



**Louisiana Barrier Island Comprehensive Monitoring Program (BICM)**  
**Volume 2: Shoreline Changes and Barrier Island Land Loss 1800's-2005**

Part 1: Shoreline Segment & Regional Delineation

Part 2: Methodologies

Part 3: Shoreline Changes 1855-2005

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## **Part 1: Shoreline Segments and Regional Delineation**

The Louisiana Coastal Zone is losing land at rates of as much as 100 km<sup>2</sup>/yr, resulting in drastic changes to shoreline position, geometry, and configuration. In order to: 1) establish a baseline dataset for future restoration efforts, 2) define the character and patterns of historical shoreline change, and 3) quantify the rates of linear shoreline retreat, a comprehensive shoreline change analysis of the entire Louisiana Gulf shoreline was undertaken. This study documents historical rate and range of Louisiana Gulf shoreline change for the period from 1855 to 2005 and provides a comprehensive quantification of shoreline evolution trends along Louisiana's Gulf shoreline. Using historical maps, satellite imagery, and aerial photography, patterns and rates of shoreline change were documented for 4 time periods: 1855-2005 (historical term), 1920's-2005 (long term), 1996-2005 (short term), and 2004-2005 (near term). The high-water line was used as the official shoreline and was interpreted and determined on the aerial photography and satellite imagery according to the location of the wet and dry-beach contact or the high-water debris line. Measurements of shoreline movement and change were taken along transects perpendicular to an offshore baseline spaced at 50 meter intervals alongshore. The shoreline was divided into 80 reaches based on the geomorphology, coastal evolution trends, existence of man-made structures, and/or a combination of these factors. The average historical rate of shoreline change is -2.7 m/yr. The average long-term rate of shoreline change is -4.2 m/yr. During the last decade, shoreline change rates have accelerated to -8.2 m/yr. The impacts of Hurricanes Katrina and Rita in 2005 accelerated the near-term rate of erosion to -57.8 m/yr. The highest rates of erosion due to the 2005 storm impacts were found along the Mississippi River delta barrier islands of the Isle Derniers, Timbalier, and Chandeleur Islands with some sectors undergoing over 182 meters of landward retreat. Beach nourishment, dune construction, and backbarrier marsh creation projects were the only areas where shoreline retreat was not detected in this study.

### **Shoreline Change Analysis**

The shoreline change results presented in this document are based on existing historical cartographic, Color Infrared (CIR) aerial photographs, and Digital Globe QuickBird satellite imagery held in the digital archives of the Coastal Research Laboratory's Geographic Information System (GIS) within the Pontchartrain Institute for Environmental Sciences (PIES) at the University of New Orleans (UNO). The GIS covers the period between 1855 and 1996, as well as new satellite image and air photo interpretation/GIS analysis between 1998 and 2005. This BICM study utilized various image processing algorithms, spatial models, and air photo interpretation to perform a shoreline change analysis for 4 time periods: 1855-2005 (historical term), 1920's-2005 (long term), 1996-2005 (short term), and 2004-2005 (near term). Previously published papers and reports that supplement this analysis include Morgan and Larimore 1957; Adams et al. 1978; Penland and Boyd 1981 and 1982; van Beek and Meyer-Arendt 1982; Morgan and Morgan 1983; Penland et al. 1990 b; McBride et al. 1992; Byrnes et al. 1995; McBride and Byrnes 1997.

### **Shoreline Segments**

A total of 80 shoreline reaches were delineated for this analysis. A shoreline reach is defined as a contiguous uniform section of shoreline based on the geomorphology, change trends, existence of man-made structures, and/or a combination of one or more of these coastal elements. Figure 1 is a map depicting the 80 shoreline change reaches for coastal Louisiana. Table 1 lists the shoreline reaches with their lengths and the parishes in which they are found.

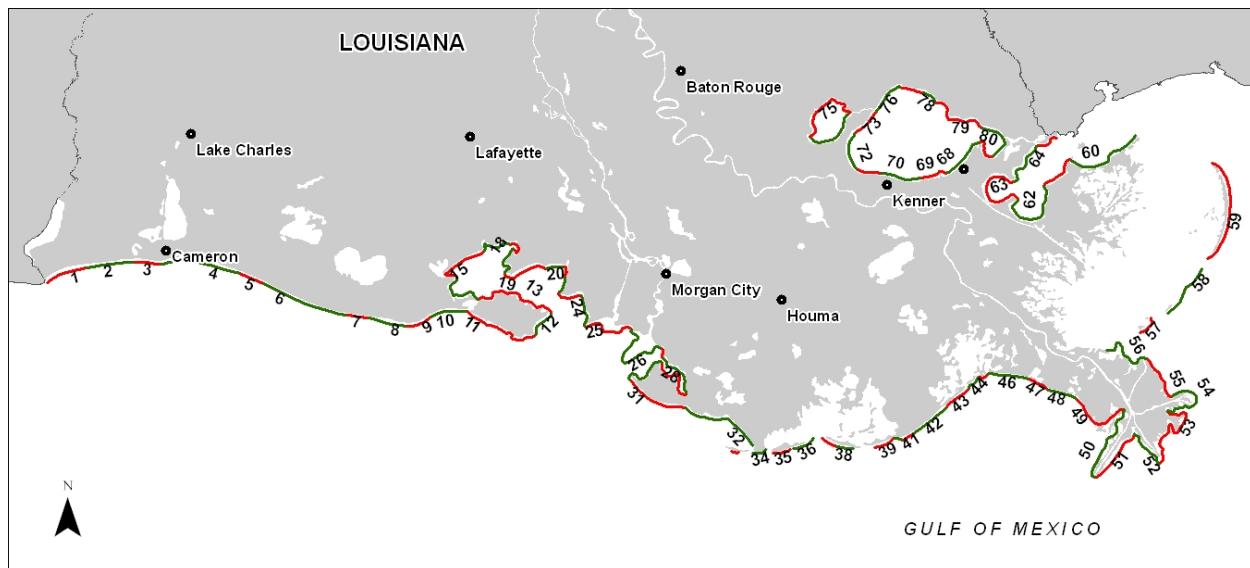


Figure 1. Shoreline reaches established in the BICM analysis.

## Shoreline Regions

The Chenier Plain region is located in west Louisiana and is the marginal deltaic plain of the Mississippi River. For the purpose of this analysis, the region was divided into the Western Chenier Region and the Eastern Chenier Region. Shoreline Reaches 1-4 make up the Western Chenier Plain and Reaches 5-10 make up the Eastern Chenier Region. The Acadiana Bays region is the oldest part of the Mississippi River Deltaic Plain and is geomorphically unique and distinct from the transgressive barrier shorelines to the east. The Acadiana Bays represent the erosional remnants of the Teche/Maringouin delta complex. Trinity Shoal, Ship Shoal, and the Atchafalaya shell reefs are the transgressive depositional systems of this delta complex. Shoreline reaches 11-25 make up the Acadia Bays between Marsh Island and Point Au Fer Islands. They are situated in south-central Louisiana and include the Atchafalaya shell reefs. The Teche region (Shoreline reaches 26-36), are located just east of the Acadiana Bays. This region consists of the Isle Dernieres barrier island arc, one of the four main barrier shorelines in Louisiana and site of the first CWPPRA restoration projects. The initial progradation of the Teche delta began approximately About 5.8 ka, in the western part of the Mississippi River deltaic plain (Frazier, 1967). Gradually, the major locus of Teche deposition shifted eastward depositing sediments in a southeastward direction. The Teche-Mississippi River System was actively depositing sediments in this area until approximately 3.5 ka when the primary flow of the Mississippi River shifted far to the east and continued building the St. Bernard delta. The Mississippi River continued to build the St. Bernard delta until sometime between 2 ka (Frazier, 1967) and 1.4 ka (Törnqvist and others, 1996), when flow was diverted westward and the Lafourche delta began to prograde seaward. Abandonment of the Lafourche course for the Plaquemine-Modern delta lobe occurred around 0.5 ka (Frazier, 1967) or as early as 1.3 ka as suggested by Törnqvist and others (1996). Shoreline Reaches 37-45 make up the Lafourche Region and Reaches 46-56 make up the Modern Delta region. The Chandeleur and Breton Islands make up a north-south-trending island chain, remnants of the St. Bernard Delta that occupied the area 2,000 years ago. The ancient delta was deposited by the Mississippi River, and its remnants lie northeast of the modern river delta. Since abandonment, the St. Bernard Delta, including the islands and the adjacent Breton Sound, has undergone erosion and subsidence. Shoreline Reaches 57-59 make up the Chandeleur Islands region. The Lake Pontchartrain Basin was formed when the St.

Table 1. Shoreline Reaches, Lengths, and Parishes

<b>Reach No.</b>	<b>Reach_Name</b>	<b>Length(miles)</b>	<b>Parish</b>
1	Johnson's Bayou	11.0	Cameron
2	Ocean View Beach	12.3	Cameron
3	Holly Beach	6.7	Cameron
4	Hackberry Beach	20.7	Cameron
5	Mermentau Beach	6.6	Cameron
6	Rockefeller Refuge	23.0	Cameron
7	Mulberry Island	5.4	Vermillion
8	Freshwater Bayou	9.8	Vermillion
9	Cheniere Au Tigre	6.7	Vermillion
10	Rainey Refuge	9.7	Vermillion
11	Marsh Island	20.9	Iberia
12	South Point	7.6	Iberia
13	Marsh Northshore	22.7	Iberia
14	Hell Hole Bayou	13.2	Vermillion
15	Vermilion Beach	15.4	Vermillion
16	Avery Island	9.4	Iberia
17	Weeks Island	5.7	Iberia
18	Cypremort West	9.1	Iberia
19	Cypremort East	11.7	St. Mary
20	Cote Blanche Island	4.6	St. Mary
21	The Jaws	3.4	St. Mary
22	Point Marone	4.5	St. Mary
23	Point No Point	6.4	St. Mary
24	Bayou Sale	8.7	St. Mary
25	Wax Lake Delta	14.1	St. Mary
26	Atchafalaya Delta	22.8	Terrebonne
27	Plumb Bayou	2.8	Terrebonne
28	Four League Bay-East	12.5	Terrebonne
29	Four League Bay-West	13.6	Terrebonne
30	North Point	13.0	Terrebonne
31	Point Au Fer	16.4	Terrebonne
32	Oyster Bayou to Caillou Boca	20.9	Terrebonne
33	Raccoon Island	1.9	Terrebonne
34	Whiskey Island	3.7	Terrebonne
35	Trinity Island	4.8	Terrebonne
36	East Island	6.0	Terrebonne
37	Timbalier Island-West End	4.3	Terrebonne
38	Timbalier Island-East End	4.3	Terrebonne
39	East Timbalier Island	5.5	Lafourche
40	Raccoon Spit	2.5	Lafourche

**Table 1 (cont.)** Shoreline Reaches, Lengths, and Parishes

<b>Reach No.</b>	<b>Reach_Name</b>	<b>Length(miles)</b>	<b>Parish</b>
41	Fourchon Beach	3.0	Lafourche
42	Caminada Headland	10.9	Lafourche
43	Grand Isle	7.3	Jefferson
44	West Grand Terre	4.3	Jefferson
45	East Grand Terre	2.7	Plaquemines
46	Chaland Headland	10.6	Plaquemines
47	Shell Island	5.4	Plaquemines
48	Scofield	8.1	Plaquemines
49	West Bay	16.4	Plaquemines
50	Southwest Pass-West	21.3	Plaquemines
51	Southwest Pass-East	15.1	Plaquemines
52	South Pass	11.4	Plaquemines
53	Garden Island Bay	25.8	Plaquemines
54	Pass A Loutre	17.6	Plaquemines
55	Delta National	12.5	Plaquemines
56	Baptiste Collete	15.5	Plaquemines
57	Breton Island	5.5	Plaquemines
58	Grand Gossier and Curlew Islands	14.9	Plaquemines
59	Chandeleur Islands	27.9	St. Bernard
60	Isle Aux Pitre	20.6	St. Bernard
61	Biloxi Marsh	10.4	St. Bernard
62	Shell Beach	20.2	St. Bernard
63	Bayou Bienvenue	20.5	Orleans
64	New Orleans Landbridge	12.8	Orleans
65	Pearl River	5.8	St. Tammany
66	Lake Catherine	5.6	Orleans
67	South Point	6.3	Orleans
68	Little Woods	11.9	Orleans
69	Orleans Lakefront	7.2	Orleans
70	Jefferson Lakefront	10.3	Jefferson
71	LeBranche Marshes	6.4	St. Charles
72	Frenier Swamp	10.2	St. John
73	Pontchartrain Landbridge	7.7	St. John
74	Maurepas South East	15.1	St. John
75	Maurepas North West	19.3	Livingston
76	Tangipahoa River	9.4	Tangipahoa
77	Madisonville	5.7	St. Tammany
78	Mandeville	4.5	St. Tammany
79	Big Branch Marshes	15.8	St. Tammany
80	Slidell	6.9	St. Tammany

Bernard delta complex of the Mississippi River Deltaic Plain built out of the alluvial valley onto the continental shelf about 3,000-4,000 years ago (Frazier, 1967). The northern boundary of the St. Bernard delta complex coincided with the south shore of the modern-day Lake Pontchartrain. The St. Bernard delta complex buried the Pine Island barrier island trend under a sequence of deltaic sediments which resulted in the formation of Lakes Maurepas and Pontchartrain. Shoreline Reaches 60-80 make up the Pontchartrain Basin region. Figure 2 is a map depicting the 8 geomorphic regions for coastal Louisiana.

