UNITED STATES
DEPARTMENT OF THE INTERIOR

U. S. GEOLOGICAL SURVEY
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EXPLANATION

a — Sand beach and nearshore terrace

Fine-grained sand, blown and washed into the lagoon from Padre Island and partially redistributed by waves and currents, forming a beach and subaqueous nearshore terrace along the east side of Laguna Madre

b — Trough

Fine-grained shelly sand forming a centrally located, unvegetated trough generally deeper than 3 feet (1 m)

c, d — Vegetated flats

Fine-grained shelly sand and muddy shelly sand, forming relatively flat portions of the lagoon floor between the central trough and the shores. c. Vegetated largely by Halophila engelmannii, generally in a narrow zone bordering the trough. d. Vegetated largely by shoal grass, Halodule beaudettei, generally in water shallower than 3 feet (1 m)

e, f — Shoals

Fine-grained shelly sand and sandy shell gravel in relatively shallow, topographically irregular areas, mainly along the west side of Laguna Madre. e. Unvegetated. f. Vegetated, largely by shoal grass, Halodule beaudettei

g — Shell beach

Shell gravel and shelly sand, locally cemented by calcium carbonate to form beachrock, on the west side of Laguna Madre and along the shore of South Bird Island

h, i — South Bird Island beach-ridge complex

Sand, shell gravel, and muddy sand, forming a complex system of vegetated beach ridges and ponded inter-ridge swales on South Bird Island. h. Subaerial ridges. i. Ponded swales

j, k, l — Spoil banks

Material, largely sand, in part shelly and muddy, cast aside during channel dredging. j. Subaerial. k. Intermittently exposed. l. Subaqueous, in part vegetated by Halodule beaudettei, Halophila engelmannii and Ruppia maritima

m — Dredged channels

Contact

Dashed where approximately located or gradational

4 — Sounding in feet

Datum is mean low water. Shoreline shown represents approximate line of mean high water. The mean diurnal range of tide in Laguna Madre is less than 1/4-foot, but seasonal changes in water level and changes due to rainfall and wind set-up can amount to a foot or more

Step

Relatively steep narrow slope forming the edge of a shoal, flat-topped bar, or terrace; hachures on side of lower elevation; dashed where less steep or lower than 1/2 foot.

Ridge axis

Axis of relatively steep-sided, narrow ridge; dashed where sides are less steep or lower than 1/2 foot

Laguna Madre shoreline of Padre Island in 1877

Laguna Madre shoreline of Padre Island in 1948

▲ Lighted beacon

○ Daybeacon

NOTE ON CHANGEABILITY OF MAPPED FEATURES

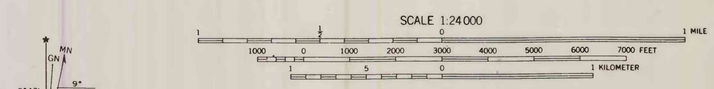
The sediment units mapped here are all of Holocene (Recent) age. Because many of these sediments are undergoing rapid depositional and erosional changes, this mapping cannot be considered a final record but rather must be thought of as a datum point from which future changes may be measured. Some of the features, however, change more slowly than do others, as evidenced by comparisons of the latest aerial photographs with older maps and aerial photographs. Unfortunately, most of the available aerial photographs do not show underwater features very clearly because of the typically high turbidity of Laguna Madre water. The present mapping is based largely on high-altitude color aerial photographs taken by the National Aeronautics and Space Administration on January 19, 1973, a day of exceptionally low turbidity in the lagoon. The mapping was field checked during the summer of 1973.

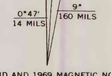
The mainland shoreline of Laguna Madre has remained in essentially the same position as when first mapped in 1877 (U.S. Coast and Geodetic Survey, 1887). At least a few of the larger shoals along the mainland shoreline have moved little if at all since they were first recorded on aerial photographs taken in 1937 by Tobin Surveys, Inc. However, none of the photographs taken before 1968 show the shoals clearly enough to rule out the possibility of some shoal movement. During the period from 1968 to 1973, however, the shoals and even most of the low steps formed by bars superimposed on the shoals have definitely remained fixed, as shown by aerial photographs taken in those years by the National Aeronautics and Space Administration. These shoals and superimposed bars, which may be small-scale analogs of the giant shoals off the Carolina capes (White, 1966; Hoyt and Henry, 1971; Swift and others, 1972), probably are actively shaped only during hurricanes.

