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Department of Natural Resources
Coastal Restoration Division and
Coastal Engineering Division

2004 Operations, Maintenance, and Monitoring Report

for

Boston Canal/ Vermilion Bay Shoreline Stabilization

State Project Number TV-09
Priority Project List 2

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Vermilion Parish

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For
Boston Canal/ Vermilion Shoreline Stabilization (TV-09)

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I. Introduction

The Boston Canal/Vermilion Shoreline Stabilization project is located in the Teche-Vermilion Basin, which is included in Region 3 of the Coast 2050 Plan. Shoreline erosion is a major cause of land loss in this basin and shoreline maintenance provides important protection to interior marshes. The project area consists of approximately 466 ac (186 ha) of brackish marsh and open water. It is located in Vermilion Parish, approximately 12 mi (19.3 km) south of Delcambre, Louisiana. The project boundaries extend from Mud Point on the western end to Oaks Canal on the eastern end. The northern boundary is brackish marsh and the southern boundary is Vermilion Bay. *Spartina patens* (marshhay cordgrass) and *Schoenoplectus americanus* (chairmaker's bulrush) combine to make up 64% of the marsh vegetation. *Spartina cynosuriodes* (big cordgrass) makes up 19% of the area and is typically found on elevated bayou banks. The open water area contains submerged and floating aquatics which are confined to a narrow band along the shore due to the tidal influence.

The shoreline retreat from 1948 to 1972 for Vermilion Bay (Mud Point to Lake Cleodis) as estimated by the Louisiana Department of Transportation and Development was 2.6 ft/yr (0.8 m/yr). Shoreline change in Vermilion Bay in the vicinity of Four Mile Canal calculated by USGS in 2003 was 2.86 ft/yr (0.87 m/yr).

The project was designed to stabilize the Vermilion Bay and Boston Canal shorelines to prevent further regression of the shorelines into the adjacent marsh. Vegetation was planted along approximately 13 1/4 mi (21.3 km) of Vermilion Bay shoreline bounded on the west by Mud Point and on the east by Oaks Canal. The transplants, 34,090 container grown one gallon pots of *Spartina alterniflora* (saltmarsh cordgrass), were planted parallel to the shoreline on five-foot centers in two rows west of Boston Canal and in three rows east of Boston Canal.

Rock bulkheads were constructed parallel to the banks of Boston Canal, extending into Vermilion Bay and then turning 90^{o} to follow the shoreline. The structures are designed to prevent the banks at the mouth of the Boston Canal from widening into the adjacent marshes. Sediment fences were installed behind each rock bulkhead to trap sediments during times of overwash. This increased sedimentation will subsequently encourage revegetation of the area behind the bulkheads. Construction was completed on September 1, 1995.

