LOUISIANA SEA GRANT

INTRODUCTION

The most important research and outreach challenges that Louisiana Sea Grant (LSG) faces relate to sustainability of communities and ecosystems in the hurricane-prone deltaic coast bordering the northern Gulf of Mexico. The 2005 tropical storm season with Hurricanes Katrina and Rita, and the 2008 storm season with Hurricanes Gustav and Ike, revealed much about the region's increasing hurricane vulnerabilities and associated secondary impacts of disturbance to a degrading delta.

Additional economic and environmental vulnerabilities were exposed during the 2010 Deepwater Horizon oil spill, the 2008 and 2011 Mississippi River floods, and, most recently, Hurricane Isaac. This deltaic coast, with reliance of communities on ecosystem services, will also continue to be confronted with the effects of climate change, sea level rise, and land subsidence on coastal parishes (counties) and their residents.

Administration of this cross-disciplinary, multi-institutional effort is the responsibility of LSG. Although the primary functions of the office are unchanged, the scope and complexity of its activities have expanded tremendously since 1968. LSG actively promotes inter- and intra-university involvement in State, regional, and Federal marine affairs; incubates new institutional capabilities and programs; conducts and coordinates marine informational and advisory services; and provides advisory and referral services for many agencies, businesses, and individuals.

Eighty-five percent of Louisiana's population – LSG's primary constituency – resides in a vulnerable deltaic coast, which is also a major locus of strategically important seafood, oil and gas, maritime, refining, and petrochemical industries of great national significance. The program can provide services most effectively by actively recruiting relevant research projects and by establishing and maintaining an aggressive outreach program that relies on partnerships with State and Federal agencies and private companies to supplement limited resources.

HEALTHY COASTAL ECOSYSTEMS

The maintenance and restoration of healthy ecosystems is fundamental to life along Louisiana's Gulf coast. Coastal development, overfishing, sea level rise, coastal subsidence, loss of barrier islands, and other factors have resulted in water quality degradation and hypoxia, fisheries decline, wetlands loss, proliferation of invasive species, reduced storm and surge protection, and a host of other challenges. Louisiana's invaluable coastal wetlands and forests have suffered most severely from the combined effects of man's activities and nature's whims.

To restore and preserve the state's coastal ecosystems, Louisiana Sea Grant (LSG) promotes innovative research and outreach that increase our understanding of ecosystem function and the implementation of appropriate designs for restoring lost function.

RESEARCH

Mini-dredge Restoration Project

One possible solution to wetland loss is to use sands and soils dredged from canals to fill in degrading marshes, but this work requires a substantial financial investment. LSG researchers in the Louisiana State University (LSU) Department of Oceanography and Coastal Sciences are on the forefront of studying how to fortify and restore the state's vanishing marshlands with the use of new hydraulic mini-dredges.

The mini-dredge fits into small waterways, is less expensive than traditional dredging methods, and employs a portable unit instead of bulky machinery. The mini-dredge studied, valued at $100,000, is contained on a barge about 9 feet wide by 24 feet long. A pump mounted on the barge is suspended from a winch on a track that moves forward and back. The 15-horsepower pump's movement agitates sediment on the water bottom, forcing it into the water column. That loose sediment is then captured, rather than taking it directly off the water bottom, for restoration purposes.

Theoretically, the dredge can pump up to 70 percent solids at a rate of 20 cubic yards per hour through a 4-inch hose. This converts to filling a one-acre area with a one-foot depth of dredged material in 75 hours.

Coastal Zone Boundary Expansion

Louisiana's original coastal zone boundary was proposed in 1975 following a multi-agency research project sponsored by the National Oceanic and Atmospheric Administration (NOAA).

While the 1975 coastal zone boundary study proposed a scientifically based and fairly extensive coastal zone, political considerations drastically reduced the size of the state's first proposed landward coastal zone (CZ) boundary, which was to be a band three miles in from the coast. Such a restrictive coastal zone did not meet the requirements of the Coastal Zone Management Act and did not receive federal approval. Through a process of political concessions and accounting for biophysical parameters, which included all or parts of 19 coastal parishes and approximately 5.3 million acres of land, a revised CZ was adopted in 1978.

During the 2009 legislative session, Louisiana Senate Concurrent Resolution No. 60 asked the Coastal Protection and Restoration Authority (CPRA) to conduct a science-based study on the adequacy of the existing inland coastal zone boundary. The Louisiana Department of Natural Resources' Office of Coastal Management took the lead on the study and worked with the LSG Law & Policy Program to develop draft findings. Based on that study, the Louisiana Legislature revised and expanded the CZ boundary during its 2012 regular session.

Floating Islands Expand Beyond Decorative Water Features

Made from 100 percent recycled polyethylene terephthalate (PET) plastic, Floating Islands Environmental Solution's (FIES) mats are buoyant, Brillo-like sheets that are designed to mimic naturally occurring wetland vegetation and can be introduced into any aquatic system.

FIES supplies their product to six states in the Gulf Coast. Both private and public entities use the floating islands. Zoos use them in their aquatic and wetland exhibits. Small municipalities use them as water filtration mechanisms.

LSG water quality specialist Brian LeBlanc has aided the company in fine-tuning the usage of the floating mats, researching how they can best be used to address point and non-point source pollution, and also be employed for shoreline stabilization in areas undergoing wetland restoration.

Researchers Improve Efficiency of Restoration Spending

LSG researchers are helping maximize the return on dollars for coastal restoration in the Northern Gulf of Mexico. The Gulf's critical ecosystems are slated for billions of dollars in restoration spending in coming years.

Rex Caffey, director of Marine Extension for LSG and a natural resource economist with the LSU AgCenter, heads up the project. Its overall goal is to improve the efficiency of coastal restoration spending and to get the most out of limited dollars through development and comparison of alternative restoration methods.

The Bureau of Ocean Energy Management (BOEM)recently approved an $840,000 research grant to extend the tool developed during the project for the economic assessment of alternative sediment sources for barrier shoreline restoration and beach renourishment. This project, and a previous ecosystem services values-based project via BOEM, yielded more than $800,000 in new money for projects totaling $1.6 million (1:1 match).

Alligator Industry Research

In Louisiana, alligator farmers bring in nearly $47.5 million annually, with roughly $43.4 million of the value coming from trade in skins.

Finding the most efficient means of raising these animals is the goal of the Alligator Research Facility (ARF). Construction on the $150,000, approximately 3,600 square-foot, insulated metal building was completed in 2012.

Since alligators are strictly carnivores, a farmer's biggest expense is feed, according to Mark Shirley, a Marine Extension agent with LSG who helped secure industry funding for the research facility. Shirley, who keeps farmers up-to-date on pertinent issues as LSG's alligator specialist, said the high-protein, animal-based commercial pellets can cost as much as $1,000 per ton – far more than any other livestock feed. One of ARF's objectives is to determine the most economical feed without sacrificing alligator hide and meat quality.

"The industry needs some practical questions answered," noted Greg Lutz, LSG aquaculture specialist. Aside from questions about nutrition, ARF will be used to study growth rate, skin quality and survival of farmed alligators. "No one has ever built a facility like this before," he said. "We are moving cautiously at every step to make sure it works and that it is a realistic environment, like what you would find at a farm. This is the only one in the world for the study of the American alligator."

OUTREACH

Bayou St. John Restoration

In 1699, the French explorer Pierre Le Moyne Sieur d'Iberville was looking for a short overland route from Lake Pontchartrain to the Mississippi River. Local natives brought him to a sleepy bayou that successfully put he and his men near the east bank of the Mississippi. That discovery of what would

become known as Bayou St. John (BSJ) fated the placement of the colony of Nouvelle Orleans, providing a calm-water access route for the wind-driven trade to and from the center of the Louisiana Territory.

