



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

Monitoring Plan

for

Clear Marais Bank Protection

State Project Number CS-22
Priority Project List 2

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Calcasieu Parish

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MONITORING PLAN

PROJECT NO. CS-22 CLEAR MARAIS

ORIGINAL DATE: May 30, 1995

REVISED DATES: July 23, 1998, August 14, 2003

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, monitoring of shoreline markers was increased to five times post-construction.

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. As a result of a joint meeting with DNR, USGS, and the federal sponsor, the recommendations for this Monitoring Plan were to eliminate the 2006 and 2015 aerial photography. Satellite imagery collected through CRMS and classified to land and water will supplement shoreline measurements. These recommendations have been incorporated into this revised Monitoring Plan and are described in the Monitoring Elements section.

Project Description

The Clear Marais shoreline protection project area is located along the north bank of the Gulf Intracoastal Waterway (GIWW) in Cameron Parish between the Alkali ditch and Goose Lake (figure 1). The project provides features to protect 3,827 ac (1,531 ha) of freshwater marsh that are threatened by saltwater intrusion and marsh loss from breaches in the GIWW shoreline. Of the 3,827 ac of fresh marsh, 1,179 ac (472 ha) are vegetated marsh and 2,648 ac (1,059 ha) are open water, with the dominant plant species present in the marsh being *Sagittaria lancifolia* (bulltongue), *Scirpus californicus* (bullwhip), and *Juncus effusus* (soft rush).

The construction of the GIWW, which was deepened to its present depth of 12 ft (3.7 m) between 1942 and 1949, provides an avenue for high-action wave energy. This wave energy is increased during high-river stages in the Calcasieu-Sabine basin (USDA 1993). The marshes located adjacent to the GIWW are protected from rapid fluctuations of water salinity and water level by a water management levee. However, increased tidal action and boat wakes threaten to create breaches in the levee that would connect the GIWW with interior ponds and marshes. The shoreline erosion rate of the north bank of the GIWW adjacent to the freshwater wetlands is 10 ft/yr (3.05 m/yr), based on

