MONITORING PLAN

PROJECT NO. TE-24 ISLES DERNIERES RESTORATION
PHASE 1 (Trinity Island)

ORIGINAL DATE: September 8, 1994
REVISED DATE: July 23, 1998

Preface

Pursuant to a CWPPRA Task Force decision on April 14, 1998, the original monitoring plan was modified to provide a comprehensive monitoring program for all Terrebonne Basin barrier island restoration projects. An agreement was reached between U.S. Environmental Protection Agency, National Marine Fisheries Service, and Louisiana Department of Natural Resources to combine monitoring survey budgets to use Scanning Hydrographic Operational Airborne Lidar Survey (SHOALS) technology. The SHOALS survey methods produce a more comprehensive elevational data set for the entire Terrebonne Basin barrier islands, without increasing the project specific surveying costs. Additionally, habitat mapping has been changed to only an interpretation of land to open water. Aerial photography has been reduced from a total of six flights to one pre-construction flight. Due to the change in planting design, percent survival has been eliminated. Soil sampling has been eliminated as a monitoring variable. Elevational surveys will be conducted utilizing the SHOALS technology, and will be sampled only in 1999, 2001, 2003, 2007 and 2016 instead of annually.

Project Description

The Louisiana deltaic plain is fronted by a series of headlands and barrier islands that were formed as a result of the Mississippi River deltaic cycle. Following deltaic abandonment, headland sand deposits are reworked and deposited longshore forming flanking barriers (Penland et al. 1988). Submergence of the abandoned delta separates the headland from the shoreline forming a barrier island arc. The transgressive island arc cannot keep pace with the high rate of relative sea level rise and eventually becomes an inner-shelf shoal (Penland et al. 1988).

The Isles Dernieres are a barrier island arc transformed from the abandonment of the Caillou headland (part of the Lafourche delta complex) which occurred approximately 500 years B.P. (Penland and Boyd 1985). The Isle Dernieres, which separate Terrebonne Bay, Lake Pelto and Caillou Bay from the Gulf of Mexico, is a 20-mile (32 km) long island arc and which is segmented into four islands: Raccoon Island, Whiskey Island, Trinity Island and East Island (McBride et al. 1989). East Island and Trinity Island are the eastern-most islands of the Isle Dernieres (figure 1).