With the invention of the steam engine and then internal combustion, the trade route on Bayou St. John fell from favor giving way to the Mississippi River. The once critical bayou degraded to a relic distributary whose main significance was a flood liability during hurricanes.

In 2011, the fate and character of BSJ again changed. As part of NOAA's Regional Hydrological Restoration Program, a proposal submitted by the Gulf of Mexico Sea Grant programs was awarded initial funding to restore vital water flow to BSJ by eliminating redundant and dysfunctional water control structures built in the 1960s. LSG Marine Extension worked with local stakeholders to implement the project. With support and supplemental funding from the Orleans Levee District, the project was finished in late 2013 - completing the connection between the Lake's brackish waters and the interior of BSJ. Suitable aquatic species once again have recolonizing the tidally influenced bayou.

Derelict Crab Trap Rodeos Round-Up Lost, Abandoned Fishing Gear

For several years, LSG has worked with the Louisiana Department of Wildlife and Fisheries and community volunteers to clean coastal waters of derelict crab traps. Many derelict taps continue to "ghost fish," ensnaring blue crabs and other important aquatic species unnecessarily. They also pose a potential navigation hazard to boats and can become entangled in other fishing gear like shrimp trawl nets.

Sea Grant was awarded a $164,000 grant from the National Fish and Wildlife Foundation for the Louisiana Derelict Crap Trap Removal and Prevention Project in 2012 and 2013.

Between 2004 and 2012, nearly 20,000 derelict crabs were removed from inshore waters. In 2012 alone, nearly 2,000 traps were removed from St. Bernard and Plaquemines Parish waters. Similar numbers were collected in 2013.

LaDIA Fellows Move Forward

LSG is creating stronger connections between researchers and community members in coastal Louisiana through LaDIA (Discovery-Integration-Application) fellowships.

Focused heavily on science communication, Fellows receive science communication training while working with an LSG Extension agent who serves as an outreach mentor. At the end of the

program, Fellows submit a portfolio of communication products that should clearly and easily explain their research's scope and results.

The first class of LaDIA Fellows included graduate students and post docs. The second class, which began in the summer of 2015, includes 11 tenure-track faculty members from five university campuses.

EDUCATION

Marsh Maneuvers

Marsh Maneuvers is a four-day camp held for high school 4-H Club members each summer at Rockefeller Wildlife Refuge in Grand Chenier. Since the program's inception more than 20 years ago, it has become well-known for its hands-on educational activities related to coastal ecology, wetland loss, and key social issues affecting the health and economic well being of Louisiana's coastal communities.

Approximately 64 students participate in the program each summer. During the weeklong residential camp, students experience the coastal environment, learn about natural resources, help re-vegetate a marsh, and learn how the state's wetlands affect their lives.

Marsh Maneuvers is hosted by the LSU AgCenter in cooperation with LSG and the Louisiana Department of Wildlife and Fisheries.

Ocean Commotion

Since 1998, LSG's Ocean Commotion annually offers nearly 2,000 students in grades K-8 an opportunity to learn about a host of issues that range far beyond ocean-exclusive themes in a lively, hands-on learning environment.

Exhibit topics include coastal marshes and wetlands, invasive species, local ecosystems, boating safety, and Louisiana geology and wildlife. More than 60 presenters from private business, universities around the state, government agencies, and public, non-profit, and private educational organizations participate as exhibitors annually. In 2014, about 200 pre-college students worked exhibits, peer teaching and serving as role models for younger student participants. Three hundred and four college and graduate students also worked exhibits at Ocean Commotion in 2014. Since 2010, about 8,000 K-8th graders have attended Ocean Commotion.

Master Naturalists Program Established

The Louisiana Master Naturalist Program (LMNP) was founded, with the assistance of LSG, as a means of educating residents about the state's landscape, plants, and animals.

As a recent addition to the other 34 states that have Master Naturalist programs, the Greater New Orleans chapter graduated its first class of 19 course participants in December 2012. Master Naturalists attend classes and field workshops that help them understand the

connections among the state's environment, culture, and economy. The program then requires them to volunteer their time and to share what they have learned with others.

Five other communities throughout Louisiana have thus far shown interest in forming additional LMNP chapters.

Coastal Science Assistantship Program

Annually, four new students pursing master's degrees are selected to participate in the Coastal Science Assistantship Program (CSAP), a partnership between the Louisiana Coastal Protection and Restoration Authority (CPRA) and LSG that provides graduate students with up to three years' financial support. CSAP students receive $25,000 per year while working on applied coastal ecosystem restoration research important to CPRA. The program also creates a pool of researchers and scientists from which CPRA can recruit. Since the start of the program in 2008, 44 students have been supported through CSAP.

EnvironMentors Chapter Launched

EnvironMentors is a national program, sponsored by the National Council for Science and the Environment, that pairs high school students otherwise unlikely to succeed in the sciences with faculty, graduate students, and environmental professionals in one-to-one mentoring relationships. The program increases students' environmental awareness and encourages them to pursue science, technology, engineering, and math careers.

The LSU chapter is a cross-campus collaboration between the College of Education's GEAR UP program and LSG. Louisiana Sea Grant's 2011 Knauss Fellow, Lauren Land, and NMFS/Sea Grant Marine Population Dynamics Fellow, Melissa Hedges Monk, wrote the grant to establish the LSU EnvironMentors chapter.

On average, 15 Scotlandville Magnet High School students broaden their science education each year as part of LSU's EnvironMentors chapter. Students come to campus twice a week during the academic year to meet with their mentors, learn to work in a laboratory, use a college library, conduct basic research, and present findings at a poster session – as well as visit museums and aquariums.

SAFE & SUSTAINABLE SEAFOOD

Louisiana has experienced a decline in many of its major fisheries while seafood consumption nationwide has been simultaneously on the rise. Louisiana Sea Grant (LSG), through its research, Extension, and Education activities, and work with industry partners, has helped to stabilize and improve many sectors of our fisheries industry.

According to the NOAA Aquaculture Program, mariculture (aquaculture of saltwater species) is in its infancy in the U.S., amounting to just over $1 billion of a $70 billion worldwide industry. This is especially so in Louisiana. Mariculture creates important new opportunities to meet the increased demand for seafood, but a number of questions need to be addressed for its full potential to be realized.

Seafood safety is a growing concern as international trade increases and fish diseases and contamination of imports loom as larger problems. LSG plays key roles in advancing public understanding of the nature of these problems and opportunities. Through the use of its research, Extension, and Education capacities, LSG supports the kind of informed public and private decision making that leads to a sustainable supply of safe seafood long into the future.

RESEARCH

Seafood Waste Turned into Crab Bait

Julie Anderson, LSG fisheries specialist, is exploring ways to turn seafood byproducts into crab bait that could help blue crab fishermen stave off rising costs associated with having baitfish shipped from the Atlantic Ocean.

The experimental bait starts as a gel made from algae. Anderson then adds different types of seafood byproducts to the gel, testing each one to see which is the most appetizing. The goal is to create bait that is less expensive but maintains the same blue crab catch levels as traditional bait. “It’s like we’re trying different flavors of Jell-O,” she said. Lab results show that shrimp byproducts are the most popular bait flavor. The next step in the research is field-testing the experimental baits over several harvest seasons.

The most popular baitfish for Louisiana crabbers is Atlantic-caught menhaden. But the small fish is valuable for more than just baiting crab traps. It is also harvested as a source of omega-3 fatty acids and for other human uses. The high demand has caused Atlantic states to worry that the population is being overfished.

Alligator Industry Research

In Louisiana, alligator farmers bring in nearly $47.5 million annually, with roughly $43.4 million of the value coming from trade in skins.

