Restoration of Barrier Islands Overlying Poorly-Consolidated Sediments, South-Central Louisiana

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ABSTRACT

Late Holocene barrier islands along south-central Louisiana comprise primarily very fine sand overlying poorly-consolidated, organic-rich, fine silts and clays. These barriers experience high rates of relative sea level rise largely due to subsidence. Lowering of a barrier island by subsidence is compounded as barrier sand is transported onto previously non-loaded sediments, *e.g.*, into the bay via overwash during storms or alongshore due to sediment transport. The existing barrier elevation and width may thereby be reduced, making future overwash and inlet breaching more likely, and the new deposit begins to load the previously poorly-consolidated substrate. Over century to millennial time scales, these barriers may become subaqueous and abandoned on the inner shelf (*e.g.*, Ship, Tiger, and Trinity shoals, Louisiana).

One means of abating barrier island loss is large-scale island restoration through infusion of sediment. Because barrier islands can protect fragile wetlands, infrastructure, and mainland shores, large-scale island restoration is being considered as part of the Louisiana Coastal Area Study. However, for those barriers overlying poorly-consolidated sediments, the additional loading due to island restoration will increase the magnitude and rate of local subsidence. Present design procedure does not account for time-dependent consolidation due to loading by initial placement of sediment on these islands and possible future maintenance renourishment. A newly-developed two-dimensional (cross-shore) mathematical model was applied to investigate the dependence of beach nourishment on barrier island morphologic change within a poorly-consolidated setting. Initial results indicate that, to minimize barrier island migration and maintain dune height, it is advantageous to construct one large nourishment project, rather than smaller projects that are renourished incrementally.