



Texas Gulf Shoreline Movement, Land Loss, and Beach and Dune Volumes and Peak Elevations through 2019

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ABSTRACT

Rates of Gulf shoreline movement along the Texas coast, determined from the 1930s through 2019 from aerial photographs, GPS measurements, and airborne lidar surveys, average 1.27 m/yr of retreat. Net shoreline retreat occurred along 80% of the shoreline, resulting in net land loss of 6,600 ha since 1930 at an average rate of 74 ha/yr. Rates of movement are more recessional on the upper Texas coast than they are on the middle and lower coast. Movement rates measured for the most recent period (2000 to 2019) average 1.25 m/yr of retreat, similar to the longer-term rate. These rates are lower than postglacial rates that range from 3 to 55 m/yr estimated from bathymetric shoreline proxies and past sea-level positions, but are similar to mid- to late Holocene retreat rates of 0.1 to 1.7 m/yr. Estimated postglacial relative sea-level rise and shoreline retreat rates suggest that each millimeter per year of sea-level rise translates to 0.8 to 1.8 m/yr of shoreline retreat. Rapidly retreating shoreline segments have lower beach and foredune peak elevations than do segments where shorelines are stable or advancing. Peak elevations are below 4.5 m along nearly 50 percent of the Texas Gulf shoreline and are below 3 m along about 20 percent of the shoreline. Areas of low peak beach and foredune elevations and low sediment volumes above 1 m elevation include the upper coast, the Brazos-Colorado headland, and parts of Matagorda Peninsula and Matagorda Island. Total beach and foredune sediment volume above 1 m elevation is estimated to be nearly 133,000,000 m³, of which more than half is on Padre Island. Peak elevations and volumes above threshold elevations highlight shoreline segments where little sediment is available to mitigate erosion and segments that are most vulnerable to breaching and washover during tropical cyclone passage.

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