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Department of Natural Resources
Coastal Restoration Division and
Coastal Engineering Division

2004 Operations, Maintenance and Monitoring Report

for

Sabine Refuge Marsh Creation

State Project Number CS-28
Priority Project List 8

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Cameron Parish

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2004 Operations, Maintenance and Monitoring Report
For
Sabine Refuge Marsh Creation (CS-28)

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I. Introduction

The project area is composed of 3,300 acres (1,335 ha) of wetlands located in the Calcasieu-Sabine Basin on the Chenier Plain. The area is within the Sabine National Wildlife Refuge and roughly bounded by Starks North Canal to the north and east, Back Ridge Canal to the south, and existing marsh to the west (figure 1). Hurricanes and canal building between 1956 and 1978 caused landloss in the area. Saltwater from the Calcasieu Ship Channel (CSC) is currently introduced from several sources including the GIWW through Alkali Ditch and probably more importantly through West Cove Canal via Back Ridge Canal. Vegetation has shifted from intermediate sawgrass dominated marsh including *Cladium jamaicense* (sawgrass), *Schoenoplectus californicus* (giant bulrush), and *Phragmites australis* (Roseau cane), with some fresh marsh to more brackish species including *Spartina patens* (saltmeadow cordgrass), *Schoenoplectus americanus* (bulrush), and *Schoenoplectus robustus* (saltmarsh bulrush) since at least 1968. Most of the project is currently shallow open water with brackish marsh on the surrounding edges. The current land loss rate is approximately 0.5 square miles (1.3 km^2) per year.

The Sabine Refuge Marsh Creation project (CS-28) is designed to create approximately 1,120 acres (450 ha) of emergent vegetated marsh and to nourish and protect existing broken marsh. During the January 2001 maintenance dredging by the Operations Division of the U.S. Army Corps of Engineers-New Orleans District, approximately 1,000,000 cubic yards of sediment were dredged from the Calcasieu Ship Channel between miles 8.3 to 10.4 (13.4 to 16.7 km) and placed in confined areas within the Sabine National Wildlife Refuge. The first cycle created approximately 200 acres of vegetated marsh. Over 36,000 *Spartina alterniflora* plants were planted along the edges of the perimeter and the constructed canals in the Cycle 1 dredge placement area. Four more cycles of dredge placement are scheduled to occur every year beginning in 2005 (figure 2).

