

SHORELINE EVOLUTION FROM 1945 TO 1988 AT GRAND ISLE, LOUISIANA

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ABSTRACT

Louisiana is losing over 55 square miles of its coast annually due to natural processes and many forms of human intervention. Sand bodies are especially affected in the Mississippi Delta Plain where Grand Isle, the State's only inhabited barrier island, is located (Fig. 1).

Recent historical trends in erosion and deposition on Grand Isle were evaluated using aerial photographs acquired in 1945, 1949, 1956, 1958, 1963, 1964, 1965, 1966, 1971, 1976, 1978, 1982, 1986, and 1988. Shoreline changes in fourteen different zones on the island were calculated for each set of aerial photographs and summarized on maps and in tables. Meteorological data and historical records also helped to explain the patterns of change (Table 1).

The major factors contributing to shoreline changes at Grand Isle are:

1. The nature of the unprotected sediments forming the margins of the island: unstabilized shorelines include slopes composed largely of sand, tidal marsh, sand and shell beaches, and recently dredged fill.
2. Shoreline orientation with respect to wave fetch, prevailing wind directions, and approaching storms.
3. Duration and magnitude of major storms.
4. Local weather, along with regional and worldwide climate.
5. Relative sea level rise, due to subsidence of the Mississippi Delta Plain sediments from compaction, consolidation, and isostatic adjustment, as well as to a currently rising global sea level. The present rate of relative sea level rise at Grand Isle averages 0.41 inches/year.
6. Sediment deprivation, largely due to human influences such as dams, reservoirs, artificial levees, and control structures located in the Mississippi drainage basin, alluvial valley, and delta plain.
7. Disruption of longshore drift by construction and orientation of jetties, groins, and breakwaters.
8. Beach nourishment and marsh infilling by humans.

In the 43 year interval studied, naturally-induced shoreline retreat exceeded accretion on both the north (bay) and south (beach) sides of the island. However, largely because of human intervention through beach nourishment and jetty building, the area of Grand Isle actually increased by 33.9 acres between 1945 and 1988 (Table 2).

