TV-12

Little Vermilion Bay Sediment Trapping Summary Data and Graphics

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Little Vermilion Bay Sediment Trapping (TV-12)

Project Overview:

Little Vermilion Bay is a shallow western extension of Vermilion Bay, located in south-central Vermilion Parish, Louisiana (figure 1). Prior to 1900, marshes surrounding Little Vermilion Bay were brackish or saline. By 1952, fresh water from the Atchafalaya Basin began reaching Atchafalaya Bay and reduced salinities in the area (Adams and Baumann 1980). With strong southeasterly winds, sediment-rich waters from Atchafalaya Bay reach Little Vermilion Bay and deposit sediments in the proposed project area.

Perhaps the most important hydrologic change within this region was the dredging of the Gulf Intracoastal Waterway (GIWW). Construction of the Gulf Intracoastal Waterway (GIWW) was authorized by the Rivers and Harbors Act of 1925 [Louisiana Coastal Wetlands Conservation and Restoration Task Force (LCWCRTF) 1993]. Recent studies, involving satellite imagery and turbidity meters, indicate that northwest winds (resulting from cold fronts) are largely responsible for re-suspending sediments in Little Vermilion Bay and that the GIWW and Freshwater Bayou are significant sources of fresh water and sediment into the area (Walker 1998). Sediment availability is of fundamental importance to the project. The recognition of the potential for subaerial development in Little Vermilion Bay stimulated interest in designing a plan to enhance this development (National Marine Fisheries Service [NMFS] 1998).

At mean tide levels, water depth in Little Vermilion Bay ranges from 1 to 3 ft (0.3 - 0.9 m). Soil types surrounding Little Vermilion Bay are classified as Clovelly-Lafitte (Natural Resources Conservation Service [NRCS] 1996). Clovelly soils consist of continuously flooded, very poorly drained, and very slowly permeable organic matter formed in moderately thick accumulations of herbaceous plant

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Project Overview: (continued)

material, overlying very fluid clayey alluvium (NRCS 1996). Lafitte soils consist of mostly flooded, very poorly drained, and moderately rapidly permeable, organic matter from herbaceous plant material, overlying clayey alluvium (NRCS 1996). Marshes surrounding Little Vermilion Bay have been classified as brackish by O'Neil (1949) and Chabreck and Linscombe (1968, 1978, 1988). Primary plant species include *Phragmites australis* (roseau cane), *Spartina patens* (saltmeadow cordgrass), *S. alterniflora* (smooth cordgrass), *Sagittaria* sp. (arrowhead), *Schoenoplectus californicus* (giant bulrush), *Typha* sp. (cat-tail), *Juncus romerianus* (needle rush), and *Cladium jamaicense* (sawgrass) (nomenclature according to Godfrey and Wooten [1981a and 1981b]).

At present, no documented studies of wetland change nor coastal restoration activities have been conducted within Little Vermilion Bay. However, Vermilion Land Corporation constructed spoil terraces adjacent to the project area as a pilot study. Unpublished results indicated that after 13 months, while the unvegetated terraces eroded away, those that were vegetated actually were improving through growth and colonization of additional plants.

The Little Vermilion Bay Sediment Trapping Project area will affect 964 ac (390 ha), of which 67 ac (27 ha) are intermediate marsh and 897 ac (363 ha) are open water (figure 1). It is located in the northwestern corner of Little Vermilion Bay at its intersection with Freshwater Bayou.

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Project Overview: (continued)

The project includes multiple features that classify it not only as a sediment trapping project but also a vegetative planting and shoreline protection project. Construction was completed in September 1999. The features include:

1. Approximately 14,000 to 19,900 linear feet (4,267 - 6,065 m) of distributary channels 100 ft (30.5 m) wide and 10 ft (3.0 m) deep were dredged.

2. Created approximately 68 acres (8.9 - 12.5 ha) of terraces.

3. Vegetative plantings of gallon containers and sprigs of *S. alterniflora* were planted at the base of terraces and along the existing shoreline.

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Project Objectives:

1. Enhance the amount of wetlands created by natural sediment deposition where confined flow of Atchafalaya River water enters the project area through the dredging of distributary channels.

2. Protect the existing wetlands of the project area by reducing wave energy through the creation of terraces.

3. Create emergent marsh on terraces along distributary channels and on newly deposited soils.

4. To encourage colonization by submerged aquatic vegetation between and around terraces.

Specific Goals:

