Sea Grant
Louisiana

Research Projects for 2014

The Louisiana Sea Grant College Program (LSG) is supporting seven research projects for the funding period which began Feb. 1, 2014. Below is a synopsis of the projects, along with a list of principal investigators and their affiliations.

Field Testing and Technology Transfer of an Alternative Bait for the Blue Crab Fishery

Julie Anderson (Louisiana State University AgCenter, Louisiana Sea Grant)

During the current omnibus cycle, LSG funded a project to determine if waste and by-products produced by the shrimping industry could be converted into bait for crab traps. The next phase of the research will take the bait developed in the lab and test it in real-world situations. Field testing will be conducted at four sites over three seasons, allowing for measurements of the bait's effectiveness across seasonal, temperature and salinity changes. Once field testing has provided confirmation of the usefulness of the new bait, it will be tested by commercial fishermen. Researchers hope to develop a cost-efficient alternative commercial crab bait. Traditional baits mainly consist of wild-caught fish, particularly Atlantic menhaden, which are rising in price.

Forecasting Land Building and Hurricane Flood Risk Reduction by River Diversion in Mississippi River Delta

Qin Jim Chen (Louisiana State University)
Ehab Meselhe (The Water Institute of the Gulf)

A major component of Louisiana's Comprehensive Master Plan includes using river diversions to move water and sediment into areas most susceptible to land loss and erosion. In order to do this efficiently, there are a number of factors that must be considered.

This project proposes to use the combined resources of The Water Institute of the Gulf (TWIG) and LSU to create models that will show the hydrodynamics, sediment transport and morphology, visualizing what will happen when the diversions are completed. By using the Delft3D modeling suite, researchers will look at how diversions will affect the receiving basins in Breton Sound. Once completed, the models will be able to show tidal changes, wave impact and salinity levels. These models can then be used to help coastal managers control the allocation of sediments in order to reduce negative impacts diversions may have on navigation, residents and the coast.

Impact of Climate Change on Louisiana Coastal Ecosystem: Development of Research-Driven Student-Centered Learning Modules

Emad Habib (University of Louisiana at Lafayette)
Jenneke Visser (ULL)
Douglas Williams (ULL)
Yuxin Ma (ULL)

Louisiana's unique coastal ecosystem offers numerous educational opportunities concerning fundamental hydro-ecological processes and how those processes are affected by natural and human impacts. This study proposes to use the coastline as a "teaching laboratory." The researchers will develop a learning tool called "EcoHydroViz," which will include a suite of learning modules with a unique focus on the effect of climate change on Louisiana's coastal ecosystems. These learning modules will allow students to access datasets on future scenarios of climate change, and analyze model simulations to study the impact on the ecosystem, such as changes in water level, salinity and marsh vegetation distributions. Once developed, the lesson modules will be used to educate university-level students about hydrological impacts on ecosystems and better prepare students for the challenges facing the state in coming years.

Improving Region Specific Eastern Oyster Models by Quantifying Physiological Responses to Regional Environmental and Climatic Variability Using a Dynamic Energy Budget Approach

Jerome F. LaPeyre (LSU AgCenter)

The eastern oyster is an integral part of Louisiana's coastal ecosystem for both ecological and economic reasons. With more than 85 percent of global shellfish reefs labeled as functionally extinct, it is important to find ways to protect and enhance this vital natural resource.

By developing a dynamic energy budget (DEB) model specific to the conditions found in Louisiana's coastal waterways, researchers hope to gain a better of understanding of how environmental conditions affect the growth and mortality of the eastern oyster in the northern Gulf of Mexico. The DEB model provides a way of understanding how energy is assimilated and used for maintenance, growth and reproduction according to the individual and its environment. Currently, DEB models for the eastern oyster are lacking in their accounting for all the environmental conditions common to Louisiana's coast, especially temperature and salinity. The model, once produced, can then be used to determine the effects of climate change and human-caused activity on the state's oyster population, as well as generalized for use in other coastal areas.

Response of Louisiana Black Mangrove to Climate Changes: Learning from the Past to Predict the Future

Kam-biu Liu (LSU)

Understanding what Louisiana's coast looked like 2,000 years ago could give the state some insight into the future as climate change and coastal management initiatives begin to have an impact. By creating a pollen record of vegetation changes across Louisiana's coast, this project will provide a means of predicting the future changes in distribution and abundance of mangroves across Louisiana's coast as the climate warms. The replacement of salt marsh grass by mangroves possibly offers many advantages for coastal restoration, as mangroves can help to reduce erosion and build land through trapping sediment in their dense root structures.

The research will focus on two specific time periods: the Medieval Warm Period, which lasted from about 950 to 1250 A.D., and the Little Ice Age from 1550-1850 A.D. Specifically, the project will look at the presence of black mangroves along the state's coast during these periods. Mangroves exist in tropical and subtropical climates and come in three varieties: red, white and black. Currently, Louisiana has few populations of black mangroves and none of the red or white variety, but this may not have always been the case. As temperatures are expected to rise due to climate change, current mangrove populations could increase, but there may also be a migration of new species into Louisiana. Quantification of the past will provide the necessary information to plan effectively for the future of coastal Louisiana.