Finding the most efficient means of raising these animals is the goal of the Alligator Research Facility (ARF). Construction on the $150,000, approximately 3,600 square-foot, insulated metal building was completed in 2012.

Since alligators are strictly carnivores, a farmer’s biggest expense is feed, according to Mark Shirley, a Marine Extension agent with LSG who helped secure industry funding for the research facility. Shirley, who keeps farmers up-to-date on pertinent issues as LSG’s alligator specialist, said the high-protein, animal-based

commercial pellets can cost as much as $1,000 per ton – far more than any other livestock feed. One of ARF's objectives is to determine the most economical feed without sacrificing alligator hide and meat quality.

"The industry needs some practical questions answered," noted Greg Lutz, LSG aquaculture specialist. Aside from questions about nutrition, ARF will be used to study growth rate, skin quality and survival of farmed alligators. "No one has ever built a facility like this before," he said. "We are moving cautiously at every step to make sure it works and that it is a realistic environment, like what you would find at a farm. This is the only one in the world for the study of the American alligator."

Safe Harbor Options Studied

LSG is spearheading a study looking into safe harbor options for commercial fishermen in the Vermilion Bay area. The idea is to identify which points along waterways are passable and which are impassable due to depth, in light of the vessel dimensions of the commercial fishing fleet in the area. Once the information is collected and researchers have an idea of what the water bottoms look like, engineers can create designs and develop size and cost estimates of what the infrastructure for a safe harbor might entail. The project is the result of a $35,000 FEMA Community Resilience Innovation Challenges grant, sponsored by the Rockefeller Foundation.

By destroying, damaging or pushing boats inshore, Hurricanes Katrina and Rita put as much as 55 percent of the commercial fishing fleet out of commission during the 2006 fishing seasons. Safe harbor options allow commercial harvesters to get back on the water quickly following a storm to meet the local and national demand for seafood.

OUTREACH

Louisiana Direct Seafood

LSG Extension personnel secured a $549,000 grant from the Gulf States Marine Fisheries Commission for expansion of the Delcambre Direct Seafood Marketing Program, an online direct marketing effort connecting local fishermen to seafood consumers. In the past three years, the program, now called Louisiana Direct, has been expanded to four coastal locations. Louisiana Direct allows fishermen to receive a premium price for their product, often pre-selling much of their catch through their online presence before they reach dock.

In Delcambre, direct sales have solidified at a facility called Bayou Carlin Cove, which has space for multiple fishermen to sell their catch, as well as a 7,500 square-foot pavilion for a seafood and farmers market. LSG worked with local officals in their efforts to acquire a $3.4 million federal community development grant and $600,000 from the Twin Parish Port District for Bayou Carlin Cove.

Trade Adjustment Act

LSG Extension agents partnered with the Farm Service Agency to provide the intensive technical training mandated under the Trade Adjustment Act (TAA). Recent trade petitions from the Gulf shrimp sector secured more than $100 million in TAA funding, but to be eligible for financial payments, shrimpers had to first complete 12 hours of technical assistance training. A total of 2,351 shrimp harvesters in Louisiana qualified. Topics ranging from product quality to business plan development were featured in more than 60 coastal meetings conducted by Marine Extension agents from November 2010 to April 2011.

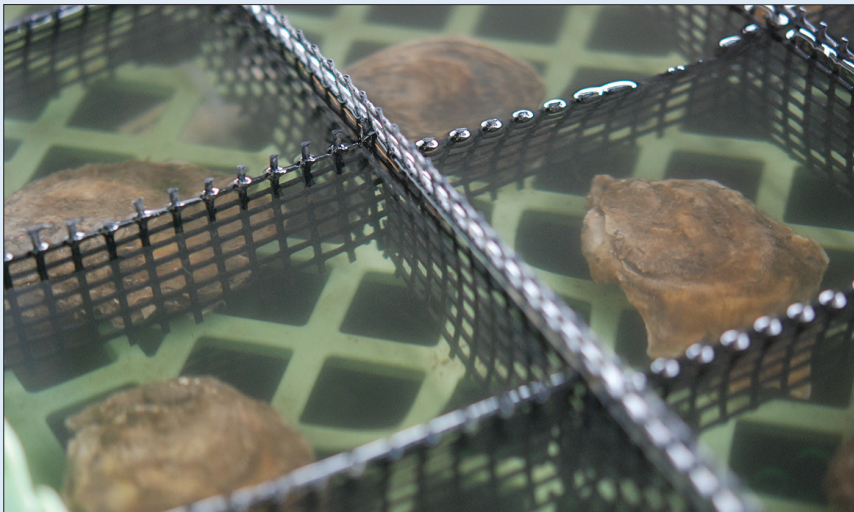
Commercial Distributorship of Oyster Lab Products

The Louisiana Oyster Dealers and Growers Association (LODGA) and LSG entered into a contractual agreement for the commercial distribution of LSG oyster lab products. Under the contract, LODGA is responsible for the sale of oyster larvae and seed produced at LSG's lab on Grand Isle. The products – bred from broodstock maintained at the lab – include eyed diploid and triploid larvae, and diploid and triploid oyster seed, as well as disease-resistant diploid seed.

Triploid oysters are a new line of oysters that exhibit greater summertime meat yield and growth compared to wild oysters, due to sexual sterility from having three sets of chromosomes. Diploid oysters are found in nature, having two sets of chromosomes.

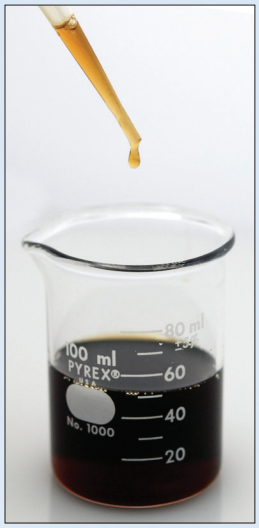
Triploid oysters are a result of crossing a special broodstock of tetraploid oysters, having four sets of chromosomes, with diploid oysters. Triploid oysters and tetraploid oyster broodstock are the result of 20 years of research. LSG also produces wild diploid oyster larvae for the Louisiana Department of Wildlife and Fisheries' public oyster reef restoration program.

The lab's disease-resistant line of oyster seed is the result of nearly a decade of federal- and state-funded research.



Making Urban and Suburban Inroads

Sea to Table events hosted by LSG were conducted in both the Greater New Orleans Area and Baton Rouge. The four events – held at Whole Foods Markets – provided consumers with information on how to purchase quality, fresh seafood, and how to pair seafood with wines, and featured samples of sustainable Gulf seafood. Additional hosts included the Audubon Nature Institute's GULF program, the LSU AgCenter, and Whole Foods.



GoMRI Oil Spill Research Outreach Program

The four Gulf of Mexico Sea Grant college programs (GoMEXSGP) are funded by the Gulf of Mexico Research Initiative (GoMRI) to implement a two-year oil spill science extension and outreach (EO) program. The purpose of this project is to enhance the overall GoMRI outreach effort in the Gulf of Mexico and beyond by translating findings – including information on the safety of Gulf seafood – from GoMRI research into useable products and information. Ultimately, the program will demonstrate how high-quality science, such as that coming from GoMRI-sponsored work, is critical for a healthy Gulf of Mexico. The GoMRI/ Sea Grant outreach program functions regionally and shares results regionally and nationally through the Sea Grant network, and enhances the economic, environmental, and/or societal benefits of GoMRI's research.