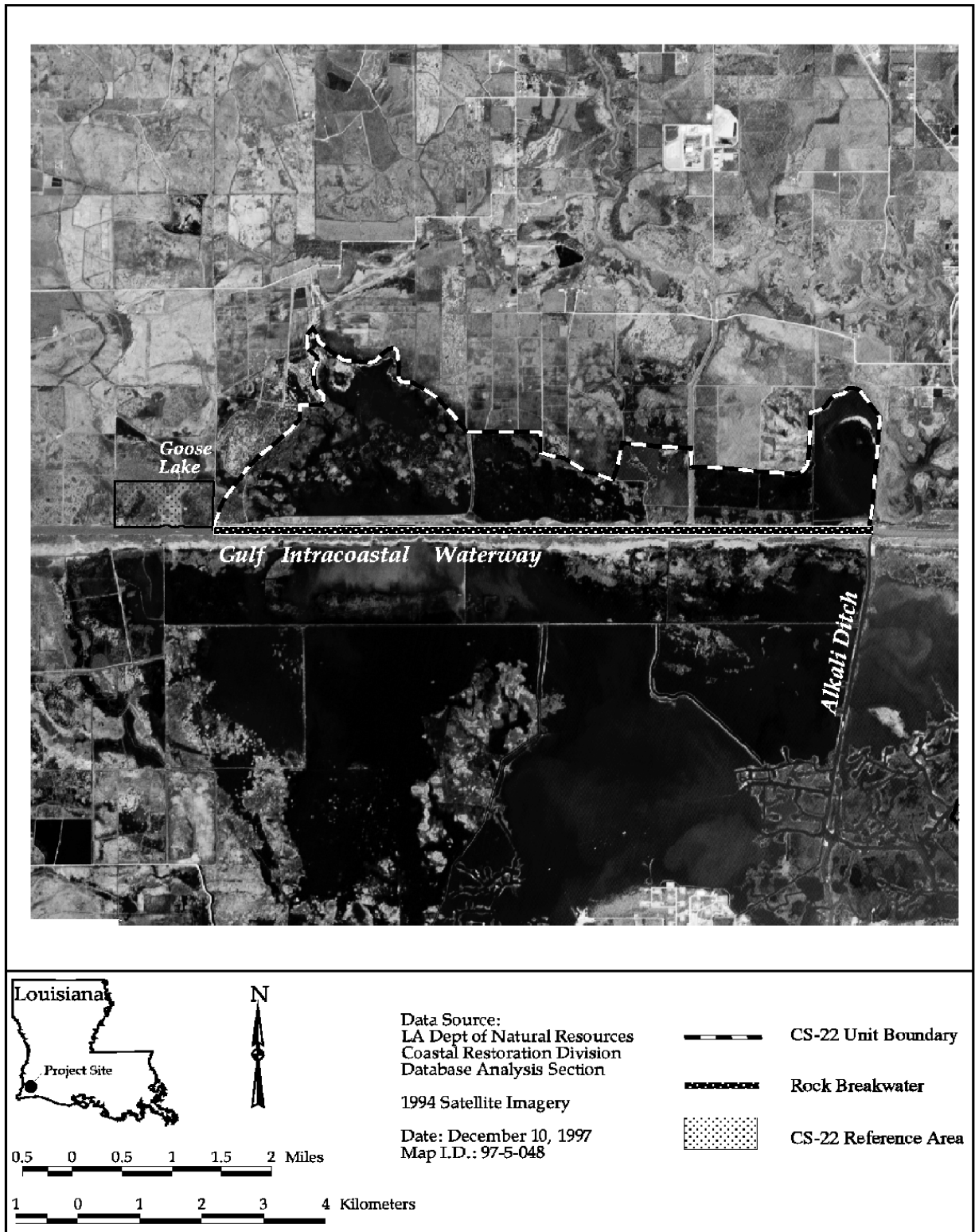


Figure 1. Clear Marais (CS-22) project area, reference area, and shoreline protection feature location.

aerial photography (USDA 1992). Additionally, the present rate of wetland loss in the project area is 1.1%/yr (USDA 1992). The susceptibility to saltwater damage and the erosional forces of the GIWW threaten the integrity of the remaining acres of the vegetated freshwater marsh.

The project design includes a 35,000 ft (10,668 m) rock dike along the north shore of the GIWW to protect the integrity of the Clear Marais freshwater wetlands north of the GIWW. Currently there are no locations for fishery exchange from the GIWW into the interior marsh, therefore the breakwater will not impact existing fishery access into the project area.

Other projects that have successfully employed the use of a rock breakwater is the Blind Lake Project and Cameron Prairie Refuge project. Both projects are located in Cameron Parish along the GIWW and have been subjected to the same high-energy wave erosion as the Clear Marais project area. Both projects have met their goals and objectives of preventing further erosion of existing spoil bank.

Project Objective

1. Maintain and protect approximately 35,000 linear ft (10,668 m) of management levee along the north bank of the GIWW that will contribute to protecting the integrity of the freshwater marshes of Clear Marais adjacent to the GIWW.

Specific Goal

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

1. Decrease the rate of shoreline erosion along the north bank of the GIWW south of the Clear Marais marshes through the use of a rock breakwater.

Reference Area

The importance of using appropriate reference areas cannot be overemphasized. Monitoring on both project and reference areas provides a means to achieve statistically valid comparisons, and is therefore the most effective means of evaluating project success. The evaluation of sites was based on the criteria that both project and reference areas receive similar hydrological influences from the GIWW and are of similar soil type. For this shoreline protection project, 1 mi (1.6 km) west of the proposed breakwater will be used as a reference area. Aerial photography will be flown for both project and reference areas. A similar sampling scheme will be used for the reference area as used for the project area.

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 Elements

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

1. **Aerial Photography** To document vegetated and non-vegetated areas, color infrared aerial photography (1:12,000 scale with ground controls) will be obtained. The photography will be georectified using National Wetland Research Center (NWRC) standard operating procedures described in Steyer et al. (1995), but detailed photointerpretation, mapping and GIS is not currently planned. The photography will be obtained in 1994 (pre-construction).

Based on the CRMS review, aerial photography originally scheduled for 2006 and 2015 was eliminated. Land:water analysis from aerial photography will be replaced with land:water analyses conducted on basin-scale satellite imagery collected through CRMS. In addition, approximately 5 Chabreck and Linscombe stations are located within the project area which can provide information relative to vegetation habitat changes.

2. **Shoreline Change** To document shoreline movement, 35 shoreline markers will be placed at points along the vegetated marsh edge adjacent to the rock breakwater at a maximum interval of 1000 ft (305 m). Five shoreline markers will be placed at the same 1000 ft intervals 1 mi (1.6 km) west of the proposed breakwater in the reference area. The position of the shoreline relative to the shoreline markers will be documented in 1997, 2000, 2003, 2006, 2010, and 2015 by direct measurement. A GPS coordinate will be obtained for each shoreline marker placed to maintain baseline condition over time. The shoreline will be stratified into three different land types: severe erosion directly adjacent to Clear Marais wetlands, moderate erosion from end of management levee to Brannon ditch and mild erosion east of Brannon ditch to the Alkali ditch (figure 2). Determination of land types were made through evaluation of aerial photography.