A Novel Technique to Measure Nitrogen Fluxes in Newly Formed and Restored Marshes and Tidal Creeks: Developing Realistic Ecological Metrics for Eutrophication Assessment and Nutrient Budgets

Victor Rivera-Monroy (LSU)
Kanchan Maiti (LSU)

Eutrophication occurs in water bodies when there is an increase in nutrients, which can lead to excessive algal blooms that deoxygenize the water. It is a natural process but can be exacerbated by human activity such as farming that produces agricultural runoff.

The Louisiana Comprehensive Master Plan includes river diversions that could alter the nutrient supply in some areas. This project will employ new technology in the form of a High Vertical Resolution Profiler System (HIVERPROS) sediment profiler and two benthic chambers to collect sediment and water samples from the bottom of water bodies, providing data lacking in previous studies. The HIVERPOS will allow sediment to be profiled *in situ*, or at the water bottom, as opposed to having to bring the samples to the surface, which can cause gas release and loss from jostling and interaction with the atmosphere. By keeping the samples at the bottom, a better picture of the actual level of nutrients can be gleaned, providing better information when choosing denitrification processes.

Marker-Assisted Selective Breeding to Produce Dermo-*Resistant Eastern Oysters*

Qinggang Xue (LSU AgCenter)
Jerome F. LaPeyre (LSU AgCenter)
John Supan (LSG, LSU)

Finding a method to effectively choose healthy oysters for selective breeding to combat the deadly oyster disease *Dermo* is the focus of this project. Traditional methods of selective breeding, which include choosing surviving members of a disease-ridden population, may not provide the best option, as there is an increased chance of a reduction in genetic diversity due to inbreeding. Over time, disease resistance could be lost as inbreeding oysters has been found to impair immunity resistance to diseases and stressful environments.

The researchers propose to use a newly discovered family of protease inhibitors, cvSI, as a marker for determining the suitability of an oyster for selective breeding purposes. The new inhibitors were discovered by the researchers in a previous Louisiana Sea Grant-funded project, and it appears to work to defend against the parasite *Perkinsus marinus*, which causes *Dermo*. To test the hypothesis, oysters will be collected from wild populations in coastal Louisiana. They will then be measured for cvSI activity, and the top 10 percent and bottom 10 percent in terms of activity will be used. Another 50 oysters will be selected randomly. Each group will be bred at the Louisiana Sea Grant Oyster Hatchery on Grand Isle and the progeny tested for susceptibility to *Dermo*.

The LSG research proposal solicitation process began in late 2012 with a call for statements of interest that addressed topics in the program's current Strategic Plan. Statements of interest were reviewed by a screening panel, and authors of the highest ranked statements were invited to submit full proposals. However, authors of the lower ranked statements were advised that any full proposal submitted would be fully and fairly evaluated. Full proposals were subsequently examined by external peer reviewers. The external peer review panel scored and ranked the proposals, and provided its recommendations to the program. LSG selected the proposals for funding based on the merit recommendations provided by the panel and the programmatic fit of the proposed research to LSG's Strategic Plan.

Sea Grant
Louisiana

2012-13 Omnibus Research Projects

The Louisiana Sea Grant College Program funded seven research projects for the omnibus period that began Feb. 1, 2012. Below is a synopsis of the projects, along with a list of the principal investigators and their affiliations.

Contribution of Maximum Freshwater Discharges from Caernarvon Diversion Project to Oyster Mortality Related to Freshwater Inflows in the Breton Sound Estuary, Louisiana

Jerome LaPeyre (LSU AgCenter)
James Geaghan (LSU)

Although a number of studies have been conducted on the effects of salinity and temperature on oysters, few studies have examined their combined effects, the effects of very low salinities, the effects of oyster size, or prolonged periods of low salinity.

Spat, seed and market-sized oysters will be produced at the Louisiana Sea Grant oyster hatchery, and their mortality and condition after exposure to salinity and temperature combinations in the range observed in Breton Sound during maximum freshwater discharges will be determined in controlled laboratory experiments and in the field. This project will be critical to better understand what controls salinities in Breton Sound and, more generally, the impact of fresh-water diversions, one of the key restoration/coastal management tools identified in the state coastal management plan, on oyster resources.

Development of Alternative Bait for the Commercial Blue Crab Fishery

Julie Anderson (Louisiana Sea Grant, LSU AgCenter)

The cost per pound of bait has significantly increased for Louisiana blue crab fishermen, as other costs, such as fuel and supplies, are also increasing. Atlantic menhaden is a bait of choice, but the current supply line shipping fish to Louisiana has several significant problems, and menhaden are in demand for other uses. Not only does the cost of the fish increase, so does the cost to ship them.

The objective of this study is to determine the feasibility of developing an artificial bait for the blue crab industry using waste byproducts from existing fisheries. Cost-effective bait will reduce expenses for blue crab fishermen and reduce fishing pressure on Atlantic menhaden, as well as add value to currently worthless byproducts.