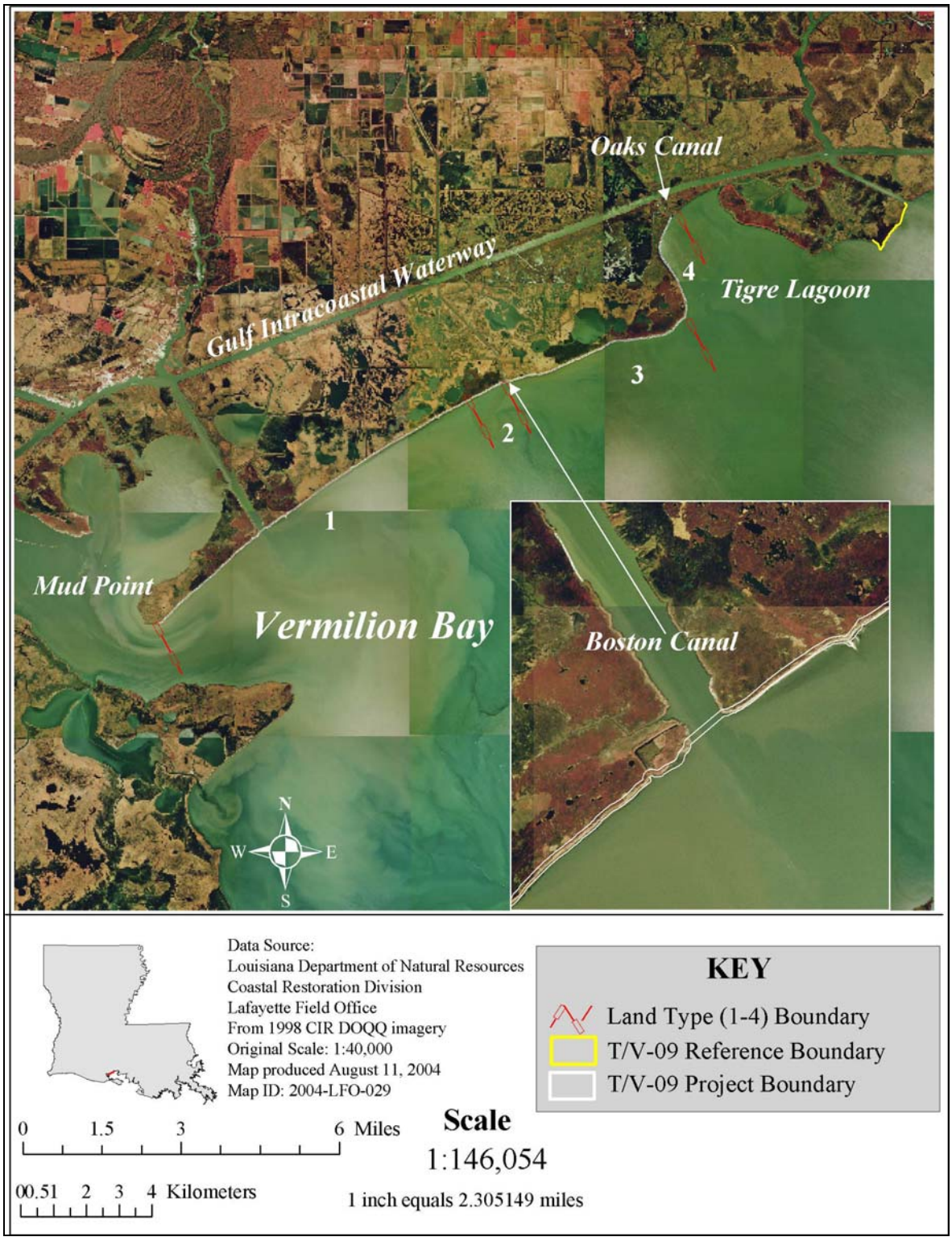

Figure 1. Boston Canal/Vermilion Bay Shoreline Stabilization (TV-09) project area, reference area, and land type boundaries.

II. Maintenance Activity

a. Project Feature Inspection Procedures

The purpose of the annual inspection of the Boston Canal/Vermilion Bay Shore Restoration Project (TV-09) is to evaluate the constructed project features to identify any deficiencies and prepare a report detailing the condition of project features and recommend any necessary corrective actions needed. Should it be determined that corrective actions are needed, LDNR shall provide, in the report, a detailed cost estimate for engineering, design, supervision, inspection, and construction contingencies, and an assessment of the urgency of such repairs (LDNR 2002).

The annual inspection of the Boston Canal/Vermilion Bay Shore Restoration Project (TV-09) was held on March 16, 2004 under clear skies and cool temperatures. In attendance were Stan Aucoin, Dewey Billodeau, Herbert Juneau and Patrick Landry of LDNR. NRCS was represented by Brad Sticker. Parties met at the Lafayette Field Office of CED and proceeded to the TV-09 project area. The annual inspection began at approximately 9:50 a.m.

The field inspection included a complete visual inspection of all features. Staff gauge readings were used to determine approximate elevations of water, rock weirs, earthen embankments, steel bulkhead structures and other project features. Photographs were taken at each project feature and Field Inspection notes were completed in the field to record measurements and deficiencies.

b. Inspection Results

Rock breakwaters

For the most part, the breakwaters are in excellent post construction condition. There is no apparent toe-scour or rock displacement. Some shoreline retreat has occurred on the eastern and western ends of the rock dike. These areas will be closely monitored, and should the situation significantly worsen, steps will be taken to close/stabilize these areas. Signage and associated pilings are stable and functioning.

Sediment Fencing

The sediment fencing was modified in March, 2002. Modifications of the fences involved cutting geotextile panels from the top of the fence down to approximately 6 inches below the mudline and removing each panel. The sediment fences were preventing sediment from filling the entire marsh area behind the dikes. Since removal of the fences, sediment has been more evenly distributed.

Smooth Cordgrass plantings

Although the plants were not closely inspected on this trip, according to Christine Thibodeaux, TV-09 Monitoring Manager, "the high average percent survival of *Spartina alterniflora* on the shoreline indicates that the plants have become established. The plants have become indistinguishable from one another and form a continuous vegetated layer along the shoreline and according to the monitoring plan, will no longer be monitored. Percent survival of *S. alterniflora* at the 36 month post-planting averaged 90.6 % among all land types. Percent survival of *S. alterniflora* at the 36 month post-planting in the high, medium and low *Phragmites australis* coverage was 12.5 %, 62.5 %, and 89.1 %, respectively. Percent cover of *S. alterniflora* at the 36 month post-planting in high, medium, and low *P. australis* coverage was 5.6 %, 56.9 %, and 75.9 %, respectively."

c. Maintenance Recommendations

i. Immediate/ Emergency Repairs

None

ii. Programmatic/ Routine Repairs

None

III. Operation Activity

a. Operation Plan

b. Actual Operations

There are no active operations associated with this project.

IV. Monitoring Activity

a. Monitoring Goals

The objectives for the Boston Canal/Vermilion Bay Shoreline Stabilization project are:

1. Protect approximately 466 ac (186 ha) of wetlands between Mud Point and Oaks Canal from physical erosion from Vermilion Bay through shoreline stabilization.

2. Stabilize 13.25 mi (21.3 km) of the Vermilion Bay shoreline and prevent further regression of the Boston Canal banks.

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

1. Decrease the rate of shoreline erosion at the intersection of the Boston Canal and Vermilion Bay by armoring the corners of the canal with rock bulkheads.

2. Decrease the rate of shoreline erosion and maintain the integrity of approximately 466 ac (186 ha) of shoreline and interior marsh on the northern edge of Vermilion Bay by establishing *S. alterniflora* along the shoreline.

b. Monitoring Elements

Aerial Photography:
To document vegetated and non-vegetated areas, near vertical color-infrared aerial photography (1:24,000 scale with ground controls) was obtained in 1994 (pre-construction) and post construction in 1997. The original photographs were checked for flight accuracy, color correctness, and clarity and were subsequently archived. Aerial photographs were scanned, mosaicked, and georectified by USGS/NWRC personnel according to standard operating procedures (Steyer et al. 1995, revised 2000).

