

GRAND ISLE - A BARRIER ISLAND IN THE GULF OF MEXICO

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ABSTRACT

Grand Isle is part of a barrier island chain along the coast of southeastern Louisiana. It separates the estuarine environment of Barataria Bay from the marine environment of the Gulf of Mexico. The island is 7-1/2 miles long and about half a mile wide.

Mechanical analyses of 102 surface samples indicate that the island is composed of fine-grained terrigenous sand, silt and clay, with a minor percentage of shell material. Median grain diameters range from 0.166 mm for beach sands downward to 0.005 mm for isolated clay pockets of the back-island area. Grain size isopleth maps demonstrate a parallelism of grain size characteristics to sedimentary features and environments such as the beach, dunes, ridges, and inter-ridges. They also demonstrate an increase in the size of beach sand to the southwest. Beach and dune sands are well sorted. Ridge and inter-ridge sediments contain a higher percentage of silt and clay and exhibit poorer sorting. Organic content of representative sediment samples ranges from 0.20 to 9.08 percent. The high oxidation environments of the beach and dunes generally have the lowest organic content. Carbonate content in the form of shell material ranges up to 4.20 percent with the smaller grain-size sediments generally having a higher carbonate content.

The subsurface stratigraphy was studied using 127 soil boring logs. All strata encountered by the borings (to a maximum depth of 320 feet) were Holocene sands and clays. The oxidized Pleistocene contact is interpreted to be at a depth of 400 feet as determined by deeper borings on nearby islands. Four Holocene sands are recognized in this subsurface section. The deepest sand, interpreted to be a Holocene transgressive unit, is 120 to 170 feet thick. The maximum thickness of three shallower sands is 43 feet, and the average thickness is 10 to 20 feet. The three upper sands are fine to very fine-grained. The deepest sand is fine to coarse-grained. Typical silty prodelta clays and highly plastic offshore clays are found between the sand beds.

The Grand Isle beach has an average slope of $2\ 1/2^\circ$. A low dune ridge runs almost continuously behind the beach. Approximately 25 sets of relict beach and dune ridges can be identified behind the active dunes. These sets trend nearly parallel to one another and to the present beach. The ridges are 25 to 100 feet wide and are three feet or less in height.

The sediments to a depth of 100 feet are interpreted to be related to deltaic progradation of the ancestral Mississippi River. This deltaic progradation began about 5600 years ago when sea level reached a stillstand. The Lafourche delta formed west of Grand Isle about 2000 years ago. As wave action attacked the delta front, sediment was carried north-eastward by littoral currents. A barrier spit was constructed into the mouth of Barataria Bay. The barrier spit was eventually breached by a tidal gut. Grand Isle has grown from this original nucleus island by beach and dune-ridge accretions.