1. Increase sediment deposition in the project area conducive to the establishment of emergent vegetation.

2. Create and enhance emergent marsh by planting on terraces and along suitable existing shorelines.

3. Increase the occurrence of submerged aquatic vegetation in shallow open water within the project area.

4. Reduce shore erosion rate in the project area.

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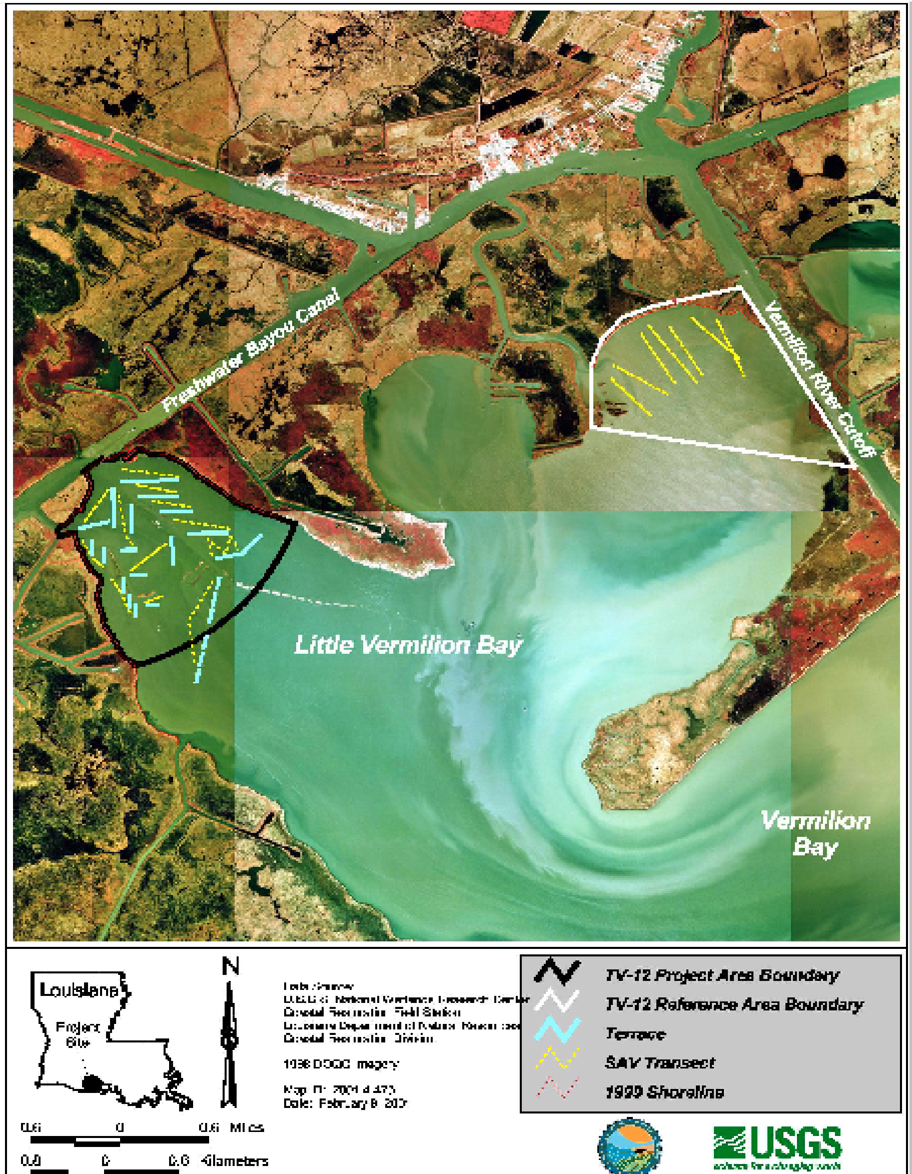

Figure 1. TV-12 project and reference area boundaries.

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<u>Monitoring Elements</u>:

Aerial Photography: To document marsh to open-water ratios and marsh loss rates, color infrared aerial photography (1:12,000) was obtained in 1999 (prior to construction), and postconstruction in 2002, and will be obtained in 2009, and 2017. Habitat mapping is not required. However, imagery will be delineated to classify all land in the project and reference areas as either (1) preexisting wetlands, (2) terraces, and (3) non-terrace, newly developed wetlands (i.e., those that develop in open water areas between the terraces or adjacent to the preexisting shoreline). Otherwise, the photography will be analyzed with GIS by NWRC using procedures as outlined in Steyer et. al. (1995).

Hydrophytic Classification: The vascular plants that colonize the terraces will be evaluated and classified into a wetland indicator status based on a plant species frequency of occurrence in wetlands. The status will be obtained from the "National List of Wetland Plant Species That Occur in Wetlands: Louisiana" (Reed 1988). The five classifications to be used and their prevalence index values are obligate wetland (OBL=1), facultative wetland (FACW=2), facultative plants (FAC=3), facultative upland (FACU=4), and obligate upland (UPL=5). Data will be collected using line intercept methodology on a minimum of two and a maximum of four transects per terrace (dependent upon length), with samples taken at 3.28 ft (1 m) intervals. All plants that are in the vertical plane of the line will be identified, assigned a prevalence index number, and averaged for each 3.28 ft (1 m) segment. The number of segments with prevalence index values of 1, 2 or 3 on each terrace will be determined and a percentage of the total calculated. Measurements will be taken across the terraces from vegetated edge to vegetated edge and differential Global Positioning System (dGPS) readings will be taken for consistency of sampling area throughout each sampling year. Hydrophytic classification was determined in 2002, and will be repeated in 2004, 2009, and 2017.

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Monitoring Elements: (continued)

Submerged Aquatic Vegetation: To document changes in the frequency of occurrence of submerged aquatic vegetation (SAV), a modification of the rake method will be employed (Chabreck and Hoffpauir 1962). The project and reference area will be monitored along 5 transects each divided into 3 blocks. Each block will have a minimum of 50 sampling stations. At each station, aquatic vegetation will be sampled by dragging a garden rake on the pond bottom for about 1 second. The presence of vegetation will be recorded to determine the frequency of aquatic plant occurrence (frequency = number of occurrences/number of stations x 100). When vegetation is present, the species present will be recorded in order to determine the frequencies of individual species (Nyman and Chabreck 1996). SAV abundance was sampled in 1999 (pre-construction), and will be sampled in 2004, 2009, and 2017.

Bathymetry/Topography: Sediment deposition will be monitored along existing transects used in bathymetry map creation (for engineering purposes). Several transects encompassing an array of terrace and channel formations will be selected for development of elevational profiles. Elevation of the water bottom sediments will be determined along each transect in a similar fashion to that in the initial survey. Surveys were conducted by a professional engineering firm in 1999 (immediately post-construction), in 2002, and will be conducted in 2004, and 2009. Survey years may change to gather additional information earlier in the project life based on potential ineffectiveness of the project.

Shoreline Change: To document shoreline change in the project area, GPS surveys were conducted at the vegetative edge of the bank to document the position of the shoreline in 1999 (pre-construction) and will be repeated post-construction in 2004, 2009, and 2017. A similar survey will be conducted in the reference area. GPS shoreline positions will be mapped and used to measure shoreline movement over the life of the project.

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Aerial Photography

Color infrared aerial photography (1:12,000) was acquired in 2000 and the land to water ratio of the reference and project areas, including the newly constructed terraces, was calculated. Additional, true color aerial photographs were taken of the project area to document the terraces' condition over time.

Figures:

Figure 2. Year 2000 land-water analysis.