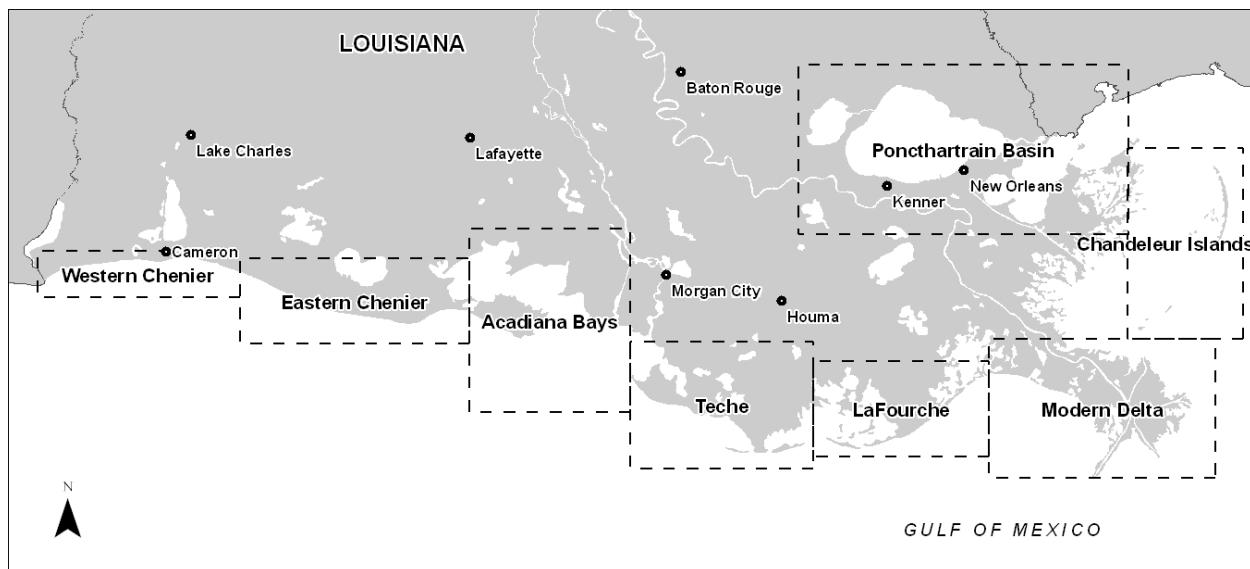


Figure 2. Geomorphic regions established for the BICM analysis.

## Part 2: Methodologies

The simplest and most basic information is the position of the shoreline over time. From this measurement, the position of the High Water Line (HWL) line at any point in time can be derived. A comparison of the HWL at any two time-periods allows the measure of shoreline position change in English (ft) or Metric (m) units. The amount and rate of shoreline change per unit per year can be derived from this measurement. In the case of islands, the area can be calculated and two area measurements will yield the rate of area change.

Shorelines compiled in this analysis were derived from a number of sources, including National Oceanic and Atmospheric Administration (NOAA)/National Ocean Service (NOS) topographic sheets (T-sheets), U.S. Geological Survey digital orthophoto quarter quads (DOQQ's), Color Infrared (CIR) aerial photography or Digital Globe QuickBird satellite imagery (Table 2). Shoreline data compiled prior to 1996 were obtained from the NOAA Coastal Services Center (CSC) or digitized directly from mylar-based T-sheets published by NOAA/NOS. The CIR aerial photography used in this analysis was created from film scanned with 24-bit color and 1-meter spatial resolution. Each pixel on the photograph represents one meter or about three feet square on the ground. The CIR aerial photographs and QuickBird satellite imagery were registered to the USGS DOQQ's prior to shoreline extraction to ensure they meet National Map Accuracy Standards for 1:12,000-scale maps. All image data was resampled to 2-meter pixel size using the nearest neighbor resampling method and converted to Universal Transverse Mercator (UTM) projection (Zone 15). This type of imagery can easily be mosaicked to provide very useful maps quickly and at

low cost. This map product is inexpensive and the ease of production is such that a mosaic aerial imagery map set or atlas can be produced each year at the end of the hurricane season or after a major storm or construction event.

The HWL was used as the official shoreline on cartographic data and was interpreted and determined on the aerial photography and satellite imagery according to the location of the wet- and dry-beach contact or the high-water debris line (Shalowitz, 1964; Anders and Byrnes, 1991). Because the upper foreshore represents the landward limit of influence by normal wave and current processes, the HWL is the most appropriate reference for measuring change in shoreline position (Langfelder and others, 1968). Fortunately, it is also the steepest portion of the foreshore and a small change in water elevation produces a relatively small horizontal displacement of the shoreline (McBride and others, 1968). The imagery was classified into land/water features using a modified water index model developed by the Pontchartrain Institute for Environmental Sciences (PIES). The water index was calculated from the ratio of the blue/green band to the near infrared band. These two bands provided the best contrast between land and water features. Aerial photography dated March 1996 was used to construct a shoreline west of the mouth of the Mississippi River from Raccoon Point to Sandy Point and to the east for the Chandeleur Islands. The Mississippi River Delta, Chenier Plain, Acadian Bays and Pontchartrain Basin shorelines were compiled using the 1998 USGS DOQQ's. The 2004 shoreline was compiled from a combination of Digital Globe QuickBird satellite imagery and USGS DOQQ's. The QuickBird imagery dated March 2004 was used to construct shorelines from Sabine Pass eastward to Sandy Point, not including the Acadian Bays, and for the Chandeleur Islands (north-south shorelines). The 2004 Acadian Bays, Mississippi River Delta and Pontchartrain Basin shorelines were extracted from USGS DOQQ's. The 2005 shoreline was compiled using CIR aerial photography, USGS DOQQ's and QuickBird imagery. CIR aerial photography dated November 2005 was used to construct the shorelines from Raccoon Point to Sandy Point and Breton Island. The North Chandeleur Island shoreline was compiled from the QuickBird data set dated October 2005. The Pontchartrain Basin, Acadian Bays and Chenier Plain shorelines were compiled from USGS DOQQ's dated between October to December 2005. Table 2 lists the temporal distribution of shorelines used in this analysis. All shorelines were integrated into GIS format and input to a geodatabase for further analysis.

To evaluate change in shoreline position, the Digital Shoreline Analysis System (DSAS) version 3.2, available from the USGS Wood Hole Science Center, was used to generate transects perpendicular to an offshore baseline at 50 meter intervals alongshore (Figure 3). Baselines were digitized parallel to the general trend of the historic shorelines so that orthogonally oriented transects originating from the baseline would most closely match transects placed by manual 'best fit' methods. The transect/shoreline intersections were calculated along the baseline and brought into Microsoft Excel to calculate the shoreline rate-of-change statistics. Measurements of shoreline movement were taken along transects perpendicular to the composite shoreline. Average rates of movement and area change were calculated by dividing absolute measurements by elapsed time (year and month-where available). For this study, shoreline change maps were produced to determine the spatial and temporal distribution of shoreline movement (magnitude and rate of change) and document geomorphologic evolution.

**Table 2** Temporal Distribution of BICM Shorelines.

Shoreline Data Source					
Region		T-Sheet	USGS DOQQ	CIR Aeiral	Digital Globe QuickBird
Lakes	Maurepas	1899, 1930	1998, 2004, 2005		
	Pontchartrain	1850, 1930	1998, 2004, 2005		
	Borgne	1850, 1930	1998, 2004, 2005		
Chandeleur Islands	North Island	1855, 1922		1996	2004, 2005
	South Islands	1885, 1922	1998, 2004, 2005	1996	
Mississippi River Mouth		1855, 1932	1998, 2004, 2005		
Plaquemines Shoreline		1884, 1932		1996, 2005	2004
Lafourche Shoreline		1884, 1933		1996, 2005	2004
Isles Dernieres		1887, 1934		1996, 2005	2004
Acadian Bays		1880, 1932-52	1998, 2004, 2005		
Chenier Plain		1880, 1932	1998, 2005		2004

This target of producing a barrier shoreline imagery mosaic can be accomplished each year and yield the first product at the beginning of BICM at Time 0, the start of this monitoring program. If desired, the data product from Aerial Mosaic Maps can be used to update the geomorphic baseline data from Shoreline Change Maps. New measurements of amounts and rates of change can be provided from Aerial Mosaic Maps to update the short-term and long-term tables of shoreline change in the Vector Shoreline Geodatabase and Shoreline Change Maps. If desired the resolution of the data is such that incremental units of change can be calculated for any length of shoreline. Data products from the Vector Shoreline Geodatabase and Shoreline Change Maps can be produced for any period of time as long as data products from Aerial Mosaic Maps are produced every year for data consistency. Thus, the Aerial Mosaic Maps integrated into the BICM Program as the annual baseline and can be used to update the historical short-term (<decade) and long-term (>decade) shoreline history in Shoreline Change Measurements and Area Change Measurements.

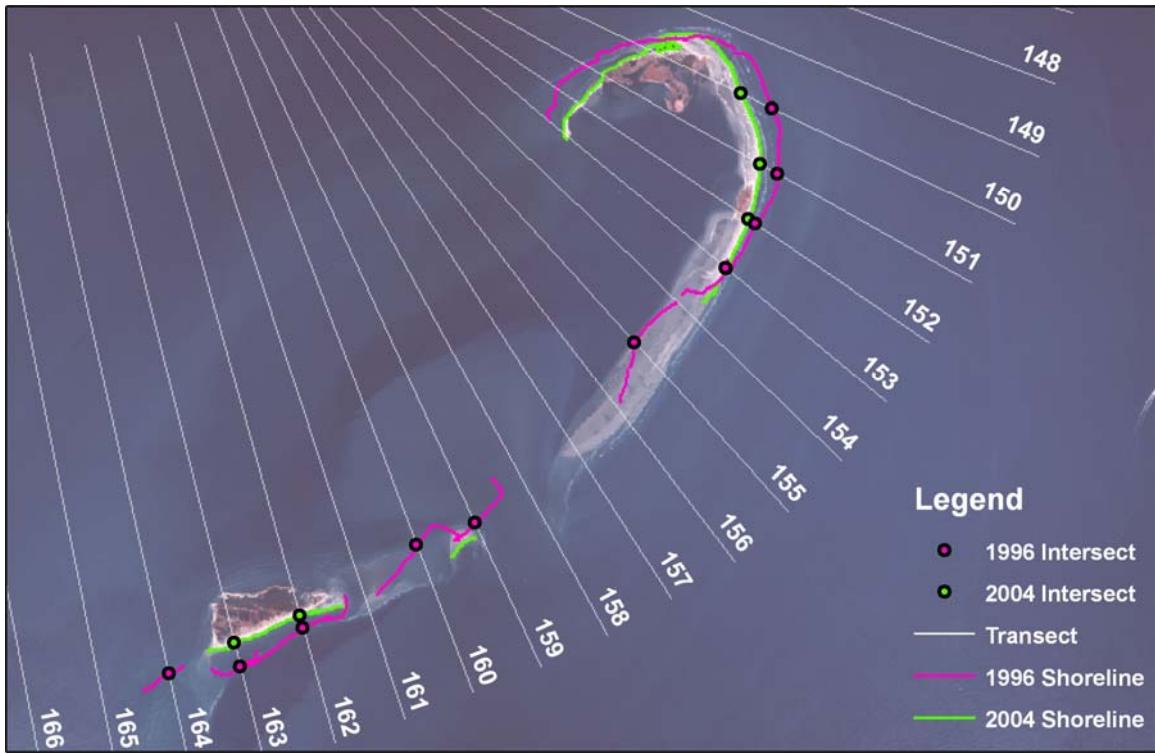


Figure 3. Example of transect/shoreline intersections along the baseline.

### Part 3: Shoreline Changes: 1855 - 2005

This section presents the most current analysis of historical rate and range of Louisiana Gulf shoreline change for the period 1855 to 2005 (Table 3). The historical area change for the barrier islands is also presented for the period 1887 – 2005 (Table 4). The long-term average shoreline change data (1855 – 2005) provide periodic information as to how existing coastal conditions developed. Historic rates of change are available for the eight geomorphic regions: A) Western Chenier Plain, B) Eastern Chenier Plain, C) Acadiana Bays, D) Teche Delta, E) Lafourche Delta, F) Modern Delta, G) Chandeleur Islands, and H) Pontchartrain Basin exceeding 100 years. Long-term shoreline change data are available for the same regions exceeding 50 years. Short-term shoreline information at the decade scale and near-term shoreline information at  $\pm 1$  year is available for all areas.

Figures 4 through 7 are maps depicting the shoreline change for the 80 shoreline reaches for coastal Louisiana between 1855 and 2005. Table 5 lists the average historical, long-term, short-term and near-term shoreline change rates and ranges.

Table 3 Historical (1855-2005), Long Term (1904-2005), Short Term (1996-2005) and Near Term (2004-2005) Coast-wide Shoreline Change.

Id	Reach_Name	Historic Change	Long-Term Change	Short-Term Change	Near-Term Change
		Avg. (ft/yr)	Avg. (ft/yr)	Avg. (ft/yr)	Avg. (ft/yr)
1	<i>Johnson's Bayou</i>	12.5	6.2	21.3	115.0
2	<i>Ocean View Beach</i>	-1.7	-2.0	8.8	66.8
3	<i>Holly Beach</i>	-4.0	-7.7	-16.6	17.8
4	<i>Hackberry Beach</i>	2.7	-2.7	-4.2	40.6
5	<i>Mermen tau Beach</i>	-25.9	-30.6	-36.1	60.5
6	<i>Rockefeller Refuge</i>	-34.0	-42.1	-51.0	4.8
7	<i>Mulberry Island</i>	-25.2	-24.0	-34.5	-23.8
8	<i>Freshwater Bayou</i>	8.6	18.4	10.4	35.9
9	<i>Cheniere Au Tigre</i>	4.0	-7.4	-22.0	-39.8
10	<i>Rainey Refuge</i>	-7.7	-7.9	-9.6	-22.8
11	<i>Marsh Island</i>	-8.4	-7.2	-17.1	17.6
12	<i>South Point</i>	-10.8	-12.7	-24.7	7.7
13	<i>Marsh Northshore</i>	-19.5	-16.9	-21.9	-63.4
14	<i>Hell Hole Bayou</i>	-6.3	-6.5	-7.9	-9.7
15	<i>Vermilion Beach</i>	-4.7	-5.8	-2.3	19.3
16	<i>Avery Island</i>	-7.7	-11.8	-7.6	-10.2
17	<i>Weeks Island</i>	-7.2	-5.8	-7.1	-46.1
18	<i>Cypremort West</i>	-12.5	-22.1	-17.8	-16.7
19	<i>Cypremort East</i>	-17.0	-11.1	-18.7	-22.4
20	<i>Cote Blanche Island</i>	-12.6	-9.3	-7.0	15.5
21	<i>The Jaws</i>	-13.0	-10.4	-2.8	28.4
22	<i>Point Marone</i>	-12.0	-13.7	-15.3	-30.0
23	<i>Point No Point</i>	-12.8	-12.3	-11.7	-72.2
24	<i>Bayou Sale</i>	-11.3	-9.1	-11.8	-19.3
25	<i>Wax Lake Delta</i>	49.5	129.7	-5.3	-7066.4
26	<i>Atchafalaya Delta</i>	79.3	254.6	413.4	-2017.2
27	<i>Plumb Bayou</i>	NoData	-8.7	-33.0	-148.0
28	<i>Four League Bay-East</i>	NoData	-7.3	-8.1	-2.5
29	<i>Four League Bay-West</i>	76.1	26.2	-21.9	-19.1
30	<i>North Point</i>	-14.5	-13.3	-20.2	-102.8
31	<i>Point Au Fer</i>	-17.1	-17.7	-7.1	-29.9
32	<i>Oyster Bayou to Caillou Boca</i>	-17.6	-21.6	-35.2	-82.2
33	<i>Raccoon Island</i>	-27.9	-23.5	-12.2	-106.0
34	<i>Whiskey Island</i>	-52.1	-57.1	-62.2	-181.4
35	<i>Trinity Island</i>	-37.2	-36.7	-40.8	-95.4
36	<i>East Island</i>	-19.2	-18.7	-16.4	-114.5
37	<i>Timbalier Island-West End</i>	NoData	7.2	13.6	21.1
38	<i>Timbalier Island-East End</i>	1.2	-13.9	-25.0	29.9
39	<i>East Timbalier Island</i>	-64.3	-23.8	-62.9	-199.5
40	<i>Raccoon Spit</i>	-83.8	-35.9	-58.3	-136.2
41	<i>Fourchon Beach</i>	-55.3	-23.7	8.4	-76.1
42	<i>Caminada Headland</i>	-36.9	-35.9	-24.8	-190.9
43	<i>Grand Isle</i>	1.8	4.0	-2.9	22.7
44	<i>West Grand Terre</i>	-14.5	-11.5	-22.6	-23.1
45	<i>East Grand Terre</i>	-36.7	-47.4	-60.8	-106.1