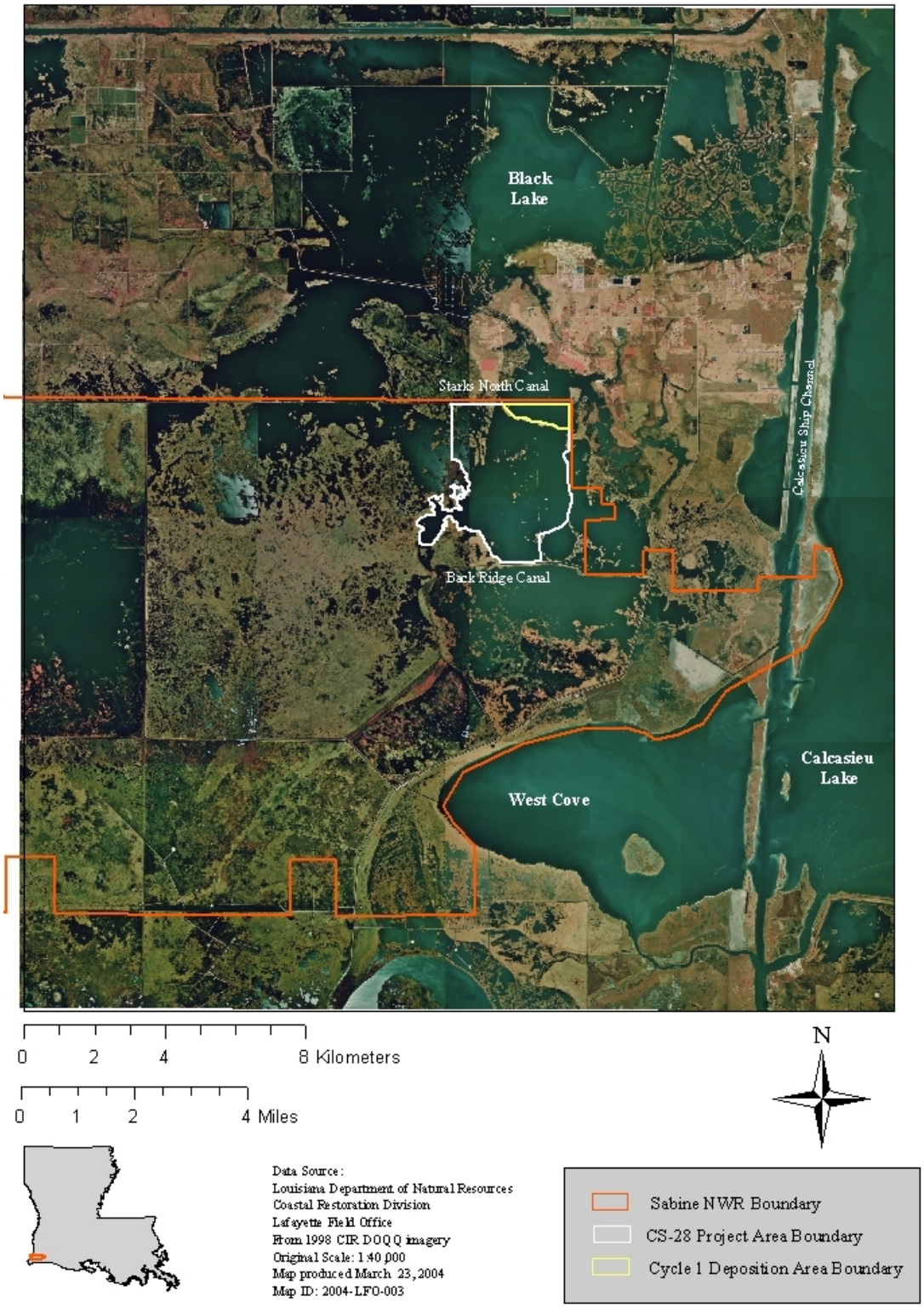

Figure 1: Sabine Refuge Marsh Creation (CS-28) project area boundary.

