



**Coastal Protection and Restoration
Authority of Louisiana
Office of Coastal Protection and
Restoration**

**2008 Operations,
Maintenance, and Monitoring
Report**

for

**BAYOU CHEVEE SHORELINE
PROTECTION**

State Project Number PO-22
Priority Project List 5

July 2008
Orleans Parish

Prepared by:

Bryan Gossman
and
Barry Richard

CPRA/Office of Coastal Protection and Restoration
New Orleans Field Office
CERM, Suite 309
2045 Lakeshore Dr.
New Orleans, La 70122



Suggested Citation:

Gossman, B. and B. Richard 2008. *2008 Operations, Maintenance, and Monitoring Report for Bayou Chevee Shoreline Protection (PO-22)*, Louisiana Department of Natural Resources, Coastal Restoration Division, New Orleans, Louisiana



2008 Operations, Maintenance, and Monitoring Report
For
Bayou Chevee Shoreline Protection (PO-22)

Table of Contents

I. Introduction 4

II. Maintenance Activity 6

 a. Project Feature Inspection Procedures 6

 b. Inspection Results 6

 c. Maintenance Recommendations 6

III. Operations Activity 6

IV. Monitoring Activity 6

 a. Monitoring Goals 6

 b. Monitoring Elements 7

 c. Preliminary Monitoring Results and Discussion..... 7

 Shoreline Change 7

 Vegetation (SAV) 12

V. Conclusions 15

 a. Project Effectiveness 15

 b. Recommended Improvements 15

 c. Lessons Learned..... 15

VI. Literature Cited 16



Preface

The 2008 OM&M Report format is a streamlined approach which combines the Operations and Maintenance annual project inspection information with the Monitoring data and analyses on a project-specific basis. This new reporting format for 2008 includes monitoring data collected through May 2008, and annual Maintenance Inspections through June 2008. Monitoring data collected after May 2008 and maintenance inspections conducted between July 2008 and June 2009 will be presented in the 2009 OM&M Report.

I. Introduction

The Bayou Chevee Shoreline Protection project is located within the northern section of the Bayou Sauvage National Wildlife Refuge, approximately 10 miles northeast of New Orleans, Louisiana (figure 1). The project area is located on the southern shoreline of Lake Pontchartrain and is divided into two areas, the north cove area and the south cove area. The north cove project area, comprising 164 acres, is located just north and west of Bayou Chevee. It extends 300 ft into the marsh from the existing shoreline of a 110-acre pond of open-water and includes 54 acres of brackish marsh. The south cove area, consisting of 48 acres, is located southeast of Bayou Chevee and northwest of Chef Menteur Pass. It extends 300 ft into the marsh from the existing shoreline around a 27-acre cove and includes 21 acres of brackish marsh. Project and reference area marshes are dominated by *Spartina patens* (marshhay cordgrass) with *Pluchea spp.* and *Cyperus spp.* present.

High wave and current energies associated with Lake Pontchartrain and Chef Menteur Pass have caused extensive shoreline erosion along the Lake Pontchartrain shoreline that has been estimated to average 15 ft/yr, or approximately 3.55 ac/yr from 1958-1983 (U.S. Army Corps of Engineers [USACE] 1997). Over the twenty year life of the project, the shoreline would be expected to erode 300 feet, without project implementation. Shoreline erosion was not a measurable problem for the interior pond of the north cove prior to 1997 when the pond was separated from Lake Pontchartrain by a 250 ft strip of marsh. However, by early 1997, this marsh had disappeared leaving the interior shoreline exposed to the wave energies of Lake Pontchartrain.

The PO-22 project consists of approximately 8,875 linear feet of rock bankline protection along the shoreline of Lake Pontchartrain, extending north and south from Bayou Chevee. Construction was completed on December 12, 2001. The shore protection will allow for the enclosed shallow water areas to be colonized by a greater abundance of submerged aquatic vegetation (SAV).



Figure 1. Location of Bayou Chevee Shoreline Protection (PO-22) project and reference areas with 2008 shoreline.

II. Maintenance Activity

a. Project Feature Inspection Procedures

An inspection of the Bayou Chevee Shoreline Protection Project (PO-22) was held on March 13, 2007, by representatives of LDNR, Barry Richard, Peter Hopkins and Jason Binet of USACE. The tidal gauge in Chef Pass read 0.2 ft NAVD at the time of the inspection.

b. Inspection Results

Structures appear to be settling, however, it was not noticeable enough to warrant any action at this time.

c. Maintenance Recommendations

i. Immediate/Emergency Repairs

No immediate repairs are suggested.

ii. Programmatic/Routine Repairs

The next scheduled rock lift is in 2009.

III. Operations Activity

No operations activities were performed.

