



**State of Louisiana
Department of Natural Resources
Coastal Restoration Division**

Monitoring Plan

for

Perry Ridge Shore Protection

State Project Number CS-24
Priority Project List 4

December 2013
Calcasieu Parish

Prepared by:

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LDNR/Coastal Restoration and Management

MONITORING PLAN

PROJECT NO. CS-24 PERRY RIDGE SHORE PROTECTION

ORIGINAL DATE: May 28, 1997

REVISED DATES: July 23, 1998, August 14, 2003, December 12, 2013

Preface

Pursuant to a CWPPRA Task Force decision on April 14, 1998, the original monitoring plan was increased in scope to conform with monitoring of projects of similar type. Specifically, post-construction aerial photography was increased from two to three and shoreline monitoring was increased from every five years to every three years. Additionally, if monitoring funds become available, salinity monitoring will be conducted for a one year period following a significant drought.

Pursuant to a CWPPRA Task Force decision on August 14, 2003 to adopt the Coastwide Reference Monitoring System (CRMS-*Wetlands*) for CWPPRA, updates were made to this Monitoring Plan to merge it with CRMS to provide more useful information for modeling efforts and future project planning while maintaining the monitoring mandates of the Breaux Act. The implementation plan included review of monitoring efforts on currently constructed projects for opportunities to 1) determine if current monitoring stations could be replaced by CRMS stations, 2) determine if monitoring could be reduced to evaluate only the primary objectives of each project and 3) determine whether monitoring should be reduced or stopped because project success had been demonstrated or unresolved issues compromised our ability to actually evaluate project effectiveness. The recommendations for modifying this Monitoring Plan are the result of a joint meeting with DNR, USGS, and the federal sponsor. Specifically, the 2010 and 2016 land:water analyses were eliminated and monitoring shoreline position will be done with shoreline markers only, not DGPS. The recommendations have been incorporated into this revised Monitoring Plan and are described in the Monitoring Elements section.

Project Description

The Perry Ridge Shore Protection (CS-24) project provides features to protect 1,203 ac (481 ha) of vegetated shoreline along the Gulf Intracoastal Waterway (GIWW) which in turn will benefit 5,945 ac (2,378 ha) of predominately intermediate marsh located north of the shoreline. The project is on the north bank of the GIWW from Perry Ridge to the Vinton Drainage Canal in Calcasieu Parish, Louisiana (figure 1). Of the 5,945 ac, 2,675 ac (1,070 ha) are shallow open water and 3,270 ac (1,308 ha) are emergent marsh. The project area is bounded on the north by an arbitrary line connecting the northern tip of Big Island and the Gray Canal, on the south by the GIWW, on the east by the Vinton Drainage Canal and the Gray Canal, and on the west by Perry Ridge and Big Island.

The dominant plant species present on most of the high ridges along the shoreline are *Ilex vomitoria* (yaupon holly), *Celtis laevigata* (hackberry tree), *Sapium sebiferum* (Chinese tallow tree), and *Myrica cerifera* (wax myrtle). *Pinus echinata* (short-leaf pine tree) dominates the only pine ridge present in the project area. These ridges are characterized by high cutbanks ranging approximately

