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The Holocene History and Facies Architecture of the Nueces Bayhead Delta of the Northwestern Gulf of Mexico

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ABSTRACT

The economic importance of coastlines highlights the need to understand how coasts evolve in response to changing climate. Prior work suggests that many of the estuaries in the northwestern Gulf of Mexico underwent large changes at 2.6, 4.8, and 8.2 ka. Twenty-eight vibracores, eight Geoprobe cores, twenty-eight radiocarbon ages, and twenty-five kilometers of seismic profiles were used to determine the response of the Nueces Bay-head Delta to the 2.6 ka and 4.8 ka events. Within the cores we identified nine sedimentary facies representing five distinct deltaic environments. Within the 25 km of seismic data, we identified five seismic facies that correspond to the deltaic environments identified within the sediment cores. Fifteen sand lobes interpreted to be buried mouth-bar deposits identified in the seismic profiles and cores were used to trackchanges in the location of the seaward edge of the delta through the middle to late Holocene. Following progradation of the delta at 6.9 ka, the delta underwent two back-stepping events in which the delta front transgressed up to 20 km at 4.8 ka and 2.6 ka. Following these two back-stepping events the delta prograded up to 14 km seaward of the maximum landward location of the delta. During delta progradation from 4.8–3.2 ka, $11 \pm 2.4 \times 10^3$ m^3/yr of sand was delivered to the delta. During delta back-stepping from 3.2–2.6 ka, $5.9 \pm 2.4 \times 10^3$ m^3/yr of sand was delivered to the delta. During the last phase of delta progradation from 2.6 ka–present, $5.3 \pm 2.4 \times 10^3$ m^3/yr of sand was delivered to the delta. The decrease in the volume of sand delivered to the delta during the back-stepping event at a time when the rate of sea-level rise was decreasing and regional records of climate show drying suggests that the back-stepping events were likely driven by climate changes.