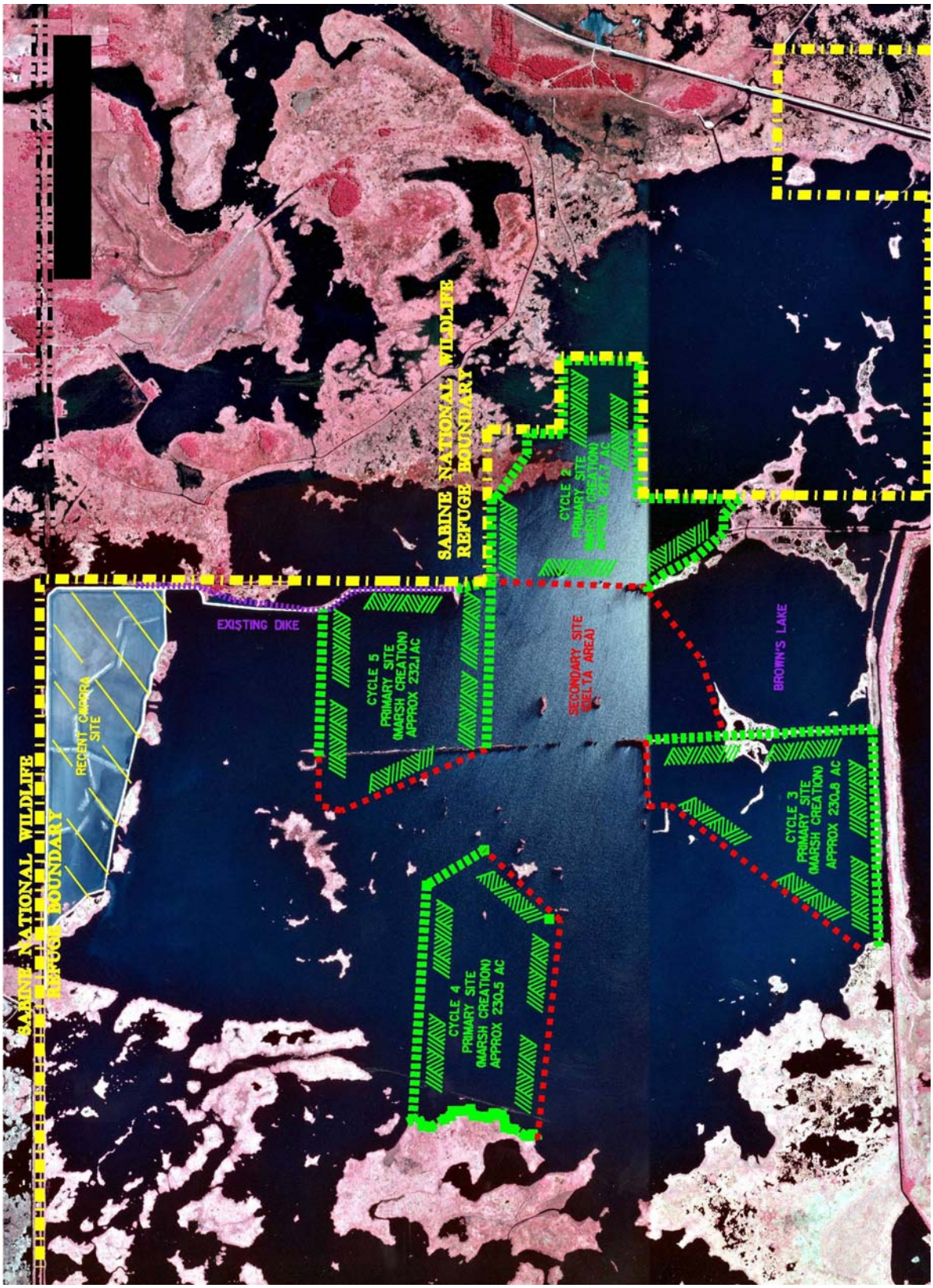

Figure 2. Location of Cycle 1 dredge placement area and the proposed locations of Cycles 2-5.

II. Maintenance Activity

There are no O&M monies for this project therefore, no inspection, activity, operations or plan applies.

III. Monitoring Activity

a. Monitoring Goals

The objective of the Sabine Refuge Marsh Creation Project is to create new vegetated marsh and enhance and protect existing surrounding marsh vegetation.

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

1 Place dredge spoil slurry to a maximum height of 4.5 ft (1.4 m) MLG to settle to a height of 2.5 ft (0.8 m) MLG, after five years, for each of five dredging cycles.

2. Create 125 acres (50 ha) of vegetated wetlands in the first dredge placement cycle and 230 acres (93 ha) in each cycle for Cycles 2 through 5.

3. Reduce loss of existing surrounding marshes within the project area.

b. Monitoring Elements

Aerial Photography:
Near-vertical color-infrared aerial photography (1:24,000 scale) was used to measure vegetated and non-vegetated areas for the project and reference areas. The photography was obtained in 2000 prior to project construction and on December 15, 2002 following construction. The original photography was checked for flight accuracy, color correctness, and clarity and was subsequently archived. Aerial photography was scanned, mosaicked, and georectified by USGS/NWRC personnel according to standard operating procedures.

Emergent Vegetation:
To document changes in emergent vegetation due to the project, vegetation was monitored pre-construction in 2001 and post-construction in 2002. Ten stations were established in the project area and vicinity in pre-existing marshes (figure 3). Eight stations were also established in the first cycle dredge deposition area after construction, but before vegetation was planted along the edges. Two 2 m^2 plots were sampled at each of the stations. Percent cover, height of dominant species, and species richness were quantified. Vegetation will be sampled in late summer of 2004, 2006, 2008, 2010, and 2017.

Elevation Survey:
The elevation of the initial placed dredge material was documented within placement sites for the first dredging cycle in 2002. Elevation measurements were to be recorded in 2003 for Cycle 1 and every year after each subsequent cycle is built (2004, 2006, 2008, 2010, and 2017). Surveys have not been conducted in Cycle 1 since construction due to logistical difficulties.