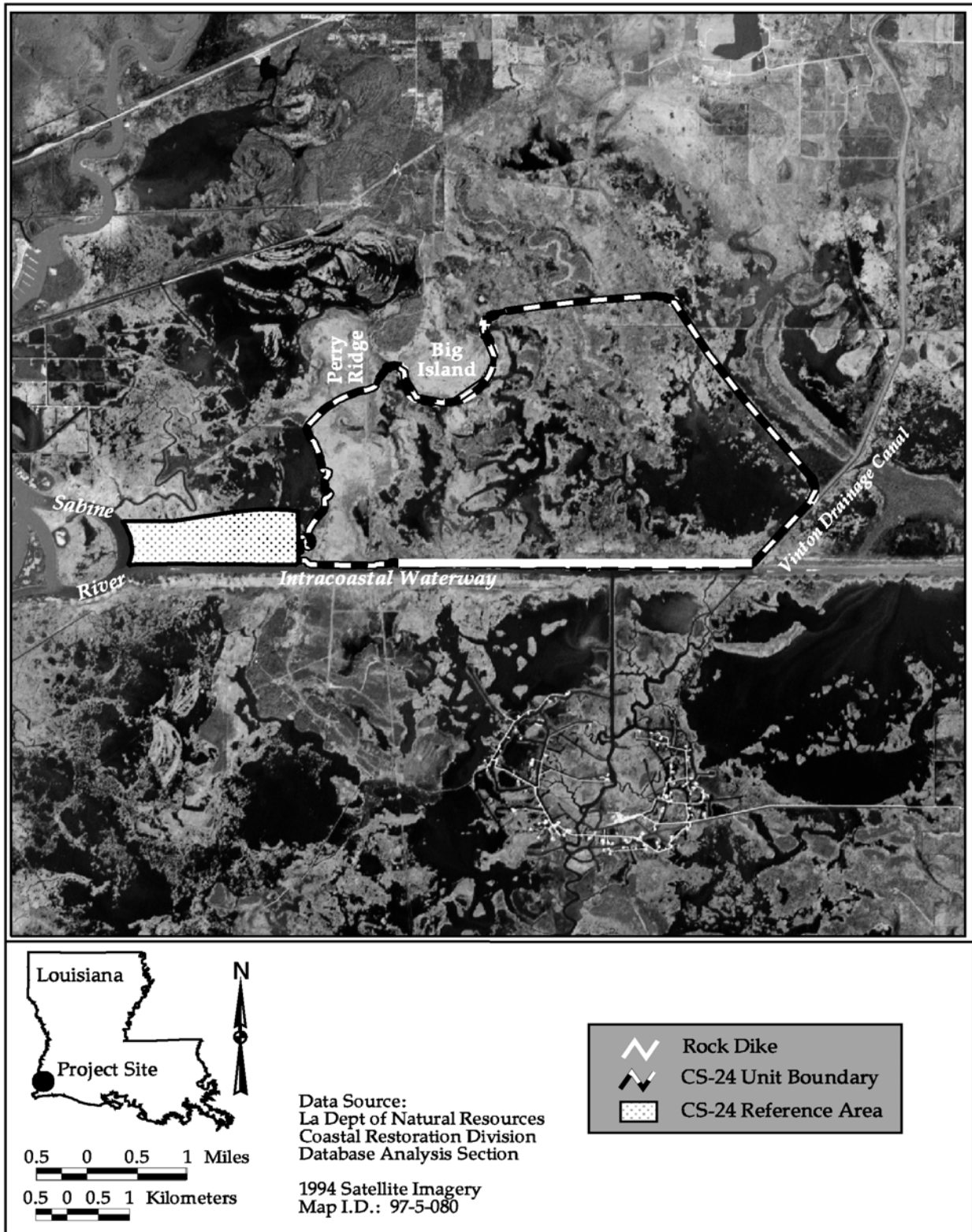


Figure 1. Perry Ridge Shoreline Protection (CS-24) project boundary, reference area boundary, and rock dike location.

2 to 30 ft (0.6 to 9.1 m). *Eleocharis sp.* (spike rush), *Solidago sempervirens* Var. Mexicana (seaside goldenrod), *Phragmites australis* (Roseau cane), *Scirpus californicus* (California bulrush), *Spartina patens* (marshay cordgrass), and *Juncus roemerianus* (black needle rush) dominate the areas along the shoreline that are breached or very near being breached. The dominant soil types in the project area are Gentilly and Clovelly mucks comprising 90% and 10% of the project area respectively. Both soil types consist of continually flooded, very poorly drained, very slowly permeable mineral soils in brackish coastal marshes (U.S. Department of Agriculture, Soil Conservation Service [USDA/SCS] 1988). These types of soil are very susceptible to removal through tidal scour and high energy surges.

Marsh loss in the vicinity of Perry Ridge has been caused by water level fluctuations and tidal scour from the GIWW as the result of breaches in the northern spoil bank (U.S. Department of Agriculture, Natural Resources Conservation Service [USDA/NRCS] 1996). The shoreline erosion rate of the north bank of the GIWW in the vicinity of the project area is 10 ft/yr (3.05 m/yr), based on aerial photography (USDA/SCS 1992). Several factors contribute to the loss of shoreline in this area. Double-wide barges allowed in this section of the GIWW increase erosion rates due to high wave energy. The GIWW in the vicinity is 30 ft (9.1 m) deep which allows higher salinities to reach the Perry Ridge area. The construction of the Calcasieu Ship Channel, deepening of Sabine Pass, the construction of the Sabine-Neches waterway, and the removal of the bar at the mouth of the Calcasieu River have all increased water current. The construction of the GIWW has shifted the project area from essentially non-tidal to tidally influenced. Historically, the project area consisted of freshwater wetlands (USDA/NRCS 1996). Chabreck classified this area as an intermediate marsh in 1968, 1978, and 1988 (Chabreck and Lindscombe, 1978).

To prevent further wetland loss through bank erosion and subsequent tidal scour of shoreline marshes, approximately 12,000 linear ft (3.7 km) of free-standing rock dike was constructed along the north bank of the GIWW from Perry Ridge to the Vinton Drainage Canal (figure 1). In addition to shoreline protection, the rock dike should reduce the amount of salinity spikes reaching the marsh by maintaining a pool of freshwater behind the rocks.

