

## **Louisiana's RESTORE Act Center of Excellence Research Grants Program 2018 Annual Report to the RESTORE Council**

### ***Executive Summary***

On April 8, 2014, the Coastal and Protection and Restoration Authority (CPRA) of Louisiana named The Water Institute of the Gulf as the State of Louisiana's Center of Excellence. On November 1, 2015, the U.S. Department of the Treasury awarded CPRA a grant to begin its research program. The mission of the RESTORE Act Center of Excellence for Louisiana (LA-COE) is to support research directly relevant to implementation of Louisiana's Coastal Master Plan by administering a competitive grants program and providing the appropriate coordination and oversight support to ensure that success metrics are tracked and achieved.

The LA-COE completed coordination of the review process of 76 proposals (graduate studentship, research and collaborative awards) that were solicited under the first request for proposals (RFP1). The proposals were all reviewed by subject matter experts (SME) and CPRA for criteria defined in the RFP. The SME and CPRA reviews of the research and collaborative proposals were compiled for the External Review Board (ERB). The ERB consists of nationally and internationally recognized subject matter experts on topics relevant to Louisiana's Coastal Master Plan. An in-person ERB meeting was held in Baton Rouge, LA in April 2017. The ERB made funding recommendations (based on a scale of 1-3) for each research and collaborative proposal based on review and discussion of the proposals, the SME reviews, and the CPRA reviews. A Recommendation Meeting was held on May 2, 2017 with CPRA and LA-COE staff to discuss the ERB's recommendations and to develop a potential list of projects to fund, subject to concurrence by CPRA and LA-COE leadership. A Concurrence Meeting was held on May 30, 2017 to finalize which graduate studentship, research and collaborative awards would be granted. Principal investigators (PIs) were notified of the awards and then a public announcement was made via a joint LA-COE and CPRA press release on June 22, 2017. A total of 13 awards were announced; six graduate studentship awards, two collaborative awards, and five research awards.

Contracting and research grants management procedures were developed to help manage the funding process and research subrecipients, with research subawards executed in March 2018. Assessment and reporting on progress using defined metrics that address federal reporting requirements including reports to the U.S. Department of Treasury have been developed.

A conference session was co-moderated by LA-COE and CPRA to highlight research project findings at the 2018 State of the Coast conference on June 1, 2018 in New Orleans, LA. The inaugural All Hands Meeting was hosted on August 17, 2018 in Baton Rouge, LA to obtain updates from the 13 funded projects.

### ***Programmatic Elements***

#### **Award Recipient**

Following a mandate by the U.S. Department of Treasury requiring that Centers of Excellence must focus efforts on a selected set of disciplines, the LA-COE focuses on the following:

- Coastal and deltaic sustainability, restoration and protection, including solutions and technology that enable citizens to live in a safe and sustainable manner in a coastal delta in the Gulf Coast region
- Coastal fisheries and wildlife ecosystem research and monitoring in the Gulf Coast region
- Sustainable and resilient growth, economic, and commercial development in the Gulf Coast region
- Comprehensive observation, monitoring, and mapping of the Gulf of Mexico

The status of performance and annual accomplishments include: Coordinated the review of proposals by SMEs, CPRA, and the ERB. CPRA provided review of the relevance of the proposed research to implementation of Louisiana's Coastal Master Plan. Developed summary reviews and, subject to CPRA's concurrence, selected research projects for funding. Principal investigators were notified for selection of funding, and a project kick-off webinar with subrecipients was conducted. Subrecipient risk assessments were completed on all selected subrecipients, and subawards were drafted and sent to research institutions for review and negotiation. The LA-COE was operated according to Standard Operating Procedures, including development and maintenance of a website, coordination with other Centers of Excellence and additional outreach. Contracting and research grants management standards were developed and implemented to help manage subrecipients including quarterly performance progress reports from the subrecipients. Assessment and reporting on progress using defined metrics that address federal reporting requirements including reports to the U.S. Department of Treasury was also conducted.