Figure 3. Aerial photo 9/30/99 immediately post construction. Terraces are only bare ground with no vegetation. Freshwater Bayou is to the right.

Figure 4. Aerial photo April 2003 almost four years after construction. Freshwater Bayou is outside of the frame nearest to the bottom left hand corner. View is from the north out to Little Vermilion Bay to the south. Vegetation almost completely covers all terraces, and possible sedimentation is visible between some terraces.

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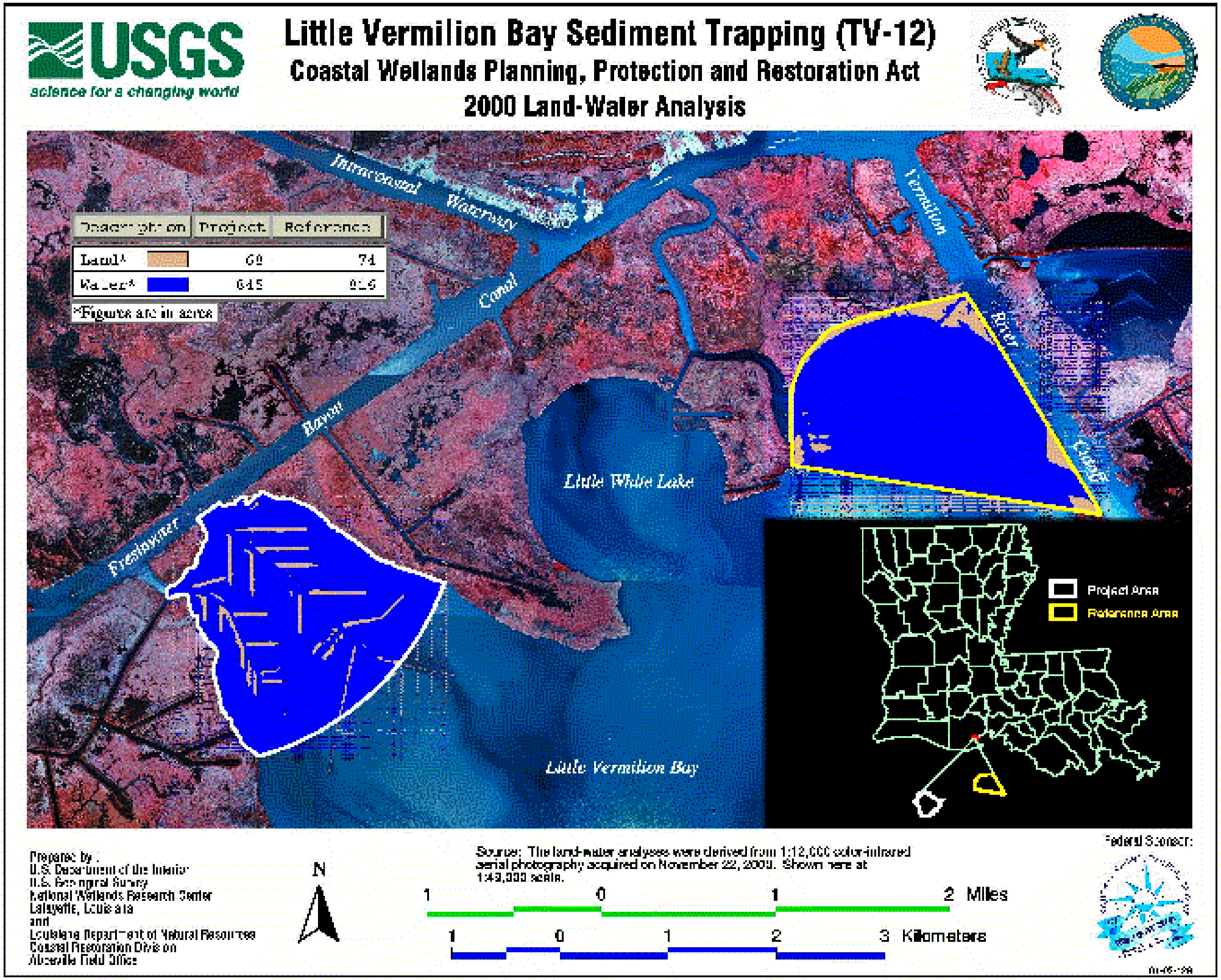

Figure 2: 2000 land-water analysis courtesy of USGS National Wetlands Research Center.

Little Vermilion Bay Sediment Trapping (TV-12)

Figure 3. Aerial photo 9/30/99 immediately post construction. Terraces are only bare dirt. Freshwater Bayou is to the right.

Little Vermilion Bay Sediment Trapping (TV-12)

Figure 4. Aerial photo April 2003 almost four years after construction. Freshwater Bayou is outside of the frame nearest to the bottom left hand corner. View is from the north out to Little Vermilion Bay to the south. Vegetation almost completely covers all terraces, and possible sedimentation is visible between some terraces.

Little Vermilion Bay Sediment Trapping (TV-12)

Hydrophytic Classification

A vegetation survey of the constructed terraces was conducted in summer 2002. The results of this intensive sampling are not yet analyzed nor available in time for this report. The following photographs describe the transition from bare ground to vegetated emergent marsh.

<u>Figures</u>:

Figure 5. Newly constructed terrace being planted in 1999.

Figure 6. View from middle of a terrace in June 2000 one year after construction and planting.

Figure 7. Planted and natural vegetation growth on a terrace – August 2001.

Figure 8. Vegetation on a terrace photographed during emergent vegetation survey in August 2002.

Figure 9. Color infrared aerial photography from 2000 showing selected transects from the 1999 elevation survey which were used as locations for the hydrophytic classification vegetation survey.

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Figure 5. Newly constructed terrace being planted in summer 1999.

Little Vermilion Bay Sediment Trapping (TV-12)

Figure 6. View from middle of a terrace in June 2000 one year after construction and planting, showing growth of planted *Spartina alterniflora* on either side.