The proposed action requires the placement of rip-rap along the northern shoreline of the GIWW where deemed necessary. The rock dike, along with the existing high cut-banks, will stabilize approximately 4.25 mi (6.8 km) of the GIWW bank by breaking navigation-induced waves that are presently eroding this shoreline. The construction consists of the placement of rock armor parallel to the existing bank, approximately 60 ft (18.3 m) from the bank. The settled height of the rip-rap will be four-feet (1.2 m) National Geodetic Vertical Datum (NGVD). Where flotation is required, the dredged material excavated from the flotation channel will be placed on the land side of the rip-rap (USDA/NRCS 1996).

Project Objectives

1. Protect the existing emergent wetlands along the north bank of the GIWW and prevent their further deterioration from shoreline erosion and tidal scour.
2. Prevent the widening of the GIWW into the project area wetlands.

3. Reduce the occurrence of salinity spikes within the project area.

Specific Goal

The following goal will contribute to the evaluation of the above objectives:

1. Decrease the rate of shoreline erosion along the north bank of the GIWW using a rock dike.

Reference Area

In order to evaluate project effectiveness over time, a reference area will be monitored concurrently with the shoreline protected by the dike. Data collected will be used to make statistically valid comparisons of the shoreline erosion rate with and without the project. The main criteria for selecting a reference area are similarities in vegetative community, soil type, and hydrology. An additional criterion in this project is the amount and type of boat traffic on the channel.

The only area with similar features to the project area is directly west of Perry Ridge. The other areas that could be considered for a reference area along the GIWW do not have the same soil type and shoreline characteristics. The reference area starts on the western boundary of Perry Ridge, along the GIWW, to the Sabine River. This area is subject to the same amount of boat traffic, similar vegetation and soil content, and a similar open water to vegetated marsh ratio as the project area. In 2002, the western portion of the reference area was incorporated in a similar CWPPRA project, the Perry Ridge West project (CS-30[PCS26ii]). Three reference stations remain between the 2 project areas.

CRMS will provide a pool of reference sites within the same basin and across the coast to evaluate project effects. At a minimum, every project will benefit from basin-level satellite imagery and land:water analysis every 3 years, and supplemental vegetation data collected through the periodic Chabreck and Linscombe surveys. Other CRMS parameters which may serve as reference include Surface Elevation Table (SET) data, accretion (measured with feldspar), hourly water level and salinity, and vegetation sampling. A number of CRMS stations are available for each habitat type within each hydrologic basin to supplement project-specific reference area limitations.

Monitoring Plan Limitations

The Perry Ridge project was classified as a shoreline protection project. However, throughout the environmental assessment and other support documentation, it states that the project is expected to moderate the effect that periodic salinity spikes in the GIWW have on interior marshes. This type of language would indicate that this project should have been classified as a Hydrologic Restoration project, and that salinity should be measured.

Salinity measurements were recommended to be conducted until one year after the next significant drought. This is because these marshes suffer from salinity spikes (acute periods of saltwater intrusion during low rainfall periods) in the GIWW rather than from chronic saltwater intrusion in the GIWW (J.A. Nyman, personal communication; USDA/NRCS 1996). For instance, drought conditions during the summer of 1996 resulted in salinity spikes in the GIWW that caused significant dieback of freshwater species such as *Sagittaria lancifolia* (bulltongue) in the project area interior, but did not kill brackish species such as *S. patens* that are adjacent to the GIWW (J.A. Nyman, personal communication). Because of funding limitations and the difficulty in budgeting for an uncertain period, it was recommended that salinity data collected just south of the project area be utilized to examine the influence of the project on salinity.

Monitoring Elements

The following monitoring elements will provide the information necessary to evaluate the specific goal listed above:

1. Aerial Photography To document shoreline position, and land and water areas along the GIWW in both the project and reference areas, near-vertical, color-infrared aerial photography (1:12,000 scale, with ground controls) will be obtained once prior to construction in 1997, and in post-construction year 2001. The photography will be georectified by National Wetlands Research Center (NWRC) personnel using standard operating procedures described in Steyer et al. (1995). Detailed photointerpretation, mapping, and Geographical Information System (GIS) interpretations are not currently planned on the CS-24 aerial photography. (See item no. 4 in the Notes section.)

Based on the CRMS review, the 2010 and 2016 land:water analyses were eliminated. Land:water changes will be documented using basin-level satellite imagery that will be collected and analyzed through CRMS.