EDUCATION

Louisiana Fisheries Forward

LSG Extension personnel secured a $1.2 million grant to develop a professionalism-training program for commercial fishermen. The program, Louisiana Fisheries Forward (LFF), is a voluntary curriculum of web-based videos, printed materials and workshops focusing on issues ranging from quality assurance to business planning. In 2014, more than 600 commercial fishermen participated in LFF workshops held at coastal locations throughout the state.

LFF expands on programs, seminars and other annual outreach events hosted by LSG. "New industry realities require that fishermen, dock owners, and processors are equipped to understand business trends and strategies, technologies, and policies in order to survive in an increasingly competitive and more regulated trade," said Thomas Hymel, LSG Marine Extension agent and LFF director. "Our overall goal is to improve the economic viability and resource stewardship of Louisiana's commercial fishing industry."

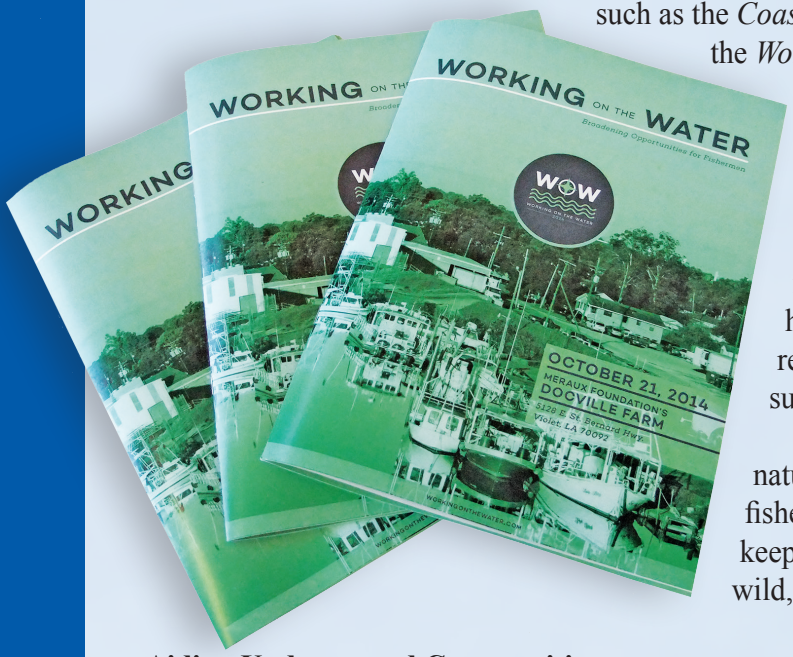
HACPP Training

Fishermen, aquaculturists, dock owners, seafood processors, and producers of specialty foods from as far away as Alaska attended three-day seafood Hazard Analysis and Critical Control Points (HACCP) trainings hosted by LSG.

HACCP is a means of internal control for safety, consistency, awareness, and correction of process deviation in the food industry. At one LSG-sponsored training, 28 workshop participants came from seven states to study the Food and Drug Administration-recognized curriculum. Implementation of a HACCP plan in seafood processing facilities has been a federal requirement since 1997.

Exploring Eco-Tourism Opportunities

Coastal landowners, farmers, charter fishermen, marina owners, swamp tour operators and others interested in income opportunities from nature-based tourism attended LSG-sponsored seminars, such as the *Coastal Ecotourism Workshop* at Stella Plantation, the *Working on the Water Summit* in St. Bernard, and the *Lake Charles Eco-Tourism Workshop*. Topics participants explored included revenue potential from natural resource enterprises, business plan development, and liability and legal considerations. As a result, several nature-based tourism business partnerships have developed, along with the creation of new revenue streams for sole proprietor establishments such as a shrimp harvest tour.



Secondary revenue sources from nature-based tourism can often provide commercial fishermen with the supplemental income needed to keep their primary enterprise afloat – the harvest of wild, Gulf of Mexico seafood.

Aiding Under-served Communities

Fishermen whose first language is Vietnamese comprise up to 40 percent of the commercial fishing fleet, according to the Louisiana Department of Wildlife and Fisheries.

LSG Marine Extension agent Thu Bui works with both Anglo and Asian commercial fishermen, but her fluency in Vietnamese allows Sea Grant to reach a significant and sometimes under-served population. Bui translates critical documents, as well as at seminars, reaching hundreds of Vietnamese fishermen annually.

She has worked to make commercial and recreational fishermen aware when commercial divers are in the water and that boats should keep their distance. The award-winning effort entails bilingual signage at marinas instructing boaters about day and night diving shapes, and workshops educating dive and fishing boats on how to communicate with each other and indicate where divers are submerged.

Bui maintained frequent contact with fishermen regarding closed fishing zones and provided information concerning claims, the Vessel of Opportunity Program, and training meetings during the BP oil spill. She also interpreted technical reports and other information for fishermen and the Vietnamese-speaking public, and orchestrated special outreach for members of the state's Vietnamese fishing community during the spill.

HAZARDS RESILIENCE IN COASTAL COMMUNITIES

Sea level rise, the increased number and intensity of coastal storms, the ongoing threat of oil spills, and other natural and human hazards are putting more people and property at risk along Louisiana's coast, with major implications for human safety and the economic and environmental health of coastal areas. It is essential that residents of coastal communities understand these risks and learn what they can do – both to reduce their vulnerability and to respond quickly and effectively when destructive events occur.

Louisiana Sea Grant (LSG) uses its integrated research, training, and technical capabilities and its presence in coastal communities to play a major role in helping local citizens, decision-makers, and industries plan for hazardous events and to optimize the ability of communities to respond and rebuild.

RESEARCH

Green Dispersants Focus of Study

LSG water quality specialist Brian LeBlanc, and two LSU AgCenter colleagues, received a $500,000 grant from the U.S Environmental Protection Agency to study the feasibility of producing "green" dispersants for future oil spills in the Gulf of Mexico. Iowa State and Colombia universities are also collaborating on the project.

The study will attempt to produce oil dispersants that have less of an impact on the wetland environment. A genetically modified strain of a common bacterium, *Bacillus subtilis,* was used in the initial research. The scientists believe that modifications to the bacterium, using various fermentation energy sources or genetic modifications, can produce a by-product that will effectively disperse oil without the unwanted impacts to the ecosystem that might occur with traditional dispersants.

To date in the laboratory, the trio observed that a biosurfactants are less toxic than a traditional dispersants, and that this effect is greater in freshwater than in saline water.

Preparing Financially for Hurricane Devastation

A number of communities that weren't impacted by Hurricane Katrina in 2005 were caught off guard by debris removal costs from Hurricanes Gustav and Ike in 2008.

Many communities, especially smaller municipalities, don't have the financial resources to deal with the cleanup. FEMA helps with up to 75 percent of the cost, but it can sometimes take more than a year for local governments to be reimbursed.

LSG funded Matt Fannin, an LSU AgCenter assistant professor of agricultural economics, to utilize case studies from several Louisiana parishes to estimate the optimal level of monetary reserves needed to address hurricane recovery costs. The final product – the *Resiliency in Local Government Financing Under Coastal Risk Manual* – provides parishes and municipalities with a tool that allows them to manage their natural hazards risk and financial health over generations (50 years or more) not just storm season to storm season.

Safe Harbor Options Studied

LSG is spearheading a study of safe harbor options for commercial fishermen in the Vermilion Bay area. The goal is to identify which points along

waterways are passable and which are impassable due to depth, in light of the vessel dimensions of the commercial fishing fleet in the area. Once the information is collected and researchers have an idea of what the water bottoms look like, engineers can create designs and develop size and cost estimates of what the infrastructure for a safe harbor might entail. The project is the result of a $35,000 FEMA Community Resilience Innovation Challenges grant, sponsored by the Rockefeller Foundation.