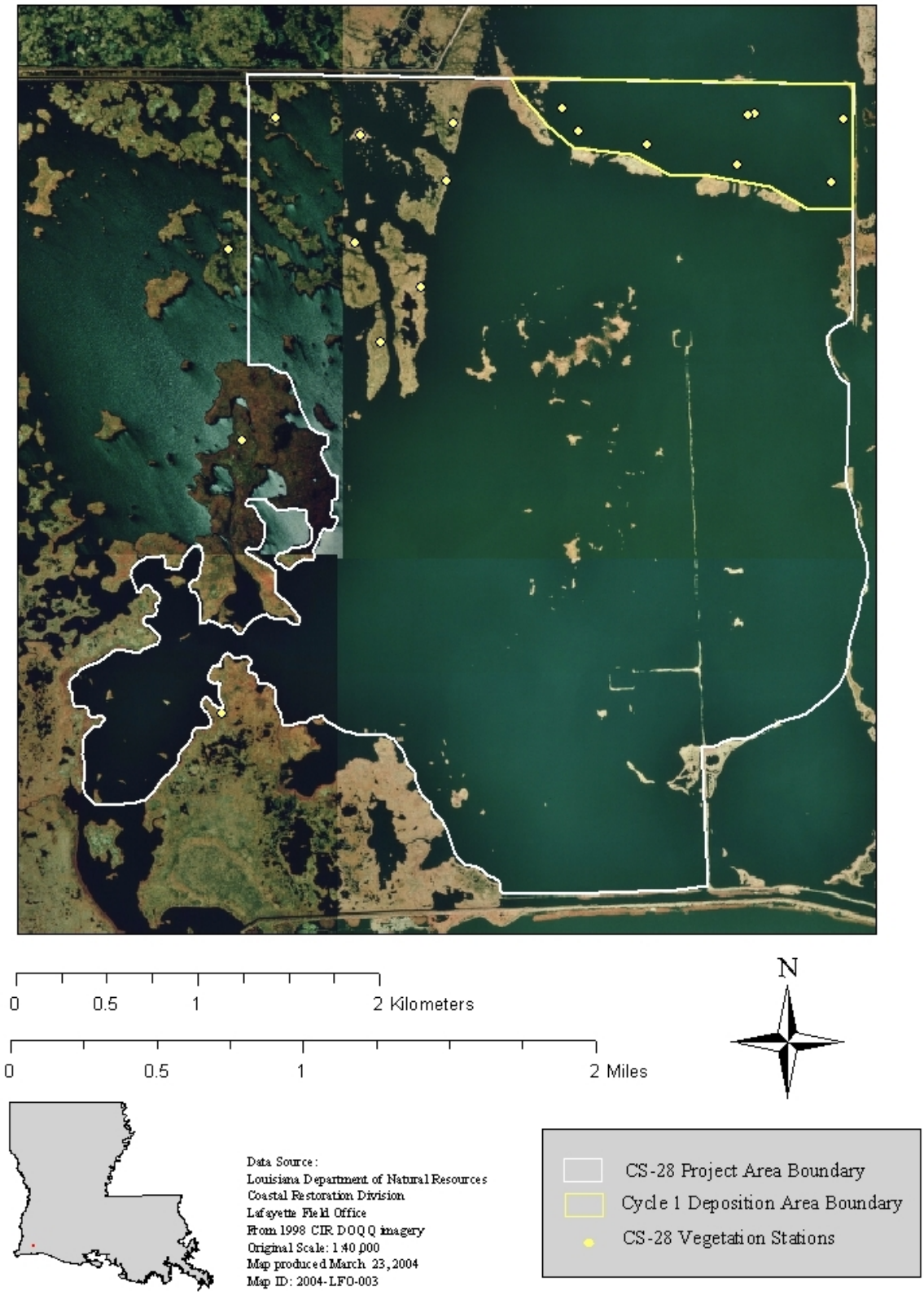

Figure 3. CS-28 project area and vegetation station locations.

IV. Monitoring Activity (continued)

c. Preliminary Monitoring Results and Discussion

Aerial Photography:

Land / Water analysis was recently completed for the photography acquired in December, 2002. The 2000 photography was collected for the adjacent Hog Island Gulley Project (CS-23) and was processed for CS-23, but has not yet been subset for the CS-28 project area. The 2002 acreages are presented in figure 4. When the photography was flown, the area was entirely mudflat. During recent field trips (October and December, 2003), it appeared that the mudflats were thoroughly vegetated (figure 5).

Emergent Vegetation:

In order to determine whether the project had an effect on pre-existing emergent vegetation one year after construction, a t-test was conducted using data from the 10 stations in the marsh adjacent to the constructed Cycle 1 project area. Total cover of emergent vegetation was 98.8% pre-construction and 97.2% post-construction. There was no significant difference in total percent cover (figure 6), height of the dominant species (figure 7), or species richness (figure 8) in response to the project. Sediment was expected to escape the first cycle of marsh creation through constructed breaches thereby affecting marsh vegetation in the project area. The breaches were constructed after the sediment had already settled. It does not appear that sediment affected the adjacent marsh.

The vegetation plots were predominantly composed of *Spartina patens* (saltmeadow cordgrass), *Distichlis spicata* (seashore saltgrass), *Paspalum vaginatum* (seashore paspalum), and *Schoenoplectus americanus* (bulrush) (figure 9 and table 1). Cover of the dominant species, *S. patens* was 91.2% pre-construction and 91.7% post-construction.

Elevation Survey:

An elevation survey was conducted “as built” following construction in 2002.