Table 3 (cont.) Historical (1855-2005), Long Term (1904-2005), Short Term (1996-2005) and Near Term (2004-2005) Coast-wide Shoreline Change

Id	Reach_Name	Historic Change	Long-Term Change	Short-Term Change	Near-Term Change
		Avg. (ft/yr)	Avg. (ft/yr)	Avg. (ft/yr)	Avg. (ft/yr)
46	<i>Chaland Headland</i>	-22.4	-20.2	-33.3	-79.9
47	<i>Shell Island</i>	-50.5	-71.9	-157.5	-213.3
48	<i>Scofield</i>	-14.9	-19.7	-34.1	-111.4
49	<i>West Bay</i>	-89.2	-249.2	-157.4	-276.6
50	<i>Southwest Pass-West</i>	-5.2	7.5	-81.2	-439.0
51	<i>Southwest Pass-East</i>	27.1	1.6	-49.6	-317.3
52	<i>South Pass</i>	0.5	43.4	209.5	-133.3
53	<i>Garden Island Bay</i>	63.0	-121.0	-324.4	-1428.4
54	<i>Pass A Loutre</i>	-16.8	-96.4	-250.2	-372.8
55	<i>Delta National</i>	242.5	189.5	-399.2	-2216.1
56	<i>Baptiste Collete</i>	32.6	4.0	-23.9	-225.4
57	<i>Breton Island</i>	-32.8	-28.5	-143.9	-750.7
58	<i>Grand Gossier and Curlew Islands</i>	NoData	NoData	NoData	NoData
59	<i>Chandeleur Islands</i>	-20.4	-28.1	-107.7	-663.2
60	<i>Isle Aux Pitre</i>	-12.4	-25.4	-36.5	-201.7
61	<i>Biloxi Marsh</i>	-9.7	-18.5	-19.6	-88.3
62	<i>Shell Beach</i>	-9.4	-10.6	-15.2	-73.5
63	<i>Bayou Bienvenue</i>	-7.7	-8.4	-14.6	-53.4
64	<i>New Orleans Landbridge</i>	-6.1	-5.3	-7.3	-16.1
65	<i>Pearl River</i>	-6.1	-5.4	-15.4	-111.3
66	<i>Lake Catherine</i>	-5.4	-10.6	-35.1	-62.5
67	<i>South Point</i>	-10.3	-10.3	-23.0	-89.7
68	<i>Little Woods</i>	-4.5	-5.2	-9.7	-56.7
69	<i>Orleans Lakefront</i>	15.9	6.6	-1.5	-11.6
70	<i>Jefferson Lakefront</i>	-6.7	-2.5	0.3	-15.8
71	<i>LeBranche Marshes</i>	-12.6	-10.0	-6.0	-8.5
72	<i>Frenier Swamp</i>	-6.5	-8.4	-6.7	-1.4
73	<i>Pontchartrain Landbridge</i>	-10.5	-11.8	-8.9	-11.8
74	<i>Maurepas South East</i>	-6.0	-5.4	-3.1	-7.7
75	<i>Maurepas North West</i>	-1.3	-4.8	-0.1	0.7
76	<i>Tangipahoa River</i>	-4.5	-6.2	-5.0	-3.2
77	<i>Madisonville</i>	-0.5	-5.5	-0.1	-0.1
78	<i>Mandeville</i>	-0.2	-2.7	-1.0	-0.1
79	<i>Big Branch Marshes</i>	-0.6	-9.0	-0.1	-6.5
80	<i>Slidell</i>	-0.4	-6.8	-0.4	0.5

Table 4 Historical (1855-2005), Long Term (1904-2005), Short Term (1996-2005) and Near Term (2004-2005) Shoreline Change by BICM Region

BICM Region	Historic Change	Long-Term Change	Short-Term Change	Near-Term Change
	Avg. (ft/yr)	Avg. (ft/yr)	Avg. (ft/yr)	Avg. (ft/yr)
Western Chenier Plain	2.4	-1.6	2.3	60.0
Eastern Chenier Plain	-13.4	-15.6	-23.8	2.5
Acadiana Bays	-7.1	-1.7	-11.9	-484.5
Teche Delta	-3.4	6.9	14.2	-263.5
Lafourche Delta	-36.1	-20.1	-26.1	-73.1
Modern Delta	15.2	-30.2	-118.3	-528.5
Chandeleur Islands	-26.6	-28.3	-125.8	-706.9
Pontchartrain Basin	-5.0	-7.9	-10.0	-39.0

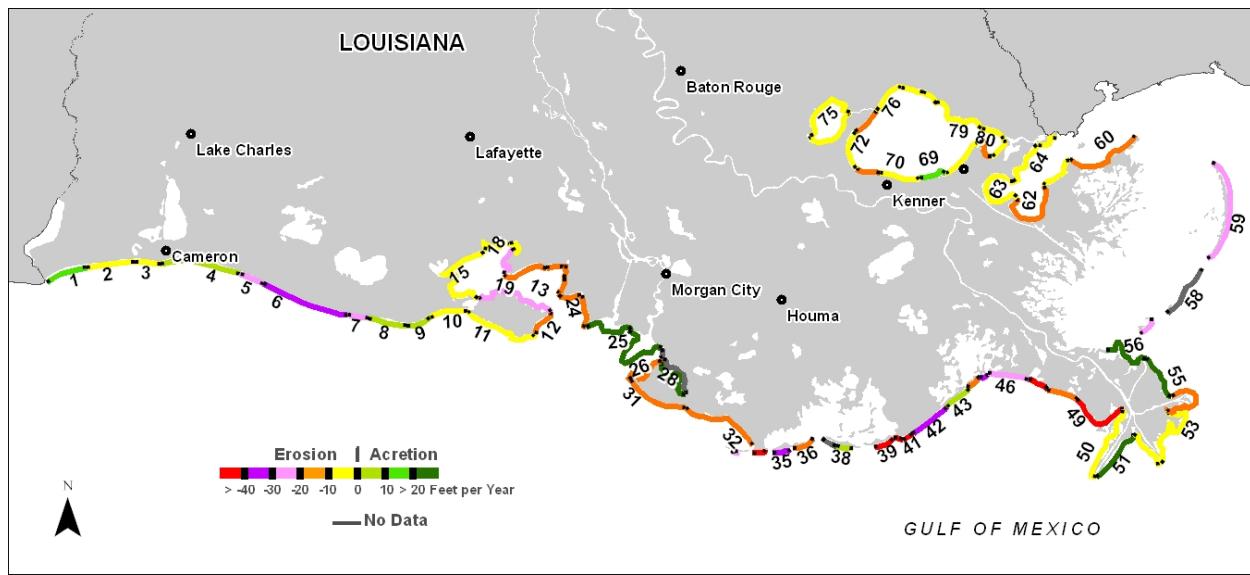


Figure 4. Map depicting the historical (1855-2005) shoreline changes for coastal Louisiana.

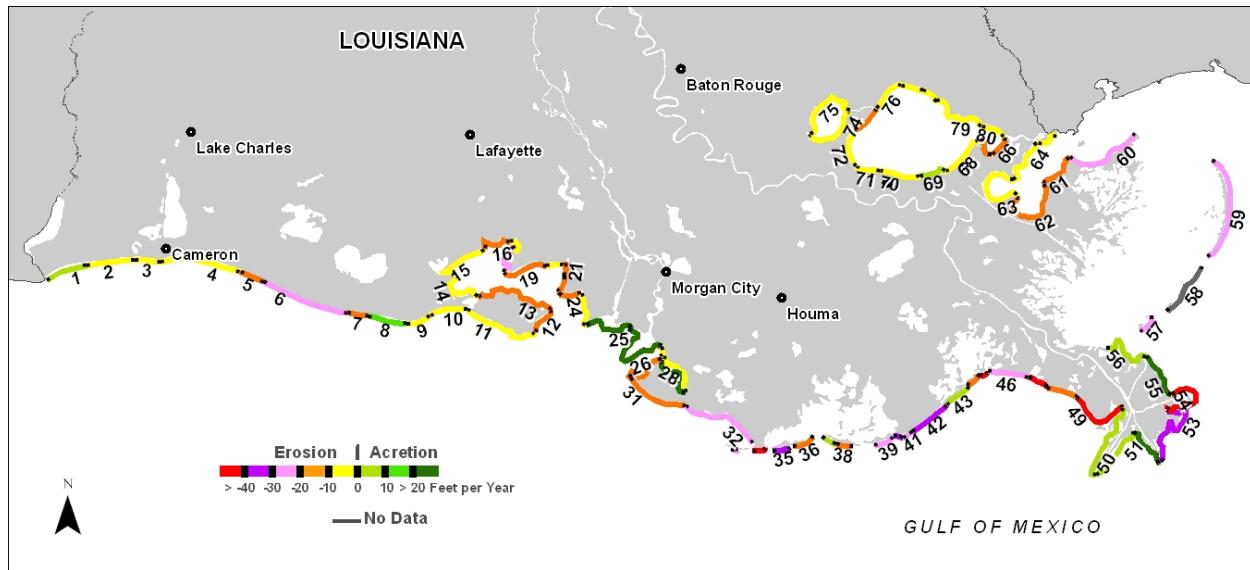


Figure 5. Map depicting the long term (1904-2005) shoreline changes for coastal Louisiana.

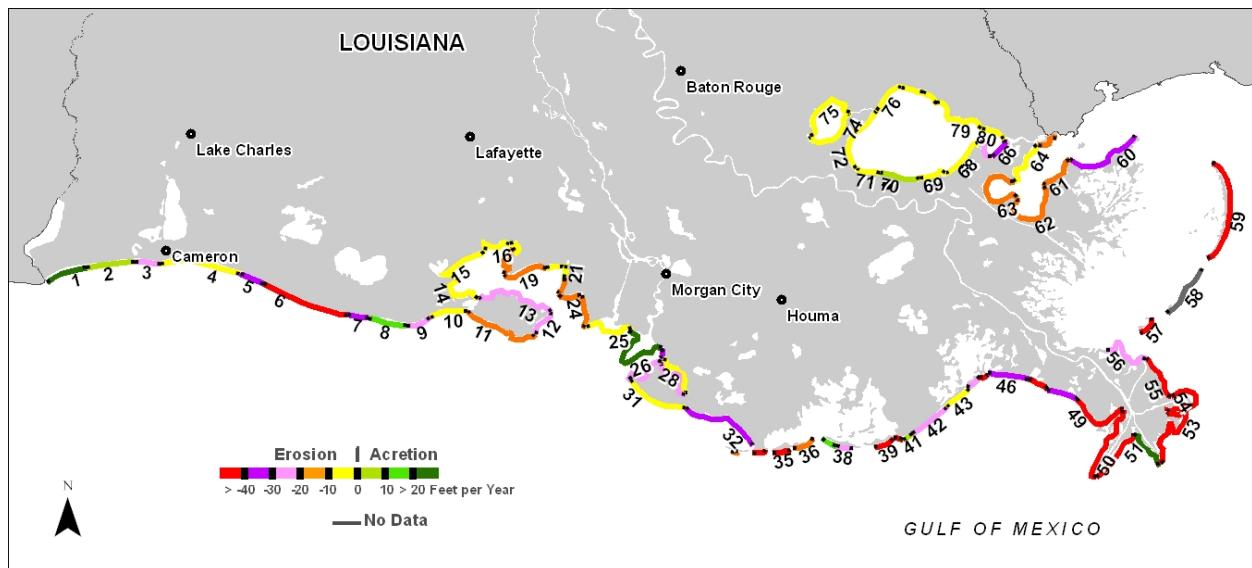


Figure 6. Map depicting the short term (1996-2005) shoreline changes for coastal Louisiana.

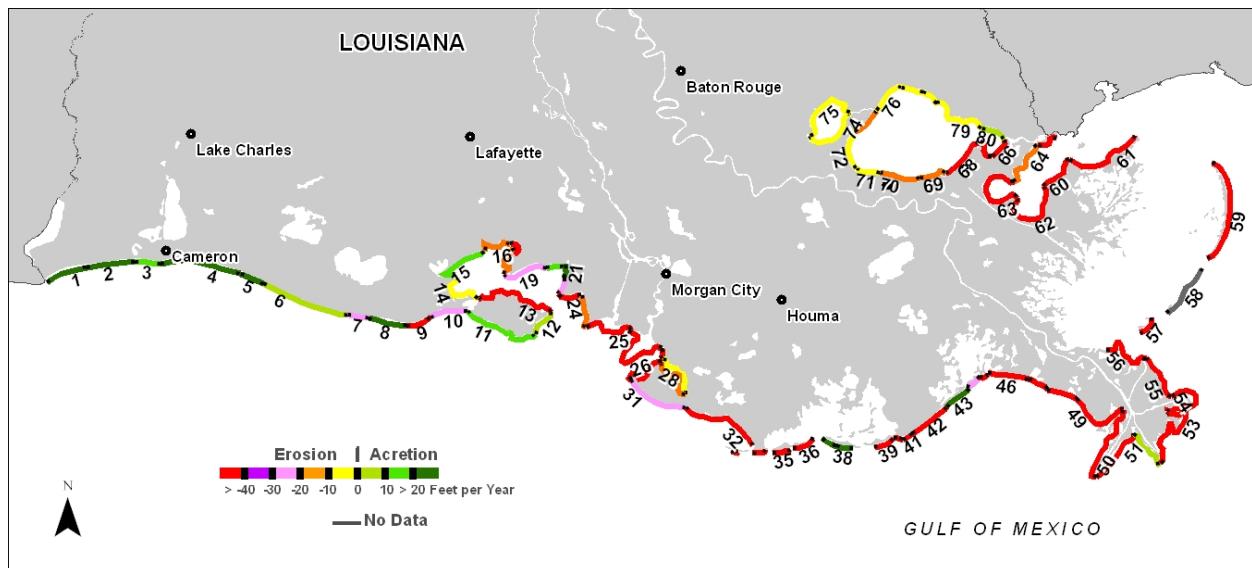


Figure 7. Map depicting the near term (2004-2005) shoreline changes for coastal Louisiana.