IV. Monitoring Activity

This is a comprehensive report and includes all data collected from the pre-construction period and the post-construction period through May 2008.

a. Monitoring Goals

The objective of the Bayou Chevee Shoreline Protection project is to provide shore protection for the north cove and south cove areas of the Bayou Sauvage National Wildlife Refuge and enhance the establishment of submerged aquatic vegetation in the south cove area while maintaining or enhancing their establishment in the north cove area.

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

1. Decrease the mean rate of shoreline erosion in both the north and south cove areas.
2. Maintain (north cove) or maintain/increase (south cove) mean abundance of submerged aquatic vegetation in the ponds behind the rock dikes.

b. Monitoring Elements

Shoreline Change

Using GPS, shoreline position was documented as-built in early 2002, and post-construction in January 2005 and May 2008. Additional surveys will be conducted in 2010, 2013, 2016, and 2019 post-construction for mapping shoreline change and movement over time. Shoreline erosion rates for the project areas will be compared to the shoreline erosion rates of the reference areas, and with historical rates of shoreline erosion collected by Gagliano et al. (1988).

Vegetation (SAV)

Methods described in Nyman and Chabreck (1996) were used to determine the frequency of occurrence of SAV along two transects established in each of the north and south cove project and reference areas (Fig. 2). SAV was sampled for pre-construction years 1998 and 2001, and in 2004 and 2008 post-construction. Additional surveys will be conducted in years 2010, 2013, 2016, and 2019.

c. Preliminary Monitoring Results and Discussion

Shoreline Change

All areas have experienced land loss since the previous survey in 2005, ranging from minor in the North Cove reference area to severe in the South Cove reference area. Much of the land loss that has occurred is attributable to the effects of hurricane Katrina (August 2005) as indicated by the very large area of land lost from 2005 to 2008 as compared to the relatively small area between 2002 and 2005.

The North Cove project area experienced a loss of 14.82 ac from 2005 to 2008 (Fig. 3). The majority of the land loss in this area occurred on the north facing bank along the southeastern shoreline. Additionally, the small island in the center of the North Cove project area has eroded completely since the 2005 survey.

The North Cove reference area experienced the least shoreline change of any of the four areas surveyed, with a loss of 2.56 ac from 2005 to 2008 (Fig. 4). The greatest loss occurred in the southern end of the interior pond, and the area along the shoreline of Lake Pontchartrain.

The South Cove project area lost a total of 23.59 ac from 2005 to 2008 (Fig. 5). The shoreline retreated to the south all along the area surveyed. At the western end of the South Cove project area, the shoreline breached into an existing pond. Although this area was not calculated as land loss, the shoreline profile was greatly changed. Toward the