Award Subrecipient(s) Selected for Funding:

1. Louisiana State University, Dr. Kehui Xu

- Researcher role: Research relevant to implementation of Louisiana's Coastal Master Plan
- Eligible discipline: Coastal and deltaic sustainability, restoration and protection, including solutions and technology that allow citizens to live in a safe and sustainable manner in a coastal delta in the Gulf Coast
- Research project undertaken: Integrating High-Fidelity Models with New Remote Sensing Techniques to Predict Storm Impacts on Louisiana Coastal and Deltaic Systems
- Subaward executed in April 2018. Summary: The goal is to develop and validate a coupled, process-based Delft3D and XBeach modeling system using the Caminada Headland and Hurricane Gustav as a test case. A one-way coupling of Delft3D, SWAN, and XBeach was implemented to simulate the impact of Hurricane Gustav on the Caminada Headland complex and good agreement with field observations has been found so far. Products from this work will include a database of remotely-sensed and ground-truthed biophysical information for the Mississippi River Delta, a high-fidelity hydrodynamic and eco-morphodynamic modeling system as well as conceptual strategies to maximize sediment retention of barrier island restoration projects.

2. Louisiana State University, Dr. Scott Hagen

- Researcher role: Research relevant to implementation of Louisiana’s Coastal Master Plan
- Eligible discipline: Coastal and deltaic sustainability, restoration and protection, including solutions and technology that allow citizens to live in a safe and sustainable manner in a coastal delta in the Gulf Coast
- Research project undertaken: Coupling Hydrologic, Tide and Surge Processes to Enhance Flood Risk Assessments for the Louisiana Coastal Master Plan
- Subaward executed in March 2018. Summary: In August 2016, a low-pressure system brought intense rainfall across southeastern Louisiana. During the heart of hurricane season, some officials were asking what happens if a tropical system makes landfall in the wake of a rain event that has already saturated soils and created localized flooding. This project is working to couple inland modeling with storm surge modeling with a focus on the Barataria and Lake Maurepas watersheds to ultimately provide information that can help develop better long-term plans for vulnerable communities. Work has been done on developing a synthetic coupled rainfall runoff and storm surge event and the team is working toward a goal of evaluating the coupled hydrologic and surge influence on coastal flood hazards.

### 3. University of New Orleans, Dr. Mark Kulp

- Researcher role: Research relevant to implementation of Louisiana’s Coastal Master Plan
- Eligible discipline: Coastal and deltaic sustainability, restoration and protection, including solutions and technology that allow citizens to live in a safe and sustainable manner in a coastal delta in the Gulf Coast
- Research project undertaken: An Evaluation of Faulting in Holocene Mississippi River Delta Strata through the Merger of Deep 3-D and 2-D Seismic Data with Near Surface Imaging and Measurements of Vertical Motion at Three Study Areas
- Subaward executed in March 2018. Summary: The goals of this project include mapping the distribution of faults in standard seismic industry data, identify faults that may extend up to the Holocene and project fault plans upward towards the surface to see where they may manifest themselves in surface traces, determine slip rates of faults, collect cores across fault traces to help determine slip rates, and assess potential impacts to infrastructure through examining high-resolution surveys on roads that cross fault traces. “We need to better understand that vertical motion,” Kulp reported in August. Three study areas are planned in northern Terrebonne-Timbalier Bay, Bayou Lafourche near Golden Meadow, and the Lake Pontchartrain/Lake Borgne areas of the Deltaic Plain to better understand the vertical motion of land surfaces. Coring locations in all three study areas were identified in August, but most cores are already collected in lakes Pontchartrain and Borgne and cores in the other study areas will be collected in fall 2018. Seismic surveys of all areas are also set to begin at that time.

