

LANDFORM DYNAMICS OF THE BAYOU LAFOURCHE BARRIER SHORELINE

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ABSTRACT

A three-dimensional morphodynamic model depicting temporal and spatial changes in barrier morphology is presented for the Bayou Lafourche barrier shoreline. Variations in overwash intensity generate a predictable sequence of barrier morphologies, with overwash intensity defined as the frequency and magnitude at which overwash events impact the shoreline. This model depicts continuous change in barrier morphology, with decreasing overwash intensity leading to onshore sediment transport, barrier accretion, and dune development. Increasing overwash intensity leads to barrier erosion, offshore sediment transport, and washover sheet formation.

The erosional sequence begins with stage 1, when a continuous foredune barrier is formed under low-intensity overwash and fair weather conditions. Increasing overwash intensity erodes the stage 1 foredune and creates an offshore movement of sand. Increasing overwash intensity leads to foredune breaching, overwash, and the development of an eolian terrace, stage 2. During stage 3, the foredune is eventually destroyed, forming a washover terrace. Continued intense overwash activity finally results in the destruction of stage 3, and the formation of a washover sheet, stage 4.

The accretionary sequence begins with a stage 4 washover sheet generated by intense high-energy overwash conditions. With decreasing overwash intensity, an onshore movement of sediment is produced and the barrier begins to accrete, leading to stage 3. Continuing low overwash intensities lead to discontinuous foredune development and the formation of an eolian terrace, stage 2. Stage 1 is reached when the discontinuous foredunes coalesce to form a linear continuous foredune.

Spatially, longshore variation in sediment availability results in different barrier beach stages occurring simultaneously along the Bayou Lafourche barrier shoreline. Position within the barrier island system determines sediment supply. Coastal tracts on the central headland and updrift of flanking barrier islands are characterized by a negative sediment budget and the persistence of barrier stages 3 and 4. The downdrift flanks of the erosional headland and flanking barrier islands and spits are sediment abundant, with barrier stages 1 and 2 persisting. An intense overwash event associated with a major tropical cyclone impact would transform the entire Bayou Lafourche barrier shoreline into a stage 4 barrier and initiate a new accretionary sequence.

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