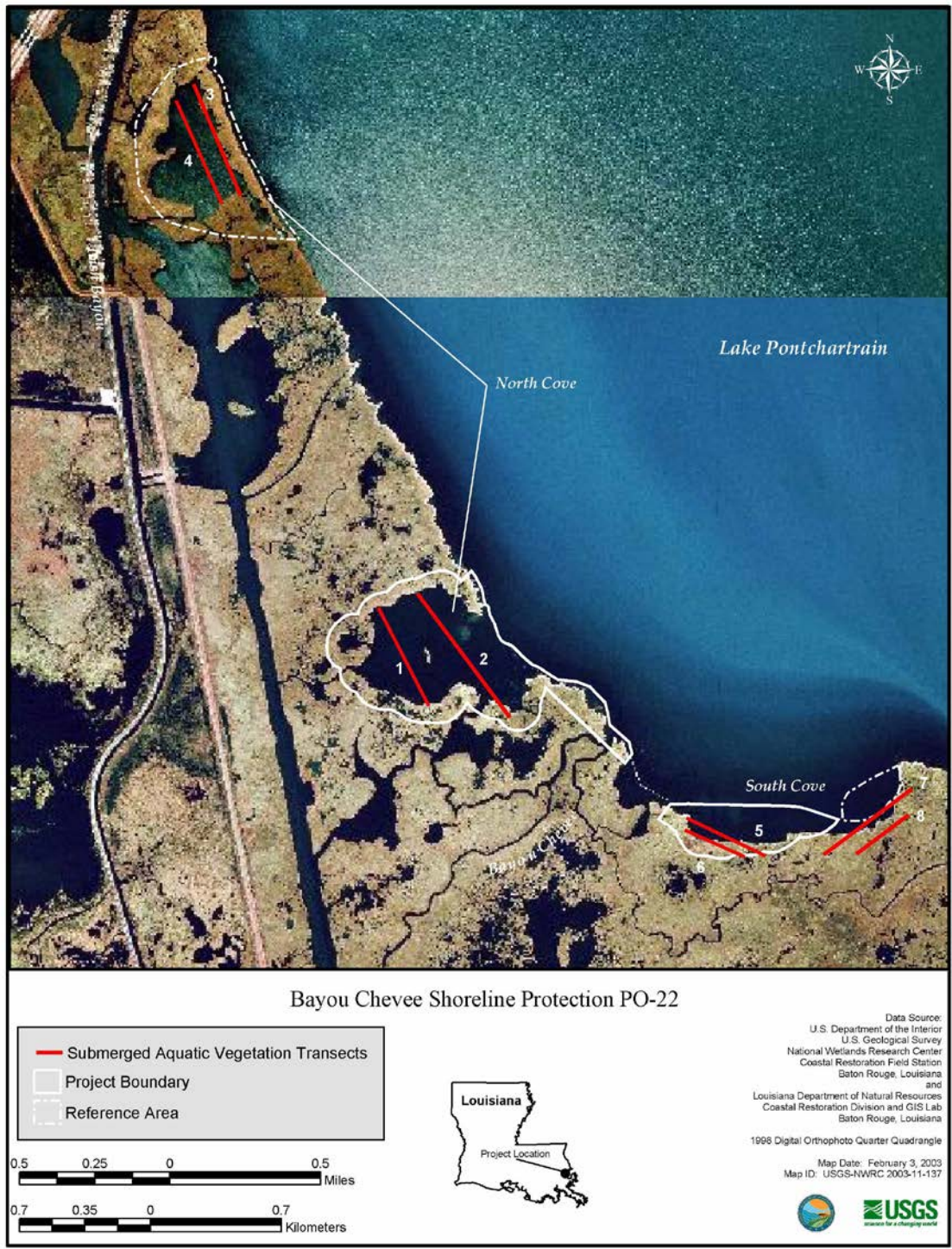


Figure 2. Location of Bayou Chevee Shoreline Protection (PO-22) submerged aquatic vegetation transects.