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Figure 7. Planted and natural vegetation growth on a terrace in August 2001

Little Vermilion Bay Sediment Trapping (TV-12)

Figure 8. Vegetation on a terrace photographed during emergent vegetation survey in August 2002.

Little Vermilion Bay Sediment Trapping (TV-12)

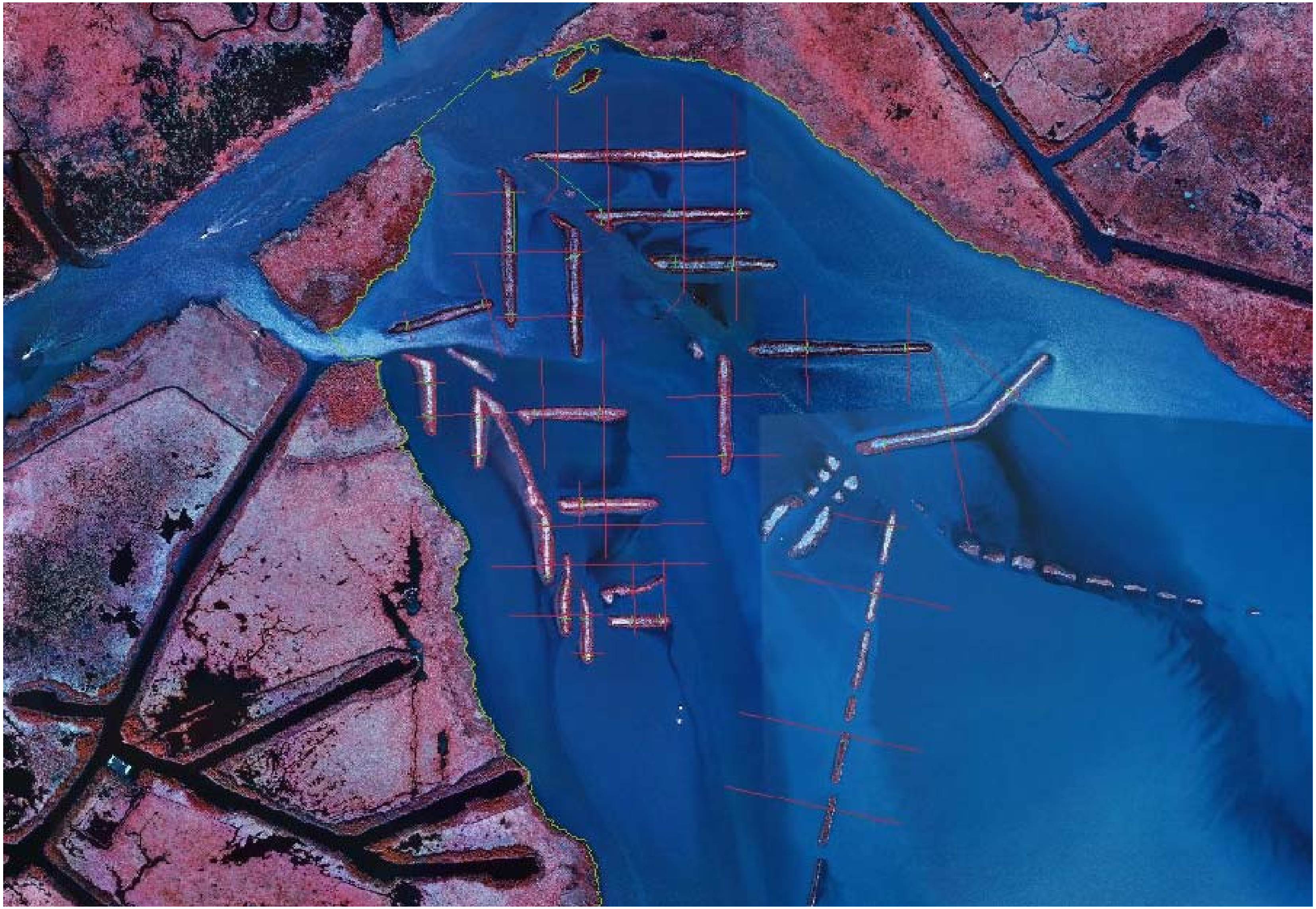

Figure 9. Color infrared aerial photography from 2000 showing selected transects from the 1999 elevation survey which were used as locations for the hydrophytic classification vegetation survey.

Little Vermilion Bay Sediment Trapping (TV-12)
Submerged Aquatic Vegetation (SAV)

SAV sampling was conducted in the project and reference areas in fall 1999 after construction of the terraces. A second SAV survey was conducted in 2003, but the results were not available in time to be included in this report.

Figures:

Little Vermilion Bay Sediment Trapping (TV-12)