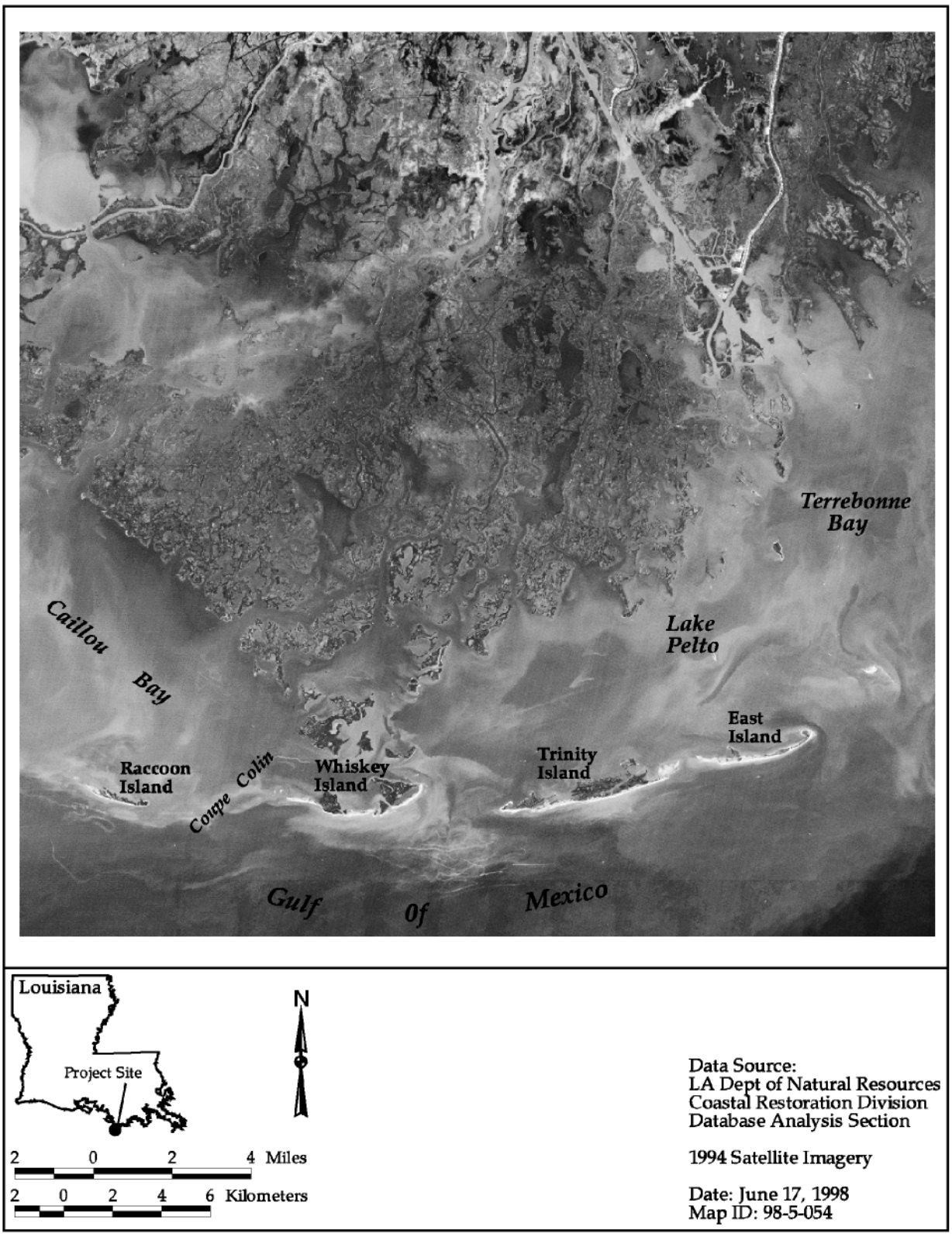

Figure 1. Isles Dernieres Islands, Terrebonne Parish, Louisiana.

Trinity Island is located in Terrebonne Parish, Louisiana, at 29° 02'46" N and 90° 43'48" W. These islands, like all of Louisiana's barrier islands, are experiencing island narrowing and land loss as a consequence of a complex interaction among global sea level rise, compactual subsidence, wave and storm processes, inadequate sediment supply, and intense human disturbance (Penland et al. 1988; McBride et al. 1989). Models developed by Penland et al. (1988) illustrate that Louisiana's barrier islands gradually narrow, fragment and transgress through time eventually becoming subaqueous shoals.

The Isles Dernieres have experienced severe erosion. Between 1890 and 1988, the Isles Dernieres shoreline has eroded at an average rate of 60.4 ft yr^{-1} (18.4 m yr^{-1}) and the area of Isles Dernieres has lost an average of 116.6 ft yr^{-1} (47.2 ha yr^{-1}) between 1978 and 1988 (McBride et al. 1989). East Island has decreased in area from 432.4 acres (175 ha) in 1978 to 212.5 acres (86 ha) in 1988 while Trinity Island has decreased in area from 1317.1 acres (533 ha) in 1978 to 901.9 acres (365 ha) in 1988. Without any restoration efforts, East and Trinity Islands are estimated to become subaqueous by the years 1998 and 2007 respectively (McBride et al. 1989).

TE-24 (Trinity Island) is considered Phase 1 of the Isles Dernieres Restoration Plan. This plan is designed to restore these barrier islands in the Isles Dernieres chain in Terrebonne Parish, Louisiana by increasing the elevation and width of the islands, closing existing breaches, and restoring back barrier marshes. The restoration of Trinity Island will include the area from New Cut to Whiskey Pass and the marsh platform between the Gulf of Mexico and California Canal (figure 2). Containment dikes will be used to create an elevated vegetated platform approximately 4 ft (1.2 m) and 800 ft (243.8 m) wide on which a dune an additional 4 ft (1.2 m) and 200 ft (60.9 m) wide will be constructed. Sand fencing will be constructed on the gulf side of the dune to trap blowing sand. Appropriate species of vegetation will be planted in the spring following completion of construction.