Table 5. Historical, Long Term, Short Term and Near Term Coast-wide Shoreline Changes

<b>1. Johnson's Bayou</b>			<b>2. Ocean View Beach</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1884-2005	12.5	5.1 / 32.0	1884-2005	-1.7	-6.3 / 6.0
1957-2005	6.2	-12.3 / 18.6	1957-2005	-2.0	-8.2 / 3.6
1996-2005	21.3	-4.2 / 97.6	1996-2005	8.8	-24.2 / 36.2
2004-2005	115.0	-46.9 / 455.6	2004-2005	66.8	-17.2 / 157.6
<b>3. Holly Beach</b>			<b>4. Hackberry Beach</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1884-2005	-4.0	-11.1 / 14.1	1884-2005	2.7	-25.9 / 27.5
1957-2005	-7.7	-33.0 / 4.7	1957-2005	-2.7	-40.9 / 31.5
1996-2005	-16.6	-35.4 / -3.0	1996-2005	-4.2	-47.3 / 56.3
2004-2005	17.8	-98.6 / 131.7	2004-2005	40.6	-274.4 / 250.8
<b>5. Mermantau River</b>			<b>6. Rockefeller Refuge</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1884-2005	-25.9	-29.8 / -17.7	1884-2005	-34.0	-55.8 / -29.1
1957-2005	-30.6	-37.6 / -10.1	1957-2005	-42.1	-93.6 / -26.7
1996-2005	-36.1	-44.6 / -7.8	1996-2005	-51.0	-274.4 / -12.5
2004-2005	60.5	-10.9 / 138.8	2004-2005	4.8	-145.2 / 126.9
<b>7. Mulberry Island</b>			<b>8. Freshwater Bayou</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1884-2005	-25.2	-36.7 / -15.8	1884-2005	8.6	-18.1 / 20.6
1957-2005	-24.0	-46.3 / -11.0	1957-2005	18.4	-21.8 / 41.0
1996-2005	-34.5	-43.7 / -10.8	1996-2005	10.4	-28.6 / 87.2
2004-2005	-23.8	-119.6 / 60.8	2004-2005	35.9	-55.2 / 422.7
<b>9. Cheniere Au Tigre</b>			<b>10. Rainey Refuge</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1884-2005	4.0	-1.3 / 5.8	1884-2005	-7.7	-14.4 / 2.7
1957-2005	-7.4	-29.5 / 7.7	1957-2005	-7.9	-20.1 / 3.2
1996-2005	-22.0	-79.3 / -1.2	1996-2005	-9.6	-23.9 / 3.9
2004-2005	-39.8	-219.7 / 58.4	2004-2005	-22.8	-108.8 / 61.2
<b>11. Marsh Island</b>			<b>12. South Point</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1886-2005	-8.4	-77.0 / 1.5	1886-2005	-10.8	-25.2 / -1.9
1952-2005	-7.2	-154.8 / 3.2	1952-2005	-12.7	-63.9 / -6.4
1996-2005	-17.1	-913.1 / 30.0	1996-2005	-24.7	-567.4 / 24.0
2004-2005	17.6	-3359.7 / 537.1	2004-2005	7.7	-424.5 / 192.3
<b>13. Marsh Northshore</b>			<b>14. Hell Hole Bayou</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1886-2005	-19.5	-73.4 / -1.9	1886-2005	-6.3	-15.4 / 0.9
1952-2005	-16.9	-106.0 / 101.9	1952-2005	-6.5	-23.9 / 4.0
1996-2005	-21.9	-432.8 / 27.6	1996-2005	-7.9	-198.9 / 3.3
2004-2005	-63.4	-2682.3 / 326.7	2004-2005	-9.7	-952.1 / 303.6

Table 5. (cont.)

<b>15. Vermilion Beach</b>			<b>16. Avery Island</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1886-2005	-4.7	-59.3 / -1.5	1886-2005	-7.7	-63.3 / 0.9
1952-2005	-5.8	-109.9 / 0.3	1952-2005	-11.8	-106.7 / 0.8
1996-2005	-2.3	-70.0 / 40.6	1996-2005	-7.6	-489.8 / 51.6
2004-2005	19.3	-85.8 / 278.9	2004-2005	-10.2	-3392.9 / 345.5
<b>17. Weeks Island</b>			<b>18. Cypremore West</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1886-2005	-7.2	-12.2 / -0.1	1886-2005	-12.5	-86.1 / -2.9
1952-2005	-5.8	-21.6 / -0.8	1952-2005	-22.1	-159.5 / 0.7
1996-2005	-7.1	-63.0 / 8.2	1996-2005	-17.8	-151.3 / 9.0
2004-2005	-46.1	-685.7 / 11.2	2004-2005	-16.7	-989.4 / 217.6
<b>19. Cypremore East</b>			<b>20. Cote Blanche Island</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1886-2005	-17.0	-53.6 / -5.9	1886-2005	-12.6	-14.8 / -2.6
1952-2005	-11.1	-95.2 / 36.7	1952-2005	-9.3	-15.0 / 13.8
1996-2005	-18.7	-411.7 / 41.9	1996-2005	-7.0	-30.6 / 130.6
2004-2005	-22.4	-377.6 / 222.3	2004-2005	15.5	-112.6 / 122.6
<b>21. The Jaws</b>			<b>22. Point Marone</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1886-2005	-13.0	-59.8 / 5.0	1886-2005	-12.0	-31.2 / -5.7
1952-2005	-10.4	-95.4 / 25.0	1952-2005	-13.7	-43.1 / -4.5
1996-2005	-2.8	-25.1 / 392.7	1996-2005	-15.3	-102.7 / 4.9
2004-2005	28.4	-131.7 / 2769.3	2004-2005	-30.0	-612.9 / 71.3
<b>23. Point No Point</b>			<b>24. Bayou Sale</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1886-2005	-12.8	-21.4 / -8.5	1886-2005	-11.3	-16.3 / -1.1
1952-2005	-12.3	-29.7 / -2.0	1952-2005	-9.1	-20.5 / 75.6
1996-2005	-11.7	-157.9 / 46.3	1996-2005	-11.8	-58.2 / 8.6
2004-2005	-72.2	-1047.7 / 84.0	2004-2005	-19.3	-298.3 / 113.6
<b>25. Wax Lake Delta</b>			<b>26. Atchafalaya Delta</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1886-2005	49.5	-48.3 / 161.6	1886-2005	79.3	87.8 / 288.0
1952-2005	129.7	-35.7 / 409.9	1952-2005	254.6	-9.5 / 574.1
1996-2005	-5.3	-741.7 / 3382.6	1996-2005	413.4	-945.0 / 3144.2
2004-2005	-7066.4	-12812.9 / 1247.9	2004-2005	-2017.2	-14740.5 / 3590.5
<b>27. Plumb Bayou</b>			<b>28. Four League Bayou - West</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1886-2005	NoData	NoData / NoData	1886-2005	NoData	NoData / NoData
1952-2005	-8.7	-107.0 / 1.5	1952-2005	-7.3	-94.6 / 103.6
1996-2005	-33.0	-744.1 / 9.8	1996-2005	-8.1	-64.8 / 81.5
2004-2005	-148.0	-4830.1 / 14.7	2004-2005	-2.5	-256.4 / 197.1

Table 5. (cont.)

<b>29. Four League Bayou - East</b>			<b>30. North Point</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1886-2005	76.1	35.1 / 80.8	1886-2005	-14.5	-84.1 / -3.4
1952-2005	26.2	-78.4 / 194.2	1952-2005	-13.3	-195.2 / 100.6
1996-2005	-21.9	-1642.6 / 14.1	1996-2005	-20.2	-997.7 / 114.9
2004-2005	-19.1	-1889.2 / 7521.5	2004-2005	-102.8	-6926.0 / 98.1
<b>31. Point Au Fer Island</b>			<b>32. Oyster Bayou to Caillou Boca</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1886-2005	-17.1	-24.7 / -2.6	1886-2005	-17.6	-66.0 / -3.8
1952-2005	-17.7	-32.0 / 4.3	1952-2005	-21.6	-132.7 / -1.2
1996-2005	-7.1	-53.0 / 296.9	1996-2005	-35.2	-870.8 / 42.2
2004-2005	-29.9	-334.0 / 259.5	2004-2005	-82.2	-6006.3 / 361.0
<b>33. Raccoon Island</b>			<b>34. Whiskey Island</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1887-2005	-27.9	-31.2 / -25.4	1887-2005	-52.1	-75.1 / -45.2
1934-2005	-23.5	-64.7 / -14.6	1934-2005	-57.1	-82.2 / -45.5
1996-2005	-12.2	-88.3 / 34.3	1996-2005	-62.2	-181.1 / 22.2
2004-2005	-106.0	-375.0 / 496.9	2004-2005	-181.4	-623.0 / 161.1
<b>35. Trinity Island</b>			<b>36. East Island</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1887-2005	-37.2	-47.8 / -34.2	1887-2005	-19.2	-31.5 / -0.6
1934-2005	-36.7	-55.5 / -29.7	1934-2005	-18.7	-42.1 / -12.1
1996-2005	-40.8	-124.7 / 41.6	1996-2005	-16.4	-175.6 / 126.3
2004-2005	-95.4	-299.3 / 18.9	2004-2005	-114.5	-808.9 / -4.9
<b>37. Timbalier Island - West</b>			<b>38. Timbalier Island - East</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1887-2005	NoData	NoData / NoData	1887-2005	1.2	-21.3 / 25.0
1934-2005	7.2	-5.5 / 18.1	1934-2005	-13.9	-29.2 / -7.0
1996-2005	13.6	-20.2 / 48.1	1996-2005	-25.0	-69.6 / -4.0
2004-2005	21.1	-320.9 / 141.9	2004-2005	29.9	-106.2 / 151.9
<b>39. East Timbalier Island</b>			<b>40. Belle Pass Spit</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1887-2005	-64.3	-83.9 / -42.6	1884-2005	-83.8	-90.9 / -55.1
1934-2005	-23.8	-37.4 / -17.1	1933-2005	-35.9	-35.9 / -27.2
1996-2005	-62.9	-151.1 / 24.1	1996-2005	-58.3	-124.6 / 3.4
2004-2005	-199.5	-812.3 / 90.0	2004-2005	-136.2	-429.1 / 63.5
<b>41. Fourchon Beach</b>			<b>42. Caminada Headland</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1884-2005	-55.3	-57.8 / -40.1	1884-2005	-36.9	-60.8 / -3.7
1933-2005	-23.7	-52.7 / 4.6	1933-2005	-35.9	-60.8 / 13.2
1996-2005	8.4	-23.2 / 49.4	1996-2005	-24.8	-92.4 / 74.9
2004-2005	-76.1	-245.0 / 12.5	2004-2005	-190.9	-699.0 / 53.9

Table 5. (cont.)

<b>43. Grand Isle</b>			<b>44. West Grand Terre</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1884-2005	1.8	-8.9 / 14.0	1884-2005	-14.5	-73.6 / -1.7
1933-2005	4.0	-3.4 / 15.9	1933-2005	-11.5	-83.6 / 4.8
1996-2005	-2.9	-82.4 / 43.2	1996-2005	-22.6	-63.1 / 198.0
2004-2005	22.7	-329.2 / 315.2	2004-2005	-23.1	-189.3 / 64.6
<b>45. East Grand Terre</b>			<b>46. Chaland Headland</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1884-2005	-36.7	-62.1 / -29.2	1884-2005	-22.4	-61.2 / 17.2
1933-2005	-47.4	-79.5 / -36.9	1933-2005	-20.2	-82.6 / 76.8
1996-2005	-60.8	-106.2 / -56.6	1996-2005	-33.3	-92.8 / 9.6
2004-2005	-106.1	-247.0 / -1.0	2004-2005	-79.9	-393.7 / 74.4
<b>47. Shell Island</b>			<b>48. Scofield Bay</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1884-2005	-50.5	-80.1 / -0.8	1884-2005	-14.9	-61.3 / 38.1
1933-2005	-71.9	-109.5 / -6.1	1933-2005	-19.7	-93.3 / 2.4
1996-2005	-157.5	-489.7 / -15.9	1996-2005	-34.1	-221.8 / 56.8
2004-2005	-213.3	-1232.4 / 33.7	2004-2005	-111.4	-520.9 / 159.1
<b>49. West Bay</b>			<b>50. Southwest Pass - West</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1884-2005	-89.2	-306.1 / 57.7	1867-2005	-5.2	-75.4 / 35.5
1933-2005	-249.2	-979.5 / 13.3	1958-2005	7.5	-152.3 / 86.2
1996-2005	-157.4	-4170.3 / 3690.1	1998-2005	-81.2	-1115.8 / 122.3
2004-2005	-276.6	-28449.1 / 27619.6	2004-2005	-439.0	-5907.7 / 191.3
<b>51. Southwest Pass - East</b>			<b>52. South Pass</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1867-2005	27.1	-30.2 / 70.9	1867-2005	0.5	-109.2 / 258.7
1958-2005	1.6	-136.5 / 119.1	1958-2005	43.4	-98.1 / 297.5
1998-2005	-49.6	-992.9 / 424.7	1998-2005	209.5	-481.2 / 2068.3
2004-2005	-317.3	-7561.7 / 2569.9	2004-2005	-133.3	-13671.8 / 11560.1
<b>53. Garden Island Bay</b>			<b>54. Pass-A-Loutre</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1867-2005	63.0	-134.5 / 273.6	1859-2005	-16.8	-80.1 / 194.0
1958-2005	-121.0	-415.2 / -1.2	1958-2005	-96.4	-294.2 / 69.3
1998-2005	-324.4	-2204.2 / 452.0	1998-2005	-250.2	-1218.7 / 485.4
2004-2005	-1428.4	-15145.0 / 3969.5	2004-2005	-372.8	-3344.0 / 2276.6
<b>55. Delta National Wildlife Refuge</b>			<b>56. Baptiste Collete</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1859-2005	242.5	127.8 / 339.5	1859-2005	32.6	-11.5 / 75.1
1958-2005	189.5	-287.0 / 477.2	1958-2005	4.0	-38.3 / 54.4
1998-2005	-399.2	-1847.6 / 503.5	1998-2005	-23.9	-455.4 / 57.4
2004-2005	-2216.1	-12871.6 / 764.5	2004-2005	-225.4	-4100.7 / 56.1

Table 5. (cont.)