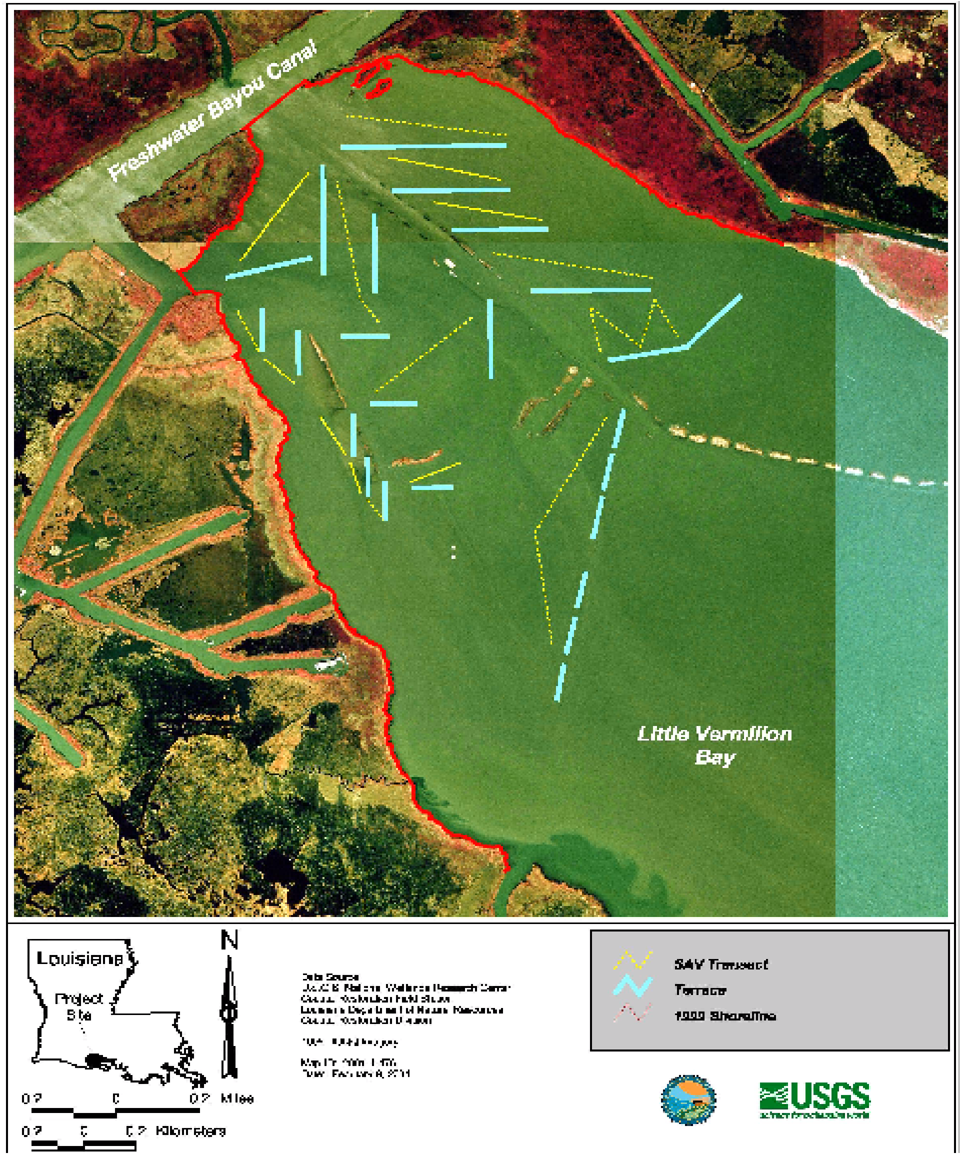

Figure 10. TV-12 project area showing terraces and SAV transect locations.

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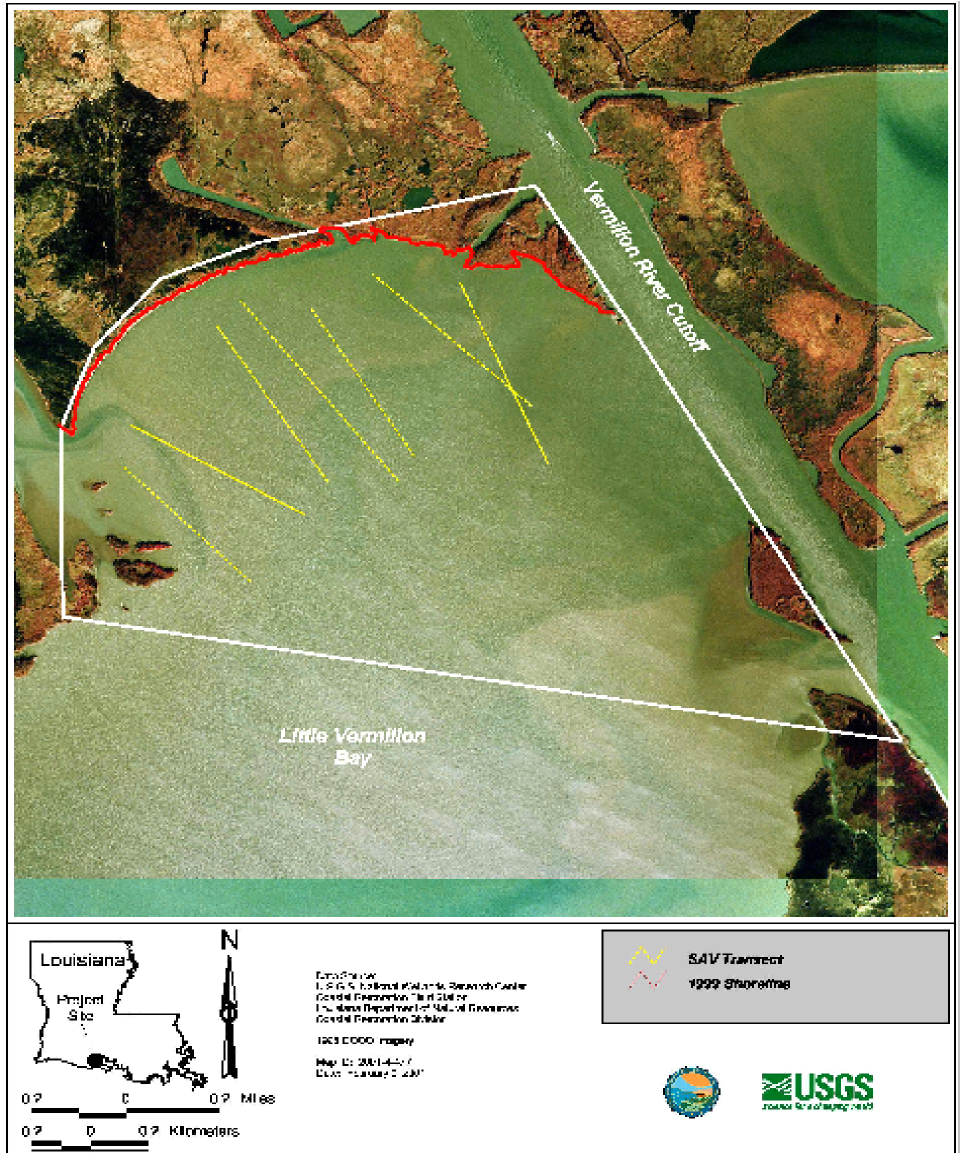

Figure 11. Reference area with SAV transect locations.