Project Objectives

1. Restore the coastal dunes of the Eastern Isles Dernieres (Trinity Island).

2. Reduce loss of sediment and enhance the physical stability of Trinity Island utilizing hand planted vegetation.

Specific Goals

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

1. Increase the height and width of Trinity Island and close breaches using dredged sediments.

2. Reduce loss of sediment through vegetative plantings therefore increasing the stability of the island.

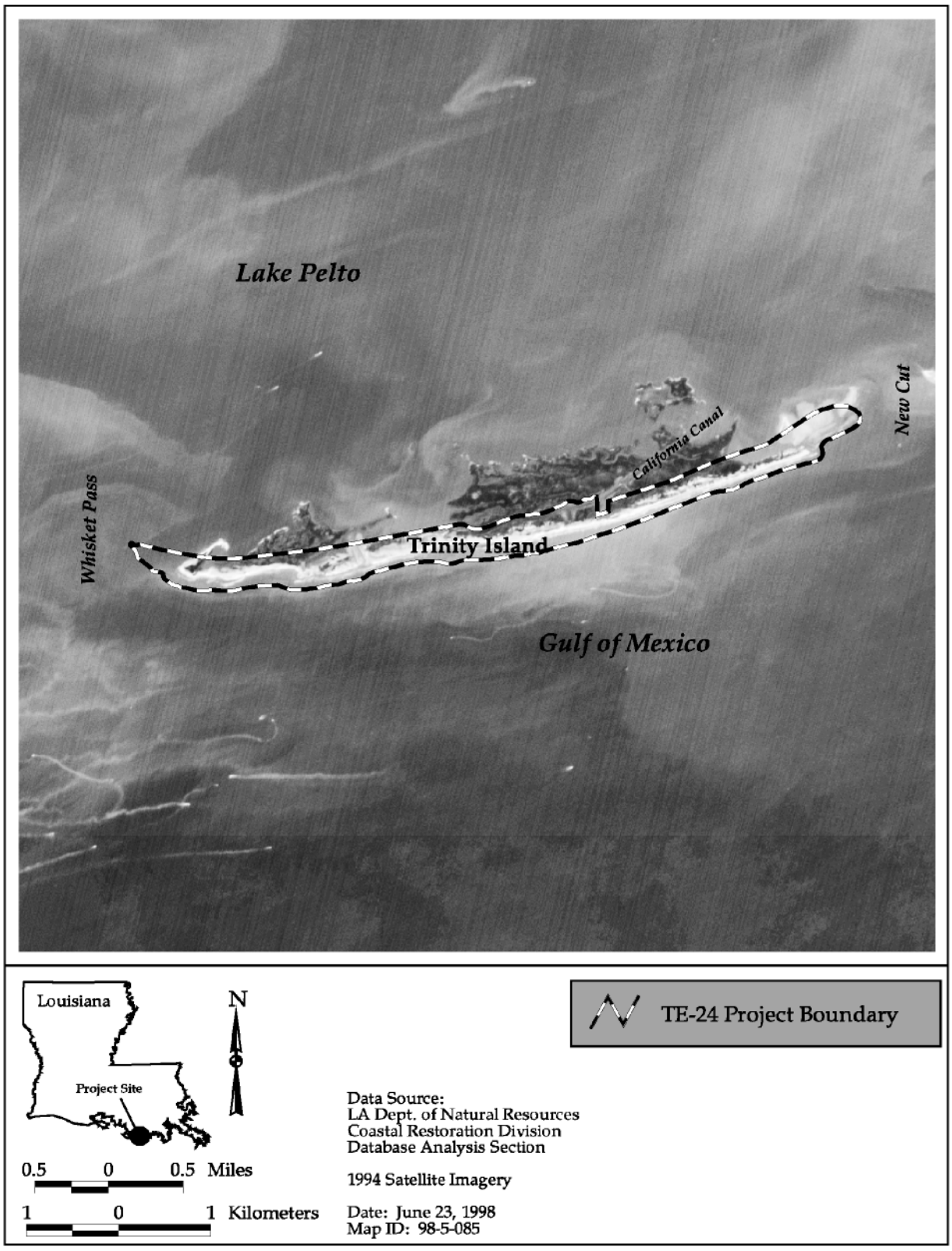

Figure 2. Isles Dernieres Restoration Phase 1 (TE-24) project area.

Monitoring Elements

The following monitoring elements will provide the information necessary to evaluate the specific goals listed above:

1. Aerial Photography

Near vertical, color-infrared aerial photography (1:12,000 scale), flown in November 1997, will be acquired from the National Wetlands Research Center (NWRC) as the pre-construction standard for future changes in the island's dimension. The photography will be georectified for land/water ratio using NWRC standard operating procedures (Steyer et al. 1995).

2) Topography

To document both horizontal and vertical change along the constructed area of East Island, transect lines were established at 200 ft (60.9 m) intervals by professional surveyors before construction. Samples were collected every 100 ft (30.5 m) across the island along each transect. Samples were collected every 30.48 m (100 ft) across the island along each transect. A complete postconstruction survey will be conducted under the construction contract. Postconstruction surveys will be conducted in October to correspond with vegetation sampling and to avoid disturbance of nesting birds on the island. Beginning in October of 1999, the postconstruction airborne lidar hydrographic surveys will be conducted using the Scanning Hydrographic Operational Airborne Lidar Survey (SHOALS) system (Lillycrop et al, 1997). The airborne lidar hydrographic survey will collect data along lines the length of the island. Data collected will be used to develop elevational transect lines. The SHOALS survey will be conducted in October 1999, 2001, 2003, 2007, and 2016.