Vegetation:
The general condition of the vegetation plantings was documented using a generally accepted methodology similar to Mendelssohn and Hester (1988), Coastal Vegetation Project, Timbalier Island. Species composition and % cover were monitored in 1.0 m^2 plots marked with one corner pole to allow revisiting the same plot over time. The same corner pole was used to mark a plot of 16 plants to determine % survival by counting live stems within each plot, dividing by the total number of plants, and multiplying by 100. Three percent of 4 groups of plantings were randomly sampled. The groups represent the variable topography of the shoreline. These criteria were documented at 6 months post-construction, and at years 1996, and 1999, when the original plants became indistinguishable. Herbivore damage was recorded if observed.

IV. Monitoring Activity (continued)

Shoreline Change:
To document shoreline movement continuous differential GPS was established at the mean high water line along the original shoreline adjacent to vegetative plantings in the project area and at a reference site located east of Avery Canal. DGPS was documented pre-construction in 1995 and in post-construction years 1998, 2001, and will be documented in 2004, 2008, and 2013 to provide a template for mapping shoreline position and shoreline changes over time. Shoreline positions will be compared to historical datasets available in digitized format for 1956, 1978, and 1988 shorelines.

c. Preliminary Monitoring Results and Discussion

Aerial Photography:
Information interpreted from GIS Land/Water analysis show an increase of project area land of 57.4 acres (23.2 ha) (figures 2-4).

Vegetation:
Percent survival of *S. alterniflora* at the 36 month post-planting averaged 90.6 % among all land types. Percent survival of *S. alterniflora* at the 36 month post-planting in the high, medium and low *P. australis* coverage was 12.5 %, 62.5 %, and 89.1 %, respectively. Percent cover of *S. alterniflora* at the 36 month post-planting in high, medium, and low *P. australis* coverage was 5.6 %, 56.9 %, and 75.9 %, respectively. The high average percent survival and percent cover of the *S. alterniflora* on the shoreline indicate that the plants have become established. However, the data indicate that survivorship and percent cover of *S. alterniflora* was lessened in established stands of *P. australis*. Data collection on vegetation is complete as per the 1999 vegetation survey because individual plants in the plots were indistinguishable (figures 5-6).

Shoreline Change:
The overall shoreline change for the Boston Canal Shoreline Stabilization (TV-09) project area from 1998-2001 is 21.44 acres. The majority of that change is considered gain with only 6.40 acres of loss (figure 7). Data collection in the reference area was discontinued in 2000 as a result of the Oaks/Avery Shoreline Protection (TV-13a) project boundary incorporating the Boston Canal reference area within it. Shoreline GPS from the Boston Canal 1998 monitoring and pre-construction GPS from the Oaks/Avery 2000 monitoring were used to calculate shoreline change. The overall change for the reference area for Boston Canal from 1998-2000 is 2.87 acres, of which less than half was loss (1.06 acres; figure 8).