<b>57. Breton Island</b>			<b>58. Grand Gossier and Curlew Islands</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1885-2005	-32.8	-53.2 / -7.7	1885-2005	NoData	NoData / NoData
1922-2005	-28.5	-48.4 / -9.1	1922-2005	NoData	NoData / NoData
1996-2005	-143.9	-288.3 / -39.1	1996-2005	NoData	NoData / NoData
2004-2005	-750.7	-2138.0 / -66.8	2004-2005	NoData	NoData / NoData
<b>59. Chandeleur Island</b>			<b>60. Isle Au Pitre</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1855-2005	-20.4	-46.6 / -3.7	1852-2005	-12.4	-61.3 / 0.5
1922-2005	-28.1	-58.0 / -11.3	1933-2005	-25.4	-132.4 / -8.8
1996-2005	-107.7	-204.4 / -33.8	1996-2005	-36.5	-866.4 / 7.3
2004-2005	-663.2	-1712.0 / -141.3	2004-2005	-201.7	-7697.6 / 45.2
<b>61. Biloxi Marsh</b>			<b>62. Shell Beach</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1852-2005	-9.7	-31.6 / -1.0	1852-2005	-9.4	-27.7 / 2.0
1933-2005	-18.5	-51.3 / -8.0	1933-2005	-10.6	-41.2 / 0.0
1996-2005	-19.6	-164.4 / 3.3	1996-2005	-15.2	-139.3 / 7.0
2004-2005	-88.3	-1178.4 / 11.8	2004-2005	-73.5	-1193.6 / 42.0
<b>63. Bayou Beinvenue</b>			<b>64. New Orleans Land Bridge</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1852-2005	-7.7	-44.2 / 1.1	1852-2005	-6.1	-42.5 / -1.0
1933-2005	-8.4	-86.0 / -0.3	1933-2005	-5.3	-80.9 / 0.5
1996-2005	-14.6	-633.7 / 1.5	1996-2005	-7.3	-557.7 / 7.5
2004-2005	-53.4	-5659.0 / 104.2	2004-2005	-16.1	-899.1 / 77.8
<b>65. Pearl River</b>			<b>66. Lake Catherine</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1852-2005	-6.1	-35.1 / -0.4	1852-2005	-5.4	-55.8 / -1.6
1933-2005	-5.4	-66.5 / 19.1	1933-2005	-10.6	-113.9 / -4.7
1996-2005	-15.4	-508.0 / 294.9	1996-2005	-35.1	-859.8 / 8.9
2004-2005	-111.3	-4545.8 / 197.5	2004-2005	-62.5	-988.5 / 191.8
<b>67. South Point</b>			<b>68. Little Woods</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1852-2005	-10.3	-29.9 / -2.5	1852-2005	-4.5	-37.7 / 16.1
1933-2005	-10.3	-52.4 / 2.9	1933-2005	-5.2	-69.9 / 38.3
1996-2005	-23.0	-312.1 / 234.3	1996-2005	-9.7	-438.7 / 29.1
2004-2005	-89.7	-2566.5 / 69.4	2004-2005	-56.7	-3733.4 / 193.3
<b>69. Orleans Lakefront</b>			<b>70. Jefferson Lakefront</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1852-2005	15.9	-2.0 / 47.0	1852-2005	-6.7	-19.1 / 5.2
1933-2005	6.6	-8.6 / 49.3	1933-2005	-2.5	-28.8 / 15.4
1996-2005	-1.5	-34.6 / 131.2	1996-2005	0.3	-122.3 / 138.2
2004-2005	-11.6	-65.6 / 36.6	2004-2005	-15.8	-883.5 / 1284.0

Table 5. (cont.)

<b>71. LeBranche Marshes</b>			<b>72. Frenier Swamp</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1852-2005	-12.6	-18.4 / -5.7	1852-2005	-6.5	-10.8 / -0.2
1933-2005	-10.0	-19.1 / -1.3	1933-2005	-8.4	-14.8 / -0.1
1996-2005	-6.0	-67.6 / 36.1	1996-2005	-6.7	-27.0 / 14.1
2004-2005	-8.5	-238.0 / 282.1	2004-2005	-1.4	-80.6 / 115.1
<b>73. Pontchartrain Landbridge</b>			<b>74. Maurepaus South East</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1852-2005	-10.5	-20.8 / -2.3	1899-2005	-6.0	-16.5 / 3.0
1933-2005	-11.8	-22.3 / -1.5	1933-2005	-5.4	-16.6 / 1.4
1996-2005	-8.9	-25.3 / 21.4	1996-2005	-3.1	-40.8 / 25.3
2004-2005	-11.8	-76.9 / 106.7	2004-2005	-7.7	-351.6 / 265.7
<b>75. Maurepaus North West</b>			<b>76. Tangipahoa River</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1899-2005	-1.3	-10.0 / 4.1	1852-2005	-4.5	-33.1 / 0.6
1933-2005	-4.8	-15.9 / 3.0	1933-2005	-6.2	-21.4 / 0.0
1996-2005	-0.1	-66.5 / 26.4	1996-2005	-5.0	-16.7 / 37.6
2004-2005	0.7	-488.1 / 303.5	2004-2005	-3.2	-139.0 / 69.9
<b>77. Madisonville</b>			<b>78. Mandeville</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1852-2005	-0.5	-1.5 / 0.6	1852-2005	-0.2	-0.9 / 0.2
1933-2005	-5.5	-23.5 / 9.1	1933-2005	-2.7	-8.1 / 1.0
1996-2005	-0.1	-16.9 / 14.6	1996-2005	-1.0	-14.7 / 14.8
2004-2005	-0.1	-51.9 / 28.7	2004-2005	-0.1	-80.3 / 29.1
<b>79. Big Branch Marshes</b>			<b>80. Slidell</b>		
Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)	Dates	Average Rate of Change (ft/yr)	Change Rate Range (ft/yr)
1852-2005	-0.6	-2.0 / -0.2	1852-2005	-0.4	-1.5 / 0.1
1933-2005	-9.0	-19.0 / 0.3	1933-2005	-6.8	-24.3 / -1.9
1996-2005	-0.1	-23.7 / 21.8	1996-2005	-0.4	-33.2 / 26.0
2004-2005	-6.5	-94.8 / 72.2	2004-2005	0.5	-127.6 / 101.2

## Part 4: Barrier Island Land Change

The following section describes the barrier island area changes as a consequence of natural processes and human impacts. Three barrier island systems are represented: The Isle Dernieres, Timbalier Islands, and Chandeleur Island. The Isles Dernieres barrier shoreline represents a barrier island arc 22.0 miles long in Terrebonne Parish. Four Shoreline Reaches: (33) Raccoon Island; (34) Whiskey Island; (35) Trinity Island; and 36) East Island make up the Isles Dernieres. Timbalier Islands are comprised of shoreline reaches 37, 38, and 39. The Chandeleur Islands consists of shoreline reaches 57, 58, and 59, although only reach 59 is described in the following section. Figures 8 through 14 are graphs depicting the area changes for the above mentioned barrier island systems between 1855 and 2005. Table 6 lists the average historical, long-term, short-term and near-term area changes for all barrier island systems along coastal Louisiana.

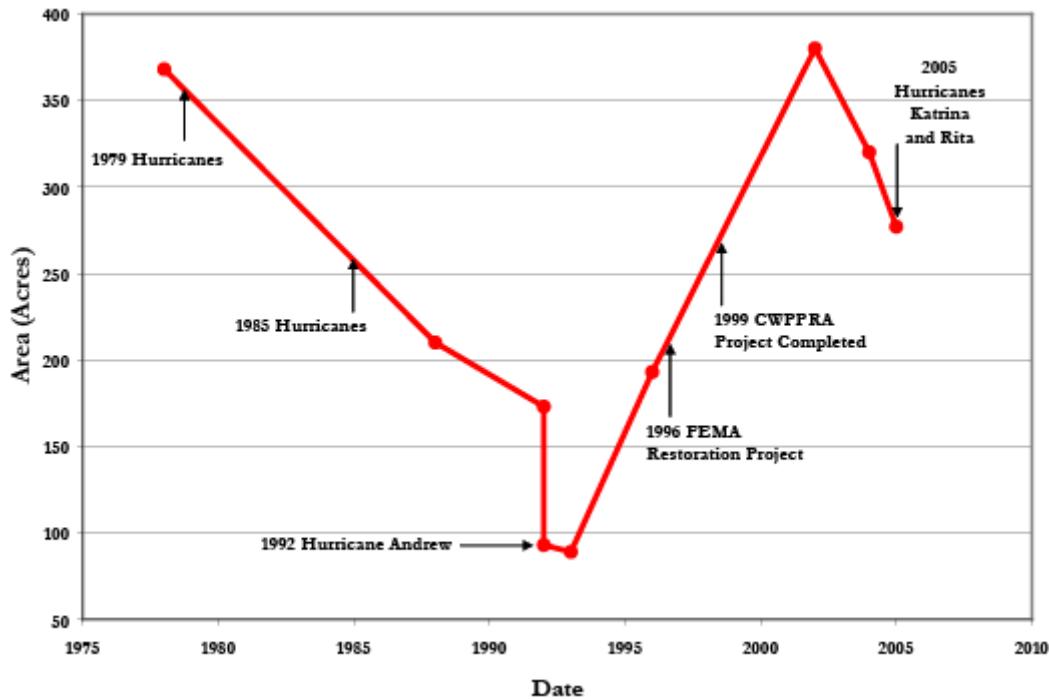


Figure 8 A time-series documenting the historical area changes in East Island (TE-20) between 1978 and 2005. Significant shoreline events are illustrated along the area time-series line.

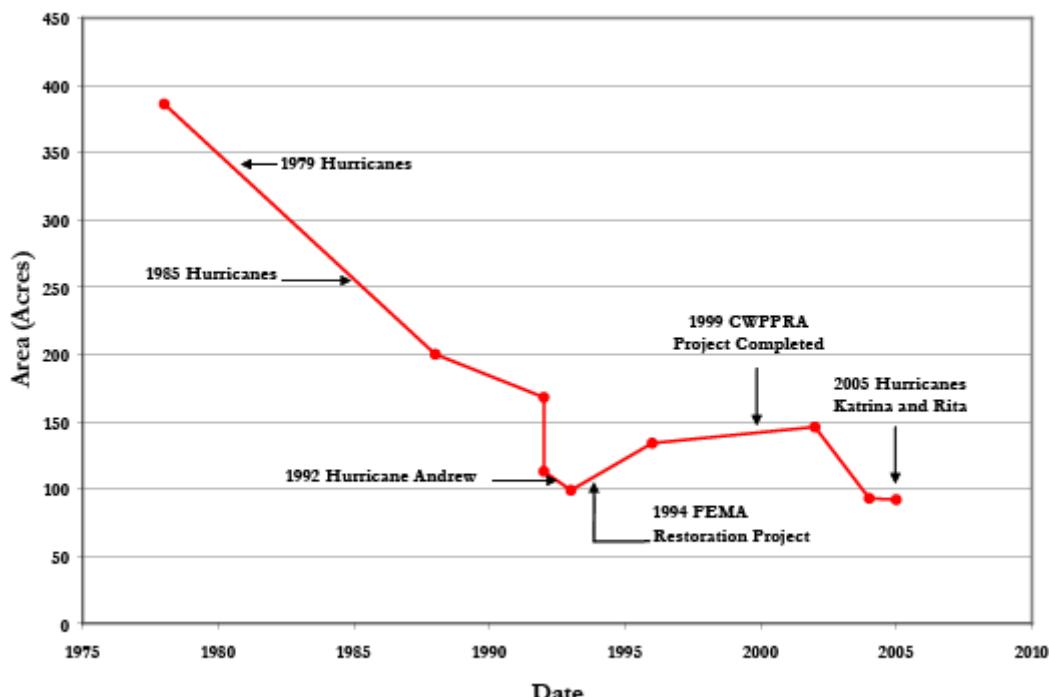


Figure 9. A time-series documenting the historical area changes in Raccoon Island (TE-29) between 1978 and 2005. Significant shoreline events are illustrated along the area time-series line.

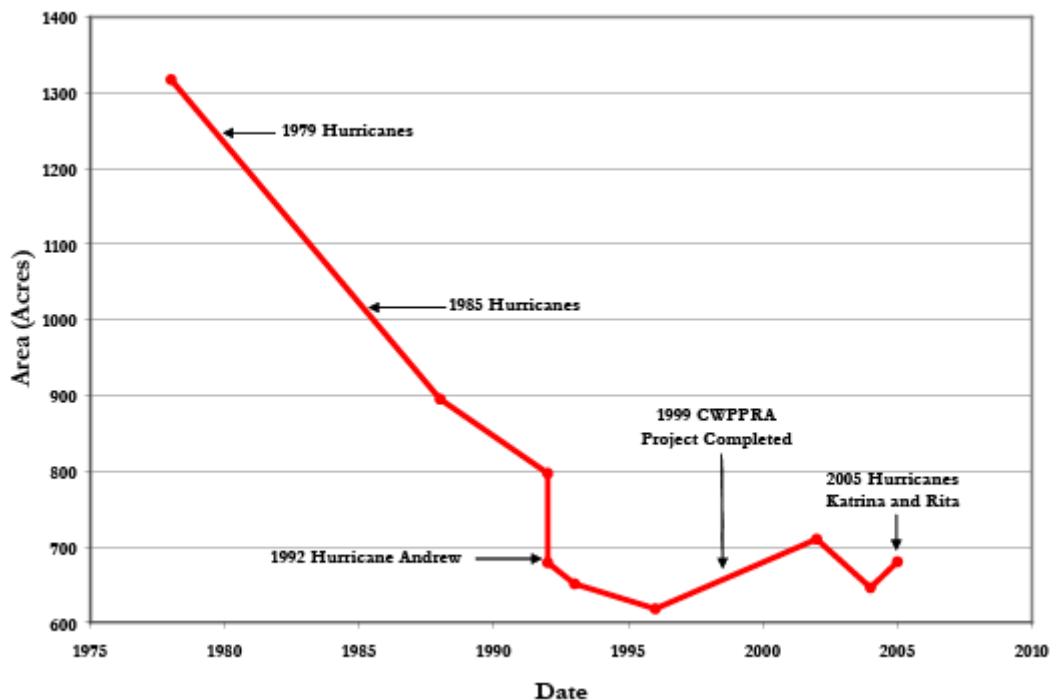


Figure 10. A time-series documenting the historical area changes in Trinity Island (TE-24) between 1978 and 2005. Significant shoreline events are illustrated along the area time-series line.