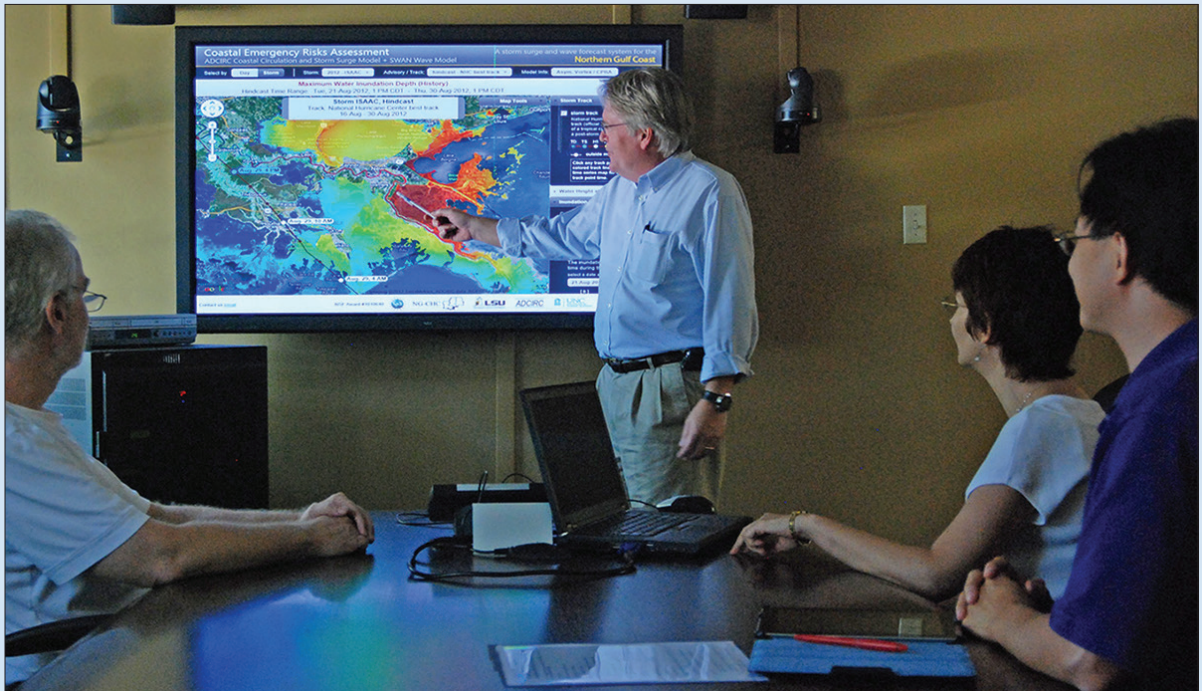
Sci-TEK Initiative

Louisiana Sea Grant and the Mississippi-Alabama Sea Grant Consortium, in partnership with the University of New Orleans and Louisiana's Coastal Protection and Restoration Authority, have funded an on-going research program focused on the integration of the traditional ecological knowledge (TEK) of local coastal stakeholders with science-based geospatial datasets to inform restoration decision-making and hazard mitigation planning. Through this multidisciplinary knowledge integration effort, the researchers have worked closely with a diverse set of local stakeholders in coastal Mississippi and Louisiana. The methods developed are designed around meaningful stakeholder engagement strategies that involve a two-way exchange of information to build spatial representations of stakeholder issue-based priorities. Those spatial representations can be used as a basis for developing recommendations for coastal restoration projects and local hazard mitigation plans that include effective stakeholder input and compliment related scientific modeling results.

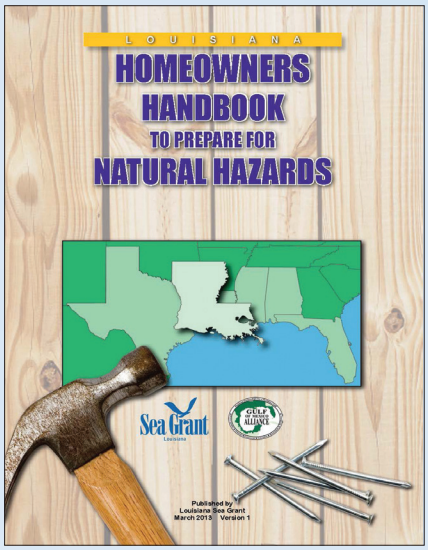
OUTREACH

Coastal Emergency Risks Assessment

Drawing on the resources of LSU's Center for Computation & Technology, scientists at the LSU School of the Coast & Environment have developed the Coastal Emergency Risks Assessment (CERA) interactive website system to visualize several parameters from the ADCIRC Coastal Circulation and Storm Surge Model during an active hurricane. These parameters include storm surge, wind speed, and water inundation above ground. Established with support from LSG and the Coastal Hazards Center of Excellence at the University of North Carolina at Chapel Hill, CERA focuses on two areas – the Gulf of Mexico and the Atlantic Coast. The system presents five-day forecasts of storm surge inundation and delivers model results in near real-time every six hours. CERA is used by the National Hurricane Center, Weather Forecast Centers at the National Oceanic and Atmospheric Administration, the U.S. Coast Guard and the Governor's Office of Homeland Security and Emergency Preparedness in Louisiana. Additionally, the CERA research group at LSU, in conjunction with LSG, has held ADCIRC/CERA training events at LSU.

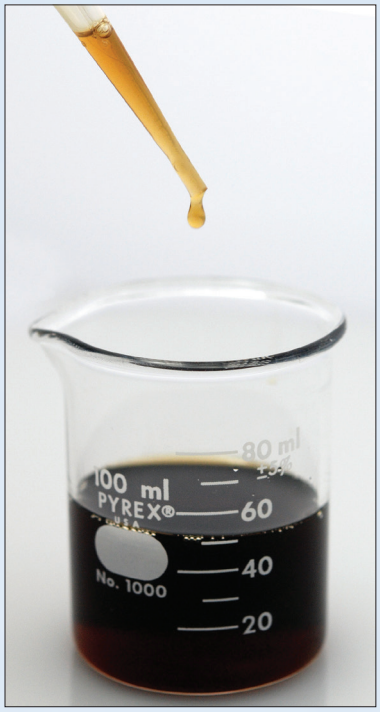


Homeowners Handbook to Prepare for Natural Hazards



The *Louisiana Homeowners Handbook to Prepare for Natural Hazards* was created to help coastal residents prepare for natural hazards so that risks to family and property may be reduced. The handbook explains the forces of nature that act on structures during storms, including the dangers associated with high winds, heavy rain, and storm surge. It lays out ways to gird a home against these forces to minimize or negate their effects, as well as information on how to reduce the human toll exacted by dangerous storms.

LSG produced the handbook with the help of other state, regional, and national organizations. It was funded through a program of the Gulf of Mexico Alliance (GOMA). To date, more than 16,000 copies of Louisiana's book have been distributed through the mail, libraries, retail outlets and community rating system meetings to homeowners as well as local governments..



GoMRI Oil Spill Research Outreach Program

The four Gulf of Mexico Sea Grant college programs (GoMEXSGP) are funded by the Gulf of Mexico Research Initiative (GoMRI) to implement a two-year oil spill science extension and outreach (EO) program. The purpose of this project is to enhance the overall GoMRI outreach program in the Gulf of Mexico and beyond by translating findings from GoMRI research into useable products and information for targeted, high-value audiences using the locally based and stakeholder-driven Sea Grant EO network. Ultimately, the program will demonstrate how high-quality science, such as that coming from GoMRI-sponsored work, is critical for a healthy Gulf of Mexico. The GoMRI/Sea Grant outreach program functions regionally and shares results regionally and nationally through the Sea Grant network and enhances the economic, environmental, and/or societal benefits of GoMRI's research. The end-result of implementing this project is a high return on the investment from GoMRI's research program by transferring oil spill research results effectively and efficiently to target audiences. Through early February 2015, 116 small and large group input meetings were held throughout the region with 530 people who were impacted by or concerned about the potential impacts of the DWH oil spill or future spills.