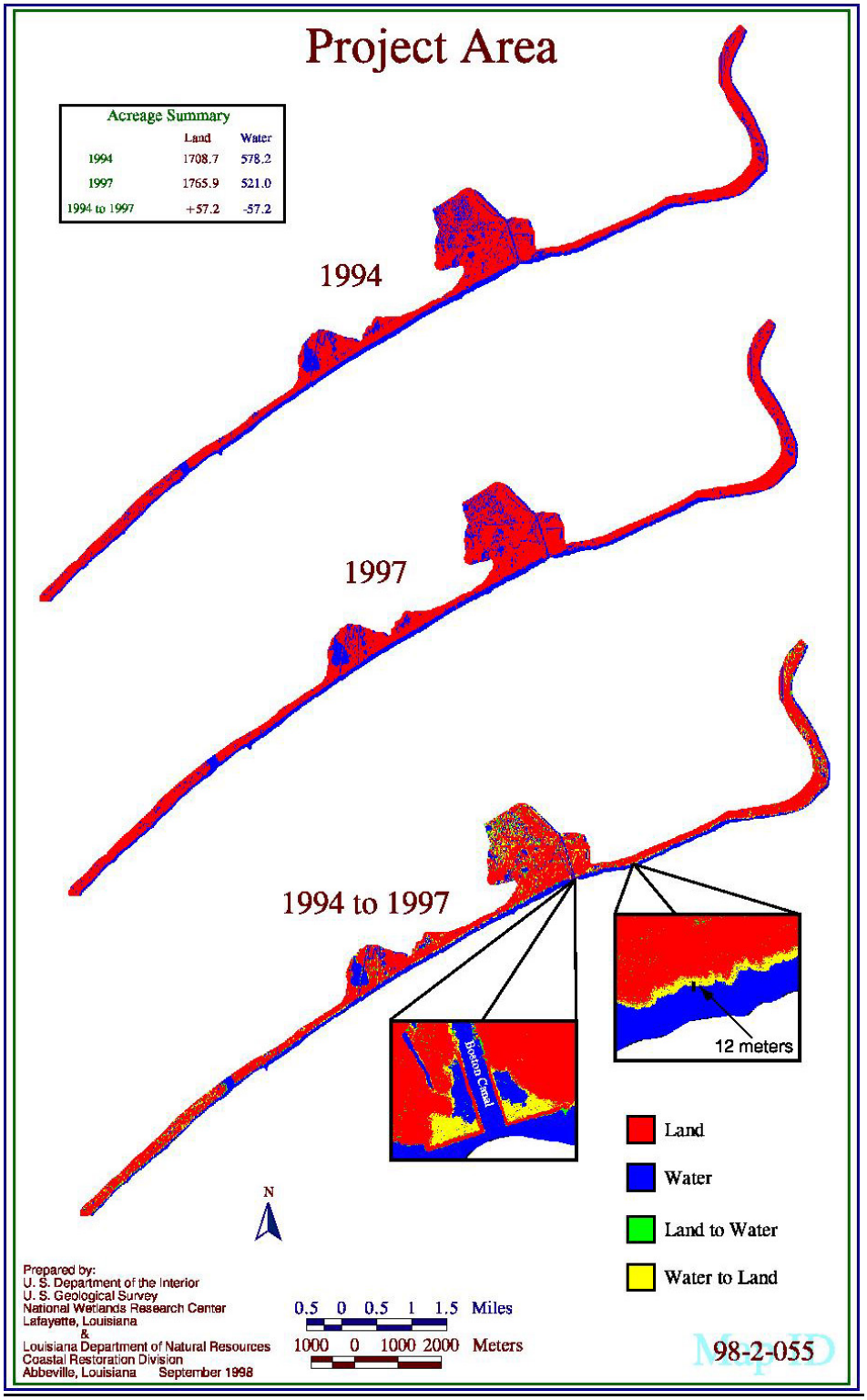

Figure 2. Boston Canal/Vermilion Bay Shoreline Stabilization (TV-09) GIS Land/Water analysis of project area.

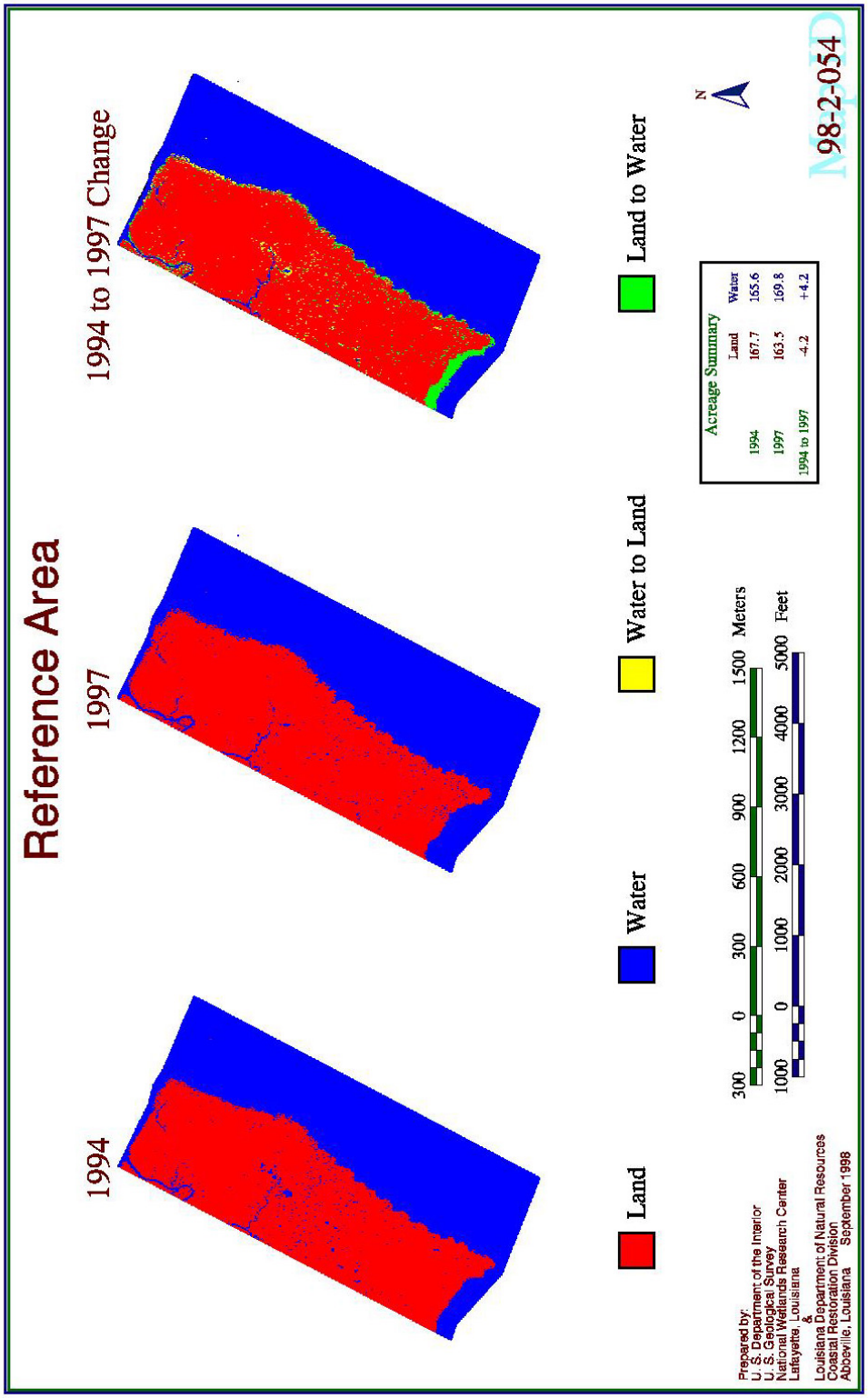

Figure 3. Boston Canal/Vermilion Bay Shoreline Stabilization (TV-09) GIS Land/Water analysis of the reference area.