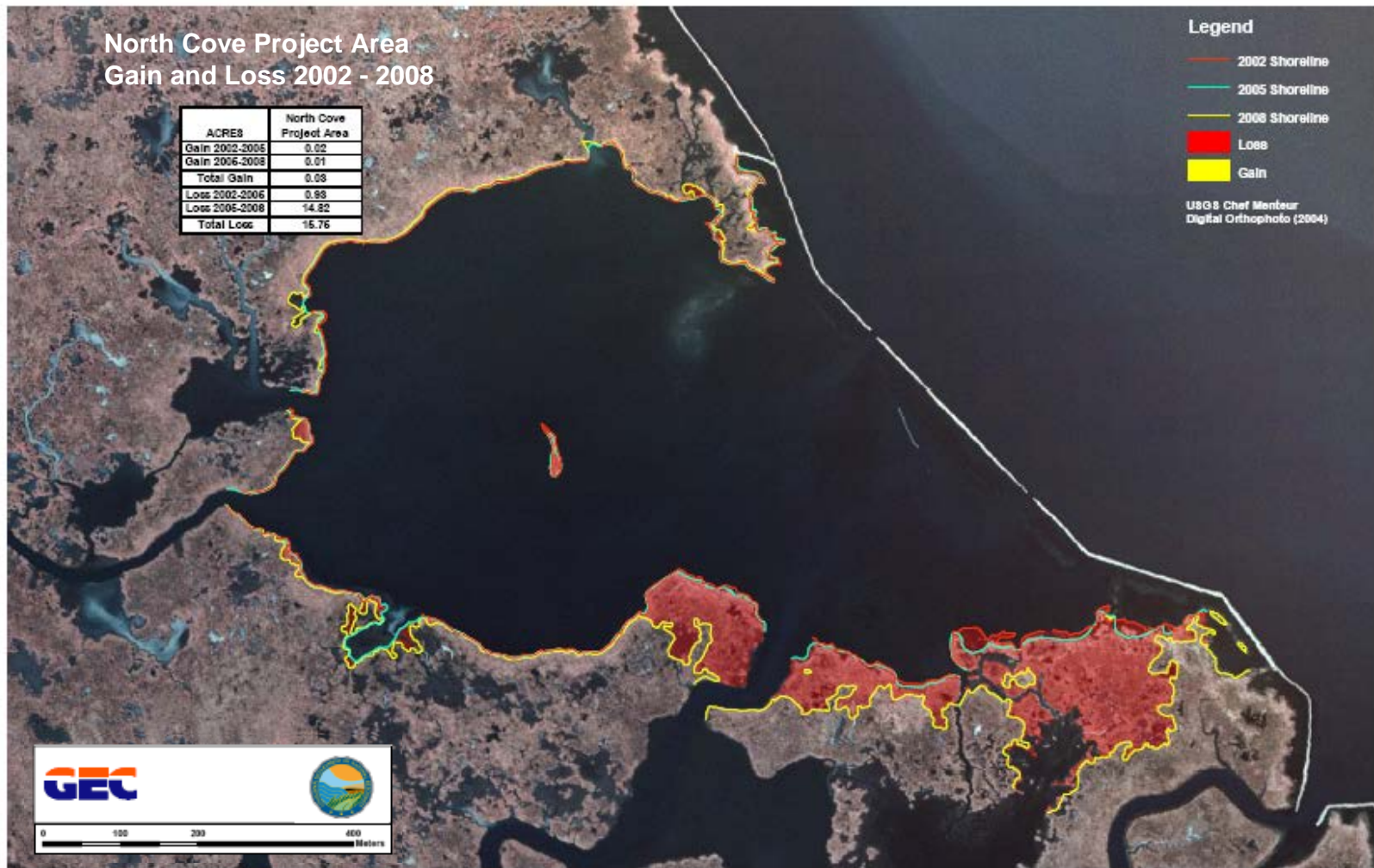


Figure 3. 2002, 2005, and 2008 shoreline position with estimates of land loss and gain for the North Cove project area of the Bayou Chevee Shoreline Protection (PO-22) project.

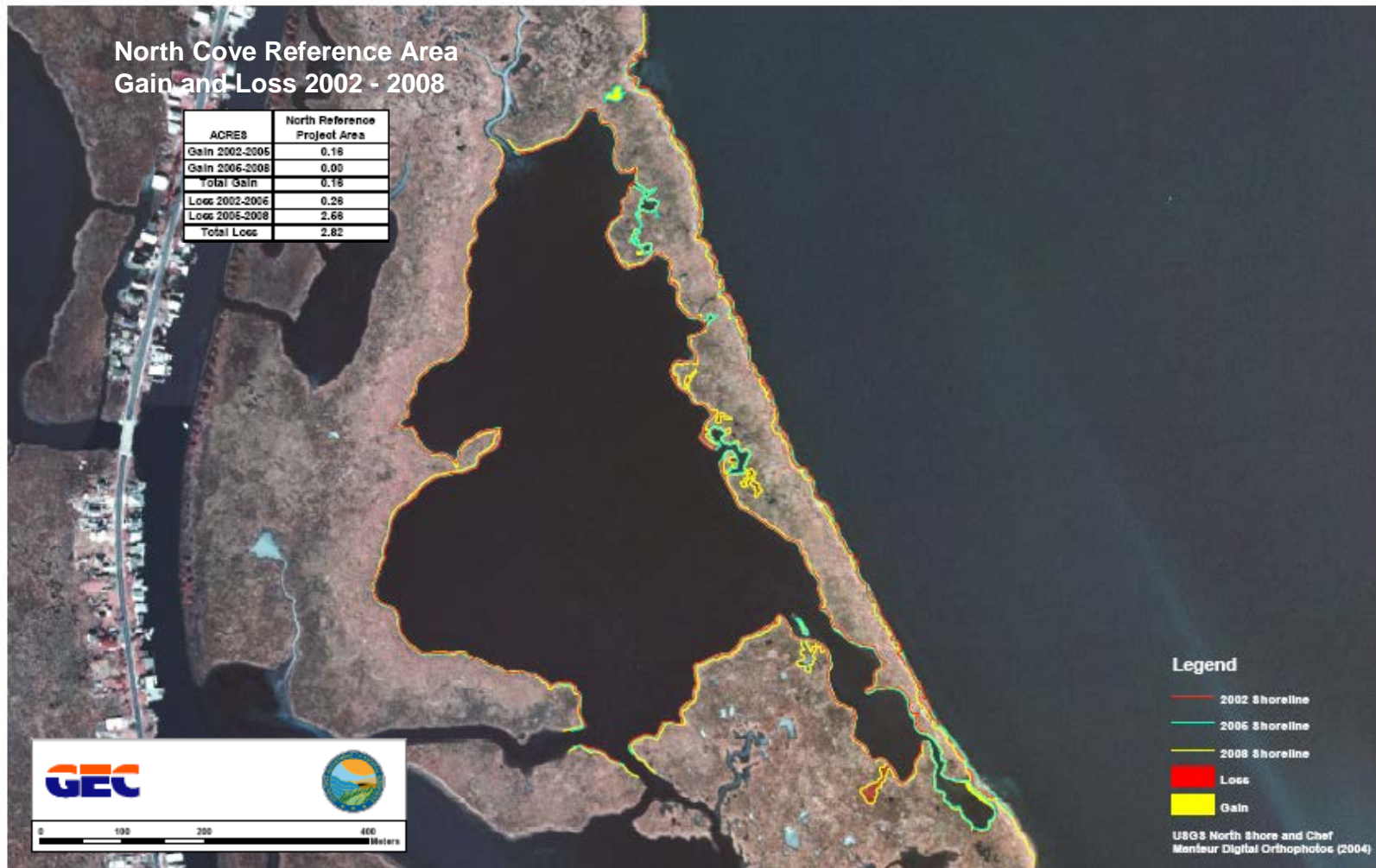


Figure 4. 2002, 2005, and 2008 shoreline position with estimates of land loss and gain for the North Cove reference area of the Bayou Chevee Shoreline Protection (PO-22) project.

