

Understanding the Effects of Vegetation Planform Densities on Shoreline Morphology

B. Carlson¹, A. Piliouras¹, W. Kim¹

brandeecarlson@gmail.com

1. Jackson School of Geosciences, The University of Texas at Austin, Austin, TX

ABSTRACT

The Mississippi River delta is sinking into the ocean due to a starvation for sediment along with compaction and subsidence of deposits through extracting hydrocarbons. Presently, engineered levees cause sediment and fresh water to be carried far out into the Gulf of Mexico rather than deposited on the delta, resulting in a 44 km²/yr loss of land during the past several decades (Kim et al., 2009). The Mississippi River delta is crucial for decreasing the impacts of waves, storms, and especially hurricanes on New Orleans and surrounding areas, making continued loss of land on the delta detrimental to coastal Louisiana. We used flume experiments to investigate the cohesive effects of vegetation on shoreline roughness under varying vegetation densities. Experiments that were preferentially seeded in only the unchannelized portions of the delta displayed rougher shoreline morphologies, while experiments that were seeded uniformly over the entire delta surface displayed a more parabolic delta. The delta with preferential seeding displayed more obvious cycles of avulsion, which can be attributed to the existence of stabilized, discrete lobes of delta growth. The delta with uniform seeding was characterized by a steadier overall growth rate in response to the lack of preferential flow paths on the delta. The completely unvegetated delta showed the least number of avulsion cycles due to a high rate of lateral migration evenly distributing sediments across the delta topset in the absence of vegetation. The results of these experiments provide insight as to how vegetation may affect land-building on a delta, with direct application to proposed diversion projects for restoring the Mississippi River delta.

Keywords: delta, vegetation, shoreline morphology