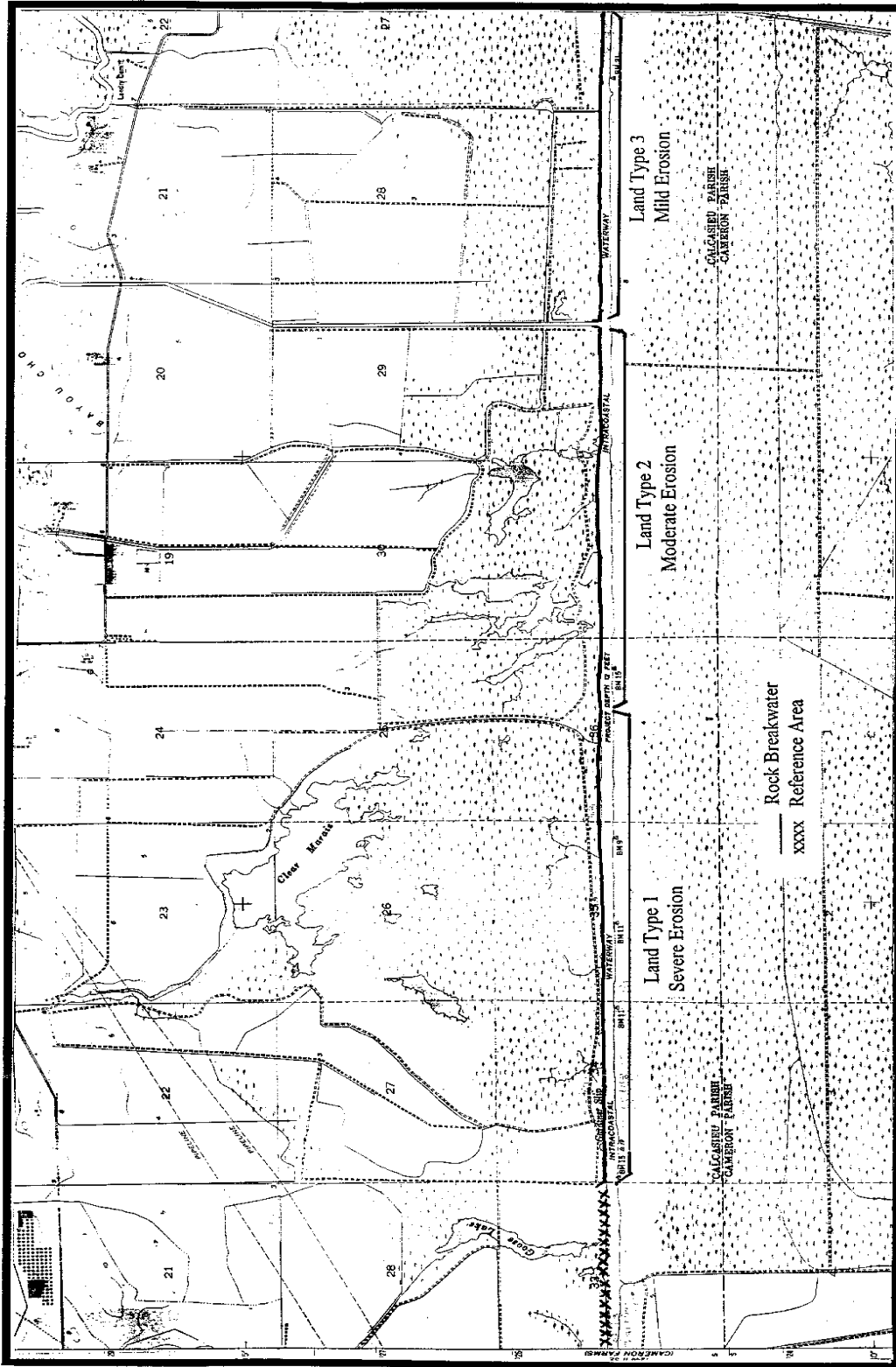


Figure 2 Clear Marais Shoreline Protection Location with Delineation of Land Types

Anticipated Statistical Analyses and Hypotheses

The following hypotheses correspond with the monitoring elements above and will be used to evaluate the accomplishment of the project goal. When the null hypothesis is not rejected, possible negative effects will be examined.

1. Descriptive and summary statistics will be used on both historical data and data collected post-project implementation to assess changes in marsh loss/gain rates.

Goal: Decrease the rate of shoreline erosion along the north bank of the GIWW adjacent to the Clear Marais freshwater marsh.

2. Descriptive and summary statistics will be used to compare measured rates of shoreline movement (ft/yr) within the project area between successive years. Also, historical values for the area as well as data available from other surveys (i.e., USACE, USFWS, LDNR, LSU) will be gathered to document and allow for statistical analysis of long-term shoreline movement along the GIWW in the project area.

Goal: Decrease the rate of shoreline erosion along the north bank of the GIWW adjacent to the Clear Marais freshwater marsh.

Two sets of hypotheses will be used to quantify shoreline movement over time within the project area and the project vs. reference area.

Hypothesis:

H_0 : Shoreline erosion rates within experimental area at time point (j) will not be significantly less than shoreline erosion rates at time point (i).

H_a : Shoreline erosion rates within experimental area at time point (j) will be significantly less than shoreline erosion rates at time point (i).

Hypothesis:

H_0 : Shoreline erosion rates within experimental area at time point (j) will not be significantly less than shoreline erosion rates within reference area.

H_a : Shoreline erosion rates within experimental area at time point (i) will be significantly less than shoreline erosion rates within reference area.