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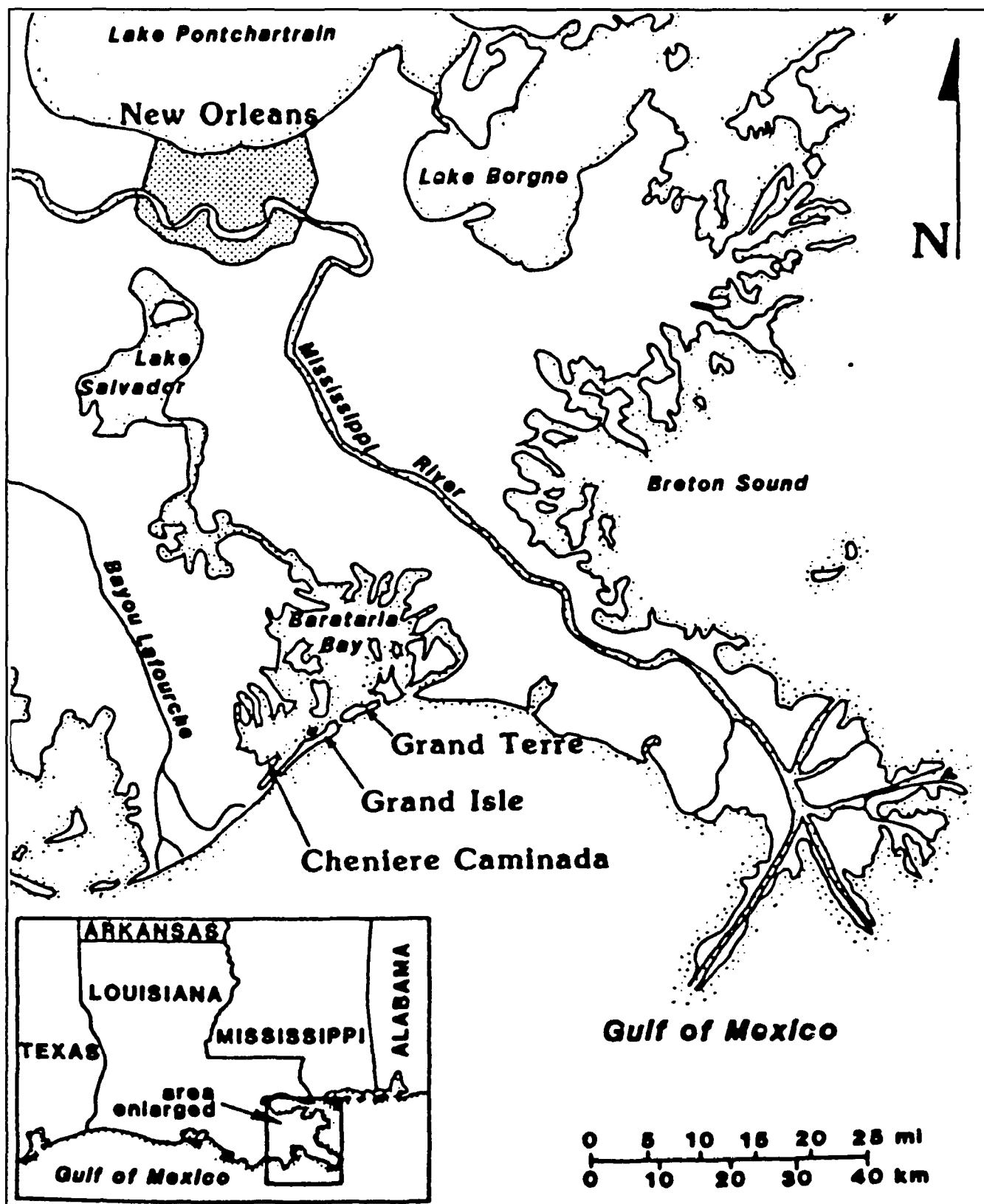


Figure 1. Location map of Grand Isle

Table 1. Dates of aerial photographs and significant events that occurred between photograph dates.

Photograph Date	Event and Data
11/5/45	Tropical Storm 6/15/46 Hurricane-Unnamed 9/19/47 Hurricane-Unnamed 9/4/48 Tropical Storm 9/4/49
9/29/49	Groin Fields 1951-52 Beach Nourishment 1955-56 Tropical Storm 8/1/55 Tropical Storm 8/27/55 Tropical Storm 6/12/56 Hurricane-Flossy 9/24/56
10/8/56	Groin Fields 1956 Beach Nourishment 1957 Tropical Storm 9/18/57
11/22/58	Barataria Pass Jetty 1958-59 Hurricane-Ethel 9/15/60 Beach Nourishment 1961-62 Significant Marsh Fill
12/9/63	Extension of Barataria Pass Jetty 1964
10/7/64	Hurricane-Betsy 9/10/65
10/8/65	Dredge Adjacent to Jetty and Beach Nourishment 1966
11/21/66	Revetment of Barataria Pass Jetty 1966 Hurricane-Camille 8/18/69
5/16/71	Caminada Pass Jetty 1972 Hurricane-Carmen 9/8/74 Dune and Beach Nourishment 1975-76
4/8/76	Hurricane-Babe 9/5/77
5/10/78	Hurricane-Bob 8/11/79
11/7/82	Dune and Beach Nourishment 1983-84 Tropical Storm 10/31/85
10/15/86	Extension of Caminada Pass Jetty 1987 Beach Repair 1/88

Table 2. Summary of Changes in area on Grand Isle over the 43 study interval.

Zone	1945 Acreage	1988 Acreage	Acreage Change
Beach	320.95	518.38	+197.43
Bayside	2070.51	1906.98	-163.53
Total	2391.46	2425.36	+33.90