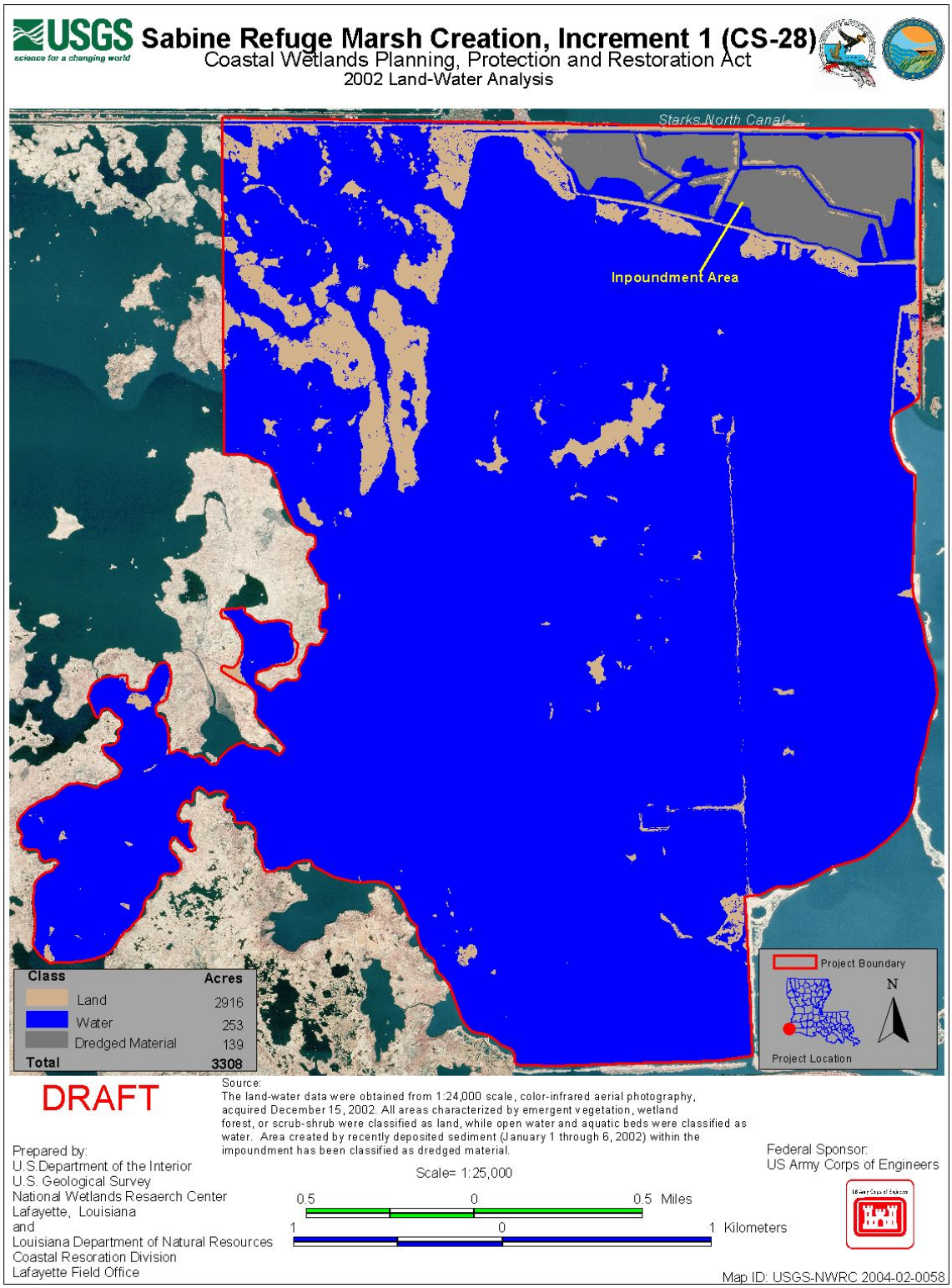

Figure 4. Land:Water analysis from photography obtained December 15, 2002 with project boundaries and land, water, and dredge material acreages. Most of the dredge material is now vegetated.

Figure 5. Photograph of marsh vegetation within the Cycle 1 deposition area. Photo taken from the north corner facing south in October, 2003 by LDWF personnel.

