# **Making Yourself Hurricane Resistant**

"I grew up in this area and we heard the stories of Hurricane Audrey back in 1957 and how horrible it was. I even repeated some of those stories myself, but I had no idea the amount of destruction that a hurricane could bring."

Kevin Savoie, 2005 Louisiana Sea Grant & LSU AgCenter Marine Extension Agent and Hurricane Rita Responder

The start of hurricane season on June 1 begins the countdown to the 10th anniversary of Hurricanes Katrina (Aug. 29) and Rita (Sept. 24). Combined, the storms took a total of 1,963 lives in the US and caused \$120 billion in damages.

Immediately following the hurricanes, Louisiana Sea Grant Extension (LSG) agents helped commercial fishermen, seafood processors, local governments and neighborhoods dig-out and start the recovery process. Further inland, Sea Grant staff and researchers developed economic impact assessments, provided assistance to those on the front lines and developed tools to help

communities become more resilient in the face of future storms. One of those tools designed for property owners is the Louisiana Homeowners Handbook to Prepare for Natural Hazards.

"The information in the book is specific to Louisiana," said Melissa Daigle, resiliency specialist with LSG. "There is information on preparing evacuation plans and kits, construction practices, retrofitting, shutter styles, insurance and emergency contact numbers. Basically, everything a homeowner needs to know in coastal Louisiana to be best prepared for coastal hazards."

The handbook is available in PDF format at <a href="http://goo.gl/UPFIPd">http://goo.gl/UPFIPd</a> as a free download that can be read on a computer or tablet. Free hard copies

are available at various locations throughout coastal parishes, or the book can be ordered for \$5 - to cover postage and handling - by emailing Jessica Schexnayder at *jsche15@lsu.edu*.

"The Cameron community is better prepared and resilient since Hurricane Rita," noted Savoie. "The community adopted the International Building Code and implemented mitigation practices. Those who followed the new codes when rebuilding made it through Hurricane lke (in 2008)."

Another tool developed by LSG is the Louisiana Coastal Hazard Mitigation Guidebook. A bit more technical than the Handbook, the Guidebook provides strategies that can help planners, managers and property owners in coastal communities better prepare for and recover from hurricanes, as well as deal with issues such as subsidence, sea level rise and other flooding. The Guidebook can be downloaded from http://goo.gl/bN2q58, or a free printed copy can be ordered by emailing jsche15@lsu.edu. Again there is a \$5 charge to cover postage and handling.

"Making yourself hurricane-proof is a deliberate act," said Rusty Gaudé, LSG and LSU AgCenter Marine Extension agent for Jefferson, Orleans, St. Charles and St. John parishes, and a Hurricane Katrina responder and survivor. "You have to have a plan. You have to be able to execute that plan."



#### Hagen Named Louisiana Sea Grant Laborde Chair

Scott C. Hagen has been named the John P. Laborde Endowed Chair for Sea Grant Research and Technology Transfer.

"Louisiana Sea Grant (LSG) is interested in providing additional support to the National Oceanic and Atmospheric Administration's

(NOAA) Weather-Ready Nation program," said Robert Twilley, LSG executive director. "Scott brings the background and experience to help achieve that objective. Additionally, his expertise in modeling coastal flooding during extreme weather events will tie in well with the Coastal Emergency Risk Assessment (CERA) program." (http://coastalemergency.org/)

Hagen comes to LSU from the University of Central Florida, where he was a professor in the Department of Civil, Environmental & Construction Engineering for more than 17 years. He received his Ph.D. in civil engineering from the University of Notre Dame and his Bachelor of Science degree in engineering from the University of Iowa. He is a licensed professional engineer (P.E.) in the state of Florida, a diplomate of coastal engineering (D.CE), a diplomate of water resources engineering (D.WRE), and was recently

named a fellow of the American Society of Civil Engineers (ASCE).

Hagen is a past member of the Board of Governors for ASCE's

Hagen is a past member of the Board of Governors for ASCE's Coasts, Oceans, Ports and Rivers Institute and served as Chair of the Coastal & Estuarine Hydroscience Committee. In 2012, he chaired

and hosted the 10th International Conference on Hydroscience & Engineering, where he was awarded the Outstanding Achievement Award for Advancement of the State-of-the-Art in Hydroscience & Engineering. He presently serves on the predictive modeling technical

advisory group for the 2017 Louisiana Coastal Master Plan.

Hagen also will hold the rank of full professor in the Department of Civil & Environmental Engineering at Louisiana State University, along with an appointment in LSU's Center for Computation & Technology. His primary research focus is on massively parallel, high performance computational modeling of ocean, coastal and inland shallow water flows. His recent efforts expand into transport and ecological modeling, particularly with respect to the coastal dynamics of sea level rise.

The John P. Laborde Endowed Chair for Sea Grant Research and Technology Transfer was established at LSU in 1994 with a gift of \$600,000

from Tidewater Inc. and a match of \$400,000 from the Louisiana Board of Regents. The Laborde Chair has enabled Louisiana Sea Grant to bring highly qualified scientists to LSU to focus on marine and coastal issues critical to the state.