3) Vegetation

Hand planted and naturally colonizing vegetation as well as aerially seeded vegetation, if present, will be monitored by measuring % cover of all species found in approximately fifty 3.3 ft • 3.3 ft (1m • 1m) plots. Forty-four plots, four per transect, will be chosen using random numbers along eleven 1,000 ft (304.80 m) transects (approximate length) 2,000 ft (609.6 m) apart. The vegetation plot position will be randomly selected, within 100 ft (30.48 m) right or left, along the elevational transect. Percent cover will be measured by estimating the percentage of the ground area within each plot covered by each species identified. In an area of natural

marsh unaffected by project construction, a reference area will be designated for vegetation comparisons. Along one transect line in the reference area, approximately six 3.3 ft • 3.3 ft (1m • 1m) plots will be surveyed for percent cover of identified species. The number of reference plots will be determined by accessibility. The reference area data will be evaluated for validity of comparison to the project area after the year 2000 and a decision will be made as to the need to continue monitoring the reference area. Differential GPS coordinates will be recorded for each vegetation plot. Data will be collected in October 1999, 2001, 2003, 2007, and 2016 to correspond with the collection of elevational survey data.

Anticipated Statistical Tests and Hypotheses

The following hypotheses correspond with the monitoring elements and will be used to evaluate the accomplishment of the project goals:

1. Descriptive and summary statistics will be used on both historical data and data from aerial photography collected during preproject and postproject implementation to assess land/water ratios of the island. This analysis will allow for the evaluation of goal 1.

2. The primary method of analysis for elevation will be to determine differences in mean elevation and width as evaluated by a repeated measures ANOVA that will consider both spatial and temporal variation and interaction. This basic model will determine changes in island elevation, the volume of island sediment, and width of the project area after construction. All original data will be analyzed and transformed (if necessary) to meet the assumptions of ANOVA (e.g. normality). The preproject and time 0 (immediate postconstruction) topographical data will be obtained from engineering surveys. Postconstruction topographical data will be obtained through the SHOALS survey methodology.

   Goal: Increase the height and width of East Island

   Hypothesis A_1:

   H_0: Mean width of the project sediment addition after project implementation at time point i, will not be significantly greater than the mean width at time 0

   H_a: Mean width of the project sediment addition after project implementation at time point i, will be significantly greater than the mean width at time 0

Hypothesis A_2:

H_0: Mean height of the project sediment addition after project implementation at time point i, will not be significantly greater than the mean height at time 0

H_a: Mean height of the project sediment addition after project implementation at time point i, will be significantly greater than the mean height at time 0

3. Analysis of Variance (ANOVA), descriptive, and summary statistics will be used to evaluate vegetative growth (first-year analyses will concentrate on descriptive and summary statistics). Analysis will be based on percent cover of the species present. The ANOVA approach may include terms in the model to adjust for station locations and elevation. If we fail to reject the null hypothesis, we will investigate for negative effects. This ANOVA will allow for the analysis and long-term documentation of vegetative coverage changes on the Isle Dernieres from time 0 (immediate postconstruction) through year five of the project.

Goal: Reduce loss of dredged sediments through the growth of vegetation

Hypothesis A:

H_0: Mean vegetation coverage at year i will not be significantly greater than mean vegetation coverage at year 0

H_a: Mean vegetation coverage at year i will be significantly greater than mean vegetation coverage at year 0

Hypothesis B:

H_0: Mean relative abundance of vegetation in the project area at time i will not be greater than mean relative abundance of vegetation in the reference area

H_a: Mean relative abundance of vegetation in the project area at time iI will be greater than mean relative abundance of vegetation in the reference area

Notes

1.	Implementation:	Start Construction:	January 19,1998
		End Construction:	June 1, 1999
2.	EPA Point of Contact:	Jeanene Peckham	(504) 389-0736
3.	DNR Project Manager:	Arthur Long	(504) 873-2010
	DNR Monitoring Manager:	Mary Anne Townson	(504) 447-0991
	DNR DAS Assistant:	Chris Cretini	(504) 342-9425

4. The twenty year monitoring plan development and implementation budget for this project is

$157,804. Progress reports will be available in June 2000 and June 2002 and comprehensive reports will be available in June 2004, June 2008, and June 2019. These reports will describe the status and effectiveness of the project.

5. Aerial seeding is still under consideration for the project. Vegetation growth from this will be included in the vegetation monitoring element if the seeding takes place.

6. References:

McBride, Randolph A., S. Penland, B. E. Jaffe, S. J. Williams, A. H. Sallenger, and K. A. Westphal. 1989. Erosion and deterioration of the Isles Dernieres barrier island arc-Louisiana, U. S. A.: 1853-1988: Transactions of the Gulf Coast Association of Geological Societies 39:431-444.

Penland, S., and R. Boyd. 1985. Transgressive depositional environments of the Mississippi River delta plain: A guide to the barrier islands, beaches and shoals of Louisiana: Louisiana Geological Survey Guidebook Series No. 3, 233 p.

Penland, S., J. R. Suter, and R. Boyd. 1988. The transgressive depositional systems of the Mississippi River delta plain: A model for barrier shoreline and shelf sand development. Journal of Sedimentary Petrology 58:932-949.

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.

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