### 4. University of Louisiana at Lafayette, Dr. Paul Leberg

- Researcher role: Research relevant to implementation of Louisiana’s Coastal Master Plan
- Eligible discipline: Coastal fisheries and wildlife ecosystem research and monitoring in the Gulf Coast Region
- Research project undertaken: Assessment of Coastal Island Restoration Practices for the Creation of Brown Pelican Nesting Habitat
- Subaward executed in March 2018. Summary: Leberg and his team are investigating how island restoration ultimately impacts birds, with a focus on Eastern brown pelicans and testing the “field of dreams” theory that, “if you build it, they will come.” Leberg said in August, there are several barriers that can impact bird colonization of restored coastal islands, including the Gulf of Mexico dead zone, influxes of freshwater in the area, predators such as fire ants or raccoons, and other factors. If these challenges substantially impact the quality of available nesting habitat on islands, or foraging habitat quality in nearby waters, breeding colonies may struggle to persist despite restoration efforts. This project is comparing restoration sites of varying ages, which are located in different coastal regions and have undergone different levels of restoration, with some sites having been restored multiple times. The work is being conducted using the Louisiana Department of Wildlife and Fisheries database, remote cameras to study predators and pelican nesting behavior, and GPS telemetry to examine adult foraging patterns. The ultimate goal is to see whether current restoration strategies meet their intended goals of creating wildlife habitat while also countering coastal land loss.

5. University of New Orleans, Dr. Marla Nelson

- Researcher role: Research relevant to implementation of Louisiana’s Coastal Master Plan
- Eligible discipline: Sustainable and resilient growth, economic and commercial development in the Gulf Coast Region
- Research project undertaken: From Adapting in Place to Adaptive Migration: Designing and Facilitating an Equitable Relocation Strategy
- Subaward executed in March 2018. Summary: The project is working to answer the questions of what factors drive decisions of whether, when, and where communities relocate as well as how local officials can facilitate equitable relocation and resettlement of residents. Identifying potential answers involves interviewing Terrebonne Parish residents and officials, reviewing past policies and programs, better understanding the challenges, and identifying innovative practices. Resident participants were selected by sending letters to residents outside the levee system, through social media, ads in houmatoday.com, notices in community spaces and snowball sampling. The plan is to interview 50-60 residents in the first year and 25-30 in the second year of the grant. As of August, 49 resident interviews had been completed. Of those, 25 of them currently live in bayou communities, 10 have relocated and 14 live out of Terrebonne Parish who have not recently relocated. The project is on track to meet the interview goal for the year. Interview recordings are being transcribed, coded and analyzed. At the

same time, between 20 to 30 local officials will be interviewed, with eight of those interviews already completed as of August 2018.

6. Louisiana State University, Dr. Kehui Xu

- Researcher role: Research relevant to implementation of Louisiana's Coastal Master Plan
- Eligible discipline: Coastal and deltaic sustainability, restoration and protection, including solutions and technology that allow citizens to live in a safe and sustainable manner in a coastal delta in the Gulf Coast
- Research project undertaken: Enhancing Sediment Retention Rates of Receiving Basins of Louisiana Sediment Diversions
- Subaward executed in March 2018. Summary: The project is looking at the characteristics of riverine mud such as grain size, the settling and compaction of dredge material, impact of shear stress and other factors. "If we can improve the mud retention by 10 or 20 percent, that's a really large number because there is so much mud being carried by the river," Xu said, explaining that if sediment in the river was 100 units, about 80 of those units would be mud. As of August 2018, Xu and his team had done literature reviews, data mining and analysis, and model setup. The goal is to develop a more holistic view of the retention rate for sediment with specific focus on Sediment Retention Enhancement Devices (SREDS) effectiveness in maximizing a river diversion's ability to build land.

7. Louisiana State University, Dr. Tracy Quirk

- Researcher role: Research relevant to implementation of Louisiana's Coastal Master Plan
- Eligible discipline: Coastal and deltaic sustainability, restoration and protection, including solutions and technology that allow citizens to live in a safe and sustainable manner in a coastal delta in the Gulf Coast
- Research project undertaken: Plant and Soil Response to the Interactive Effects of Nutrient and Sediment Availability: Enhancing Predictive Capabilities for the Use of Sediment Diversions and Dredge Sediment for Marsh Creation
- Subaward executed in March 2018. Summary: Including greenhouse and field studies, the project goal is to improve understanding of how nutrients and sediment interact and effect marsh nutrient cycles, plant productivity, above and below ground biomass accumulation and decomposition as well as soil organic matter accumulation and accretion. The working hypothesis is that in areas with limited sediment supply, additional nutrients have the potential to reduce root growth, but in areas receiving combined sediment and nutrient enhancement, increases in both above and below ground biomass are expected. The field plots for the project were set up in March 2018 with the greenhouse work occurring both at Louisiana State University and at Nicholls State University. New information is intended to be integrated into existing models that inform the Coastal Master Plan.

