CHRISTOPHER R. ESPOSITO, Ph.D.

THE WATER INSTITUTE OF THE GULF

Company Role
Research Scientist: Water Resources

Project Role / Focus Areas
- Floodplain morphology
- Sediment transport in channel networks
- Morphological Modeling
- Sediment transportation in vegetation
- Coastal zone land use and infrastructure policy

Education
- Ph.D. – Earth and Environmental Sciences, Tulane University, 2016
- M.S. – Earth and Environmental Sciences, University of New Orleans, 2011
- B.S. – Mathematics/Physical Oceanography, State University of New Jersey, 2003

Experience Profile
Christopher Esposito, Ph.D. is a Research Scientist with The Water Institute of the Gulf. He has nearly 10 years of field and modeling experience studying sediment transport and deposition in river deltas. His research is primarily focused on the connections between river channels and their floodplains, a topic which is closely related to channel management and planned river diversions in deltas. Prior to joining the Institute, Dr. Esposito obtained his Ph.D. at Tulane University and his master's degree at The University of New Orleans. Before entering graduate school, Dr. Esposito taught math and environmental education in public high schools. His interest in coastal zone management in Louisiana was sparked while leading students on field trips throughout the Mississippi River Delta.

Professional Experience

The Water Institute of the Gulf 2016-Present
- *Research Associate*

Tulane University 2011-2016
- *Research/Teaching Assistant*

ConocoPhillips 2012-2013
- *Intern, Geomodelling and SedStrat Group*

University of New Orleans 2009-2011
- *Research Assistant*

High Schools in Louisiana and New Jersey 2004-2009
- *Math Teacher, Environmental Education Teacher*

Selected Projects

Transport Thresholds for Fine Sediment in Vegetation, Louisiana (Ongoing). Sea-level rise poses a serious challenge to natural resource managers as they work to retain and restore coastal marshes. Sediment transported to a marsh by a river or tides can play an important role in mitigating the effects of sea-level rise by increasing land surface elevation. At present there are no standardized data collection techniques that can be used to monitor sediment transport into and within vegetated regions, limiting abilities to measure and predict the influence of restoration efforts. This project, developed in close collaboration with coastal restoration practitioners, aims to establish a standardized data collection methodology for monitoring sediment transport within coastal wetland vegetation. Restoration practitioners will be able to use this methodology to improve predictions of marsh sustainability and better assess the effectiveness of restoration efforts.

Mid-Barataria and Mid-Breton Outfall Management Study, Louisiana (2016 - present). A Delft3D investigation into the dynamics of sediment diversion evolution, focusing on the factors that maintain or diminish diversion performance over decadal timescales.

Selected Projects (cont.)

Mid- Barataria Engineering Modeling Support, Louisiana (Ongoing). To address these issues, higher-resolution models focusing on specific outfall regions are needed to capture relevant physical processes of the outfall channels and their interaction with the receiving basins. The main questions being addressed with this work is will the diversion channel be self-sustaining or will dredging be necessary; what the major hydrological and morphological changes in the receiving basins near the diversion are, and what are the adequate dimensions of the outfall channel to convey the desired amount of water.

Supporting the Working Coast, Louisiana (Ongoing). Partnering with industry, The Water Institute of the Gulf is working across the coastal zone with ports and industry to help address some of the challenges faced by infrastructure in these changing landscapes. The following are two examples of how the Institute is implementing its "Working Coast" strategies.

South Louisiana's Port Fourchon plays a critical national economic security role by providing the U.S. with approximately 18% of its total oil supply and servicing over 90% of the Gulf of Mexico's deepwater oil production. As Port Fourchon continues to grow, there are plans to potentially deepen the port's access channel which will yield millions of cubic yards of sediment. This situation presents a unique opportunity as the port will need to dispose of the material while also desiring additional storm protection. The Institute has proudly worked to create a Public-Private Partnership with the Port, Shell, Chevron, and Danos to determine the best, nature-based way to use the dredged material to protect the port's critical infrastructure, improve the environment; make communities from Fourchon to Larose more resilient; and yield carbon-capture sequestration benefits.

The Port of Lake Charles faces challenges due to the large amounts of sediment flowing into the Calcasieu Ship Channel, forcing ongoing dredging. While the port has been proactive in finding ways to beneficially use the dredged sediment, the port seeks a sustainable way to better manage sediment through the system. Currently, the Calcasieu Ship Channel must be dredged yearly to make sure it meets the 400-by 40-foot-deep federally mandated requirements. It's estimated that the Port of Lake Charles will need to have 97 million cubic yards of disposal capacity for dredged material within the next 20 years. In August 2017, the port tasked the Institute with providing a better understanding of how sediment moves through the ship channel as part of a strategy to reduce dredging needs and to evaluate alternative locations to find long-term and realistic dredge disposal sites.

Partnership for Our Working Coast, Louisiana (Ongoing). Partnership for Our Working Coast is working to identify beneficial, nature-based solutions for this material to contribute to Louisiana's coastal sustainability efforts, protect coastal communities, and support America's Working Coast.

Selected Publications

1. **Esposito, C. R.,** Georgiou, I. Y., & Straub, K. M. (in review). Flow Loss in Deltaic Distributaries: Impacts on Channel Hydraulics, Morphology and Stability. Water Resources Research.
2. **Esposito, C. R**., Di Leonardo, D., Harlan, M., & Straub, K. M. (2018). Sediment Storage Partitioning in Alluvial Stratigraphy: The Influence of Discharge Variability. Journal of Sedimentary Research, 88(6), 717–726. https://doi.org/10.2110/jsr.2018.36
3. Nienhuis, J. H., Törnqvist, T. E., & **Esposito, C. R.** (2018). Crevasse Splays Versus Avulsions: A Recipe for Land Building With Levee Breaches. Geophysical Research Letters, 45(9), 4058–4067. https://doi.org/10.1029/2018GL077933
4. **Esposito, C. R**., Shen, Z., Törnqvist, T. E., Marshak, J., & White, C. (2017). Efficient retention of mud drives land building on the Mississippi Delta plain. Earth Surface Dynamics, 5(3), 387–397. https://doi.org/10.5194/esurf-5-387-2017
5. **Esposito, C. R**., Georgiou, I. Y., & Kolker, A. S. (2013). Hydrodynamic and geomorphic controls on mouth bar evolution. Geophysical Research Letters, 40(8), 1540–1545. https://doi.org/10.1002/grl.50333

Selected Conference Proceedings and Presentations

1. **Esposito, C.R.** (2019) "Putting Ecogeomorphology Into Practice: The Future of Coastal Management", AGU Fall Meeting, Young Scientists View of The Future
2. **Esposito, C.R.** (2019) "Rapidly Changing Transport Conditions in Deltaic Marshes", Louisiana State University School of the Coast and Environment, Baton Rouge, LA.
3. **Esposito, C.R.,** Nepf, H.M., Beltrán-Burgos, M, Baustian, M.M., 2019: Rapidly Changing Transport Conditions In a Mississippi River Marsh, AGU Fall Meeting, San Francisco, CA.
4. **Esposito, C.R**., Meselhe, E.M., Liang, M., 2018: "River Bar Dynamics and Sand Discharge Through Diversions", State of The Coast, New Orleans, LA.
5. **Esposito, C.R.,** Liang, M., Yuill, B., Meselhe., 2017: "Maintaining the Link to the Floodplain: Scour Dynamics in Crevasses", AGU Fall meeting.