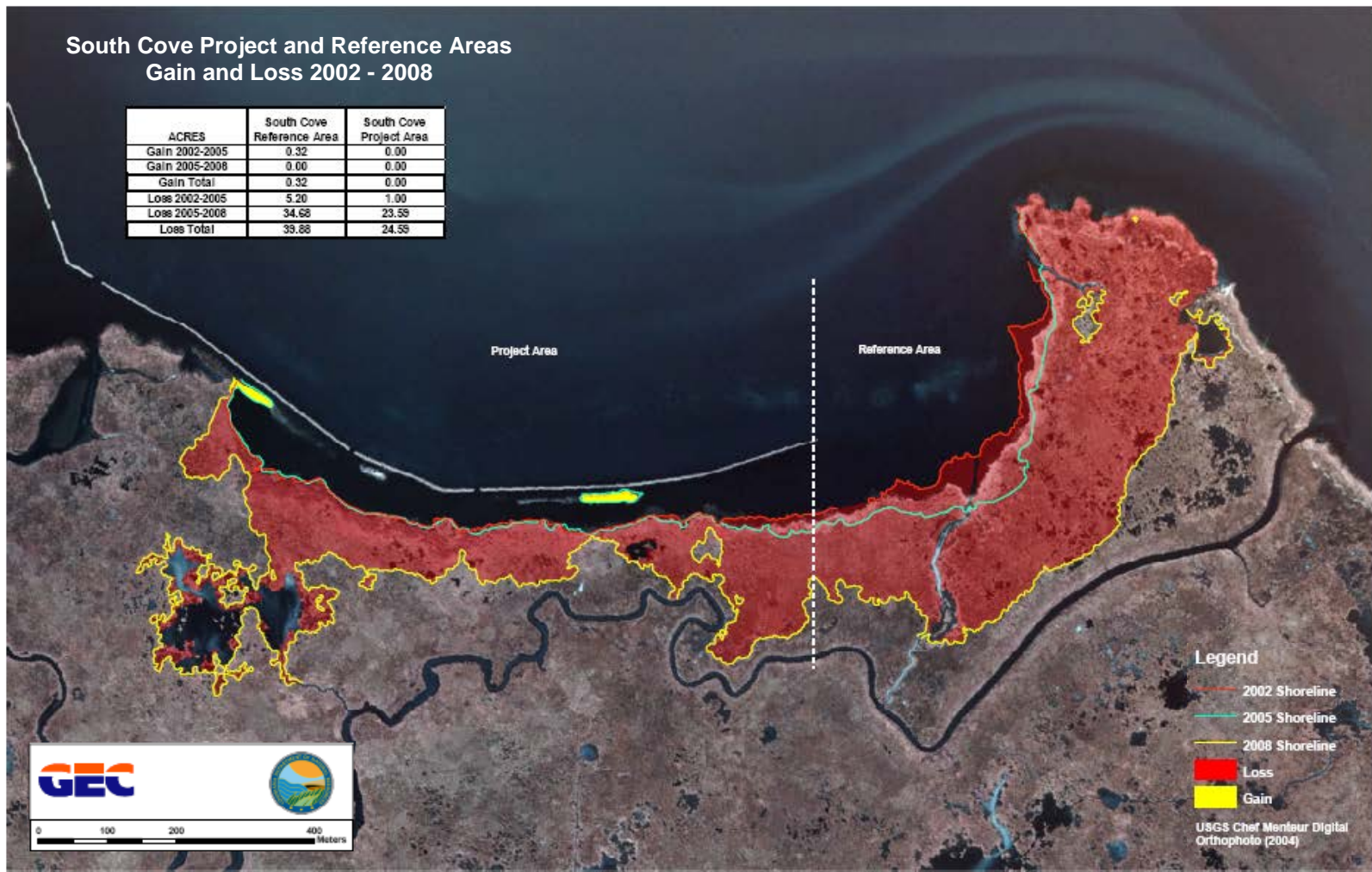


Figure 5. 2002, 2005, and 2008 shoreline position with estimates of land loss and gain for the South Cove project and reference areas of the Bayou Chevee Shoreline Protection (PO-22) project. The dotted line indicates the boundary between project and reference areas.

eastern end of the project area, the shoreline retreated all the way to the bayou to the south. The boundary between the South Cove project and reference areas was determined by drawing a straight line south from the terminal end of the rocks to the shoreline. Splitting them here shows the “erosional shadow” realized by not having the rocks terminate on land, and likely accounted for some of land loss within the South Cove project area. The land created directly behind the rocks from the placement of spoil during construction remains intact.