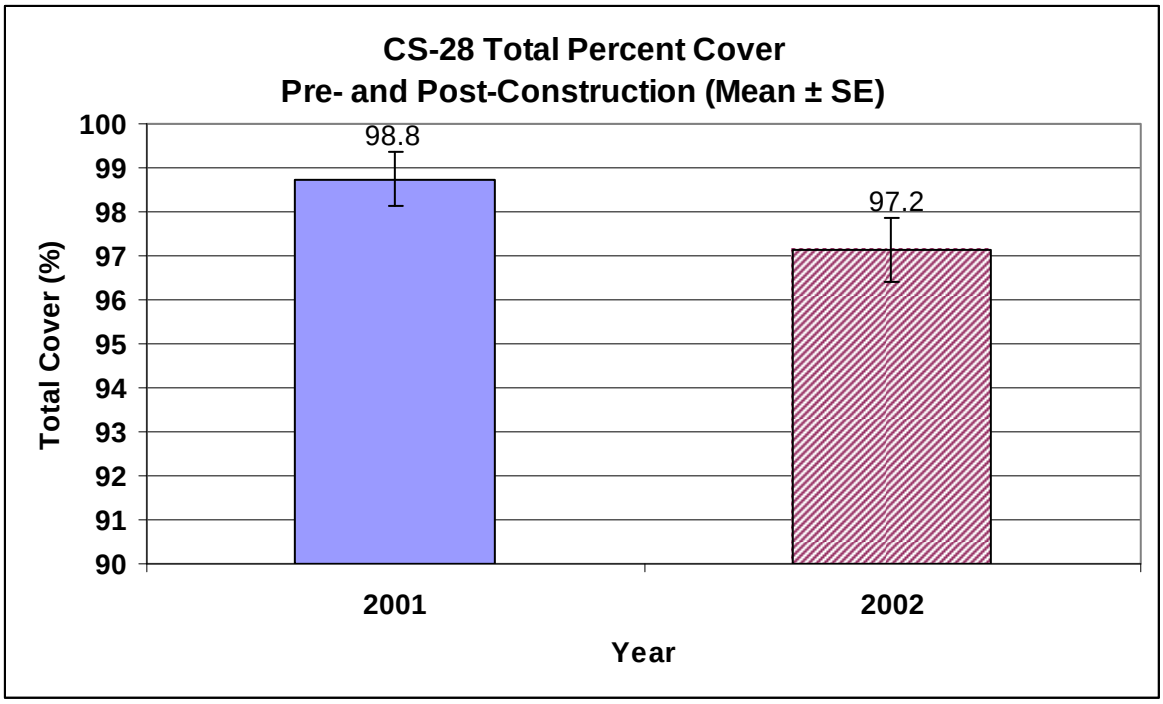

Figure 6. CS-28 Total % Cover of emergent vegetation at sites in pre-existing marsh adjacent to the dredge fill Cycle 1 area Pre and Post-construction.

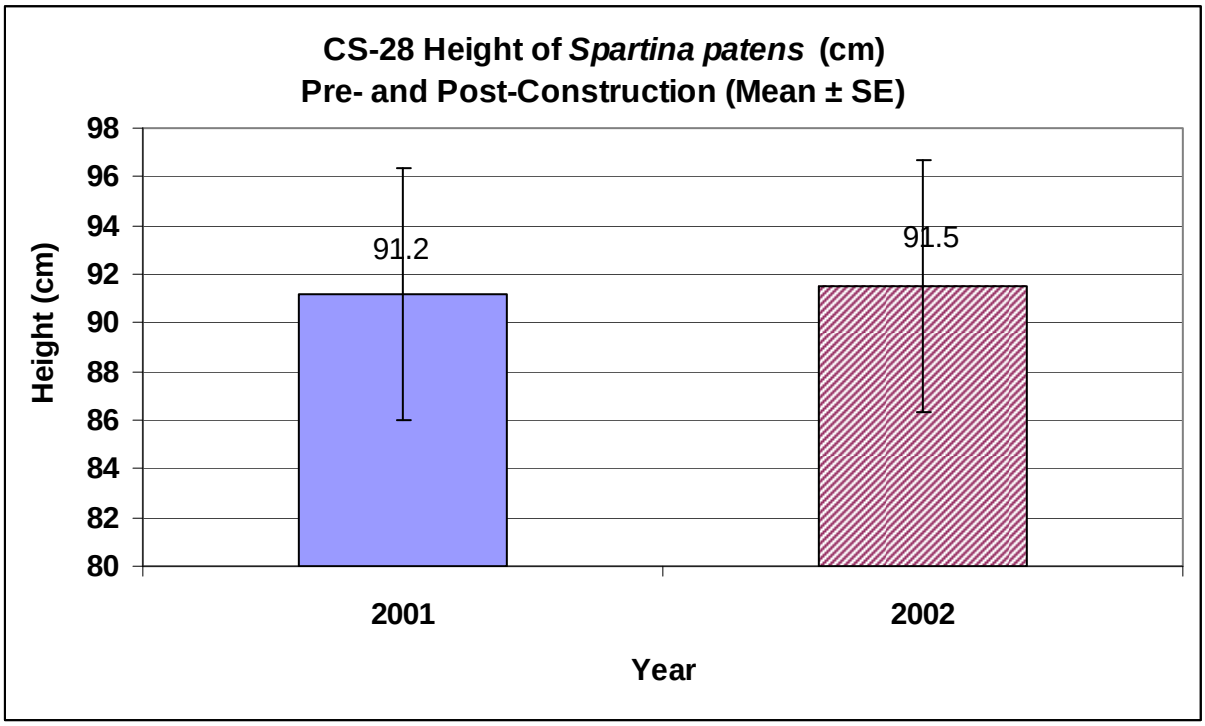

Figure 7. CS-28 Height of dominant vegetation species at sites in pre-existing marsh adjacent to the dredge fill Cycle 1 area Pre- and Post-construction.