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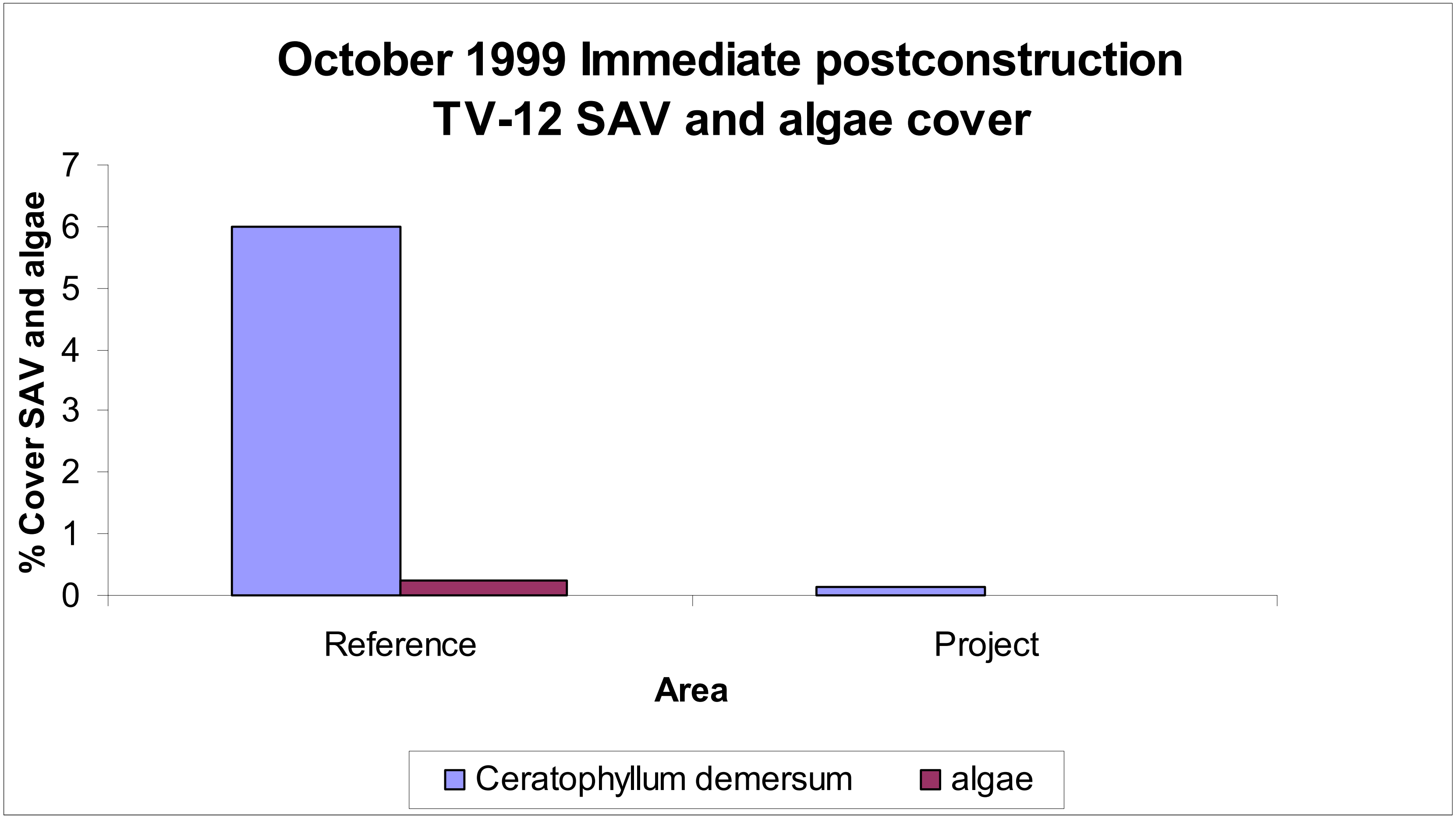

Figure 12. Percent cover of SAV, and species in the project and reference areas determined from survey performed in October 1999, after construction.

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Bathymetry / Topography

An as-built elevation survey consisting of several cross sections traversing each terrace was conducted in 1999. A post construction elevation survey of select cross sections was completed in 2003 but is not finalized and therefore not included in this report.

Figures:

Figure 1. Typical survey cross sections from 1999 as-built elevation survey showing elevations of terraces and adjacent water bottoms.

