

Coast 2050 Region 4

FRESHWATER BAYOU WETLANDS (ME-04) PHASE 1¹

ME-04-MSPR-0198-4

PROGRESS REPORT NO. 4

for the period

January 31, 1995 to January 31, 1998

Project Status

No additional data have been collected since the previous progress report. However, the shoreline monitoring station numbers included in progress reports 1, 2, and 3 have been revised as listed in tables 1 and 3 of this report to conform to a standardized monitoring station numbering system. All future progress reports will incorporate phase 1 and phase 2 into one report.

Project Description

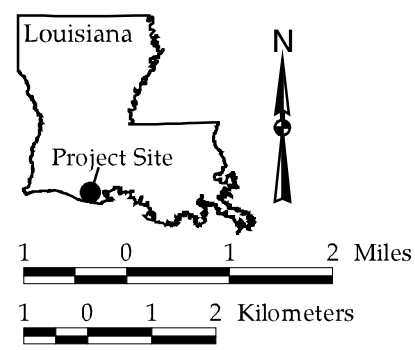
The Freshwater Bayou Wetlands (ME-04) project encompasses approximately 37,000 acres (14,974 ha) of fresh to intermediate wetlands located between La. Hwy. 82 and Freshwater Bayou Canal, approximately 5 mi (8 km) east of White Lake, Louisiana (figure 1). Boat wake-induced shoreline erosion, which averaged 12.5 ft/yr (3.81 m/yr) along each bank of Freshwater Bayou Canal between 1968 and 1992 (Brown & Root 1992), has deteriorated the spoil banks along the channel, creating multiple breaches, which allow tidal scour of the organic soils in the adjacent wetlands. Between 1968 and 1990, the bank width of this navigation canal increased threefold from 172 ft to 583 ft (52.5 m to 177.8 m), resulting in the loss of 1,124 acres (455 ha) of coastal wetlands due to bank erosion (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 Bayou Canal using a rock dike. Construction of approximately 28,000 linear ft (8.54 km) of free-standing, continuous rock dike along the west bank of the canal was completed in January 1995.

Methods

Near-vertical color-infrared aerial photography (1:24,000 scale) will be used to measure vegetated and non-vegetated areas for the project area. Aerial photography will be photointerpreted, scanned, mosaicked, georectified and analyzed by National Wetlands Research Center (NWRC) personnel

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 early construction of phase 1, a 28,000-linear-ft rock dike along the canal's west bank, which was completed in January 1995. Phase 2, which involves the installation of eight water control structures to increase water management capabilities within the project area wetlands, will be implemented in 1998.



Data Source:
 La Dept of Natural Resources
 Coastal Restoration Division
 Database Analysis Section
 1994 Satellite Imagery
 Map ID: 97-5-071

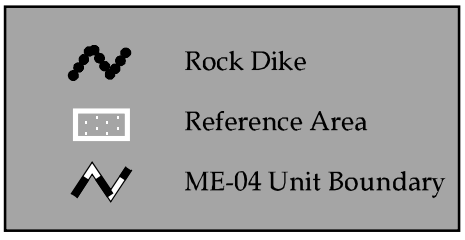


Figure 1. Freshwater Bayou Wetlands (ME-04) project area showing phase 1 features.

according to the standard operating procedure described in Steyer et al. (1995). The photography will be obtained in 1994 preconstruction and in 2001, 2007, and 2016 post-construction. To document shoreline movement, 27 shoreline markers denoting the edge of the perennial vegetation were established in June 1995 at 1,000-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 (figure 1). Each marker is referenced to a settlement plate located on the rock dike. Shoreline position relative to the shoreline markers will be monitored in 1995, 1996, 1998, 2001, 2004, 2007, 2010, 2013, and 2016 by direct measurement. However, the 1997 reassessment was conducted by a professional surveyor in late December.

Results/Discussion

Habitat mapping:² Color-infrared aerial photography of the pre-construction project and reference areas was obtained on January 11, 1997. The photography was checked for flight accuracy, color correctness, and clarity. The duplicate photography was prepared for photointerpretation and GIS analysis, and the original film was archived.

Photointerpretation has been completed for all project and reference areas and is now being checked for accuracy. Upon completion of accuracy assessment, the photointerpretation line work will be transferred onto base maps for digitizing. A digital file with 300 pixels-per-inch resolution was created from the photography for the GIS analysis. Using ERDAS Imagine, an image processing and GIS software, the photography was mosaicked and used for base map production. Global positioning system (GPS) points were collected in the field to georeference the base map to a Universal Transverse Mercator (UTM) coordinate system. The preconstruction map will then be analyzed to determine land-to-water ratios and acreage.