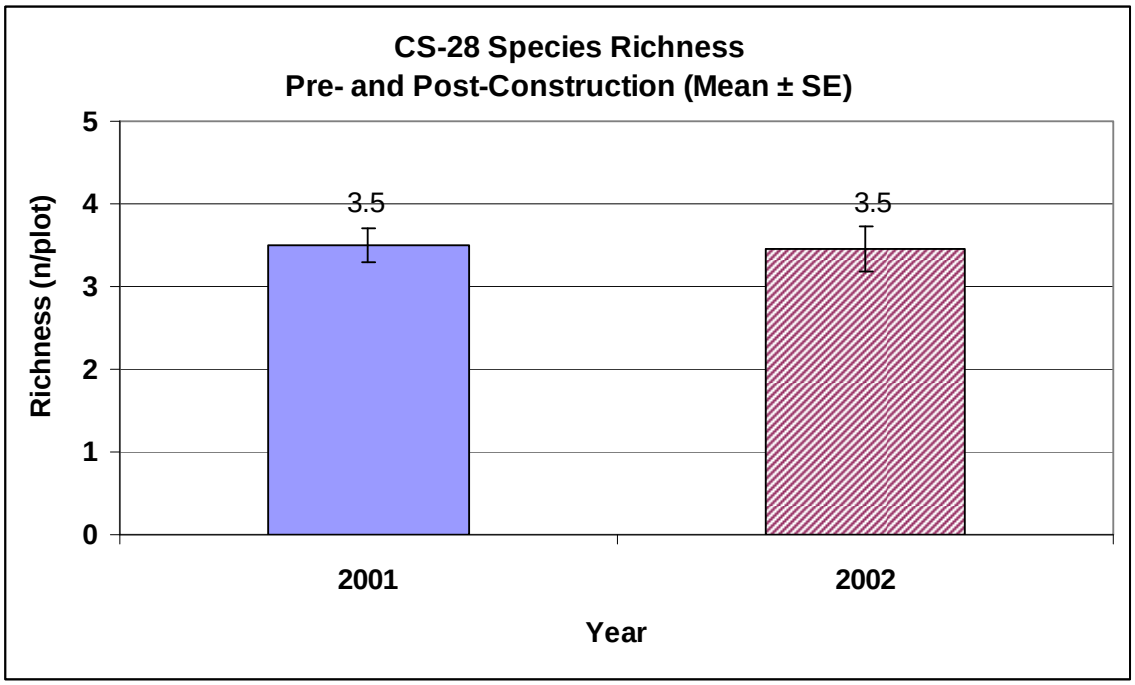

Figure 8. CS-28 Species richness of emergent vegetation at sites in pre-existing marsh adjacent to the dredge fill Cycle 1 area Pre- and Post-construction.

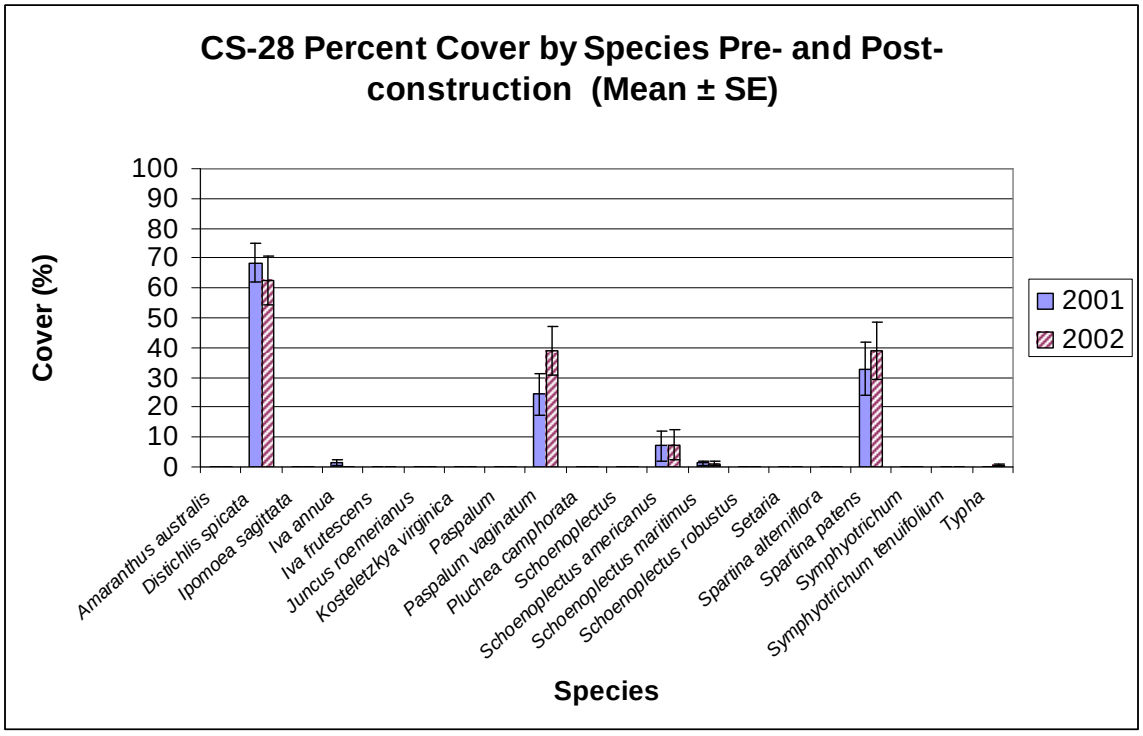

Figure 9. CS-28 Mean cover values for each species present in 2001 and 2002 at sites in pre-existing marsh adjacent to the dredge fill Cycle 1 area.