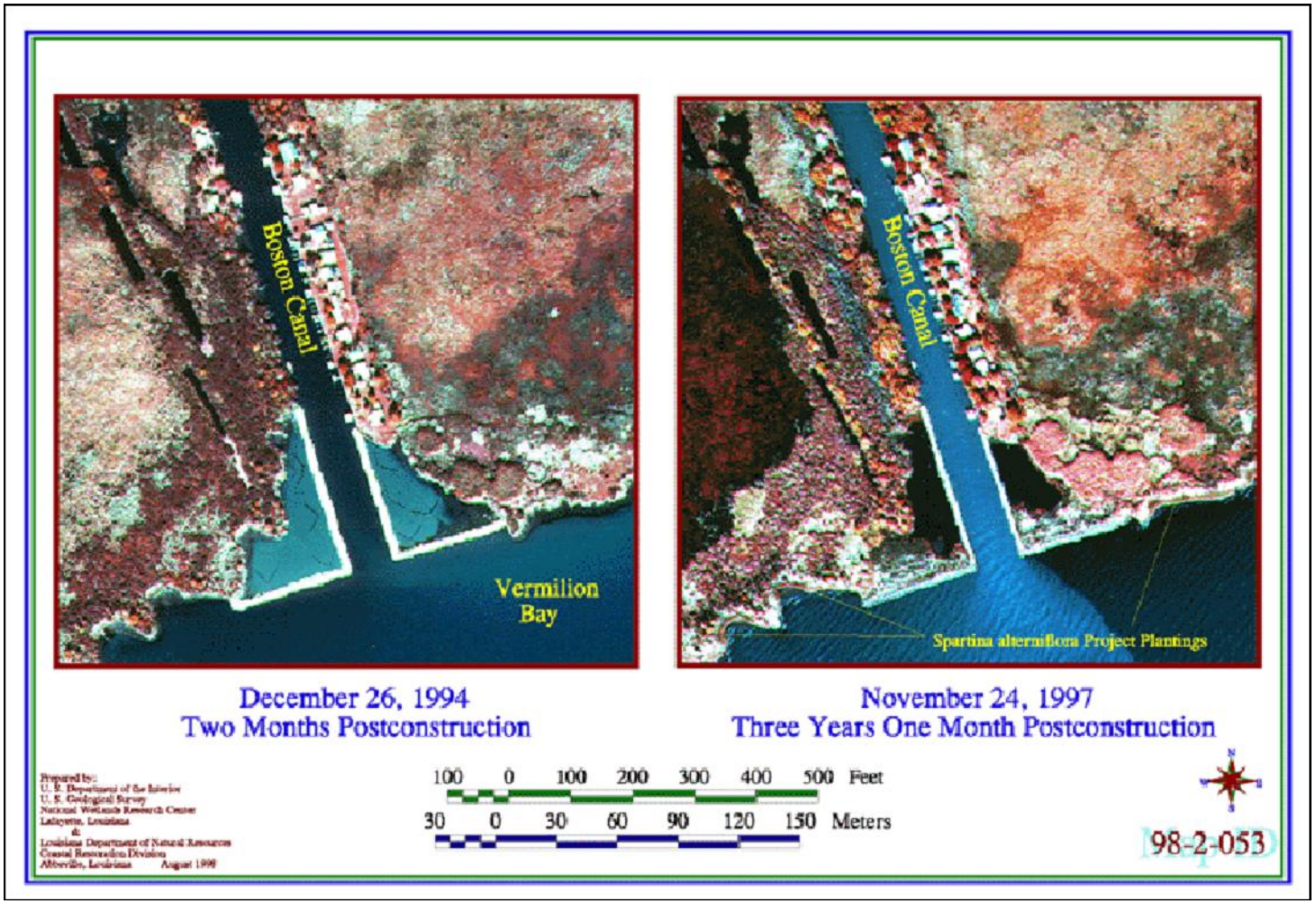

Figure 4. Aerial photography comparison of Boston Canal Shoreline Stabilization (TV-09) project at two month post construction (December 26, 1994) and three years one month post construction (November 24, 1997).