8. Louisiana Tech University, Dr. Sanjay Tewari

- Researcher role: Research relevant to implementation of Louisiana's Coastal Master Plan
- Eligible discipline: Coastal and deltaic sustainability, restoration and protection, including solutions and technology that allow citizens to live in a safe and sustainable manner in a coastal delta in the Gulf Coast & Comprehensive observation, monitoring, and mapping of the Gulf of Mexico
- Research project undertaken: Electrokinetic Barrier for Seawater Intrusion
- Subaward executed in March 2018. Summary: The project investigates electrokinetic barriers against seawater intrusion in the coastal region of Louisiana. Efforts will be made to compare the efficacy of this electrokinetic barrier against other techniques that are being used, which is important for many coastal areas that have freshwater crises due to saltwater intrusion. Tewari and his graduate student both left Louisiana Tech University and moved to separate universities. The final performance progress report has not been received yet.

9. Louisiana State University, Dr. Robert Twilley

- Researcher role: Research relevant to implementation of Louisiana's Coastal Master Plan
- Eligible discipline: Coastal and deltaic sustainability, restoration and protection, including solutions and technology that allow citizens to live in a safe and sustainable manner in a coastal delta in the Gulf Coast
- Research project undertaken: Multiple Tools for Determining the Fate of Nitrate
- Subaward executed in March 2018. Summary: This research project plans to identify what factors maximize the interaction between river water and floodplain wetlands and to better quantify transformation of nutrients (nitrate) by wetland plants, soil, and microbes of deltaic floodplains. Numerical modeling and field experiments will help better understand the fate of nitrate under emerging deltaic floodplains. Field work in the Wax Lake Delta has begun and both the field data and modeling results will help refine water quality models currently in use.

10. Louisiana State University, Dr. George Xue

- Researcher role: Research relevant to implementation of Louisiana's Coastal Master Plan
- Eligible discipline: Coastal and deltaic sustainability, restoration and protection, including solutions and technology that allow citizens to live in a safe and sustainable manner in a coastal delta in the Gulf Coast.
- Research project undertaken: Project Louisiana Rivers' Sediment Flux to the Coastal Ocean
- Subaward executed in March 2018. Summary: The impacts of decreased sediment supply to the Chenier Plain from flood control and other projects on the Mississippi and Atchafalaya rivers are well documented. What is lesser known is the contribution local rivers such as the Calcasieu, Mermentau and Vermillion have on the stability of the Chenier Plain, especially as these local rivers are more vulnerable to long-term and short-term disturbances such as climate change, sea level rise, flooding and restoration projects. This project is coupling atmospheric, surface water and groundwater modeling to better understand sediment movement

through these local rivers and examine possible changes in water and sediment changes due to climate change or future restoration projects.

11. University of Louisiana at Lafayette, Dr. Emad Habib

- Researcher role: Research relevant to implementation of Louisiana's Coastal Master Plan
- Eligible discipline: Coastal and deltaic sustainability, restoration and protection, including solutions and technology that allow citizens to live in a safe and sustainable manner in a coastal delta in the Gulf Coast & Comprehensive observation, monitoring, and mapping of the Gulf of Mexico
- Research project undertaken: Evaluation of Radar-Based Precipitation Datasets
- Subaward executed in March 2018. Summary: Precipitation is considered a major source of freshwater in coastal Louisiana (50-60 inches/year), and accurate information about its magnitudes and spatial and temporal distributions is critical for successful planning via modeling exercises and restoration project implementation. Regional-scale assessment will be conducted on radar-rainfall datasets and evaluate whether they can be directly used by the Coastal Master Plan planning models. Assessment of the radar datasets will be done using independent rainfall measurements from rain gauges that exist in coastal Louisiana. To enhance the availability of rain gauge data that are needed for evaluating the radar product, the project will install a new set of rain gauges at selected sites over the coastal zone. The project will provide information on how to improve the representation of precipitation in hydrologic and hydrodynamic models at different spatial and temporal scales.