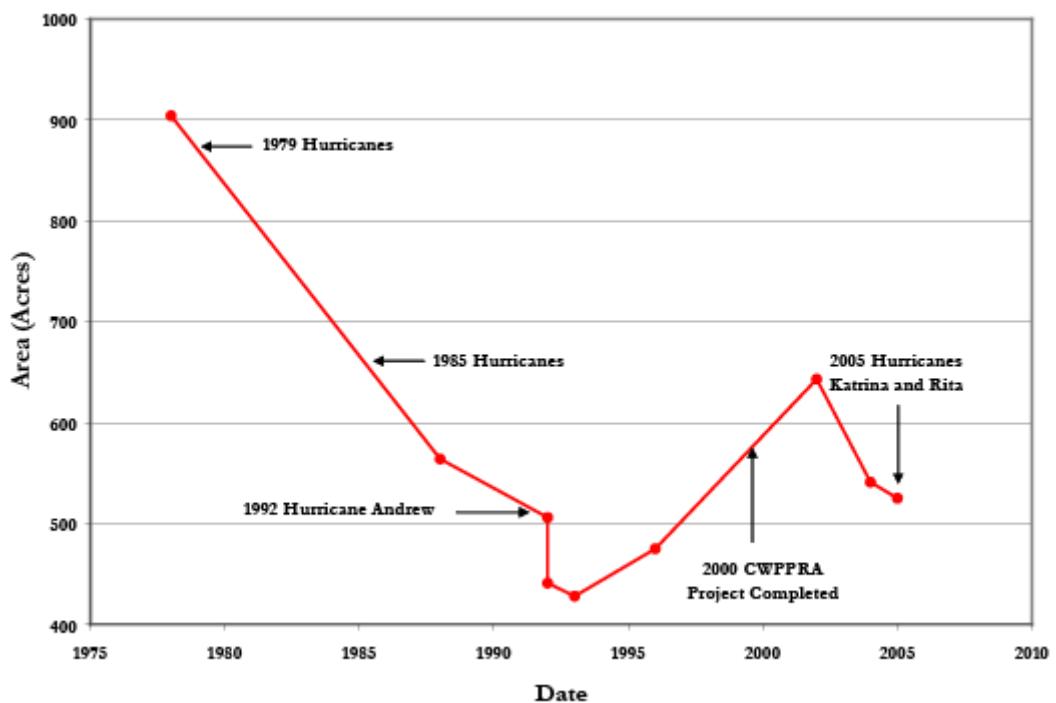


Figure 11. A time-series documenting the historical area changes in Whiskey Island (TE-27) between 1978 and 2005. Significant shoreline events are illustrated along the area time-series line.

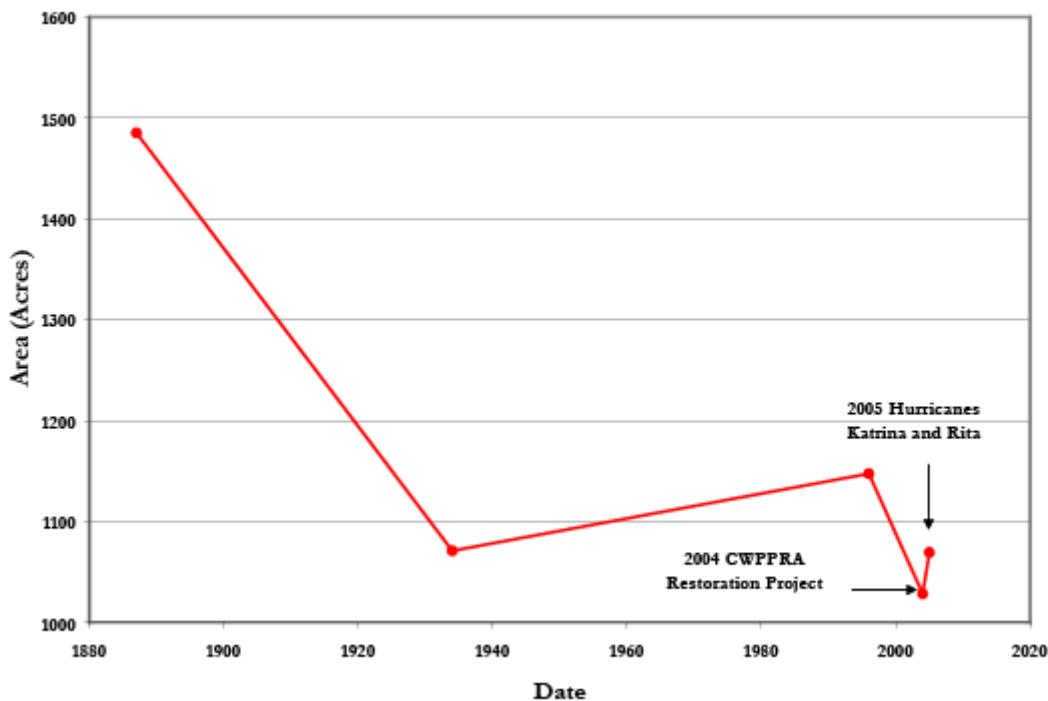


Figure 12. A time-series documenting the historical area changes in Timbalier Island (TE-40) between 1887 and 2005. Significant shoreline events are illustrated along the area time-series line.

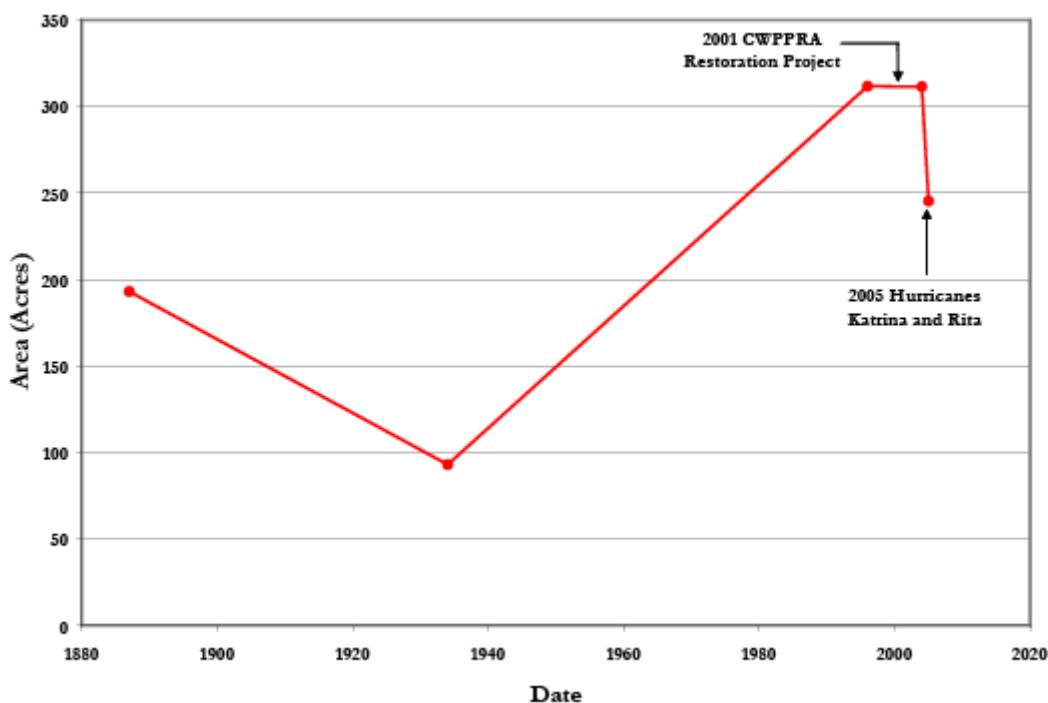


Figure 13. A time-series documenting the historical area changes in East Timbalier Island (TE-25) between 1887 and 2005. Significant shoreline events are illustrated along the area time-series line.

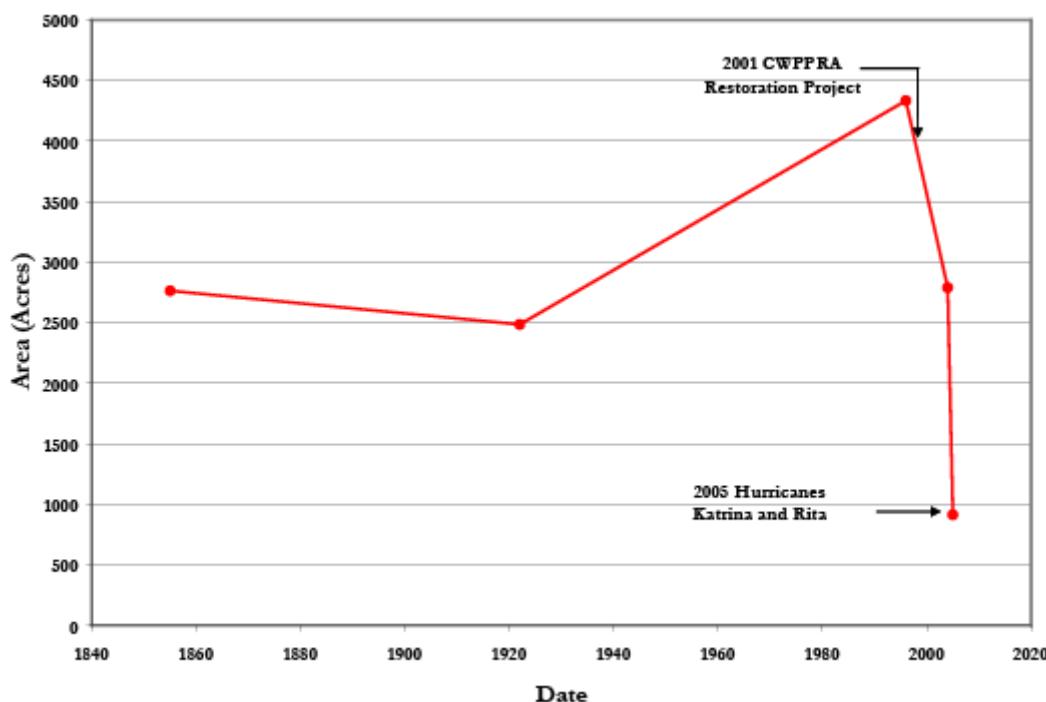


Figure 14. A time-series documenting the historical area changes in Chandeleur Island (PO-27) between 1855 and 2005. Significant shoreline events are illustrated along the area time-series line.

Table 6. Historical, long term, short term and near term barrier island area changes.

Island	1800's	1922-30's	1996-98	2004	2005
Breton	820.4	669.7	212.3	128.7	43.6
Chandeleur	6,827.5	6,140.6	4,333.1	2,789.6	913.9
Grand Gossier/Curlew	1,119.4	71.7	595.5	75.2	0.0
New Harbor	177.9	232.3	85.7	76.9	87.0
North	1,455.5	966.2	125.8	77.1	79.7
Freemason	538.7	247.1	28.8	17.6	4.8
Isle Derniers	8,727.8	4,838.3	1,566.5	1,613.9	1,595.5
Timbalier	3,669.5	2,646.5	1,147.4	1,028.4	1,069.4
East Timbalier	476.9	229.8	311.7	311.4	245.3
Grand Isle	2,616.8	2,347.5	2,439.5	2,232.0	2,286.0
Grand Terre	4,198.3	2,614.4	1,093.4	1,021.1	997.7
Shell Island	313.8	432.4	89.7	56.5	51.0

The following graphics illustrate the barrier island changes for the Isle Dernieres, Timbalier Islands, and Chandeleur Island. Figures 15 through 18 are graphs depicting linear regression of land area changes for while Figures 19 through 22 show the historical, long-term, short-term and near-term area changes for the Isle Dernieres, Timbalier Islands, and Chandeleur Island.

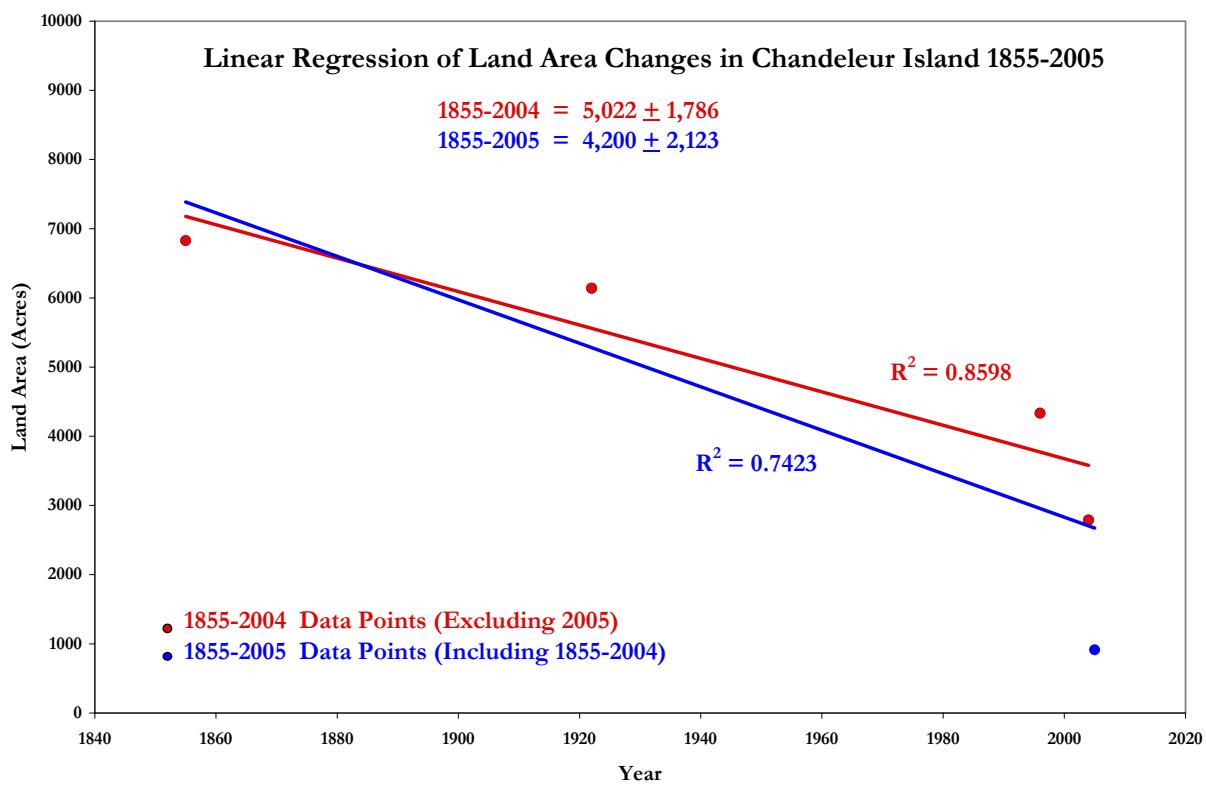


Figure 15. Linear regression of land area changes for Chandeleur Island between 1855 and 2005.