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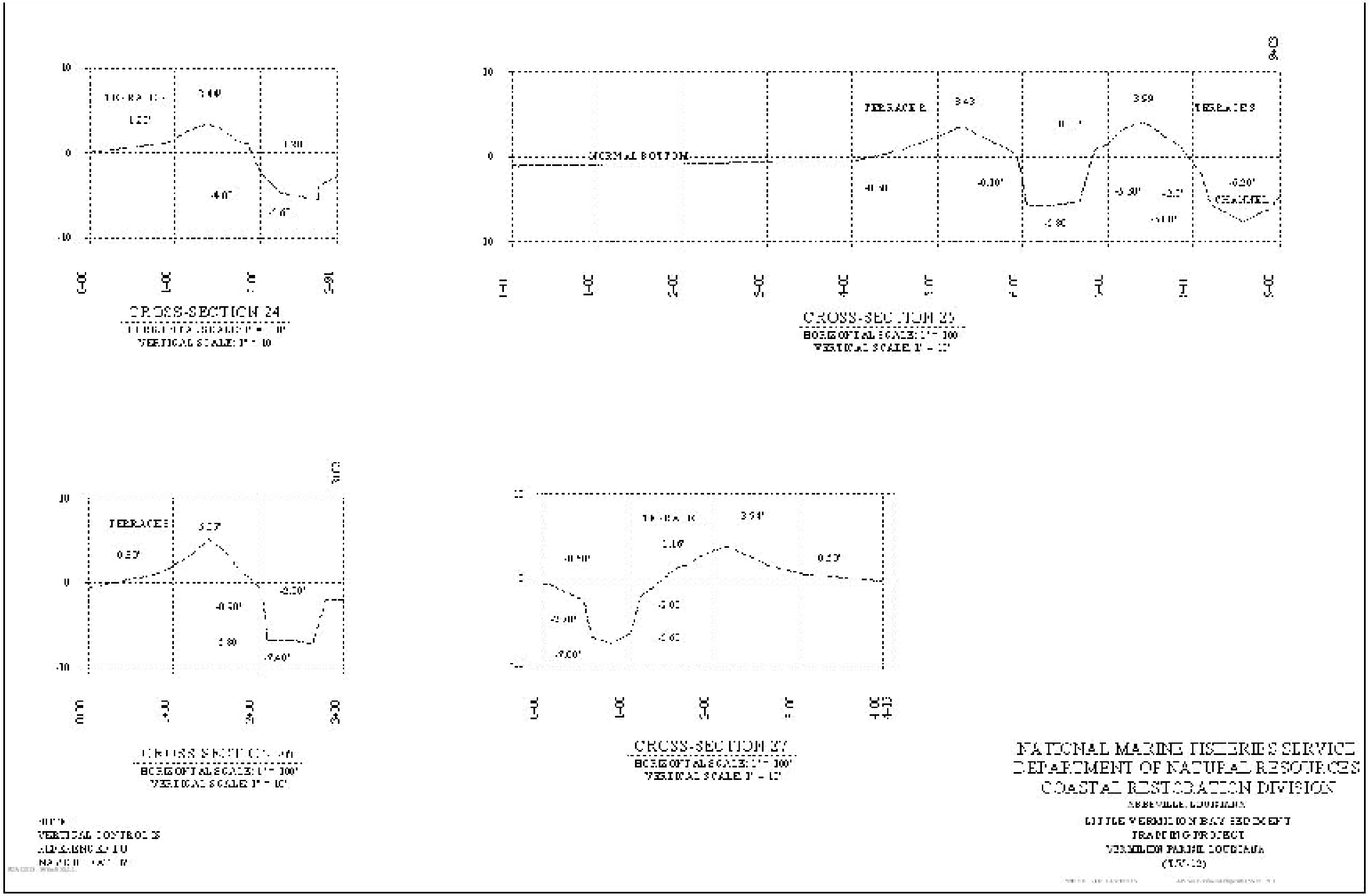

Figure 13. Typical survey cross sections showing elevations of terraces and adjacent water bottoms.

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Shoreline Change

A survey of the shoreline location of the project and reference areas was conducted in 1999 using a Trimble DGPS unit.

Figures:

Figure 14. Aerial photography of the project area overlaid with the shoreline position from GPS in red.
Figure 15. Reference area with shoreline gps in red.

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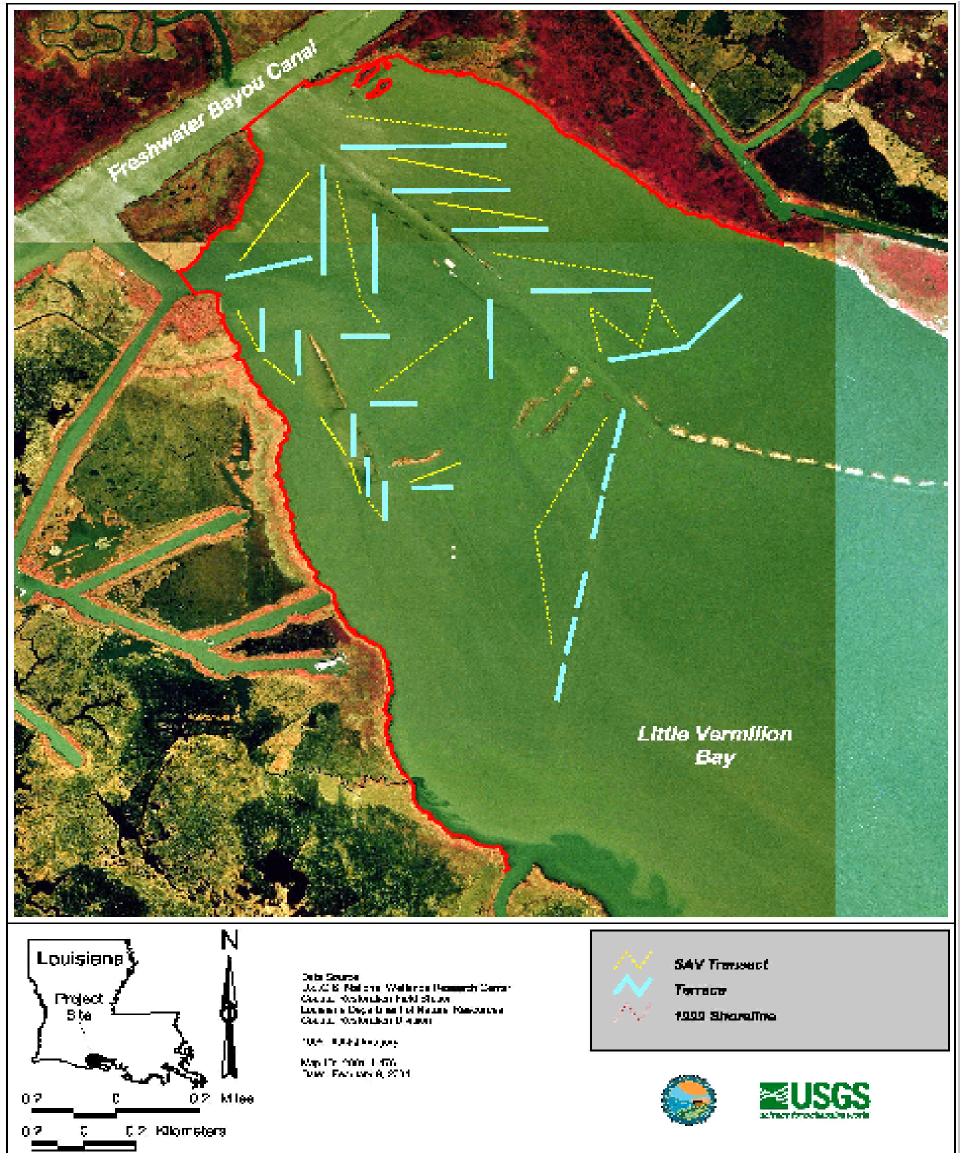

Figure 14. TV-12 project area with shoreline GPS in red.