Table 1. CS-28 Number of vegetation plots out of 20 in which each species were present for each year.

	# Plots Species Present	
Species	**2001**	**2002**
Amaranthus australis	2	2
Distichlis spicata	19	20
Ipomoea sagittata	0	1
Iva annua	5	1
Juncus roemerianus	1	2
Kosteletzkya virginica	1	0
Paspalum vaginatum	14	16
Schoenoplectus americanus	2	2
Schoenoplectus maritimus	6	7
Spartina alterniflora	1	3
Spartina patens	16	14
Symphyotrichum tenuifolium	2	0
Typha	1	1

IV. Conclusions

a. Project Effectiveness

The first cycle of Marsh Creation resulted in a densely covered marsh more quickly than anticipated. The plantings were installed one year post construction on the edge of the project area and along the edges of the interior canals that were constructed. The interior marsh quickly filled with vegetation (*S. patens*) one year post construction. The next four cycles should produce similar results.

The south levee of the Cycle 1 area was degraded one year post construction. During the construction process of the marsh creation, several gaps were cut in the southern dikes to relieve the site of accumulated water. This allowed some new sediment to exit the impoundment area and create shallow water fill areas south of and outside of the impoundment area. This sediment settled to an elevation that is potential wetland habitat (less than 0.5' deep) over roughly 200 acres (Pers. com. Roy Walters, Sabine NWR).

Although a goal of the project (to nourish and protect adjacent pre-existing vegetated marsh), there is no evidence at this time that the dredge material placement has had any effect on the adjacent vegetation. Subsequent aerial photography and land:water analysis will reveal whether or not the land loss rate in the adjacent marsh has decreased.

b. Recommended Improvements

The location of dredge cycles 2-5 have changed since the original monitoring plan for this project was written. The original design had three stations in the CS-23 project area that were considered reference stations and 7 in the CS-28 vegetation monitoring project area (adjacent marsh) that were considered project stations. Because there is no physical barrier between the CS-23 and CS-28 project areas and the stations are in close proximity, we suggest that all 10 be considered project stations and CRMS-*Wetlands* stations be selected as reference.

The project boundary has changed, requiring updated map files and computation of a new project area acreage for 2002 and future photography. Completion of the land to water analysis using preconstruction photography taken in 2000 of the CS-23 project, will provide a comparison for land created, and therefore, project success.

c. Lessons Learned

Dredge placed in this environment to less than 4.5' MLG or 3.08 NAVD88, is quickly vegetated by *Spartina patens.*

There was no impact on vegetation in the adjacent marsh following the first cycle.

Results from the most recent (2003) elevation survey should reveal the rate of dredge settlement.

Future Cycles will be designed and constructed by use of NAVD88 Elevation Datum. The net difference between MLG DATUM and NAVD88 DATUM in the area has been determined to be +1.42 feet, thus, +4.5' MLG converted to NAVD88 DATUM will become Elevation +3.08'NAVD88.

The construction of "Pre-Dug Terraces" has been determined to be not advantageous. Resulting spoil from this effort, placed in linear piles intermittently on each side of the pre-dug trenasses, hindered the movement and placement of the dredged material. Further, the resulting trenasse channels created after the sediment settled out were considered larger than necessary, thus a bit of "overkill". It is currently planned that trenasses of any future Cycles of marsh creation that are to be created should by constructed by Marsh Hoe or Marsh Buggy equipment at the desired locations at a time of one (1) year post construction.

The containment dikes for future Cycles of marsh creation should be limited to a height of Elevation +3.5' NAVD88. Borrow materials available for dikes construction is of very good quality and to contain sediments placed to Elevation +3.0' to +3.1'NAVD88, dike constructed to +3.5' NAVD88 should prove very adequate. Again, as was the process employed during Cycle 1, various gaps in the dike should be cut intermittently at desirable locations to relieve ponded water, to direct the flow within the impoundment, and to allow the escape of some material to create shallow water marsh areas.

The "planting of the vegetation" around the periphery of the marsh creation site should be reconsidered and possibly not performed. It was observed that natural re-vegetation of the newly created marsh began at one (1) year post-construction. The new natural growth was dramatic and very adequate.

The frequent "planning meetings" to develop the design of Cycle 1 provided an excellent product that all participating agencies are pleased with. Initially, the marsh creation area was proposed to receive spoil material to elevation +6.0' MLG. After several meetings of the planning group, it was agreed that material would be placed to a maximum of Elevation +4.5' MLG. Though future cycles of marsh creation will be designed to NAVD88 DATUM, the height of the immediate post construction created marsh will be similar to that placed in Cycle 1.