12. Louisiana State University, Dr. Frank Tsai

- Researcher role: Research relevant to implementation of Louisiana's Coastal Master Plan
- Eligible discipline: Coastal and deltaic sustainability, restoration and protection, including solutions and technology that allow citizens to live in a safe and sustainable manner in a coastal delta in the Gulf Coast
- Research project undertaken: Constructing Mississippi River Delta Plain Soil Stratigraphy
- Subaward executed in March 2018. Summary: This study investigates coastal land building and compactional subsidence through soil stratigraphy analysis and subsidence modeling of the Mississippi River Deltaic Plain. Results from this project are intended to benefit the Coastal Master Plan's restoration projects, such as marsh creation projects and sediment diversions. This study also investigates surface water-groundwater interactions. Remembering that the Mississippi River is very deep, water that moves through the subsurface layers is driven by the river and tides. The interactions between the river, the gulf, and the groundwater system can particularly be seen during high water events. Groundwater modeling helps predict pore water pressure and this subsurface hydraulic forcing may contribute to either sediment compaction or resuspension in certain areas of the coast.

13. Louisiana State University, Dr. John White

- Researcher role: Research relevant to implementation of Louisiana’s Coastal Master Plan
- Eligible discipline: Coastal and deltaic sustainability, restoration and protection, including solutions and technology that allow citizens to live in a safe and sustainable manner in a coastal delta in the Gulf Coast
- Research project undertaken: Determining the Influence of Surface Water Diversions
- Subaward executed in March 2018. Summary: In 2007, a series of 139 stations in the Davis Pond outflow area were sampled for plant type, bulk density, total carbon, nitrogen and phosphorus, pH, moisture content, and organic matter content. Results from this were published in 2012. Now more than 11 years later and with years of operation at Davis Pond, this project team is taking samples in the same areas to help answer the questions on whether the operation of the diversion has altered soil properties such as bulk density, organic matter content, or nutrient content, all of which are important to coastal marsh growth and resilience in Barataria Basin. Field work on this project is underway. Data from this research could help inform CPRA about the continued use of freshwater diversions such as Davis Pond and Caernarvon.

***Financial Elements***

Award Recipient

The RESTORE Act Center of Excellence Research Grant Program amended award to CPRA was issued on May 25, 2017 and is funded for \$4,202,509.00. CPRA expenditures are \$125,688 through September 30, 2018. A Cooperative Endeavor Agreement dated June 9, 2017 was executed between CPRA and The Water Institute of the Gulf (The Water Institute) to administer the award with a current contract value of \$4,036,238. Invoices from The Water Institute total \$887,830.12 through the period ending July 31, 2018, including research subaward expenditures (\$223,213).

Award Subrecipient(s)

As a result of a competitive and peer-reviewed request for proposal process, subrecipients of research awards were selected. Subawards were executed in March and April 2018. The subrecipients and associated subaward amounts are provided below:

<b>Number</b>	<b>Subrecipient</b>	<b>Subaward Amount</b>
1	Louisiana State University	\$501,270.00
2	Louisiana State University	\$499,882.00
3	University of New Orleans	\$349,173.52
4	University of Louisiana at Lafayette	\$299,733.16
5	University of New Orleans	\$295,338.00
6	Louisiana State University	\$292,495.00
7	Louisiana State University	\$292,914.80
8	Louisiana Tech University	\$57,519.00

9	Louisiana State University	\$63,100.00
10	Louisiana State University	\$77,015.26
11	University of Louisiana at Lafayette	\$71,148.00
12	Louisiana State University	\$70,070.00
13	Louisiana State University	\$83,328.00

***Gulf Coast Ecosystem Restoration Council Elements***

Leveraging Multipliers

The LA-COE and CPRA participate in bimonthly conference calls of the Gulf of Mexico Restoration and Science Programs Coordination Forum that allows for funding organizations in the Gulf region to discuss their programs, share ideas, and promote collaborations.