Assisting Communities through the Community Rating System

LSG is part of a regional project team that is working with local coastal communities participating in the National Flood Insurance Program (NFIP) to facilitate the transition to the 2013 CRS Coordinators' Manual and provide technical assistance in maintaining and improving the class rating under the new manual with emphasis on outreach, such as the creation of a Program for Public Information (PPI). The team is working with the Mississippi Gulf Coast Coastal Hazard Outreach Strategy Team (C-HOST) and the Louisiana Southwest Informational Floodplain Team (SWIFT) to strategically develop materials that best address the needs of communities participating in the Community Rating System (CRS).

In Louisiana, SWIFT consists of floodplain managers and planners from three parishes (Vermilion, Cameron, and Calcasieu) and three municipalities (the cities of Sulphur, Lake Charles, and Iowa). Materials developed through this project serve as a model for other coastal communities throughout the Gulf. Collaborators include LSG's Law & Policy Program, Mississippi-Alabama Sea Grant, Mississippi-Alabama Sea Grant Legal Program, Blue Urchin, and Grand Bay National Estuarine Research Reserve.

EDUCATION

Exchange Offers Insights into Storm Recovery

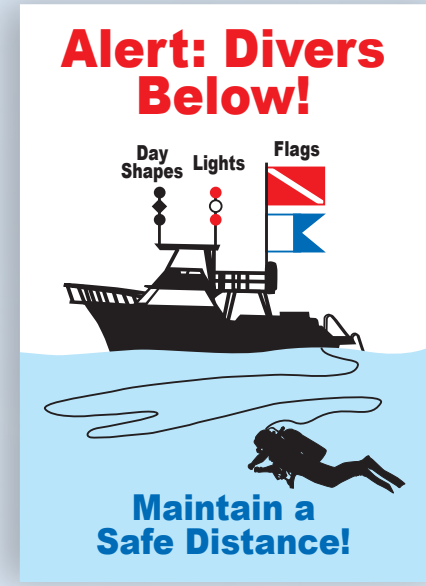
More than a year-and-a-half after Hurricane Sandy made landfall in the northeast, the Sea Grant programs in New Jersey, New York, and Connecticut were still dealing with storm recovery issues – ranging from community resilience and flood insurance to impacts on recreational fisheries and marina reconstruction. In nearly a decade since Hurricanes Katrina and Rita, LSG addressed many of the issues Sandy survivors continue to face and may have to manage for years to come. So, in May 2014, Pete Rowe, New Jersey Sea Grant Extension leader; Jon Miller, N.J. coastal process specialist; Ryan Orgera, N.J. coastal community resilience project manager; and Jay Tanski, New York Sea Grant costal processes and facilities specialist, flew into New Orleans for a LSG-sponsored week-long storm recovery learning experience. The quartet drove nearly 500 miles and around the Louisiana Coastal Zone meeting with about 40 of LSG's stakeholders who shared their Katrina and Rita recovery experiences and perspectives for the benefit of the Northeast.

Diver Safety Efforts Recognized

LSG Vietnamese-American Extension agent Thu Bui was recognized by Chevron for her efforts to improve diver safety.

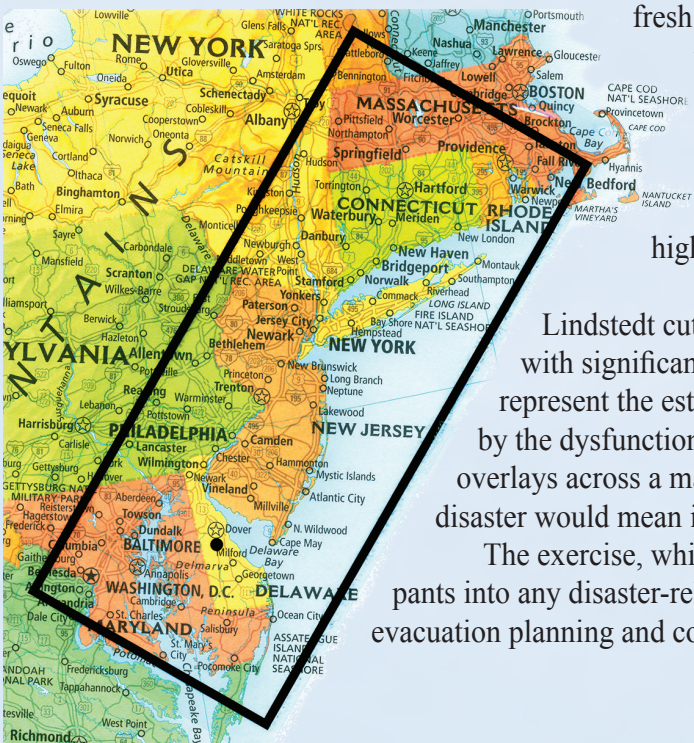
Bui has worked since 2012 to make commercial and recreational fishermen – especially Vietnamese-speaking fishermen – aware when divers are in the water and that boats should keep their distance. The project began with bilingual signage at marinas instructing boaters about day and night diving shapes, and educating dive and fishing boats on how to communicate with each other.

Working with the U.S. Coast Guard, National Institute for Occupational Safety and Health, and commercial fishing organizations such as the Southern Shrimp Alliance, Bui promoted a responsible mariner practices educational plan geared toward both dive vessels and fishermen. The effort included dive awareness brochures, posters, decals, and outreach efforts touching nearly 400 commercial fishermen. LSG also has promoted the use of spar buoys, which are now being used by the diving industry, to indicate where divers are submerged.



Maps of Many Uses

The irregular contour of the Gulf coast makes it difficult to conceptualize the reach of Hurricanes Katrina and Rita. However, a map of the United States and five sheets of clear plastic can bring a fresh perspective to storm impacts and places these impacts in a local context for residents of other regions. It's an activity based on two pieces of information about Hurricanes Katrina and Rita – the total land area flooded, and the total area that endured high winds across four Gulf states.



LSG Education coordinator Dianne Lindstedt cut polygons out of Mylar to represent areas with significant wind damage and smaller polygons to represent the estimated land area flooded by storm surge and by the dysfunctional levees in New Orleans. By moving the overlays across a map, users can visualize what a major natural disaster would mean in other parts of the country.

The exercise, which only takes a few minutes, leads participants into any disaster-related topic, from emergency preparedness to evacuation planning and community planning.

Through summer 2015, more than 600 educators – from North Carolina, Virginia, Delaware, Indiana, Florida, Louisiana and other coastal states – have been trained on how to use the tool with their students. Nearly 4,500 visitors (from as far away as Canada) attending Baton Rouge Earth Day, Audubon Earth Fest and other environmental stewardship events have used the tool.

Oral History Project

High school students from Orleans, LaFourche, St. Mary and Cameron parishes collected interviews, transcribed the recordings, and even created an art piece and original music composition as a result of the LSG Coastal Change Oral History Project. The objective was for high school students to gather oral histories from people living in at-risk parts of southern Louisiana.

Overall, 19 interviews were collected and archived with the T. Harry Williams Center for Oral History at LSU, where they can be referenced and used by researchers for generations to come. A one-hour documentary, *The Telling Tide*, also resulted from the project. The video has been shown as several film festivals across the county and is available for viewing online. Additionally, Darcy Wilkins won the Best First-Time Director Award at the 2015 Honolulu Film Awards for *The Telling Tide*. She was a research associate on the project with LSG when she developed the video.