Scott Hagen

#### Sea Grant-Supported Students Graduate

Twelve graduate students supported by Louisiana Sea Grant completed their degrees in 2014. The list includes:

• Rifat Quamrul Alam,
Master of Science, University of
Louisiana at Lafayette
Department of Geosciences.
Thesis: Development and
Enhancement of a Mechanistic
Model of Little Vermilion Bay:
Incorporation of Stochastic
Cloud Cover and Nutrient Flux
as They Affect Light Dynamics
and Phytoplankton Growth.
Major professor: Barbara Benson.

• Ruwaida Bari, Master of Science, University of Louisiana at Lafayette Department of Geosciences. Thesis: Analysis of Water Parameters, Light Dynamics and Phytoplankton Growth Kinetics in Little Vermilion Bay: Implications for Mechanistic Model Development. Major professor: Barbara Benson.

• April Elizabeth Bryant Mason, Doctor of Philosophy, Louisiana State University School of Renewable Natural Resources. Dissertation: *Nitrogen*  and Carbon Export to the Gulf of Mexico by the Atchafalaya River, a Major Distributary of the Mississippi River. Major professor: Jun Xu.

• Ciara Chambers,
Master of Science, Tulane
University Department of Earth
and Environmental Sciences.
Thesis: Spatial and Temporal
Variability of Benthic
Respiration in a Developing
Deltaic Estuary (Wax Lake
Delta, Louisiana). Major
professor: Alex Kolker

• Benjamin S. Eberline,
Master of Science, Louisiana
State University School of
Renewable Resources. Thesis:
Population Dynamics of the
Eastern Oyster in the Northern
Gulf of Mexico. Major professors:
Megan La Peyre and Jerome La
Peyre.

• Chad Robert Judy, Master of Science, Louisiana State University School of the Coast and Environment. Thesis: Impacts of the Deepwater Horizon Oil Spill on Vegetation Structure and Function of the Common Reed Phragmites Australis:

a Mecocosm Study. Major professors: Aixin Hou and Irving Mendelssohn.

• James Laleggio, Master of Science, Louisiana State University School of Renewable Natural Resources. Thesis: Direct and Indirect Effects of Nutrient and Salinity Manipulation on Wetland Vegetation; Herbivory and Flooding Stress as a Function of Fertilization. Major professor: Andy Nyman.

• Gregory Allen Matteson, II, Master of the Science, University of New Orleans Department of Civil and Environmental Engineering. Thesis: Characterization of Dredged Sediment used in Coastal Restoration and Marsh Creation Projects. Major professor: Malay Ghose Hajra.

• James Dustin Naquin,
Master of Science, Louisiana
State University School of the
Coast and Environment. Thesis:
Hurricane-induced Geologic
Change and Palynological
Assessment of a Rapidly
Subsiding Deltaic Environment
in Coastal Louisiana. Major

professor: Kam-biu Liu.

• Jason P. Peitroski, Master of Science, Louisiana State University School of the Coast and Environment. Thesis: Effect of the BP Deepwater Horizon Oil Spill on Critical Marsh Soil Microbial Functions. Major professors: John R. White and Ronald Delaune.

• Cyndhia Ramatachnadirane, Master of Science, Tulane University Department of Earth and Environmental Sciences. Thesis: Coastal Marsh Formation and its Relation to Sediment Exchange along the Chenier Plain in Southwest Louisiana. Major professor: Alex Kolker.

• Molly Marie Rybovich,
Master of Science, Louisiana State
University School of Renewable
Natural Resources. Thesis: Growth
and Mortality of Spat, Seed and
Market-Sized Oysters (Crassotrea
Virginica) in Low Salinities
and High Temperatures. Major
professors: Megan La Peyre and
Jerome La Peyre.

Persons interested in obtaining copies of the theses and dissertations should contact Jessica Schexnayder at *jsche15@lsu.edu*.

#### Louisiana Sea Grant Addresses New Oyster Refrigeration Requirements

Louisiana Sea Grant is helping oyster harvesters adjust to new "time/temperature" rules for their catch with a series of workshops and with research into alternative means of cooling oysters.

Changes in the state's Sanitary Code require that "white tag" oysters – those that can be sold for raw consumption in interstate commerce – be placed under mechanical refrigeration with an air temperature of less than or equal to 45 degrees F within one hour of harvest during May through October to lessen the likelihood that consumers will be sickened by *Vibrio* bacteria. The internal meat temperature of white-tag oysters also must be brought down to 55 degrees F within six hours. *Vibrio* normally live in warm sea water. Eating raw seafood contaminated with *Vibrio* parahaemoloyticus can cause intestinal distress, and *Vibrio* vulnificus can be deadly for immunocompromised persons. It is unknown how many cells of the bacteria are required to cause illness in humans, but cooler temperatures slow the multiplication of the pathogens. Louisiana is one of 20 states required to have a *Vibrio* management plan.