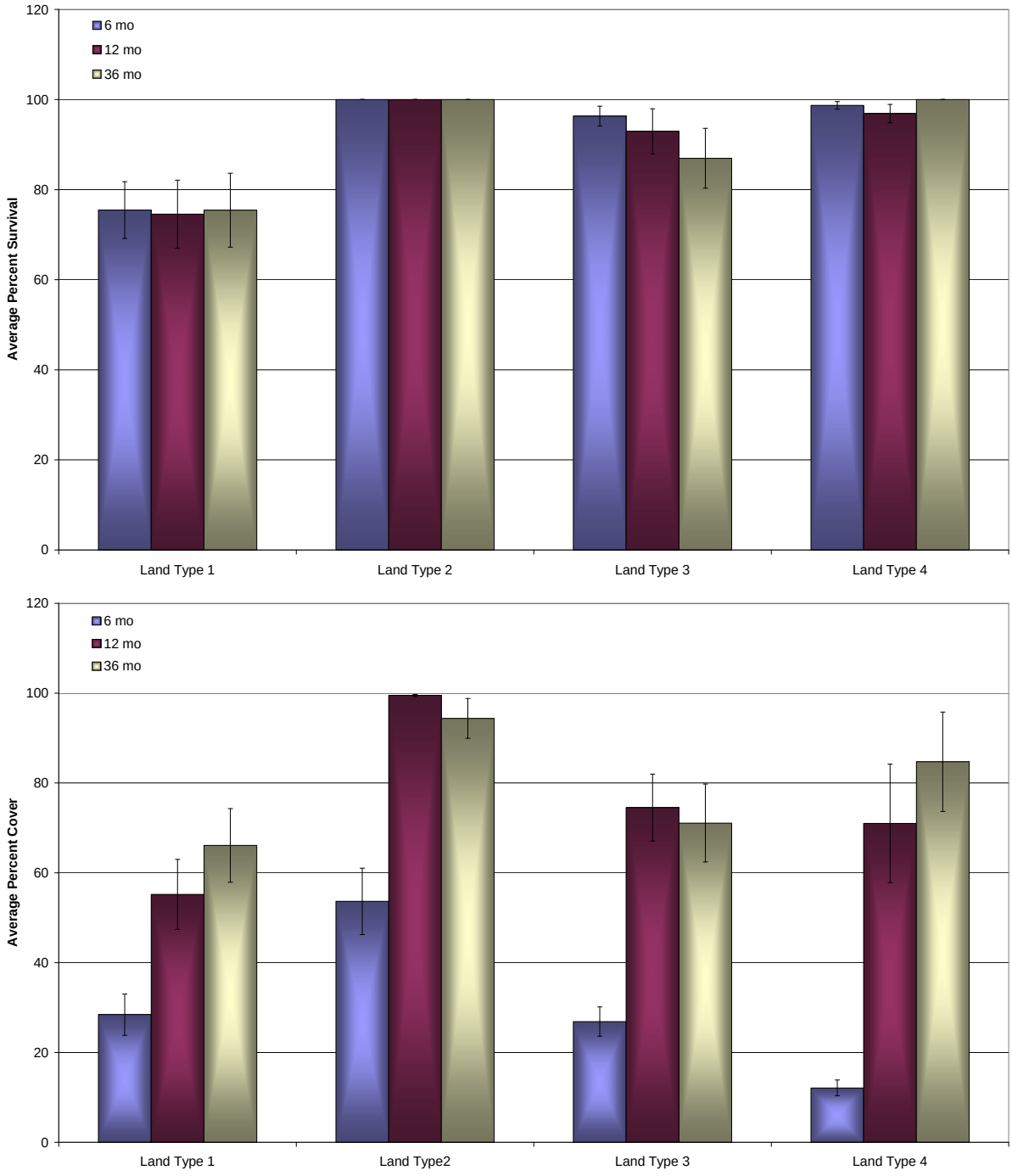

Figure 5. Boston Canal/Vermilion Bay Shoreline Stabilization (TV-09) average percent survival (upper) and average percent cover (lower) of *Spartina alterniflora* plantings in land types 1-4 observed at 6, 12, and 36 months postplanting, 1995, 1996, and 1999 means ± SE.

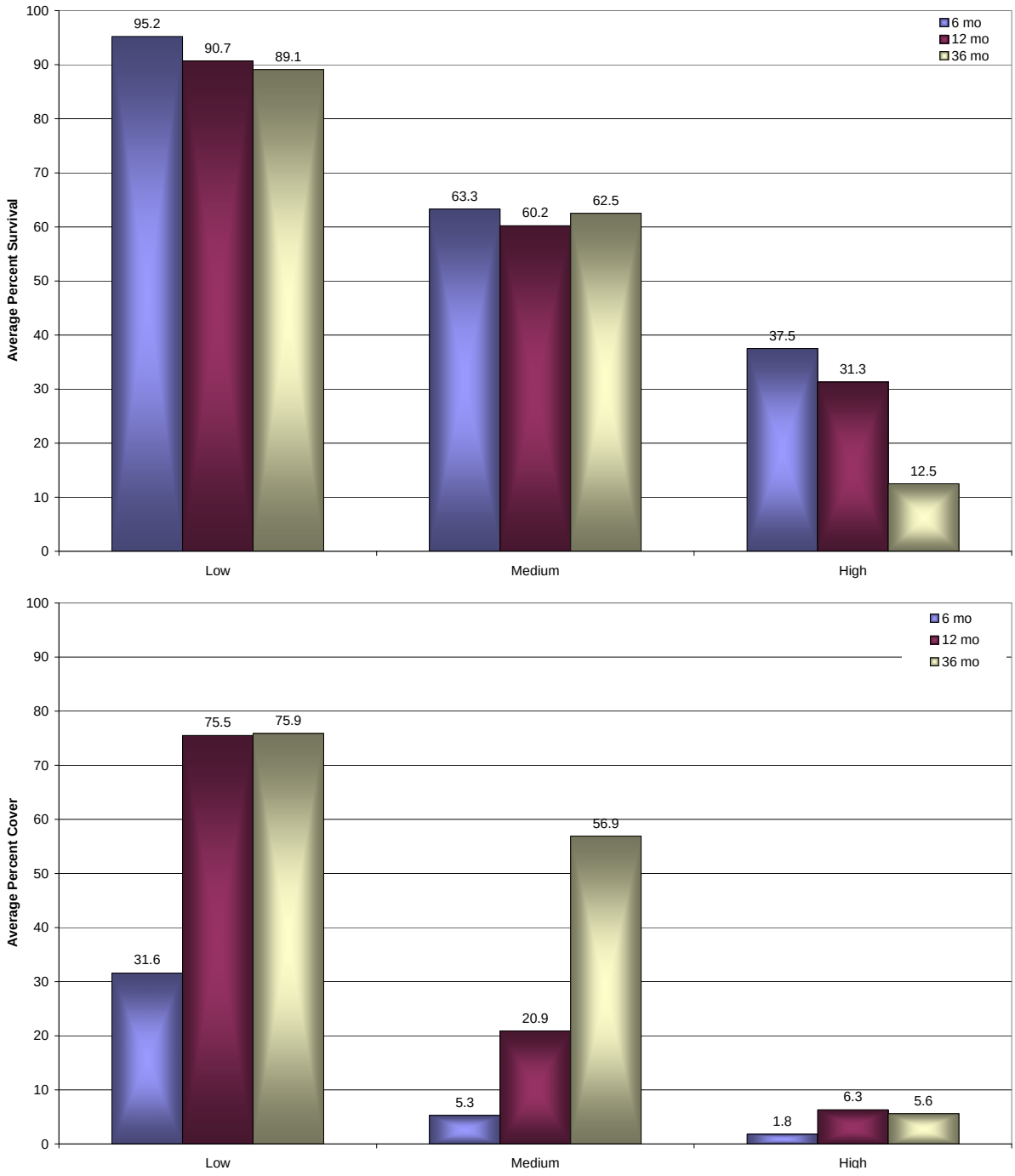

Figure 6. Boston Canal/Vermilion Bay Shoreline Stabilization (TV-09) average percent survival (upper) and average percent cover (lower) of *Spartina alterniflora* plantings at 6, 12, and 36 mo post-planting in low, medium, and high levels of *Phragmites australis* coverage.

