmarsh aster (*Aster tenuifolius* L.), thoroughwort (*Eupatorium serotinum* Michx.), marsh elder (*Iva frutescens* L.), roseau cane (*Phragmites australis* (Cav.) Trin. ex Steud.), seaside goldenrod (*Solidago sempervirens* L. var. *mexicana* (L.) Fern.), big cordgrass (*Spartina cynosuroides* (L.) Roth), and marshhay cordgrass (*S. patens* (Ait.) Muhl.). At the eroding sites, the VEB was generally on the top of an escarpment, in which case, the vertical face of the escarpment was used to delineate the shoreline position.

Erosion occurred at all six reference area monitoring sites (table 1), averaging 6.54 ft/yr (standard error [SE]: 2.02 ft/yr) over this 14.5-mo period. A paired t-test of the reference area data (table 2) indicates that erosion along these two shoreline segments was significantly greater than zero ($p < 0.05$). Along the project area shoreline (table 3), progradation of the vegetated edge of the bank (VEB) occurred at 15 of 27 sites, erosion occurred at 8 sites, and no change was observed at 4 sites. Overall, the project area shoreline prograded at an average rate of 2.34 ft/yr (SE: 0.73 ft/yr) over this

12-mo period. A paired t-test of the project area data (table 2) indicates that progradation along this shoreline was significantly greater than zero ($p < 0.001$). The results of a two-sample-test of these data indicate a highly significant difference ($p < 0.01$) between the protected project area and unprotected reference area shorelines, in terms of their response to the erosive forces of boat wake-induced wave action.

Analysis of these data indicate that the ME-04 project rock dike has successfully prevented or significantly reduced wave erosion of the protected segment of canal bank for postconstruction year 1, as compared with the unprotected reference area shoreline segments. The project appears to be meeting its specific goal of reducing shoreline erosion along the west bank of Freshwater Bayou Canal behind the ME-04 project rock dike.

References

- Brown and Root, Inc. 1992. Conceptual engineering report for Freshwater Bayou Canal bank stabilization, Vermilion Parish, Louisiana. Prepared for Department of Natural Resources, Coastal Restoration Division. Belle Chase, La.: BRI.
- Good, B., J. Buchtel, D. Meffert, J. Radford, K. Rhinehart, and R. Wilson, eds. 1995. Louisiana's major coastal navigation channels. Unpublished report. Baton Rouge: Louisiana Department of Natural Resources, Coastal Restoration Division. 57 pp.

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Construction Start:	October 10, 1994	
Construction End:	January 31, 1995	