The South Cove reference area had the greatest land loss of all four areas with 34.68 ac of land lost between 2005 and 2008 (Fig. 5). The shoreline has retreated all along the area surveyed, coming within 100 ft of the bayou to the south. Several small islands remain along the eastern end of the reference area near Chef Menteur Pass.

Vegetation (SAV)

In 1998 *Vallisneria americana*, *Myriophyllum spicatum* and *Ruppia maritima* (south cove reference only) occurred at an average frequency of 33%, 10%, and 13% respectively, within the south cove area (table 1). The south cove project and reference areas were completely devoid of SAV in 2001. By 2004 the South Cove area had been reoccupied by SAV. Both diversity and frequency had increased since the 2001 survey, with numbers rivaling and even exceeding those from the 1998 survey. However, conditions had deteriorated by 2008. SAV was scarce in the South Cove project area with 63.46% of the samples containing no SAV. Among the samples with SAV, *Myriophyllum spicatum* was the dominant species (19.23%). In the South Cove project area, the greatest concentrations of SAV were found along the western end of the transects closest to the rock wall. A more dramatic decrease in SAV frequency and diversity occurred in the South Cove reference area where 90% of samples contained no SAV. The remaining 10% of samples contained only algae. Due to a high rate of shoreline retreat in the South Cove reference area, the SAV transects are now located farther from the shore than they were in 2004.

The North Cove project area showed a similar decline between 1998 and 2001, with only algae and a small amount of *R. maritima* (6.19%) recorded during 2001 sampling compared to a high frequency and diversity of SAV in 1998 (table 2, Fig. 6). The 2004 survey of the North Cove project area resulted in an increase of both diversity and frequency of occurrence of SAV relative to the survey of 2001. The 2008 survey revealed a decrease in frequency of SAV with 30.63% of samples containing no SAV (up from 5.65% in 2004). The area was dominated by *Potamogeton pusillus* (56.76%) and *Myriophyllum spicatum* (31.53%).

The North Cove reference area showed a high occurrence of algae (81%) and *R. maritima* (61%) in 2001, but had lost the diversity and overall abundance of SAV species recorded during the 1998 sampling (table 2). In 2004, the North Cove reference area experienced an increase in diversity over the two previous surveys (table 2). Although diversity increased, abundance of species decreased with SAV absent in one third of the samples.

Table 1. Relative frequency of submerged aquatic vegetation species for south cove project and reference area during pre-construction years 1998 and 2001, and post-construction years 2004 and 2008 for the Bayou Chevee Shoreline Protection (PO-22) project. The

symbol (--) denotes the species was not documented in that area.

Scientific Name	South Cove Proj. 1998	South Cove Proj. 2001	South Cove Proj. 2004	South Cove Proj. 2008	South Cove Ref. 1998	South Cove Ref. 2001	South Cove Ref. 2004	South Cove Ref. 2008
Empty Sample	56.67	100	--	63.46	56.67	100	64.52	90.0
<i>Alga</i>	--	--	26.92	19.23	--	--	6.45	10.0
<i>Ceratophyllum demersum</i>	--	--	28.85	--	--	--	--	--
<i>Myriophyllum spicatum</i>	13.33	--	82.69	19.23	6.67	--	25.81	--
<i>Najas guadalupensis</i>	--	--	5.77	13.46	--	--	1.61	--
<i>Ruppia maritima</i>	--	--	21.15	11.54	13.33	--	4.84	--
<i>Vallisneria americana</i>	36.67	--	--	--	30.00	--	--	--

Table 2. Relative frequency of submerged aquatic vegetation species for north cove project and reference area during pre-construction years 1998 and 2001, and post-construction years 2004 and 2008 for the Bayou Chevee Shoreline Protection (PO-22) project. The symbol (--) denotes the species was not observed in that area.

