



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

**2005 Operations, Maintenance,  
and Monitoring Report**

For

**Bayou Chevee Shoreline  
Protection**

State Project Number PO-22  
Priority Project List 5

June 2005  
Orleans Parish

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For  
Bayou Chevee Shoreline Protection (PO-22)

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## **Preface**

The 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 report for 2005 includes monitoring data collected through January 2005, and annual Maintenance Inspections through June 2005.

## **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 an 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 boundaries, features and reference area.**



## **II. Maintenance Activity**

### **a. Project Feature Inspection Procedures**

The site was inspected on July 2, 2003 by Van Cook, Thomas Bernard, and George Boddie from LDNR, after the passage of Tropical Storm Bill. The field inspection included a complete visual inspection of the project feature.

### **b. Inspection Results**

No damage from the passage of the tropical system was discovered, however, some sections of the rock structure appear to be subsiding faster than other sections. Overall the condition of the structure was good.

### **c. Maintenance Recommendations**

#### **i. Immediate/Emergency Repairs**

No immediate repairs are suggested.

#### **ii. Programmatic/Routine Repairs**

No repairs are required.

## **III. Operation Activity**

### **a. Operation Plan**

There are no water control structures associated with this project, therefore no Structural Operation Plan is required.

### **b. Actual Operations**

There are no water control structures associated with this project, therefore no Structural Operation Plan is required.

## **IV. Monitoring Activity**

This is a comprehensive report and includes all data collected from the pre-construction period and the post-construction period through January 2005.

### **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 in January 2005 post-construction. Additional surveys will be conducted in 2007, 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 (figure 2). SAV was sampled for pre-construction years 1998 and 2001, and in 2004 post-construction. Additional surveys will be conducted in years 2007, 2010, 2013, 2016, and 2019.

#### **c. Preliminary Monitoring Results and Discussion**

##### **Shoreline Change**

The North Cove project area showed little change from the shoreline survey of 2002, with the exception of the north facing bank on the south east side (figure 3). This area had degraded before the rocks were placed, and was probably too far gone to recover. Also, the small island in the middle of the North Cove project area has lost the vegetation on the northern tip; however, the resulting mud flat may be of sufficient elevation to re-vegetate.

The North Cove reference area showed no discernable change from the 2002 survey. Of particular interest was the lack of retreat for the shoreline of Lake Pontchartrain adjacent to the reference area. Over the 3 years between surveys this area has remained relatively unchanged (figure 4).