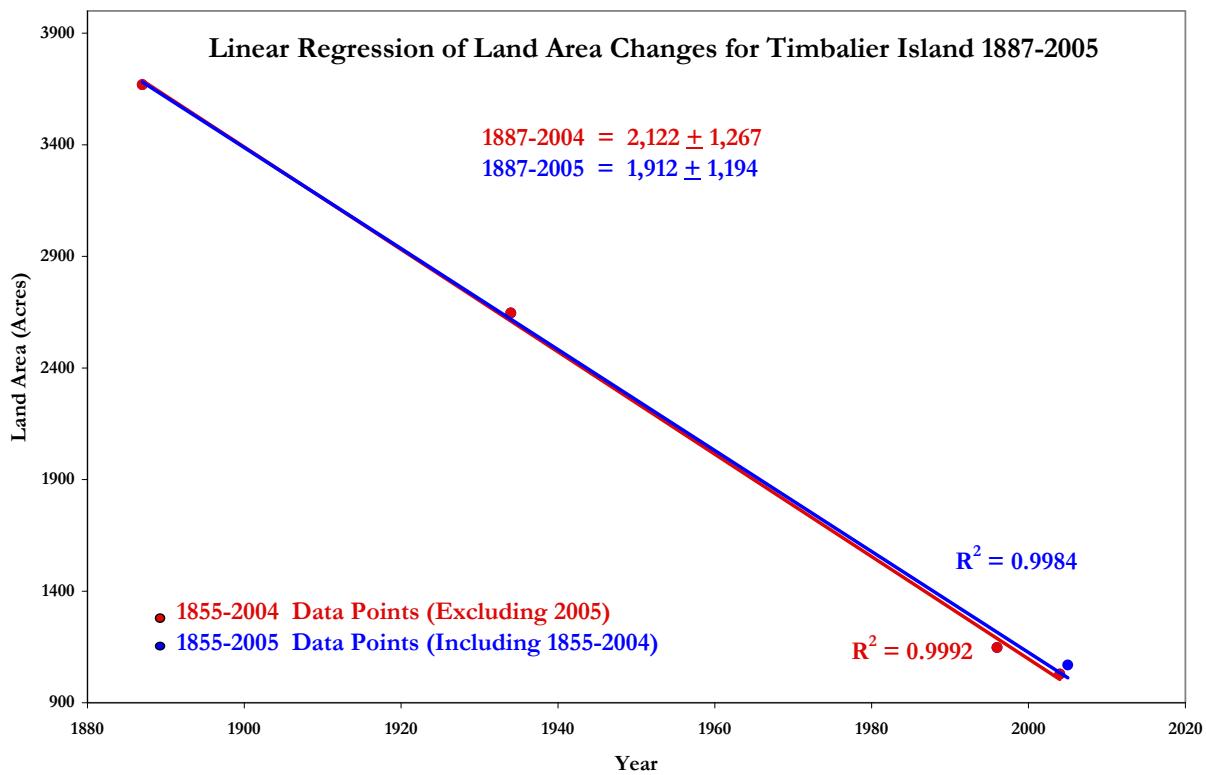


Figure 16. Linear regression of land area changes for Timbalier Island between 1887 and 2005.

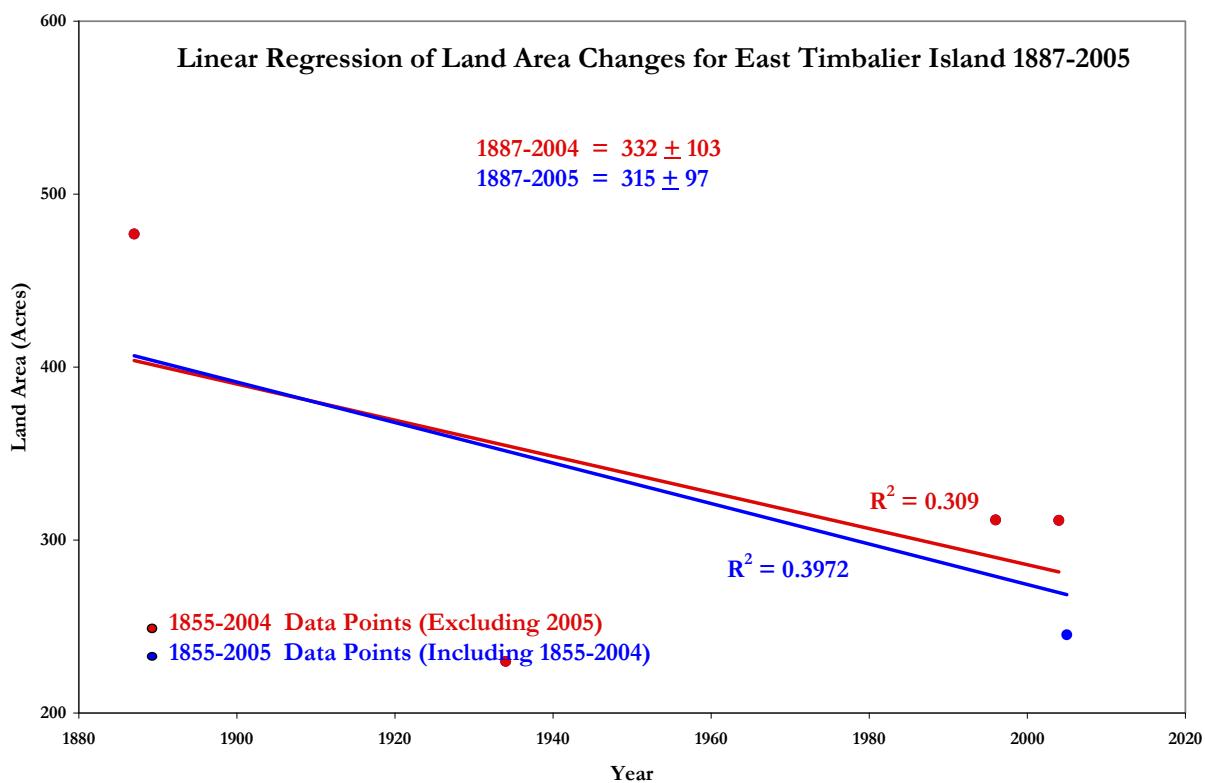


Figure 17. Linear regression of land area changes for East Timbalier Island between 1887 and 2005.

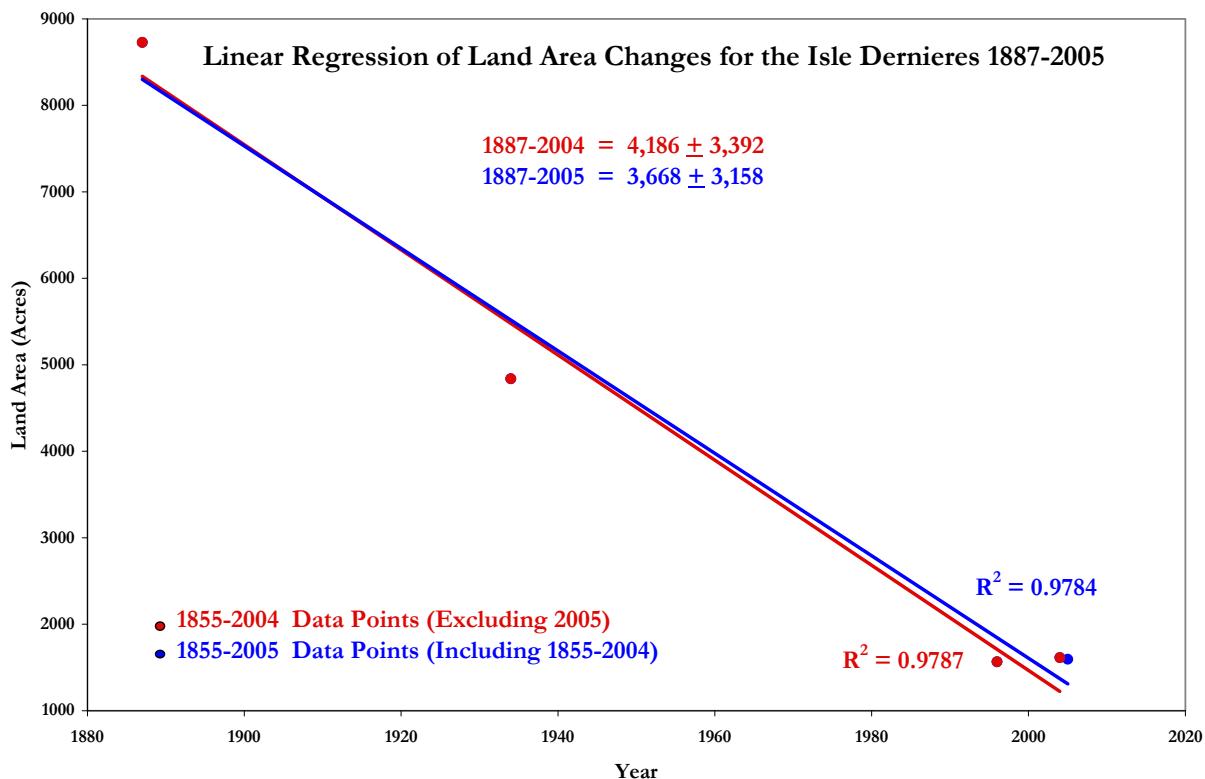


Figure 18. Linear regression of land area changes for the Isle Dernieres barrier islands between 1887 and 2005.

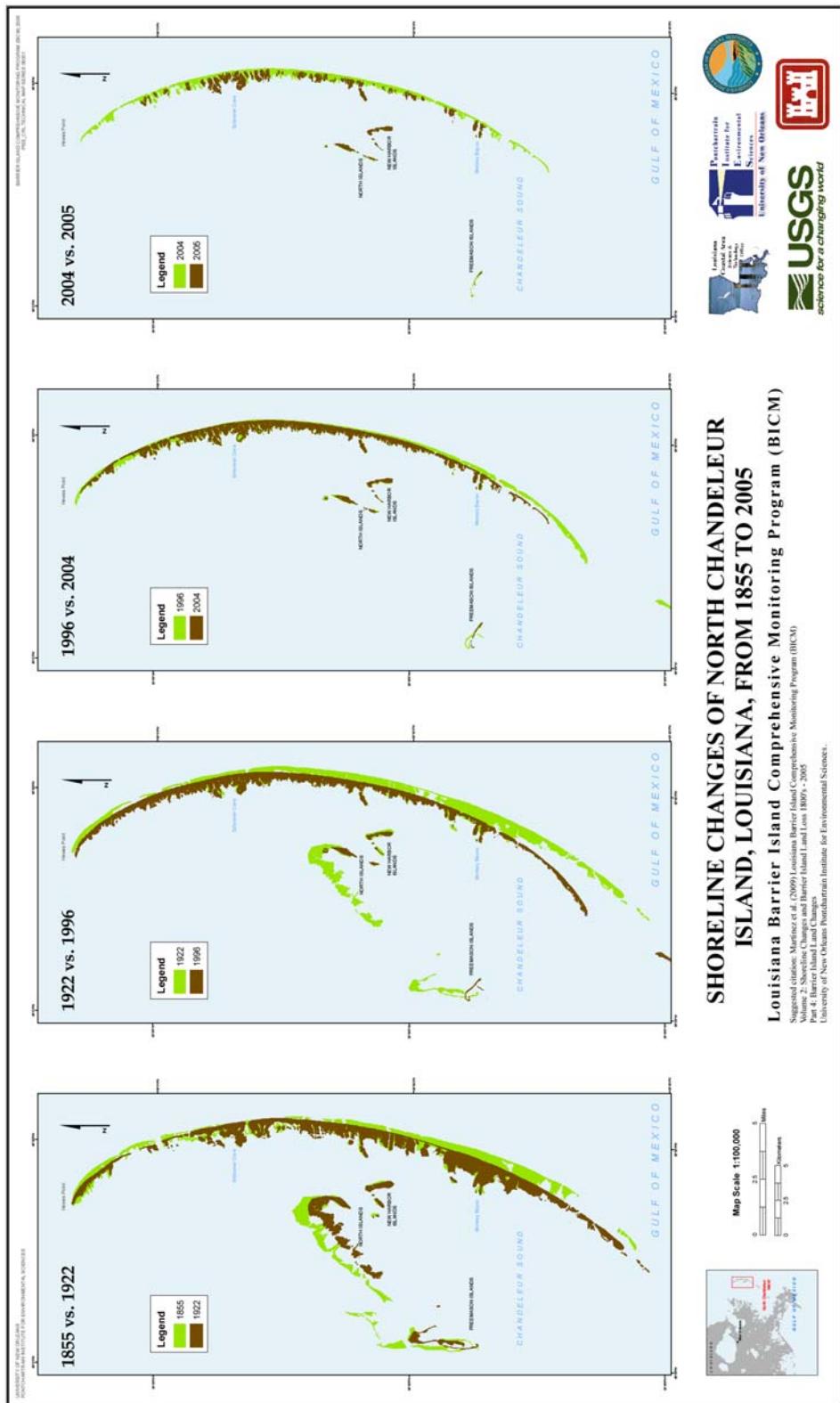


Figure 8. Historical overlays for Chandeleur Island 1855 – 2005. The Chandeleur Island contains shoreline reach 59.