Scientific Name	North Cove Proj. 1998	North Cove Proj. 2001	North Cove Proj. 2004	North Cove Proj. 2008	North Cove Ref. 1998	North Cove Ref. 2001	North Cove Ref. 2004	North Cove Ref. 2008
Empty Sample	3.33	50.44	5.65	30.63	--	9.80	29.84	1.92
<i>Alga</i>	--	46.02	58.06	14.41	--	81.37	27.42	18.26
<i>Ceratophyllum demersum</i>	16.67	--	12.10	--	--	--	11.29	--
<i>Myriophyllum spicatum</i>	88.33	--	66.13	31.53	100	--	20.97	45.19
<i>Najas guadalupensis</i>	30	--	49.19	--	100	--	38.71	80.77
<i>Potamogeton pusillus</i>	--	--	--	56.76	--	--	--	26.92

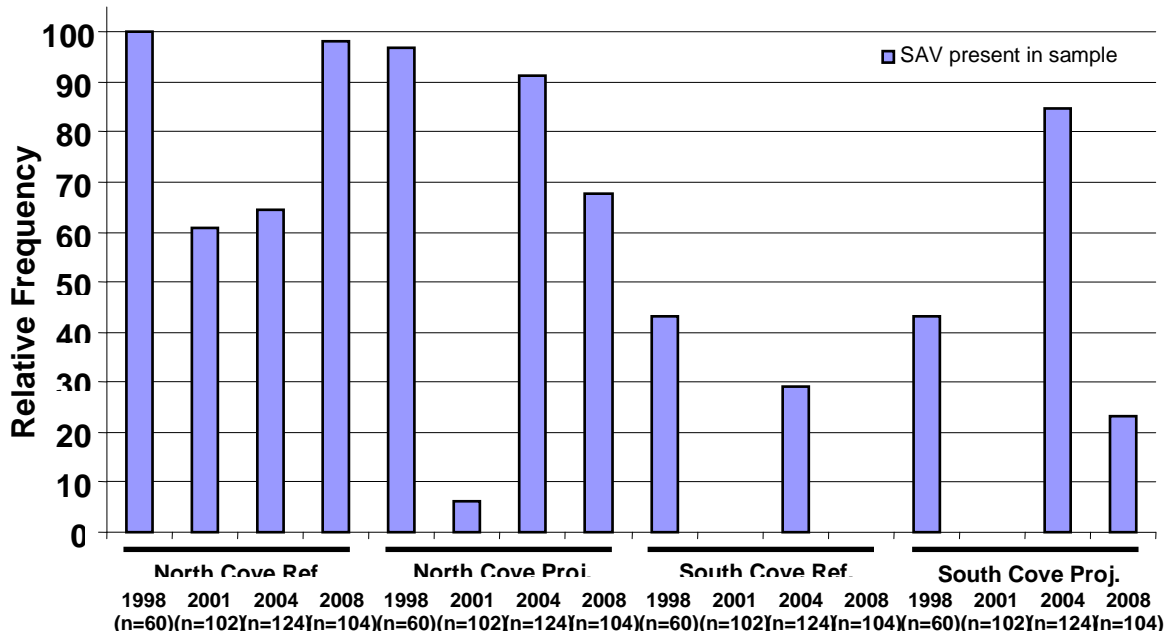


Figure 6. Frequency of occurrence of submerged aquatic vegetation in samples for North and South cove project and reference areas 1998, 2001, 2004, and 2008 for the Bayou Chevee Shoreline Protection (PO-22) project.