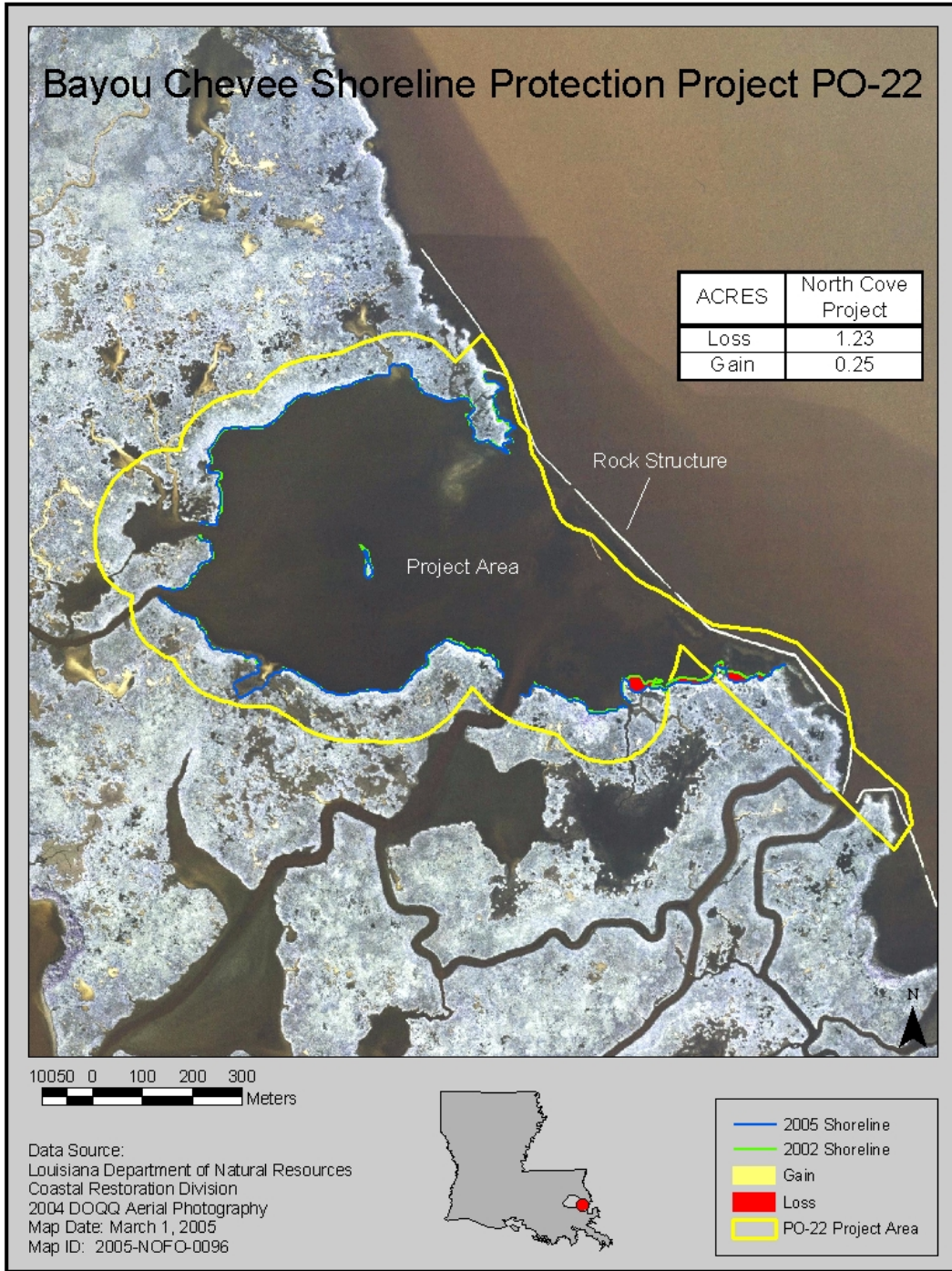
The South Cove reference area lost a total of 5.27 acres in 3 years (figure 5). This bank faces northwest and is exposed to the full force of waves created during cold fronts, which probably resulted in its demise. Although the strong currents associated with Chef Menteur Pass likely contributed to its disappearance. Since the boundaries for the South



