

# Building the Mississippi River Delta with Silt and Clay: The Texture and Sediment Retention Efficiency of a Crevasse Splay

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## ABSTRACT

Many of the world's deltas – home to major population centers – are rapidly degrading due to reduced sediment supply, making these systems less resilient to increasing rates of relative sea-level rise. The Mississippi Delta faces some of the highest rates of wetland loss in the world. As a result, multi-billion dollar plans for coastal restoration by means of river diversions are currently nearing implementation. River diversions aim to bring sediment back to the presently sediment-starved delta plain. Within this context, sediment retention efficiency (*SRE*) is a critical parameter because it dictates the effectiveness of river diversions. Several recent studies have focused on land building along the open coast, showing *SRE*s ranging from 5 to 30%. Here we measure the *SRE* of a large relict crevasse splay in an inland, vegetated setting that serves as an appropriate model for river diversions. By comparing the mass fraction of sand in the splay deposit to the estimated sand fraction that entered it during its life cycle we find that this mud-dominated sediment body has an *SRE* of  $\geq 75\%$ , i.e., dramatically higher than its counterparts on the open coast. Our results show that transport pathways for mud are critical for delta evolution and that *SRE* is highly variable across a delta. We conclude that sediment diversions located in settings that are currently still vegetated are likely to be the most effective in mitigating land loss and providing long-term sustainability.

## BIOGRAPHY



**Christopher Esposito** received a B.S. in Mathematics and Physical Oceanography from Rutgers, The State University of New Jersey in 2003, an M.S. in Earth and Environmental Sciences from the University of New Orleans in 2011, and a Ph.D. from Tulane University in 2017. He is currently a Research Scientist at The Water Institute of The Gulf.