Figure 7. *Spartina alterniflora* planting at the 6 (upper), 12 (center) and 36 (lower) mo post-planting monitoring.

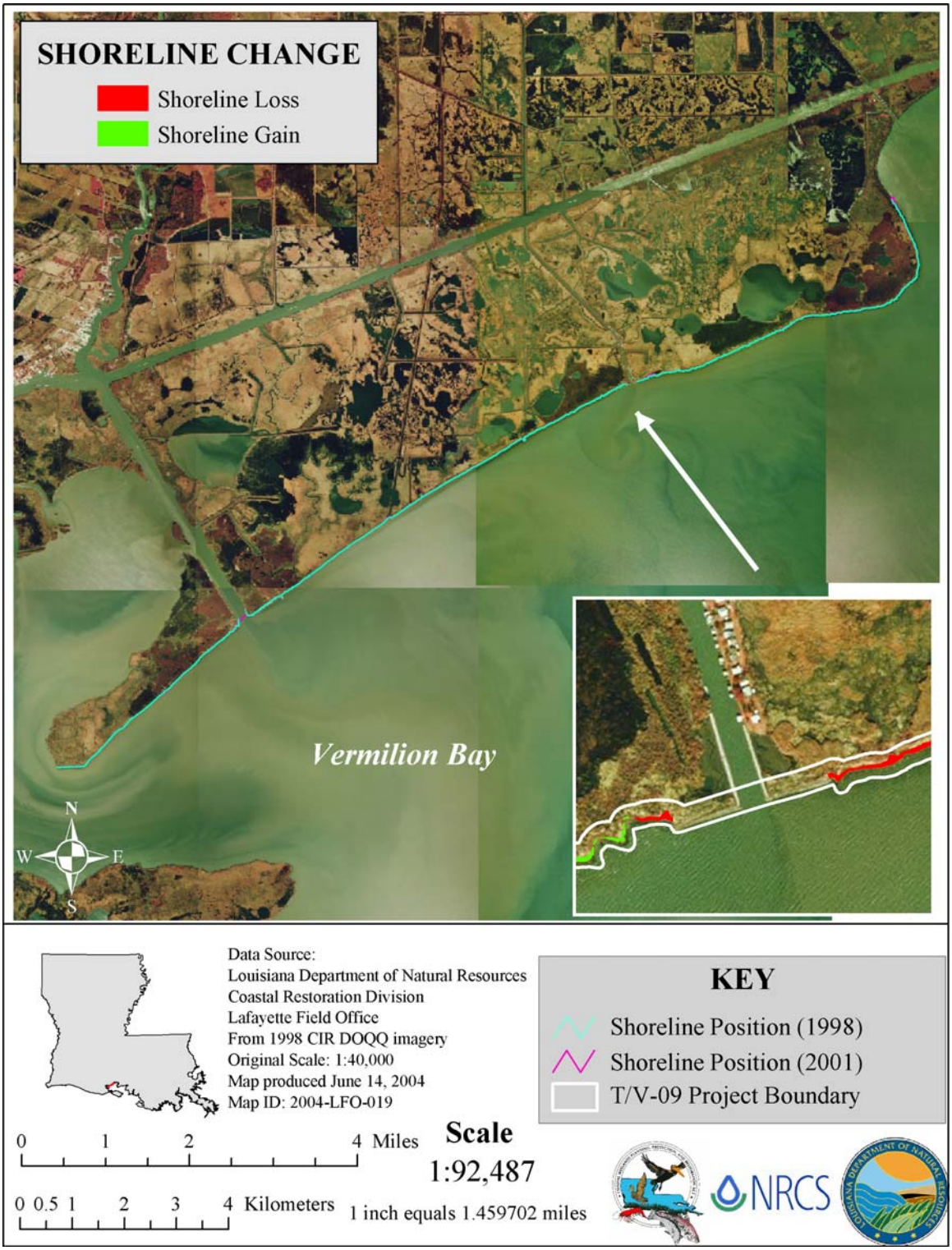

Figure 8. Shoreline position change for Boston Canal Shoreline Stabilization (TV-09) project using 1998 to 2001 differential global positioning system.