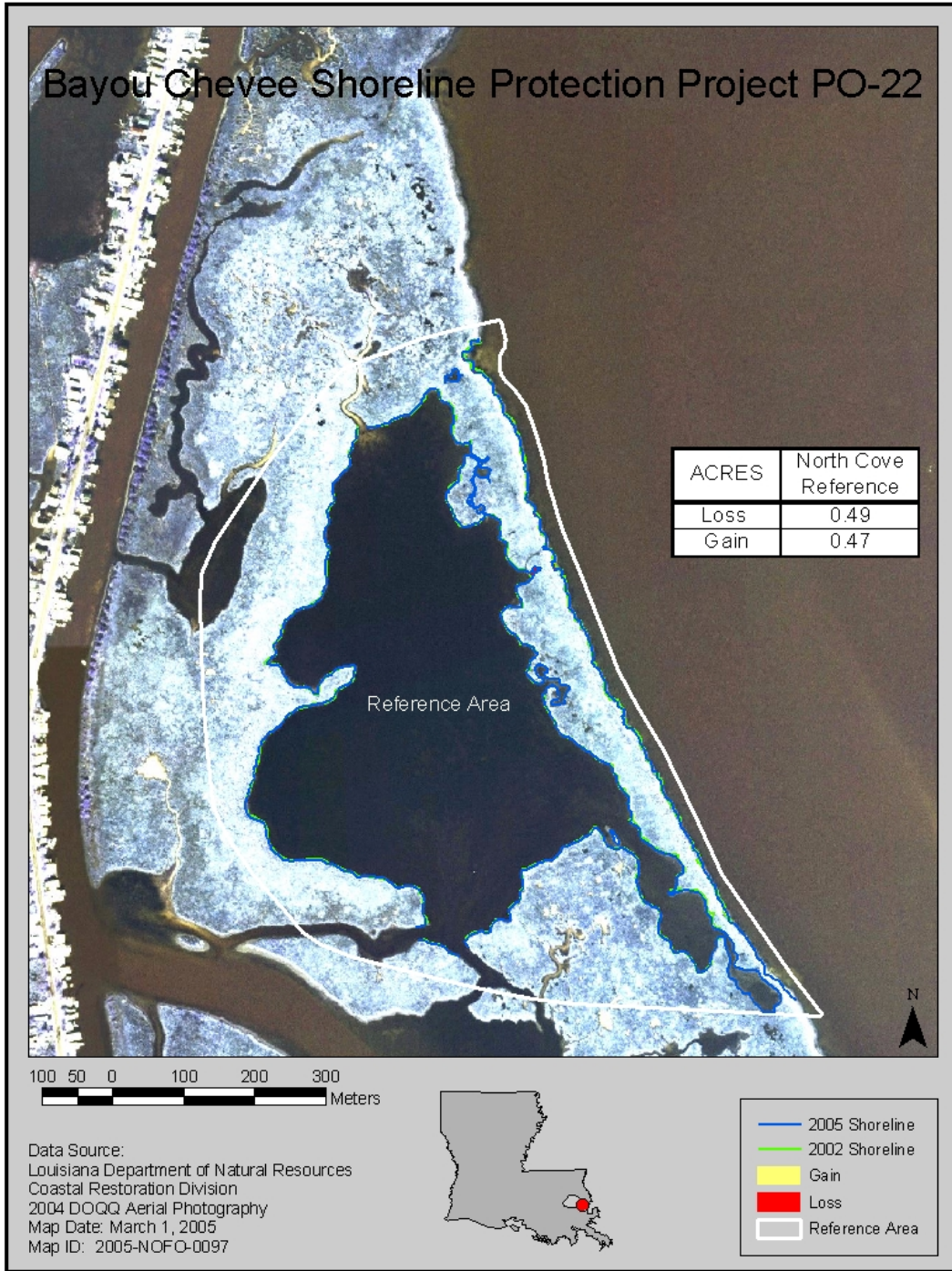


**Figure 2. Location of Bayou Chevee Shoreline Protection (PO-22) submerged aquatic vegetation transects.**



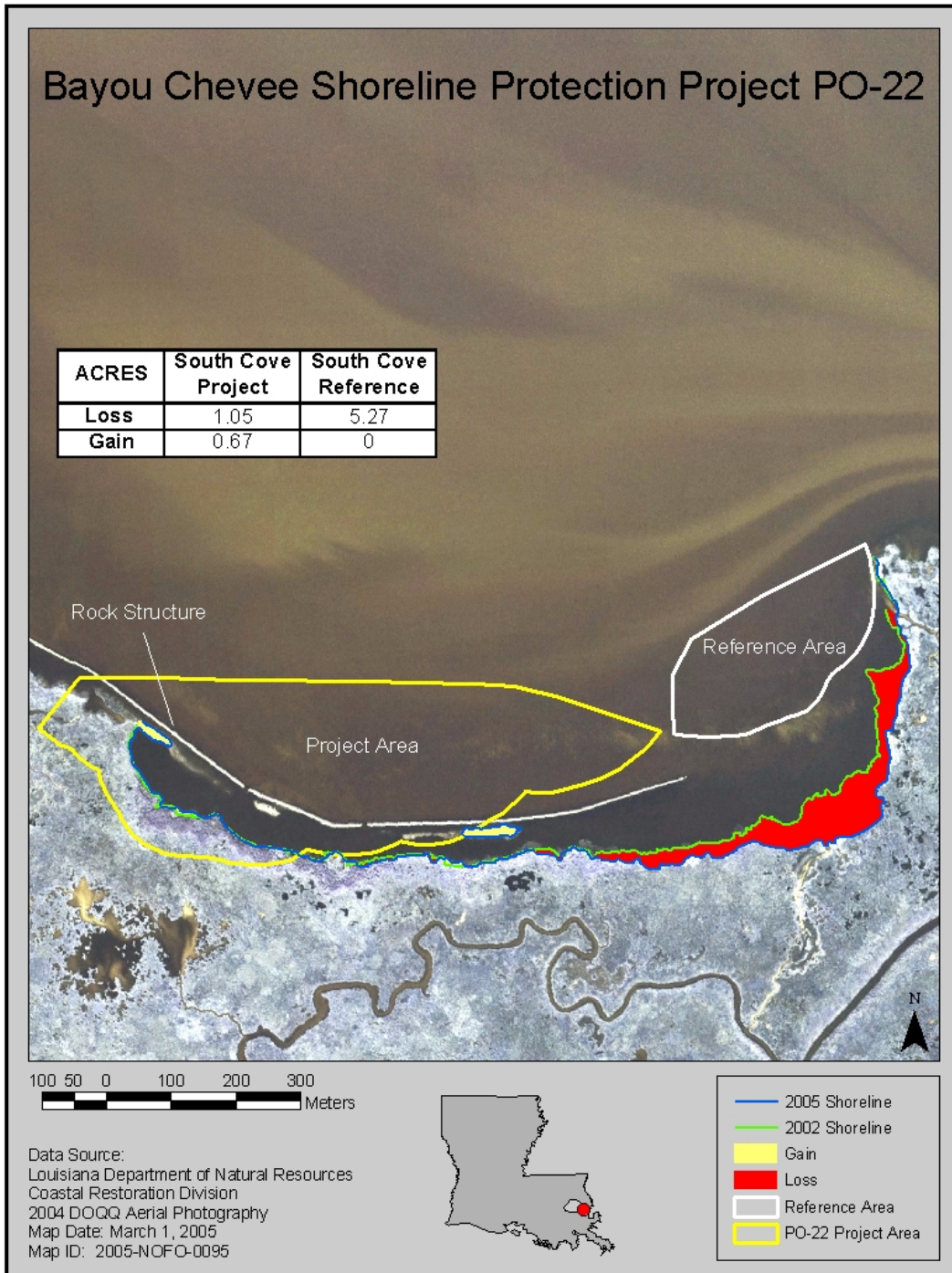


**Figure 3. 2002 and 2005 shoreline position with estimates of land loss and gain for the North Cove project area of the Bayou Chevee Shoreline Protection (PO-22) project.**



**Figure 4. 2002 and 2005 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 5. 2002 and 2005 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.**

Cove project and reference areas were decided long before the project was constructed they now appear in open water. This made determining the cut-off point between the two difficult. A straight line was drawn from the terminal end of the rocks to the shoreline to split the two. Splitting them here shows the “erosional shadow” realized by not having the rocks terminate on land, and accounted for the majority of land loss within the South Cove project area. However, the spoil placed behind the rocks in the South Cove project area has vegetated in two spots resulting in 0.67 acres of land gain (figure 5). This resulted in a net loss of only 0.38 acres for the South Cove project area.

**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. However, by 2004 the South Cove area had been reoccupied by SAV. Both diversity and abundance had increased since the 2001 survey, with numbers rivaling and even exceeding those from the 1998 survey. The South Cove project area showed the strongest recovery, with SAV being observed in every sample. *Myriophyllum spicatum* was the dominant species in both the South