In contrast to the mainland shoreline, the Padre Island shoreline of Laguna Madre has been very unstable due to the movement of wind-blown sand into the lagoon from Padre Island. During the 20-year period between the mapping done in 1948 (U.S. Geological Survey, 1951) and in 1967-1968 (Hunter and Dickinson, 1970; U.S. Geological Survey, 1969), the Padre Island shoreline of Laguna Madre advanced westward about 700 feet.

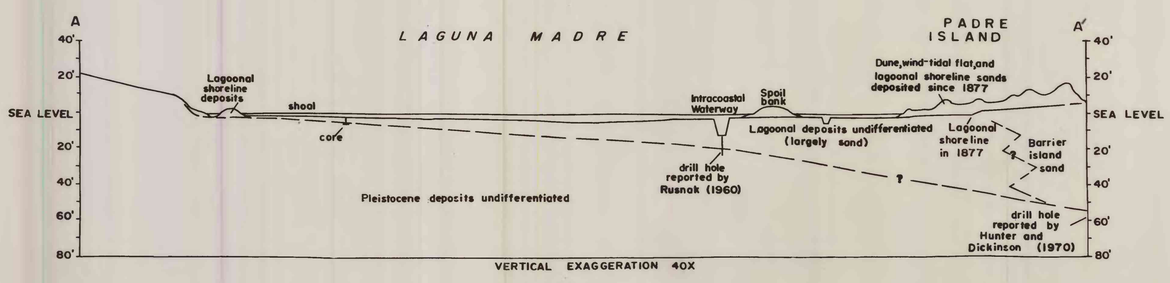
The rate of deposition on the lagoon floor is about 0.4 feet/100 years, according to Rusnak (1960). Several 4-foot cores show that the character of the sediments varies vertically from sand to shell gravel, with some muddy, shelly sand and a few thin mud beds. The various sediment types do not exhibit obviously systematic trends in abundance with increasing depth within the cores. Therefore, the changes in sediment type evidently record temporary fluctuations in depositional environment rather than a progressive alteration of the environment.

The area covered by subaqueous vegetation has been more extensive during the wet period 1968-1973 than it was during a period of drought and accompanying high salinity in the lagoon when the vegetation was studied by Simmons (1957). Vegetation has increased considerably on the shoals and subaqueous spoil banks during the interval from 1968 to 1973; the subaqueous spoil banks, for example, were largely bare in 1968 and were about 50-percent vegetated in 1973.





UTM GRID AND 1969 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET



REFERENCES

Hoyt, J. H., and Henry, V. J., Jr., 1971, Origin of capes and shoals along the southeastern coast of the United States: Geol. Soc. America Bull., v. 82, no. 1, p. 59-66.

Hunter, R. E., and Dickinson, K. A., 1970, Map showing landforms and sedimentary deposits of the Padre Island portion of the South Bird Island 7.5-minute Quadrangle, Texas: U.S. Geological Survey Misc. Geol. Inv. Map I-659.

Rusnak, G. A., 1960, Sediments of Laguna Madre, Texas, in Shepard, F. P., Phleger, F. B., and van Andel, Tj. H., editors, Recent sediments northwest Gulf of Mexico: Am. Assoc. Petroleum Geologists, Tulsa, Okla., p. 153-196.

Simmons, E. G., 1957, An ecological survey of the upper Laguna Madre of Texas: Inst. Marine Sci.: (Univ. Texas) Publ., v. 4, p. 156-200.

Swift, D. J. P., Kofoed, J. W., Saulsbury, F. P., and Sears, Phillip, 1972, Holocene evolution of the shelf surface, central and southern Atlantic shelf of North America, in Swift, D. J. P., Duane, D. B., and Pilkey, O. H., Shelf sediment transport: Process and pattern: Stroudsburg, Pennsylvania, Dowden, Hutchinson and Ross, Inc., p. 499-574.

U.S. Coast and Geodetic Survey, 1887, Coast Chart. No. 210.

U.S. Geological Survey, 1951, South Bird Island Quadrangle, 7.5-minute topographic series.

_____, 1969, South Bird Island Quadrangle, 7.5-minute series, orthophotomap.

White, A., 1966, Drainage asymmetry and the Carolina capes: Geol. Soc. America Bull., v. 77, no. 3, p. 223-240.

THIS REPORT IS PRELIMINARY AND HAS NOT BEEN EDITED OR REVIEWED FOR CONFORMITY WITH GEOLOGICAL SURVEY STANDARDS OR NOMENCLATURE

BOTTOM FEATURES AND SEDIMENTS OF A PART OF NORTHERN LAGUNA MADRE, TEXAS

U. S. Geological Survey
OPEN FILE MAP
This map is preliminary and has not been edited for conformity with Geological Survey standards or nomenclature.

By

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