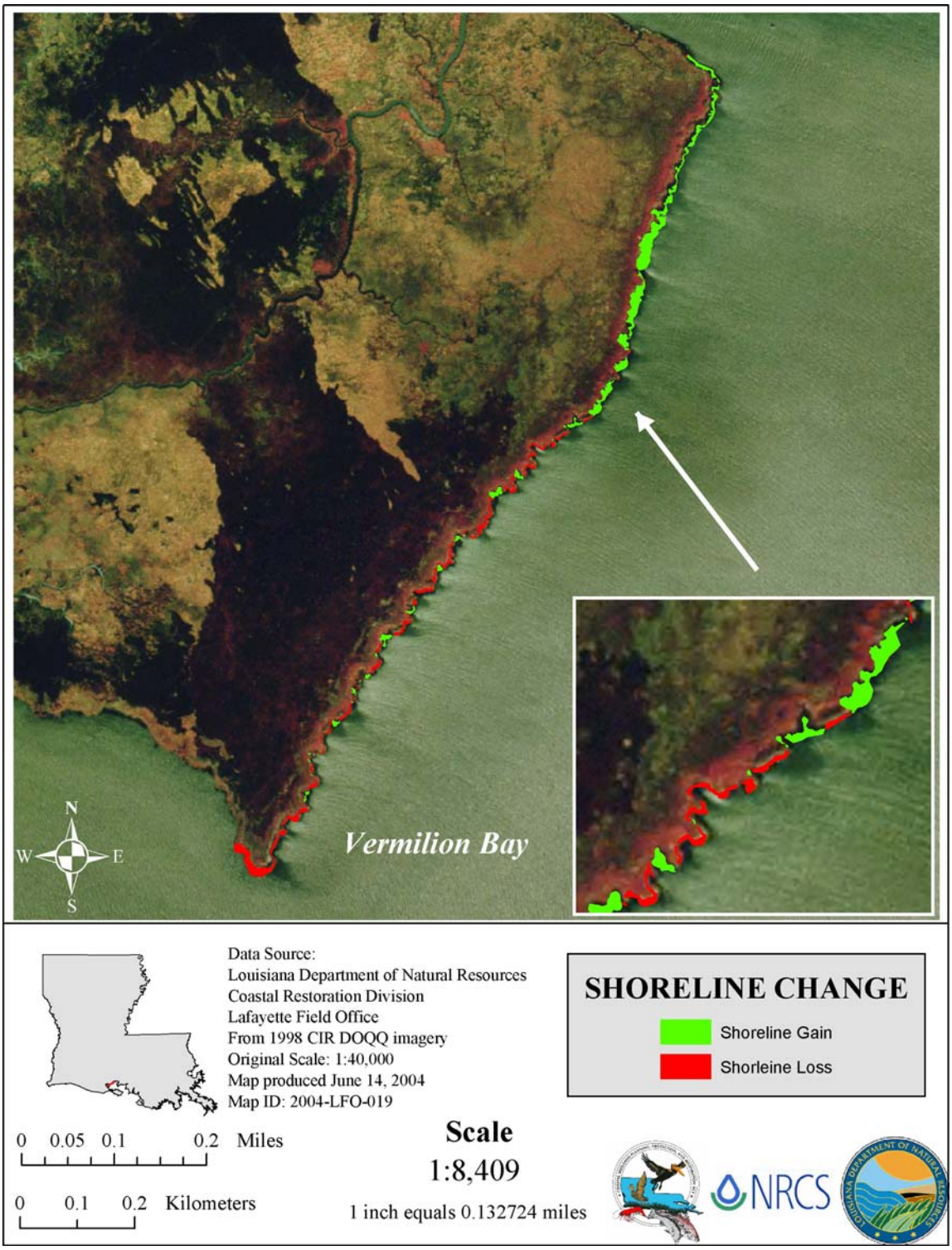

Figure 9. Shoreline position change for Boston Canal Shoreline Stabilization (TV-09) reference area using 1998 to 2000 differential global positioning system.

Figure 10. Boston Canal/Vermilion Bay Shoreline Stabilization (TV-09) rock breakwaters and sediment fences at the mouth of Boston Canal (January 2001).

Figure 11. Boston Canal/Vermilion Bay Shoreline Stabilization (TV-09) photographs: (A) sedimentation behind the breakwaters December 1994: (B) vegetation growing behind the breakwaters in February 1998.

Figure 12. Boston Canal/Vermilion Bay Shoreline Stabilization (TV-09) photographs: (Upper) vegetation behind the breakwaters July 1997: (Lower) vegetation behind the breakwaters in October 2001.

V. Conclusions

a. Project Effectiveness

The project appears to be functioning properly in maintaining the integrity of approximately 466 ac (186 ha) of wetlands and stabilizing 14.3 mi (23 km) of the Vermilion Bay shoreline. Plantings of *S. alterniflora* have become well established and are indistinguishable from each other along most of the shoreline. Sediment build-up behind the dike on the east and west sides is continuing and vegetation has taken over the exposed mud flats. Elevation data show an increase in sedimentation behind the rock breakwater.

b. Recommended Improvements

There are no recommended improvements at this time.

c. Lessons Learned

Survivorship and percent cover of *S. alterniflora* was lessened in established stands of *P. australis*. Planting *S. alterniflora* in dense stands of *P. australis* should be avoided. Sediment fences inhibited even distribution of sediment behind the rock breakwaters. In March 2002, wire on the sediment fences were removed by NRCS personnel to allow the sediment to be more evenly distributed into the open water areas behind the fences closest to the shore (see figure 12). The use of sediment fences may not be necessary behind rock breakwaters.

Based on multiple O & M inspections, the rock breakwater has proven to be very effective in reducing shoreline erosion and allowing sediment to build up behind the rock dike, while experiencing no deterioration and requiring no maintenance. The rock breakwater was constructed on the (-) 2 contour with a 2 foot top width, 2:1 side slopes and 650 lb. stone gradation. This type of typical section is recommended for future rock breakwater construction along Vermilion Bay.

VI. Literature Cited

Louisiana Department of Natural Resources. 2002. Operations Maintenance, and Rehabilitation Plan for the Boston Canal Project (TV-09), Louisiana Department of Natural Resources, Coastal Engineering Division.

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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 program. Open-file series no. 95–01. Baton Rouge: Louisiana Department of Natural Resources, Coastal Restoration Division.