2. Shoreline Change To document changes in shoreline position along the GIWW, shoreline makers will be placed at points along the vegetated marsh edge adjacent to the rock breakwater consisting of twelve transects divided by shoreline type in the project and reference areas (minimum of 3 but not to exceed 1 per 1,000 ft [305 m]). On each survey transect, a PVC pole will be installed to mark the vegetated edge of the bank (VEB), and a post will be installed at the end point in the marsh or on the spoil bank to establish a hub for use in relocating each transect. Shoreline position relative to the shoreline markers along the survey transects will be documented at the same time of the year, once as-built in 1999, and in post-construction years 2002, 2004, 2007, 2010, 2013, and 2016. Shoreline positions will be

compared to historical data sets available in digitized format for 1956, 1978, 1988, and for any subsequent years that become available during the life of the project.

Based on the CRMS review, DGPS surveys which were originally scheduled to be concurrent with the shoreline marker measurements have been eliminated.

Anticipated Statistical Analyses and Hypotheses

The following hypotheses correspond with the monitoring elements and will be used to evaluate the accomplishment of the project goal.

2. Shoreline Erosion. Descriptive and summary statistics, analysis of variance (ANOVA), and suitable hypothesis testing will be used to compare measured rates (in ft/yr) of shoreline movement along the GIWW adjacent to the project and reference areas between successive years. In addition, GIS interpretations of the pre- and postconstruction aerial photography taken on the Perry Ridge Shore Protection (CS-24) project, and of historical data sets available in digitized format for 1956, 1978, 1988, and any subsequent years that become available, will be used for statistical analysis of the long-term movement of the project area shoreline along the GIWW. When the H_0 is not rejected, the possibility of negative effects will be examined. Two sets of hypotheses will be tested to determine if the following project goal has been met.

Goal: Decrease the shoreline retreat rate along the north bank of the GIWW adjacent to the project area.

*Hypothesis*¹:

H_0 : The shoreline retreat rate along the project area at time point i will not be significantly less than the shoreline retreat rate along the reference area at time point i .

H_a : The shoreline retreat rate along the project area at time point i will be significantly less than the shoreline retreat rate along the reference area at time point i .

*Hypothesis*²:

H_0 : Shoreline retreat rate along the project area at time point i will not be significantly less than the shoreline retreat rate along the project area in previous years.

H_a: Shoreline retreat rate along the project area at time point i will be significantly less than the shoreline retreat rate along the project area in previous years.

Notes

1. Implementation: Start Construction: October 1, 1998
End Construction: February 1, 1999
2. NRCS Point of Contact: Dexter Sapp (318) 473-7688
3. DNR Project Manager: Mel Guidry (337) 482-0682
DNR Monitoring Manager: Mark Mouledous (337) 482-0661
4. The twenty year monitoring plan development and implementation budget for this project is \$153,704. A progress report will be available in November 2000. Periodic comprehensive reports on coastal restoration efforts in the Calcasieu-Sabine hydrologic basin will describe the status and effectiveness of the project as well as cumulative effects of restoration projects in the basin.
5. The marsh to open water ratio in the project area will be evaluated by NWRC personnel using GIS interpretations of the pre- and post-construction aerial photography taken (at 1:24,000 scale) for the Perry Ridge Shore Protection (CS-24) project area. GIS interpretations of these data sets, and of historical data sets available in digitized format for 1956, 1978, 1988, and for any subsequent years that become available during the life of this project, will be used in the analysis to document changes in the marsh to open water ratio within the CS-24 project area.
6. References:

Chabreck, R. H., and G. Linscombe 1978 and 1988. Vegetation type map of the Louisiana coastal marshes. Louisiana Department of Wildlife and Fisheries, New Orleans. Scale 1:62,500.

Chabreck, R. H., T. Joanen, and A. W. Palmisano 1968. Vegetation type map of the Louisiana coastal marshes. Louisiana Department of Wildlife and Fisheries, New Orleans. Scale 1:62,500.

Steyer, G. D., R. C. Raynie, D. L. Steller, D. Fuller, and E. Swenson 1995. Quality management plan for Coastal Wetlands Planning, Protection, and Restoration Act monitoring plan. Open-file series 95-01. Baton Rouge: Louisiana Department of Natural Resources, Coastal Restoration Division.

U.S. Department of Agriculture, Soil Conservation Service 1988. Soil Survey of Calcasieu Parish, Louisiana. Publication No. 1988 0 - 493-544. Washington, D.C.:U.S. Government Printing Office. 161 pp, 86 maps. Scale 1:20,000.

_____1992. Wetland Value Assessment, Alexandria, LA.: Soil Conservation Service. 3 pp.

U.S. Department of Agriculture, Natural Resources Conservation Service 1996. Environmental Assessment, USDA-NRCS, Calcasieu Parish, Louisiana. 18 +pp.

CS24mp2003-08-14.wpd