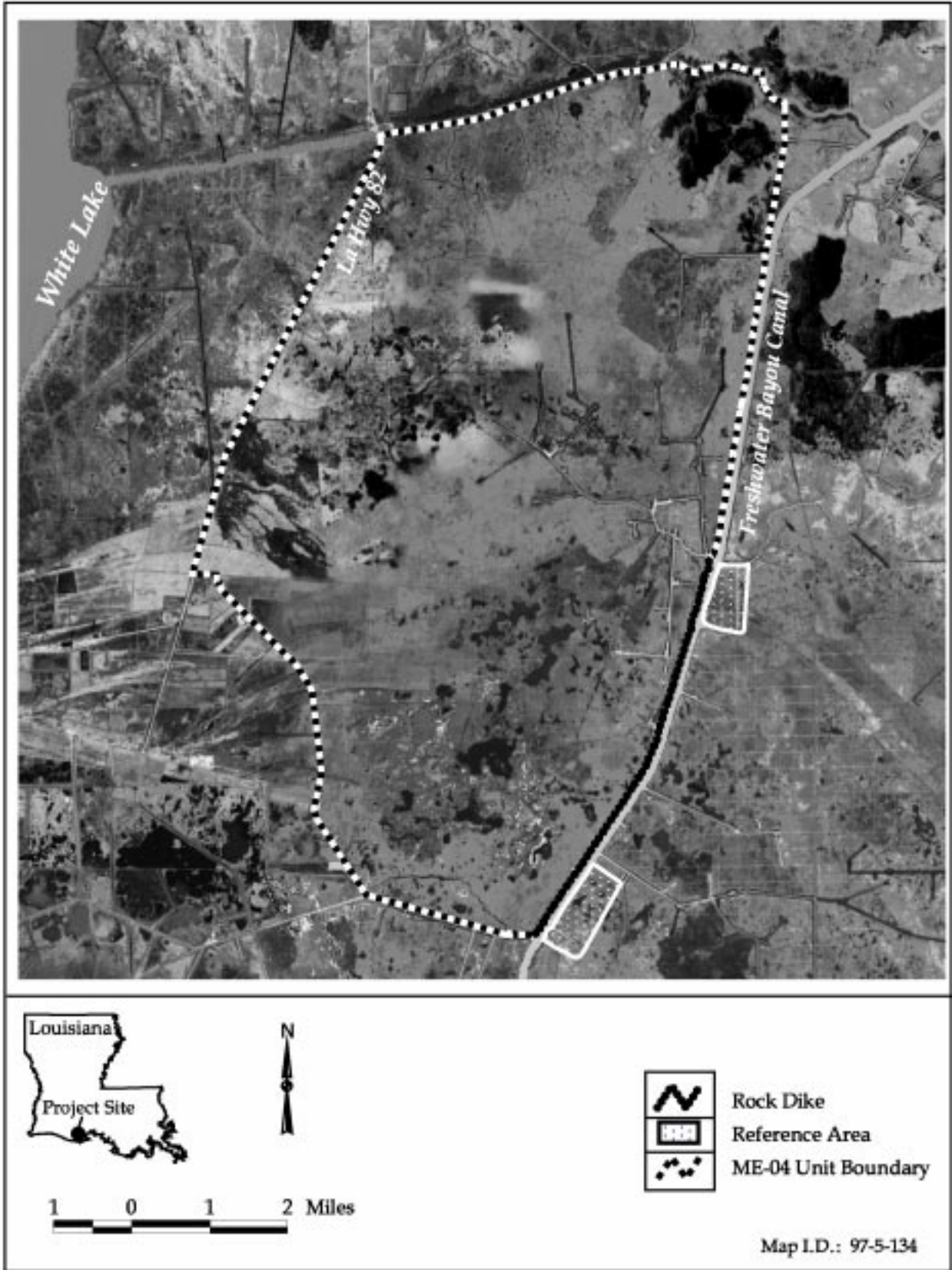


Figure 1. Freshwater Bayou Wetlands (ME-04) project area map showing phase 1 features.

Table 1. Shoreline changes at the reference area monitoring sites (n=6) along the east bank of Freshwater Bayou Canal opposite the Freshwater Bayou Wetlands (ME-04) project rock dike for the 14.5-mo period beginning April 27, 1995 and ending July 11, 1996.

SLM No.	SP No.	Change in Distance (ft)	Shoreline Change Rate (ft/yr)
R2-1-M	1	-3.8	-3.14
R2-2-M	2	-6.8	-5.63
R2-3-M	3	-6.2	-5.13
R1-1-M	20	-1.9	-1.57
R1-2-M	22	-9.95	-8.23
R1-3-M	23	-18.75	-15.51
Mean:		-7.9	-6.54

SLM=shoreline marker; SP=opposing settlement plate on ME-04 rock dike.

Table 2. Results of two paired t-tests comparing annualized shoreline changes along Freshwater Bayou Canal behind the Freshwater Bayou Wetlands (ME-04) project rock dike and along two reference areas on the opposite canal bank, as recorded between April 1995 and July 1996.

Area	N	Min	Max	Mean	SE
project	27	-0.90	13.80	2.34**	0.73
reference	6	-15.51	-1.57	-6.54*	2.02

SE=standard error; *=significant (p<0.05); **=highly significant (p<0.001).

Table 3. Shoreline changes at the project area monitoring sites (n=27) along the west bank of Freshwater Bayou Canal behind the Freshwater Bayou Wetlands (ME-04) rock dike, for the 12-mo period beginning June 12, 1995 and ending July 11, 1996.

SLM No.	SP No.	Change in Distance (ft)	Shoreline Change Rate (ft/yr)
1-M	1	+1.34	1.34
2-M	2	+1.6	1.6
3-M	3	-0.4	-0.4
4-M	4	0.0	0.0
5-M	5	+5.4	5.4
6-M	6	0.0	0.0
7-M	7	+3.9	3.9
8-M	8	+13.8	13.8
9-M	9	+1.4	1.4
10-M	10	+11.5	11.5
11-M	11	+6.0	6.0
12-M	12	-0.9	-0.9
13-M	13	-0.4	-0.4
14-M	14	-0.4	-0.4
15-M	15	0.0	0.0
16-M	16	0.0	0.0
17-M	17	+1.3	1.3
18-M	¹ 17a	+0.9	0.9
19-M	¹ 17b	+2.7	2.7
20-M	¹ 17c	+2.8	2.8
21-M	¹ 17d	+1.3	1.3
22-M	18	-0.3	-0.3
23-M	19	+5.1	5.1
24-M	20	-0.2	-0.2
25-M	21	+8.2	8.2
26-M	22	-0.8	-0.8
27-M	23	-0.6	-0.6
Mean:		+2.34	+2.34

SLM=shoreline marker; SP=opposing settlement plate on ME-04 rock dike.

¹Rock dike section without settlement plates. Established 4 transects, referenced to "X" painted on large boulders at ±1,000-ft intervals, and numbered as settlement plates 17a-17d.