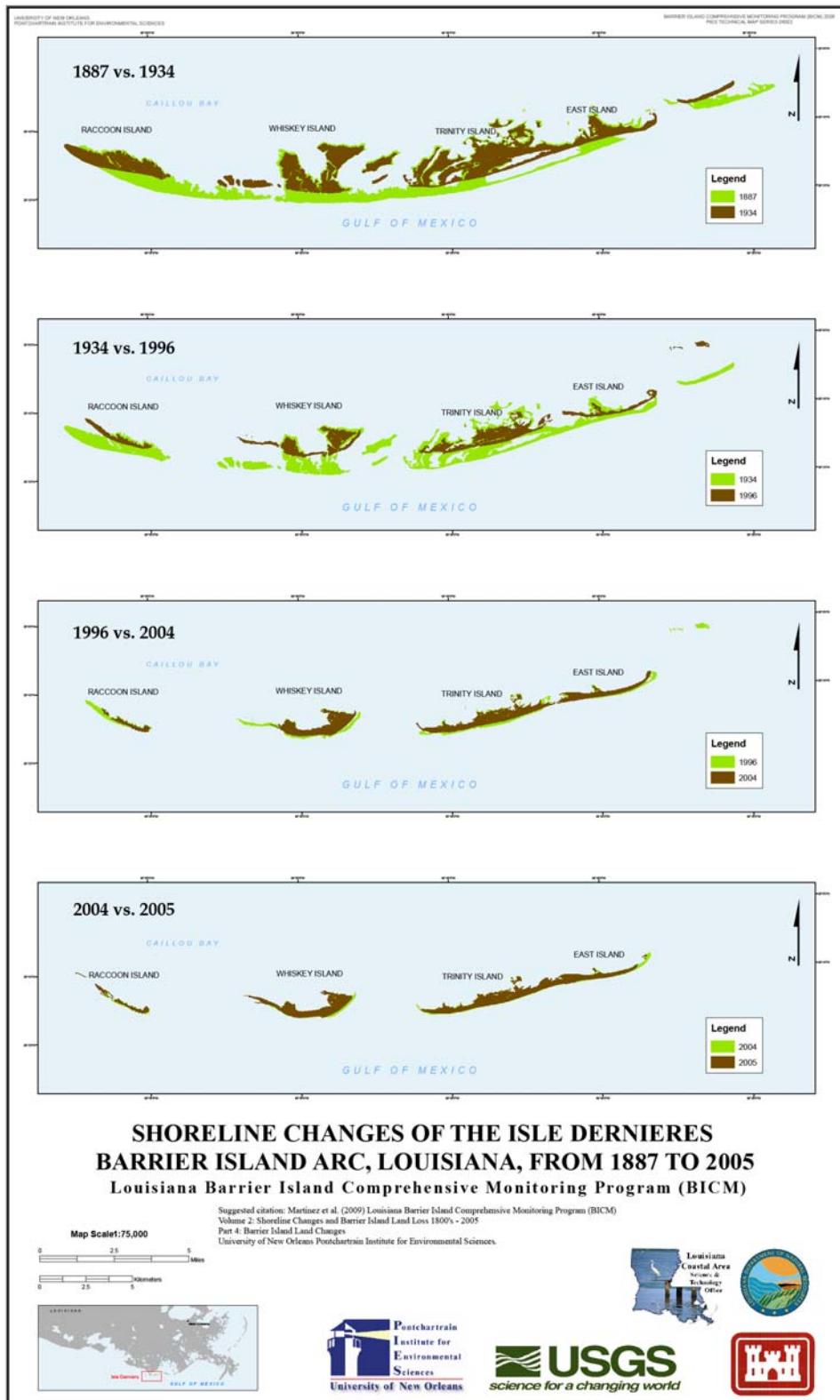


Figure 9. Historical overlays for the Isle Dernieres for 1887 – 2005. The Isle Dernieres contains shoreline reaches 33 – 36.

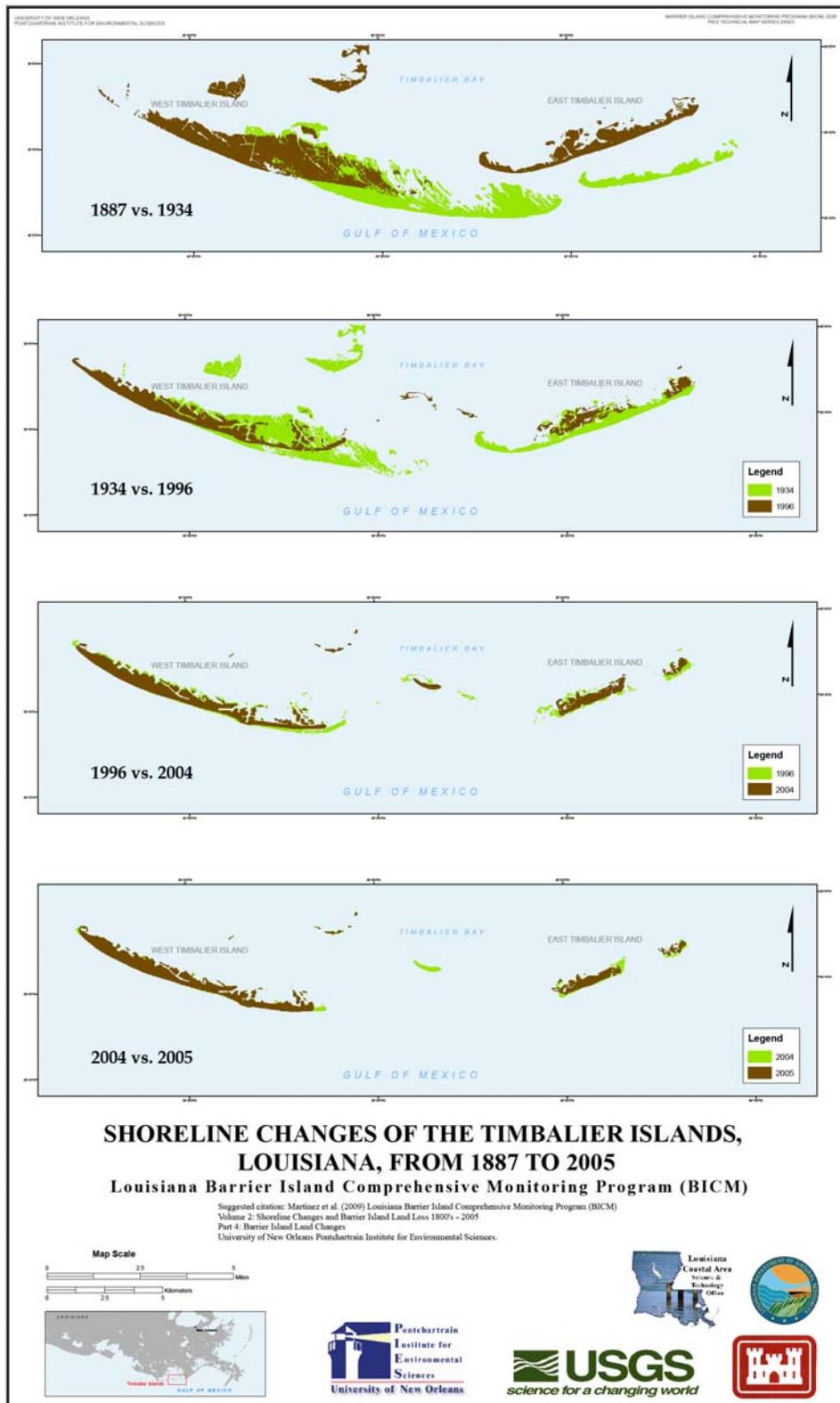


Figure 10. Historical overlays for the Timbalier Islands for 1887 – 2005. The Isle Dernieres contains shoreline reaches 37 – 38.

**Appendix A.** Tide Gauge stations, locations, and stage data (units for stage data are ft above MSL).

**1996/1998**

DATE	REGION	GAGE_ID	GAGE_LOCAT	STAGE_DATA
March-98	Chenier Plaain	73600	Calcasieu River and Pass	2.0
January-98	Lake Pontchartrain	76060	Inner Harbor Navigation Canal	1.4
February-98	Lake Maurepaus	85420	Nine miles south of Ponchatoula	1.8
January-98	Lake Borgne	85780	Bayou Terre Aux Boeufs	0.8
December-96	Chandeleur Island	1480	MS River at Mile 10.7	3.3
February-98	Mississippi River Plaquemines	1480	MS River at Mile 10.7	3.2
December-96	Shoreline	1545	MS River 0.6 mile	2.2
December-96	Caminada Headland	82260	Bayou Lafourche at the Golden Meadow	0.8
December-96	Timbalier Island	82260	Bayou Lafourche at the Golden Meadow	0.8
December-96	Isle Dernieres	82260	Bayou Lafourche at the Golden Meadow	0.8
January-98	Acadiana Bays	3780	Atchafalaya River at mile 117.7	2.9
January-98	Venice	1480	MS River at Mile 10.7	3.3

**2004**

DATE	REGION	GAGE_ID	GAGE_LOCAT	STAGE_DATA
September-04	Chenier Plain	73600	Calcasieu River and Pass near Hackberry	NO DATA
January-04	Acadiana Bays	3780	Atchafalaya River at mile 117.7 (1963 Surv)	3.5
April-04	Isle Dernieres	82260	Bayou Lafourche at the Golden Meadow gate	2.0
November-04	Timbalier Islands	82260	Bayou Lafourche at the Golden Meadow gate	3.5
November-04	Caminada Headland	82260	Bayou Lafourche at the Golden Meadow gate	3.5
November-04	Plaquemines Shoreli	1545	Bayou Lafourche at the Golden Meadow gate	NO DATA
January-04	Mississippi River D	1480	Mississippi River at Mile 10.7	2.9
March-04	Chandeleur Islands	1480	Mississippi River at Mile 10.8	2.9
January-04	Lake Borgne	85780	Bayou Terre Aux Boeufs, on bridge	1.3
January-04	Lake Maurepaus	85420	Nine miles south of Ponchatoula, LA	1.6
January-04	Lake Pontchartrain	76060	Inner Harbor Navigation Canal	0.6
January-04	Venice	1480	MS River at Mile 10.7	2.9

**2005**

DATE	REGION	GAGE_ID	GAGE_LOCAT	STAGE_DATA
October-08	Chenier Plain	73600	Calcasieu River and Pass	NO DATA
October-08	Lake Pontchart	76060	Inner Harbor Navigation Canal	NO DATA
October-08	Lake Maurepaus	85420	Nine miles south of Pontchartrain	NO DATA
October-08	Lake Borgne	85780	Bayou Terre Aux Boeufs	NO DATA
November-08	Chandeleur Isl	1480	Mississippi River	0.8
October-08	Mississippi Ri	1480	Mississippi River	0.8
November-08	Plaquemines Sh	1545	Mississippi River 0.6 mil	NO DATA
November-08	Caminada Headl	82260	Bayou Lafourche	2.1
November-08	Timbalier Isla	82260	Bayou Lafourche	2.1
November-08	Isle Dernieres	82260	Bayou Lafourche	2.1
October-08	Acadiana Bays	3780	Mississippi River	1.3
November-05	Venice	1480	Mississippi River	0.8

**Appendix B.** NOAA Coastal Survey maps used as primary data sources for the 1855 - 1898 National Geodetic Survey's (NGS) vector shorelines.

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ID	Region	Date	Description	T-Sheet
1	Mississippi Delta	1859-1875	NOAA T-SHEET	T-1037, T-1038, T-794
2	Venice	1868	NOAA T-SHEET	T-1069
3	Chandeleur Islands	1855-1885	NOAA T-SHEET	T-1097, T-1092, T-549, T-548, T-366
4	Lake Pontchartrain	1897	NOAA T-SHEET	T-2307, T-2306, T-2257, T-2256, T-2255, T-2254, T-796, T-774, T-773, T-786, T-799
5	Lake Maurepaus	1899	NOAA T-SHEET	T-2362, T-2361
6	Lake Borgne	1853-1857	NOAA T-SHEET	T-405, T-629, T-773, T-656, T-633
7	Plaquemines Shoreline	1884	NOAA T-SHEET	T-1468A, T-1648, T-1658
8	Caminada Headland	1884	NOAA T-SHEET	T-1765, T-1766
9	Timbalier Islands	1887	NOAA T-SHEET	T-1764
10	Isle Dernieres	1887	NOAA T-SHEET	T-1762, T-1763
11	Acadiana Bays	1855-1886	NOAA T-SHEET	T-1684, T-1685, T-1693, T-1687, T-764, T-793, T-1680, T-631, T-632, T-639, T-638, T-637, T-1690, T-1692
12	Chenier Plain	1884-1888	NOAA T-SHEET	T-1654, T-1655, T-1689, T-1688, T-1686, T-1684

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**Appendix B (cont.).** NOAA Coastal Survey maps used as primary data source for the 1904 - 1952 National Geodetic Survey's (NGS) vector shorelines.

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<b>ID</b>	<b>Region</b>	<b>Date</b>	<b>Description</b>	<b>T-Sheet</b>
<b>1</b>	Mississippi Delta	1922	NOAA T-SHEET	T-4044, T-4030, T-4050, T-3630, T-4043, T-2677, T-4047
<b>2</b>	Venice	1922	NOAA T-SHEET	T-4047, T-2677A
<b>3</b>	Chandeleur Islands	1922	NOAA T-SHEET	T-3920, T-3919, T-3918, T-3917
<b>4</b>	Lake Pontchartrain	1917	NOAA T-SHEET	T-3665, T-3666
<b>5</b>	Lake Maurepaus	1930	NOAA T-SHEET	T-3665
<b>6</b>	Lake Borgne	1930	NOAA T-SHEET	T-3664, T-3663
<b>7</b>	Plaquemines Shoreline	1933	NOAA T-SHEET	T-4030, T-6079, T-6078, T-6077
<b>8</b>	Caminada Headland	1933	NOAA T-SHEET	T-6076, T-6061
<b>9</b>	Isle Dernieres	1934	NOAA T-SHEET	T-6108, T-6068
<b>10</b>	Acadiana Bays	1948	NOAA T-SHEET	T9012, T9013, T9014, T9015, T9016, T9017, T9018, T9019, T9020, T9021, T9022, T9024, T9025, T9026, T9027, T9031, T9033, T11993, T11994, T11996
<b>11</b>	Chenier Plain	1933	NOAA T-SHEET	T-4791, T-4795, T-4922, T-4923, T-4924
<b>12</b>	Timbalier Islands	1934	NOAA T-SHEET	T-6062, T-6061

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