Cove project and reference areas. Its presence is probably an indication of the area recovering from drought conditions, but the three fold increase in the project area relative to the reference area is likely attributable to project affects. Cho and Poirrier (2005) determined that salinity and light were the main ecological drivers of SAV abundance and species composition in Lake Pontchartrain. With the area no longer experiencing drought conditions and the benefit of the rock structure at abating wave activity, and thus promoting water clarity, the project area flourished.

**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 year 2004 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 Ref. 1998	South Cove Ref. 2001	South Cove Ref. 2004
Empty Sample	56.67	100	--	56.67	100	64.52
<i>Alga</i>	--	--	26.92	--	--	6.45
<i>Ceratophyllum demersum</i>	--	--	28.85	--	--	--
<i>Myriophyllum spicatum</i>	13.33	--	82.69	6.67	--	25.81
<i>Najas guadalupensis</i>	--	--	5.77	--	--	1.61
<i>Ruppia maritima</i>	--	--	21.15	13.33	--	4.84



<i>Vallisneria americana</i>	36.67	--	--	30.00	--	--
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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 abundance and diversity of SAV in 1998 (table 2, figure 6). The 2004 survey of the North Cove project area resulted in an increase of both diversity and abundance of SAV relative to the survey of 2001. However, compared to the 1998 survey diversity was reduced with the absence of *Vallisneria americana*. All species recorded in 2004 were less abundant than in 1998 with the exception of *Najas guadalupensis* (49.19% in 2004 and 30% in 1998).