Enhancing Seed Versatility and Protection against Biological and Coastal Environmental Variables to Improve Success Rates of Smooth Cordgrass Aerial Seeding

Herry Utomo (LSU AgCenter)
Steve Linscombe (LSU AgCenter)

Vegetation is vital to minimizing coastal land loss in Louisiana, and smooth cordgrass is an important species in this effort. It is usually hand-transplanted, but this technique requires a great deal of time and manual effort. However, it takes less than eight seconds to aerially plant an acre of land using seed broadcast by an airplane. Successful aerial seeding will provide an economical means of conducting large-scale planting for erosion control and reclamation.

The main objective of this research is to determine the most effective way to jumpstart smooth cordgrass seed and to powder-coat the enhanced seed to improve survival, stand density, planting precision and the success rate of aerial seeding. The next step is to enhance physiological and physical properties of the seed to better adapt to coastal environmental variables so that highly reliable aerial seeding techniques can be established.

Private Market Alternatives for Maintaining Wetland Viability in Coastal Louisiana: A Double-Hurdle Approach

Walter Keithly (LSU)
Richard Kazmierczak (LSU AgCenter)

Since 1930, Louisiana has experienced a net loss of more than 1,500 square miles of coastal wetlands. The state's remaining coastal wetlands are at risk, and 80 percent of these wetlands are under private ownership. While the public benefits of wetland protection and restoration projects are likely to be large, private benefits, measured by changes in net income to the landowner, are likely to be small and, potentially, negative. However, coastal landowner acceptance of and participation in restoration programs are critical.

The primary goal of this research is to develop an economically valid model that examines the factors that motivate private coastal landowners to participate in and generate income from their coastal wetland tracts. With this understanding, the investigators will then design potential policy instruments that provide incentives for private coastal wetland stewardship.

Role of Adjustable Longline Systems in Minimizing Accumulation of Potentially Pathogenic Vibrios in Oyster

Crystal Johnson (LSU)

Vibrios are naturally occurring bacteria that are responsible for thousands of gastrointestinal illnesses annually in the United States, largely due to the consumption of raw oysters. As oysters feed, vibrios accumulate in oyster tissue, and when the oyster is eaten raw, resident vibrios have the potential to cause gastroenteritis in consumers. In adjustable longline systems, oysters are grown in bags suspended in the water column on cables rather than on traditional oyster reefs. Based

on the fact that sediment is such a rich source of potentially pathogenic vibrios, it is hypothesized that oysters harvested from estuary sediment carry higher vibrio densities than oysters suspended higher in the water column.

This project seeks to determine the difference in vibrio loads in the sediment and vibrio loads in the water column, and to determine the difference in vibrio loads in oysters cultured on-bottom and in off-bottom suspension.

Sediment Dynamics and Biogeochemical Cycling in a Developing Deltaic System: Understanding Land Building and Habitat Quality in a River Diversion

Alexander Kolker (Louisiana Universities Marine Consortium)
Brian Roberts (LUMCON)

Most experts agree that the best way to restore coastal Louisiana is to reactivate the natural deltaic land-building processes that originally built this system. This involves partially diverting Mississippi River flow, with the goal of bringing in sediments. However, freshwater diversions have potentially negative impacts, and little is known about the interaction between land building processes and water quality in developing deltas.

This project seeks to examine the interactions between deltaic land building processes and sediment biogeochemical cycling rates, a key regulator of water and sediment habitat quality. By studying conditions at the naturally accruing Wax Lake Delta of the Atchafalaya River, researchers will provide valuable information for coastal managers developing future coastal land-building projects.

Wetland Restoration with Sediment Conveyance: An Experimental Approach to Reduce Uncertainties in Attaining Successful Restoration – Phase 2

Irving Mendelssohn (LSU)
Sean Graham (LSU)

During the last several years, state and federal resource agencies have implemented sediment conveyance projects for wetland restoration. However, barriers such as cost and ecological-physical uncertainties still exist that prevent the use of this method by individual landowners, municipalities and others.

The goal of this project is to reduce the ecological and geo-physical uncertainties related to the successful use of sediment-slurry restoration using small dredges. This research has three primary aims: (1) develop protocols for the successful use of a prototype mini-dredge to be used by landowners and resource agencies for marsh restoration and rehabilitation; (2) test metrics by which successful restoration of low-salinity, high-organic coastal wetlands can be assessed; and (3) determine the critical threshold for sediment burial that promotes functional equivalency with reference marshes.

Proposal Process

The LSG omnibus proposal solicitation process began in late 2010 with a call for statements of interest that addressed topics in the program's current Strategic Plan. Forty-five statements were received, which were reviewed by a 13-member screening panel. The authors of the 20 highest ranked statements were invited to submit full proposals. Sixteen proposals were received by the deadline for submission. All of the full proposals were subsequently examined by either two or three external peer reviewers. A 10-member technical review panel convened to review and score the entire set of full proposals. Prior to the technical review panel meeting, each panel member was assigned three full proposals to review. No consensus ranking discussions were held, but each panel member was asked to rank the proposal on a scale of 1-4, and a composite average score was determined for each submission.