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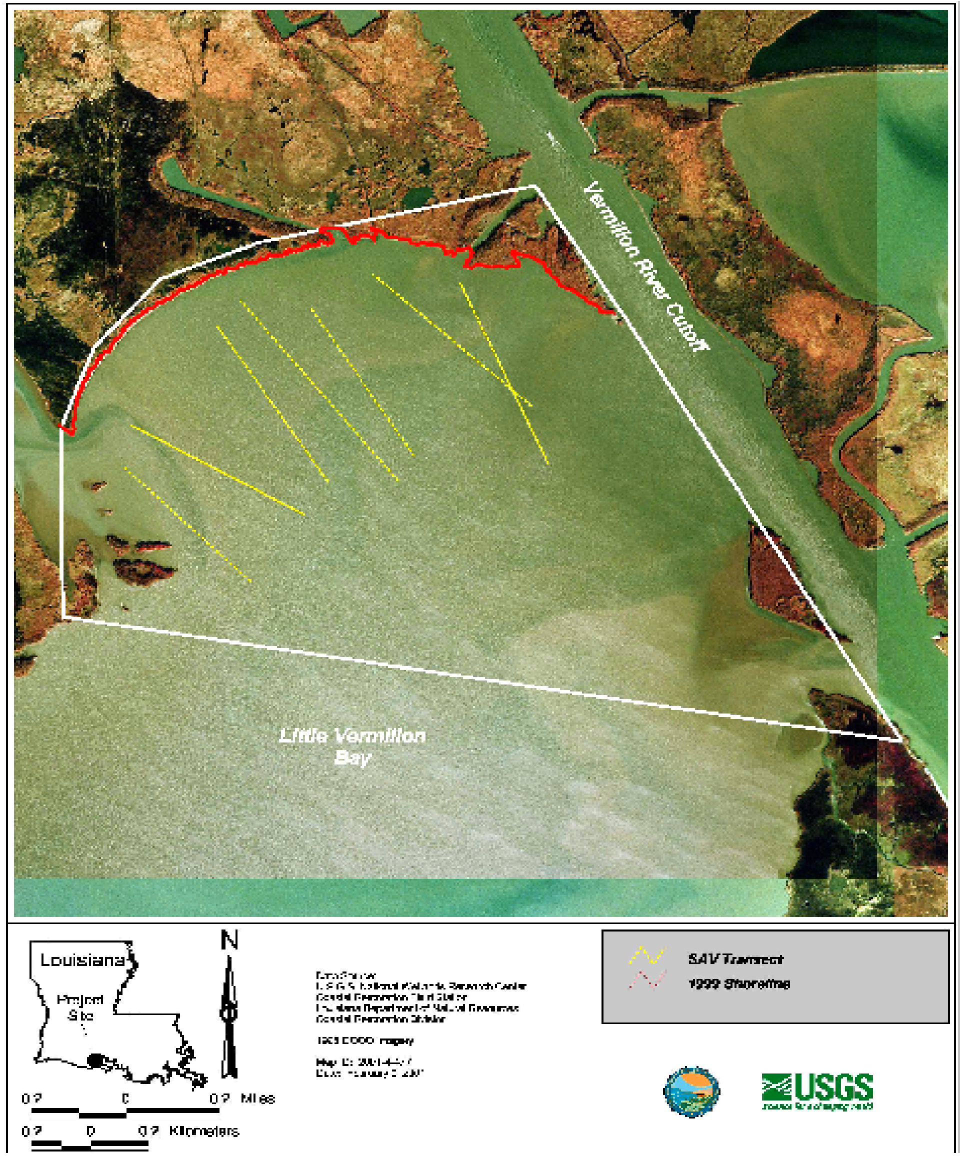

Figure 15. Reference area with shoreline GPS in red.

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Preliminary Findings

Hydrophytic classification: Vegetation, both planted and naturally established, has quickly covered most of the terrace area since the construction and planting in summer 1999. By 2000, the *Spartina alterniflora* plantings covered much of the edges of the terraces with thick, tall vegetation (figure 9). In summer 2002, the emergent vegetation on the terraces was sampled. Full analysis has not been completed but preliminary results suggest that *S. alterniflora* plantings grew well and on most terraces remain dominant on the edges. Many other species have colonized and covered the terraces. Of the approximately 40 species found, 21 are obligate wetland, 17 are facultative wetland, 3 are facultative, and 1 is facultative upland. These plants and the plantings have covered all but the highest elevations in the middle of some terraces where some bare ground remains.

Submerged Aquatic Vegetation: Significant amounts of SAV have not been collected with rake samples at construction or nearly three years later (spring 2003). However, evidence of SAV was found at some of the terrace edges during the emergent vegetation survey completed in summer 2002. Also, SAV is generally most abundant in late summer or fall, therefore SAV may have been underestimated in the recent spring sampling. The spring 2003 SAV sampling was conducted because of the imminent construction of TV-18 in area between Little White Lake and Vermilion River Cutoff which will effectively eliminate our reference area (figure 1).

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Preliminary Findings: (continued)

Bathymetry/Topography: A new elevation survey has not been completed yet, but aerial photography (figure 12) and the presence of mudflats with sprouting vegetation between terraces (spring 2003) suggest that sediment deposition has begun

Shoreline Change: Baseline shoreline GPS from 1999 is shown on figures on earlier slides. A repeat shoreline GPS survey was conducted in spring 2003, but the results are not yet available.