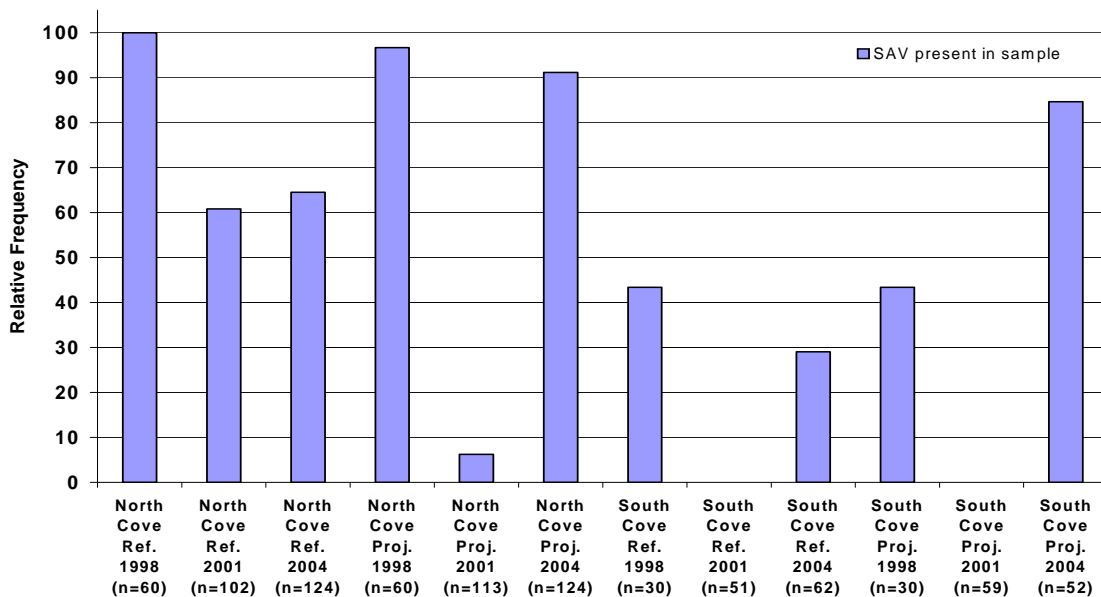
The north cove reference area showed a high occurrence of algae (81%) and *R. maritima* (61%) in 2001, but had lost the diversity and overall abundance of SAV species recorded during the 1998 sampling (table 2). In 2004, the North Cove reference area experienced an increase in diversity over the two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

Overall, a significant decline in SAV frequency and occurrence was realized across all areas between the 1998 and 2001 SAV surveys (figures 6 and 7). This loss was most likely due to drought conditions that prevailed during the 2000 growing season. During the drought salinities at the Fritchie Marsh monitoring station (PO06-06) in Salt Bayou, located northeast of the project area on the north shore of Lake Pontchartratin, averaged 10ppt, which is more than twice the normal average of 4 ppt and exceeds the tolerance levels of *C. demersum*, *M. spicatum*, *N. guadalupensis*, and *V. americana*. *Ruppia maritima*, which can withstand a broad range of salinity levels, was the only plant species observed during the 2001 sampling. The decline of *R. maritima* in 2004 with the simultaneous increase in species composition provides good evidence of the recovery from drought conditions for the entire area (figure 7). The Fritchie Marsh monitoring station (PO06-06) which recorded average salinities of 10ppt during the drought averaged 3.96 ppt during the period March 2001 to December 2003 (Hymel and Bernard 2005).