Students Prepare for a Resilient Future

While flooding and destruction from Hurricane Rita in 2005 and Hurricane Ike in 2008 made Vermilion Parish students well aware of their region's existing vulnerabilities, most did not know about the factors that potentially will exacerbate the problem and effectively draw coastal waters closer.

LSG Marine Extension agent Mark Shirley asked more than 1,000 young people across Vermilion Parish to envision their retirement years and to consider the effects of coastal erosion and rising sea level on their future quality of life. Shirley showed maps of the state's coastal zone illustrating land loss from 1932 through 2010, and explained the causes of coastal erosion. Subsidence will probably sink the Vermilion area about seven to nine inches in the next 50 years. Sea level rise is anticipated to reach approximately six to eight inches. So the Vermilion landscape could be more than a foot closer to sea level before the students are ready to retire.

Shirley discussed with students ways to mitigate damage and introduced the concept of resiliency. And using GIS technology, LSG personnel determined how high above sea level the schools Shirley visited sit. Those elevations were stamped on an aluminum GIS benchmark installed at each campus. One school was only 5.8 feet above sea level.

SUSTAINABLE COASTAL DEVELOPMENT

Coastal communities provide vital economic, social, and recreational opportunities for thousands of Louisianans. But population migration, especially since Hurricanes Rita and Katrina, have transformed the state's coastal landscapes and intensified demand on finite coastal resources. The increase in population along the north shore of Lake Pontchartrain, for example, has resulted in new housing developments, recreation facilities, and other business activities.

Changes such as these are placing tremendous pressure on coastal lands, water supplies, and traditional ways of life. To accommodate more people and activity, and to balance growing demands on coastal resources, Louisiana must develop new policies, institutional capacities, and management approaches to guide the preservation and use of coastal and ocean resources.

Louisiana Sea Grant (LSG) engages a diverse and growing coastal population in applying the best available scientific knowledge. It uses its Extension and Education capabilities to support the development of healthy coastal communities that are economically and socially inclusive, are supported by diverse and vibrant economies, and function within the capacity of their ecosystems.

RESEARCH

Best Practices for FIRM Adoption

When new Flood Insurance Rate Maps (FIRMs) are released by the Federal Emergency Management Agency (FEMA), some communities are unhappy while others are more accepting of the new floodplain designations. FIRM adoption is required for participation in the National Flood Insurance Program (NFIP). Parish and municipal adoption of new FIRMs involves public review and a possible formal appeal and negotiation process to make adjustments to the maps.

Whether community leaders either readily accept or attempt to redraw new FIRMs can have long-term socioeconomic impacts. LSG researcher Melanie Gall and her team examined the social, political, and economic processes six coastal communities used when adopting their new flood maps. From that, they created a set of best practices for the approval process and shared them with local and federal officials through workshops and publications.

Preparing Financially for Hurricane Devastation

A number of communities that weren't impacted by Hurricane Katrina in 2005 were caught off guard by debris removal costs when Hurricanes Gustav and Ike in struck in 2008.

Many areas, especially smaller municipalities, don't have the financial resources to deal with storm cleanup. FEMA helps with up to 75 percent of the cost, but it can sometimes take more than a year for local governments to be reimbursed.

LSG funded Matt Fannin, an LSU AgCenter assistant professor of agricultural economics, to utilize case studies from several Louisiana parishes to estimate the optimal level of monetary reserves needed to address hurricane recovery costs. The final product – the *Resiliency in Local Government Financing Under Coastal Risk Manual* – provides parishes and municipalities with a tool that allows them to manage their natural hazards risk and financial health over generations (50 years or more) not just storm season to storm season.

Landscape Architecture Projects Hone in on Coastal Sustainability

LSU's Robert Reich School of Landscape Architecture and LSG partnered to help several coastal communities.

In the first project, a team of students focused their efforts on finding a cost-effective and culturally acceptable solution to repairing a quarter-mile section of damaged levee that protects the

City of Des Allemands in St. Charles Parish from Bayou Des Allemands. The parish erects temporary storm surge protection when needed, but parish officials wanted a more permanent solution.

A proposed floodwall would offer protection, but it would cut the community off from neighboring waterways integral to the local economy, and it was cost prohibitive. As an alternative, students developed illustrative plans that depict a coordinated system of restored cypress forest and wetlands to protect the people, property, and infrastructure in the parish.

The second project involved developing new sport and recreational fishing opportunities on Cameron, St. Bernard, and St. Tammany parish waterways badly damaged during the 2005 and 2008 hurricane seasons. Students produced plans for boat launches and nature walks using small, remnant tracts of property that have been idle since the hurricanes. Their designs provide examples of how, with a limited budget, a community can provide tourists and residents with access to local waterways and the coastal environment.

Safe Harbor Options Studied

LSG is spearheading a study of safe harbor options for commercial fishermen in the Vermilion Bay area. The goal is to identify which points along waterways are passable and which are impassable due to depth, in light of the vessel dimensions of the commercial fishing fleet in the area. Once the information is collected and researchers have an idea of what the water bottoms look like, engineers can create designs and develop size and cost estimates of what the infrastructure for a safe harbor might entail. The project is the result of a $35,000 FEMA Community Resilience Innovation Challenges grant, sponsored by the Rockefeller Foundation.

Coastal Zone Boundary Expansion

Louisiana's original coastal zone boundary was proposed in 1975 following a multi-agency research project sponsored by the National Oceanic and Atmospheric Administration (NOAA).

While the 1975 coastal zone boundary study proposed a scientifically based and fairly extensive coastal zone, political considerations drastically reduced the size of the state's first proposed landward coastal zone (CZ) boundary, which was to be a band three miles inland of the coast. Such a restrictive coastal zone did not meet the requirements of the Coastal Zone Management Act and did not receive federal approval. Through a process of political concessions and accounting for biophysical parameters, which included all or parts of 19 coastal parishes and approximately 5.3 million acres of land, a revised CZ was adopted in 1978.

During the 2009 legislative session, Louisiana Senate Concurrent Resolution No. 60 asked the Coastal Protection and Restoration Authority (CPRA) to conduct a science-based study on the adequacy of the existing inland coastal zone boundary. The Louisiana Department of Natural Resources' Office of Coastal Management took the lead on the study and worked with the LSG Law & Policy Program to develop draft findings. Based on that study, the Louisiana Legislature revised and expanded the CZ boundary during its 2012 regular session.

OUTREACH

Delcambre Port Waterfront Expansion

The community of Delcambre has a new boat launch that can handle four boats at a time, as well as a new 7,500 square-foot pavilion for its seafood and farmers market. The $4 million project – called Bayou Carlin Cove – also includes a public fishing pier.

LSG worked with local officials in their efforts to acquire a $3.4 million federal community development grant and $600,000 from the Twin Parish Port District for the project. Previously, the 14-acre Bayou Carlin Cove site had no parking and could only handle one boat at a time. Now, the facility boasts enough space for multiple fishermen to sell their catch directly to the public, and there is room for future expansion, such as an RV park and boat storage warehouse.

In 2005, Hurricane Rita devastated Delcambre. It was flooded again by Hurricane Ike in 2008. Facilitated by LSG, the LSU Landscape Architecture Department and University of Louisiana at Lafayette (ULL) Architecture and Design programs developed concept redevelopment plans for the town that were used in the grant applications.

Project Catalogs Coastal Cemeteries

As Louisiana's coastal residents are forced to move inland because of subsidence and sea level rise, cemeteries are often overlooked as part of the cultural landscape.