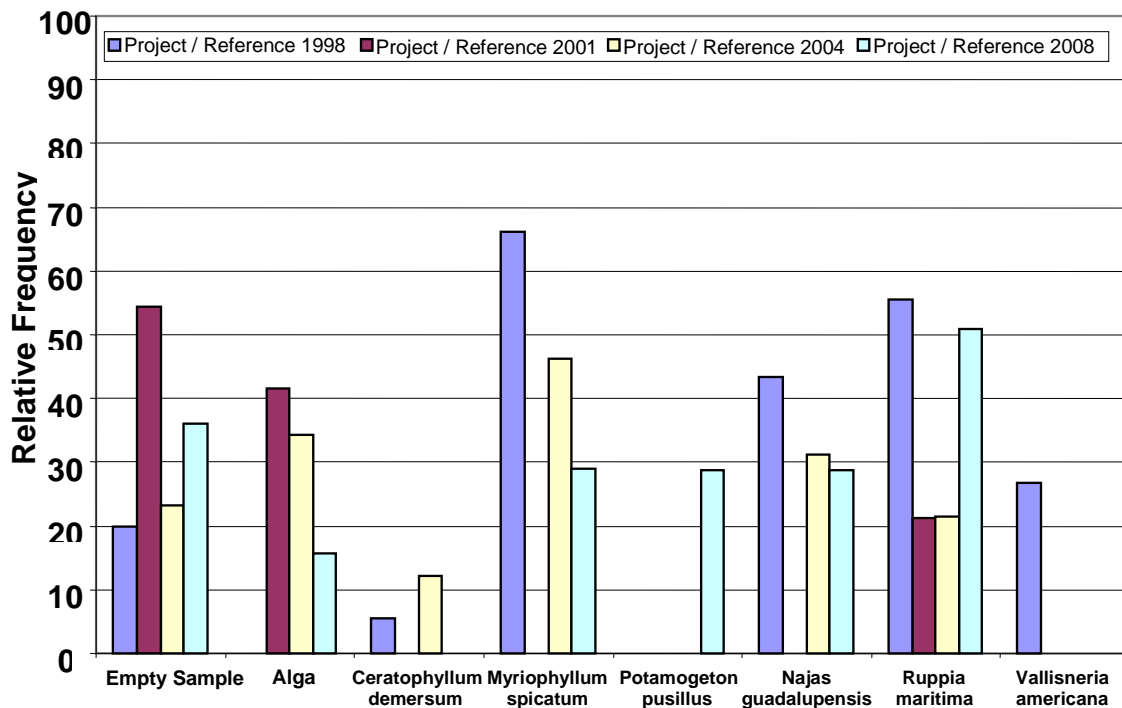


Figure 7. Relative frequency of submerged aquatic vegetation species for project and reference areas of the Bayou Chevee Shoreline Protection (PO-22) project.

The north cove reference area showed the greatest recovery of any of the four areas in 2008. SAV was present in 98.08% of samples with *Najas guadalupensis* as the dominant species (80.77%) followed by *Myriophyllum spicatum* (45.19%).

V. Conclusions

a. Project Effectiveness

The post-construction survey in 2005 showed that the rock structure had maintained the adjacent shoreline in as-built condition. However, as evidenced by the large amount of shoreline retreat between 2005 and 2008, the capacity of the rock structure to prevent erosion was overcome by the effects of Hurricane Katrina in 2005. From project construction through 2005 the North and South Cove project areas lost a combined 6.13 ac of land compared to 49.5 ac between 2005 and 2008. In all four of the surveyed areas, the greatest amount of shoreline retreat occurred on north-facing shorelines. This is most evident in the North Cove project area where the majority of the land loss was concentrated along a section of north-facing shoreline in the southeastern corner of the project area. The rest of the project area remained relatively unchanged. This trend continued in the South Cove area, where both the project and reference areas are composed of north-facing shoreline. Despite the large amount of land loss in the South Cove, it appears that the rock structure is still providing some benefit since the reference area lost approximately 47% more land than the project area.

The 2004 survey indicated a recovery of SAV frequency and diversity in all areas. The 2008 survey was more mixed. The North Cove remained relatively healthy with high frequency and diversity in both the project and reference area. The South Cove area, by contrast, has declined greatly. In the reference area, the decline in SAV is likely due to the fact that the shoreline has retreated to the south, leaving the SAV transects farther from the shore in a deep, high-energy environment. The decline in SAV in the project area is harder to explain, however the majority of the SAV in the project area was concentrated along the western end of the transects in the area afforded the most protection by the rock structure.

b. Recommended Improvements

The boundaries for the south cove project and reference areas should be updated to reflect the current conditions. Consider extending the rock dike at the South end to meet Chef Pass.

c. Lessons Learned

This project shows how dynamic and vulnerable wetlands are. The sharp contrast in land loss between 2005 and 2008 illustrates the destructive power of hurricanes. Efforts should be taken in the future to minimize construction delays. Rock structures should terminate on land to prevent the “erosional shadow” created by having the rocks end in open water. Heavy erosion along north facing shorelines shows the need to consider prevailing wind direction and wave angles in project design.

VI. Literature Cited

- Cho, H. J. and M. Poirrier. 2005. Response of Submersed Aquatic Vegetation (SAV) in Lake Pontchartrain, Louisiana to the 1997 – 2001 El Nino Southern Oscillation Shifts. *Estuaries* 28(2): 215-225.
- Gagliano, S.M, D.W. Roberts, and R.J. Sauvage, Jr. 1988. Evaluation of the Wetlands of Eastern Orleans Parish, Louisiana. Baton Rouge, Louisiana: Coastal Environments, Inc. 53 pp.
- Hymel, M. and T. Bernard 2005. 2004 Operations, Maintenance and Monitoring Report for Fritchie Marsh Restoration (PO-06), Louisiana Department of Natural Resources, Coastal Restoration Division, New Orleans, Louisiana. 20 pp.
- Nyman, J. A and R. H. Chabreck. 1996. Some Effects of 30 Years of Weir Management on Coastal Marsh Aquatic Vegetation - Implications to Waterfowl Management. *Gulf of Mexico Science* 1: 16-25.
- U.S. Army Corps of Engineers (USACE) 1997. Environmental Assessment (EA #261-A) CWPRRA Project XPO-69 Shore Protection at Bayou Chevee, Orleans Parish, Louisiana. New Orleans: U.S. Army Corps of Engineers. 13 pp.