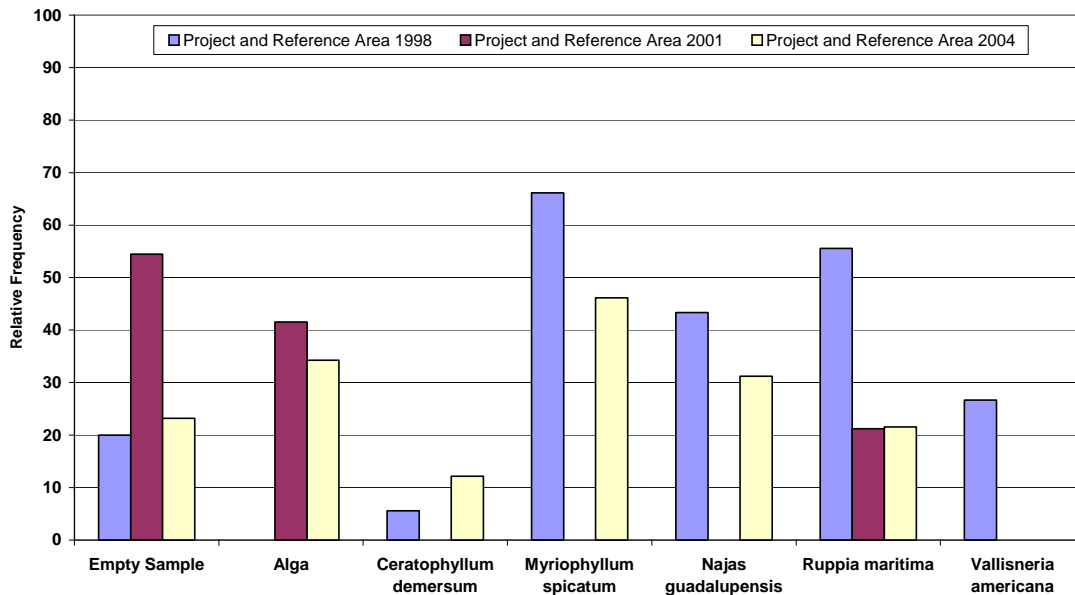
**Table 2. Relative frequency of submerged aquatic vegetation species for north cove project and reference area during pre-construction years 1998 and 2001, and post-construction year 2004 for the Bayou Chevee Shoreline Protection (PO-22) project. The symbol (--) denotes the species was not documented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

Scientific Name	North Cove Proj. 1998	North Cove Proj. 2001	North Cove Proj. 2004	North Cove Ref. 1998	North Cove Ref. 2001	North Cove Ref. 2004
Empty Sample	3.33	50.44	5.65	--	9.80	29.84
Alga	--	46.02	58.06	--	81.37	27.42
<i>Ceratophyllum demersum</i>	16.67	--	12.10	--	--	11.29
<i>Myriophyllum spicatum</i>	88.33	--	66.13	100	--	20.97
<i>Najas guadalupensis</i>	30	--	49.19	100	--	38.71
<i>Ruppia maritima</i>	81.67	6.19	17.74	78.33	60.78	33.87
<i>Vallisneria americana</i>	46.67	--	--	--	--	--



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





**Figure 7. Relative frequency of submerged aquatic vegetation species for project and reference area July 1998 and April 2001 for the Bayou Chevee Shoreline Protection (PO-22) project.**

## V. Conclusions

### a. Project Effectiveness

The post-construction survey shows that the rock structure has maintained the shoreline adjacent to it in as-built condition. However, the unprotected shorelines of the reference areas show drastically different results. When comparing North Cove project and reference areas, it appears the project has no effect because loss within the project area is greater than that of the reference area. Yet, this loss is concentrated in one area that was badly damaged prior to the rocks placement and had not completely degraded by the as-built survey. The South Cove project area benefited greatly from the rock placement in all areas except near its terminus in open water. Whereas the entire South Cove reference area shoreline retreated considerably between the surveys, and is likely a direct reflection of what the project area would have resembled without the project.

SAV has returned to the area after being nearly absent during the 2001 survey. The 2004 survey discovered both increases in abundance and diversity of SAV, but the area was still not as prolific as in 1998. However, relating this resurgence of SAV to a direct affect of the project is impossible due to drought conditions that prevailed during the 2000 growing season. The three years between surveys may not have been enough time



for the SAV community to fully recover from the affects of the drought. Freshwater species recovery with salinity decrease occurs slower than their decline with salinity increase (Cho and Poirrier 2005).

b. Recommended Improvements

The boundaries for the south cover project and reference areas should be updated to reflect the current conditions.

c. Lessons Learned

This project shows how dynamic and vulnerable wetlands are. In just three short years, the shoreline retreated considerably and the SAV community changed drastically. 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.

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