A project funded by LSG has recorded coastal cemetery data for 167 cemeteries before they are lost to the forces of erosion and the Gulf of Mexico. A number of groups have previously recorded GPS coordinates for the state's cemeteries, but most are single-point locations. LSG's Louisiana Coastal Cemetery Project recorded outer perimeter points for each cemetery surveyed. This method allows the total land area for each cemetery to be shown instead of a few random points.

The Louisiana Department of Health and Hospitals Disaster Mortuary Response Team used geospatial cemetery data from the project in Plaquemines and St. Bernard parishes to restore graves uprooted by Hurricane Isaac in 2013. Additionally, the project has been featured in the media, most recently in *Country Roads* magazine (www.countryroadsmagazine.com/culture/history/fragile-grounds).

Bayou St. John Restoration

In 1699, the French explorer Pierre Le Moyne Sieur d'Iberville was looking for a short overland route from Lake Pontchartrain to the Mississippi River. Local natives brought him to a sleepy bayou that successfully put he and his men near the east bank of the Mississippi. That discovery of what would become known as Bayou St. John (BSJ) fated the placement of the colony of Nouvelle Orleans, providing a calm-water access route for the wind-driven trade to and from the center of the Louisiana Territory.

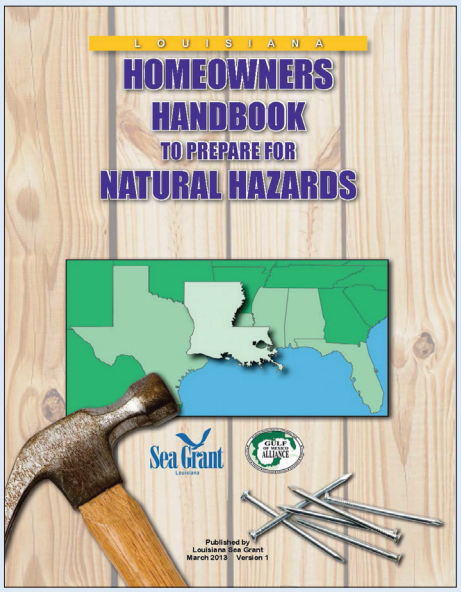
With the invention of the steam engine and then internal combustion, the trade route on Bayou St. John fell from favor giving way to the Mississippi River. The once critical bayou degraded to a relic distributary whose main significance was a flood liability during hurricanes.

In 2011, the fate and character of BSJ again changed. As part of NOAA's Regional Hydrological Restoration Program, a proposal submitted by the Gulf of Mexico Sea Grant programs was awarded initial funding to restore vital water flow to BSJ by eliminating redundant and dysfunctional water control structures built in the 1960s. LSG Marine Extension worked with local stakeholders to implement the project. With support and supplemental funding from the Orleans Levee District, the project was finished in late 2013 - completing the connection between the Lake's brackish waters and the interior of BSJ. Suitable aquatic species once again have recolonizing the tidally influenced bayou.

Homeowners Handbook to Prepare for Natural Hazards

The *Louisiana Homeowners Handbook to Prepare for Natural Hazards* was created to help coastal residents prepare for natural hazards to reduce risks to family and property. The handbook explains the forces of nature that act on structures during storms, including the dangers associated with high winds, heavy rain, and storm surge. It further lays out ways to gird a home against these forces to minimize or negate their effects, as well as information on how to reduce the human toll exacted by dangerous storms.

LSG produced the handbook with the help of other state, regional, and national organizations. It was funded through a program of the Gulf of Mexico Alliance (GOMA). To date, more than 16,000 copies of Louisiana's book have been distributed through the mail, libraries, retail and other outlets, and community rating system meetings to homeowners as well as local governments.

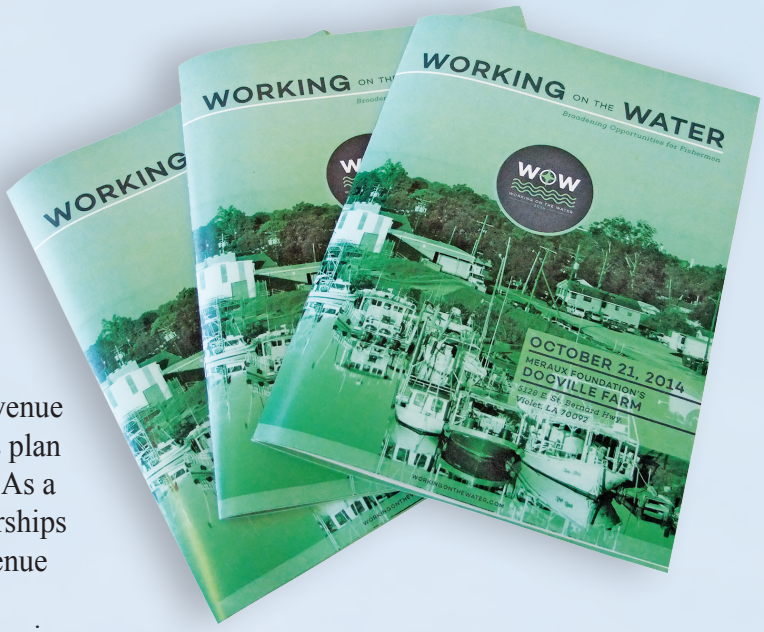


Assisting Communities through the Community Rating System (CRS)

LSG is part of a regional project team that is working with local coastal communities participating in the National Flood Insurance Program (NFIP) to facilitate the transition to the 2013 CRS Coordinators' Manual and provide technical assistance in maintaining and improving the class rating under the new manual with emphasis on outreach, such as the creation of a Program for Public Information (PPI). The team is working with the Mississippi Gulf Coast Coastal Hazard Outreach Strategy Team (C-HOST) and the Louisiana Southwest Informational Floodplain Team (SWIFT) to strategically develop materials that best address the needs of communities participating in the Community Rating System (CRS).

In Louisiana, SWIFT consists of floodplain managers and planners from three parishes (Vermilion, Cameron, and Calcasieu) and three municipalities (the cities of Sulphur, Lake Charles, and Iowa). Materials developed through this project serve as a model for other coastal communities throughout the Gulf. Collaborators include LSG's Law & Policy Program, Mississippi-Alabama Sea Grant Consortium, Mississippi-Alabama Sea Grant Legal Program, Blue Urchin, and Grand Bay National Estuarine Research Reserve.

EDUCATION



Exploring Eco-Tourism Opportunities

Coastal landowners, farmers, charter fishermen, marina owners, swamp tour operators, and others interested in income opportunities from nature-based tourism attended LSG-sponsored seminars, such as the *Coastal Ecotourism Workshop* at Stella Plantation, the *Working on the Water Summit* in St. Bernard, and the *Lake Charles Eco-Tourism Workshop*. Topics participants explored included revenue potential from natural resource enterprises, business plan development, and liability and legal considerations. As a result, several nature-based tourism business partnerships have developed, along with the creation of new revenue streams for sole-proprietor establishments.

Secondary revenue sources from nature-based tourism can often provide commercial fishermen with the supplemental income needed to keep their primary enterprise afloat – the harvest of wild, Gulf of Mexico seafood.

Louisiana History from Different Perspective

Louisiana has a long and rich history. Groups like Native Americans, French, Spanish, Acadians, and Creoles have left their mark. But with so many cultural influences, it's only natural that the clarity and distinctiveness of the many inhabitants become confused and indistinguishable.

Author, retired research professor, and LSG Scholar Don Davis clears away some of the gray in his book *Washed Away? The Invisible Peoples of Louisiana's Wetlands*, a comprehensive review of the residents of Louisiana's coastal plain from the settlement of New Orleans through the year 2008. Davis explores how those of different cultures who settled in the state – including Chinese, Filipino, Bohemians, Germans, Jews, Africans, and Los Islenos – shaped the development and industrialization of Louisiana's coast.