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 *Aster tenuifolius* (saltmarsh aster), *Eupatorium serotinum* (thoroughwort), *Iva frutescens* (marsh elder), *Phragmites australis* (roseau cane), *Solidago sempervirens* var. *mexicana* (seaside goldenrod), *Spartina cynosuroides* (big cordgrass), and *Spartina patens* (marshhay cordgrass). At the eroding sites, the

² Emergency authorization to construct the phase 1 rock dike well in advance of schedule did not allow time to schedule an aerial photography flight over the project area prior to its construction. Therefore, the aerial photography taken in January 1997 will serve as the preconstruction photography for both phases 1 and 2 of the project.

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 2.02 ft/yr) (2.0 m/yr [0.62 m/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) (0.71 m/yr [SE: 0.22 m/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. These data support the conclusion that the project is currently 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. Unpublished report prepared for the Louisiana 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.

Prepared on January 28, 1998, by Karl A. Vincent.

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|--------------------------------|------------------|----------------|
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| Federal Sponsor: | NRCS/Joe Conti | (318) 473-7687 |
| Construction Start: | October 10, 1994 | |
| Construction End: | January 31, 1995 | |

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.

| Unit | SLM Station No. ^a | SP No. | Change in Distance (ft) | Shoreline Change Rate (ft/yr) |
|--------------|------------------------------|--------|-------------------------|-------------------------------|
| R2 | ME04-93R | 1 | -3.8 | -3.14 |
| R2 | ME04-94R | 2 | -6.8 | -5.63 |
| R2 | ME04-95R | 3 | -6.2 | -5.13 |
| R1 | ME04-96R | 20 | -1.9 | -1.57 |
| R1 | ME04-97R | 22 | -9.95 | -8.23 |
| R1 | ME04-98R | 23 | -18.75 | -15.51 |
| Mean: | | | -7.9 | -6.54 |

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

^aNew numbers for SLM stations R2-1-M through R2-3-M, and R1-1-M through R1-3-M, respectively, of ME-04 progress report numbers 1, 2, and 3.

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 |
|-----------|----|--------|-------|--------------------|------|
| reference | 6 | -15.51 | -1.57 | -6.54 ^a | 2.02 |
| project | 27 | -0.90 | 13.80 | 2.34 ^b | 0.73 |

SE = standard error; ^asignificant ($p < 0.05$); ^bhighly 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 Station No. ^a | SP No. | Change in Distance (ft) | Shoreline Change Rate (ft/yr) |
|------------------------------|------------------|-------------------------|-------------------------------|
| ME04-66 | 1 | +1.34 | 1.34 |
| ME04-67 | 2 | +1.6 | 1.6 |
| ME04-68 | 3 | -0.4 | -0.4 |
| ME04-69 | 4 | 0.0 | 0.0 |
| ME04-70 | 5 | +5.4 | 5.4 |
| ME04-71 | 6 | 0.0 | 0.0 |
| ME04-72 | 7 | +3.9 | 3.9 |
| ME04-73 | 8 | +13.8 | 13.8 |
| ME04-74 | 9 | +1.4 | 1.4 |
| ME04-75 | 10 | +11.5 | 11.5 |
| ME04-76 | 11 | +6.0 | 6.0 |
| ME04-77 | 12 | -0.9 | -0.9 |
| ME04-78 | 13 | -0.4 | -0.4 |
| ME04-79 | 14 | -0.4 | -0.4 |
| ME04-80 | 15 | 0.0 | 0.0 |
| ME04-81 | 16 | 0.0 | 0.0 |
| ME04-82 | 17 | +1.3 | 1.3 |
| ME04-83 | 17a ^b | +0.9 | 0.9 |
| ME04-84 | 17b ^b | +2.7 | 2.7 |
| ME04-85 | 17c ^b | +2.8 | 2.8 |
| ME04-86 | 17d ^b | +1.3 | 1.3 |
| ME04-87 | 18 | -0.3 | -0.3 |
| ME04-88 | 19 | +5.1 | 5.1 |
| ME04-89 | 20 | -0.2 | -0.2 |
| ME04-90 | 21 | +8.2 | 8.2 |
| ME04-91 | 22 | -0.8 | -0.8 |
| ME04-92 | 23 | -0.6 | -0.6 |
| Mean: | | +2.34 | +2.34 |

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

^aNew numbers for SLM stations 1-M through 27-M, respectively, of ME-04 progress report numbers 1, 2, and 3.

^bRock 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.