"This is part of the Department of Health and Hospital's zero-tolerance policy for *Vibrio vulnificus*," said Julie Falgout, seafood industry liaison with Louisiana Sea Grant. "In the past, they just put oysters on the deck and had several hours before they had to be cooled. The new rules are basically for oysters destined to be eaten raw."

Falgout helped organize the Oyster Industry Workshop in December in Terrebonne Parish as part of the Louisiana Fisheries Forward program that brought together people with the answers to help fishermen comply with new regulations. "It's part of bringing the university to the coast," she added. The meeting also included information on weights and measures, utilizing GPS technology to locate oyster leases and other best-management practices.

John Supan, a research professor, oyster specialist and the director of the Sea Grant Oyster Research Lab also has an interest in the new rules as they affect two technologies – intensive or off-bottom culture and triploid oysters. Off-bottom production eschews traditional reef cultivation in favor of growing the bivalves in mesh bags that are suspended in the water column either by floats or by a series of anchored lines. The bags are emptied by hand, and the harvest does not require dredging. Triploid oysters are bred to be sexually sterile. Ordinary oysters (dipliods) direct their energy toward spawning in the summertime and are significantly smaller at that time of year. Triploid oysters do not reproduce and remain meaty and marketable during the summer. They also have faster growth and greater survival rates.

However, the new rules will defeat the economic advantages of triploid oysters raised in off-bottom aquaculture systems. The smaller vessels used to harvest these oysters do not have the deck space needed to carry the required refrigeration units; icing is currently not permitted; and returning the oysters to shore within the one-hour requirement is not always feasible.

"Triploid oysters have a market advantage in the summer – they are fat when the others are typically skinny," Supan explained. "Without the need to dredge, fishermen can use a skiff instead of a lugger to harvest off-bottom oysters for tremendous fuel savings. This could mean fuel costs of \$17 per week vs. \$1,000 per week. However, if you can't follow the time/temperature rule then you lose a major market advantage. Growers can only harvest from November through April without on-board refrigeration. By the dead of winter, the diploids are fat again. Instead of having an eight-month market advantage, you only have a two-month advantage. A tool or technology is needed to meet the regulatory time/temperature requirements for summer harvest on small vessels and to change mechanical refrigeration requirements."

With funding from the National Oceanic and Atmospheric Administration, Supan; Steve Hall, associate professor of Biological Engineering with LSU and the LSU AgCenter; and graduate student Melody Thomas are investigating the use of on-board icing in lieu of mechanical refrigeration in a project titled "On-board Rapid Cooling of Cultured Oysters to Address Regulatory Needs," in collaboration with FDA and industry representatives. Their main objective is to produce a commercial prototype machine that washes oysters then chills them with ice. They also plans to compare the effectiveness of dipping oysters in static vs. circulating ice slurries; to test the levels of *V. vulnificus* and *V. parahaemolyticus* in treated and control shellfish; to generate more up-to-date data that federal and state shellfish control authorities can use when making regulations and; to test the gaping of iced vs. un-iced oysters in cold storage.

"If successful, this research could improve the economic feasibility of oyster culture during the summer months. This would lead to improved harvesting and refrigeration practices," Supan said.

#### **Message from the Executive Director**

We mark three solemn events in 2015 that forever changed the way we live in the Mississippi River Deltaic Plain. This summer it will be 10 years since Hurricanes Katrina and Rita. And this spring it will be five years since the Deepwater Horizon oil spill.

Natural and manmade catastrophes such as these have had a profound influence on our coast, our citizens and Louisiana Sea Grant's (LSG) mission. Without a doubt, LSG is the leading program within the Sea Grant network when it comes to responding to, recovering from and preparing for devastating disasters.

In the past two years, we have distributed more than 15,000 copies of the *Homeowners Handbook to Prepare for Natural Disasters*. Those who need a free copy in advance of hurricane season can order one from Louisiana Sea Grant, or download it from our website (www.laseagrant.org/wp-content/uploads/LA\_Homeowners\_Handbook\_v3.pdf). The book is a valuable resource to help mitigate your risks.

Our new Sea Grant Laborde Chair – Scott Hagen – brings invaluable experience in modeling flooding during tropical storms and hurricanes that will help our state become more "weather ready." Our outreach specialists are spearheading efforts to identify safe harbors for the commercial fishing fleet, as well as working with our coastal communities to make them more resilient following a storm. Additionally, Louisiana Sea Grant's recently funded resilient communities projects will help local governments better prepare financially for natural disaster cleanup and explore non-structural methods to cope with flooding risks.

As we look back on all the hurricanes, flooding and other calamities of the past decade, Louisiana Sea Grant also is looking forward and strengthening our ability to withstand and rebound from similar hazardous events.

Robert Twilley, Ph.D. Executive Director Louisiana Sea Grant College Program



## **UROP Research Projects Announced**

The Louisiana Sea Grant (LSG) College Program established the Undergraduate Research Opportunities Program (UROP) in 1992. It provides talented undergraduate students interested in pursuing advanced studies in marine-related disciplines with hands-on research experience. Projects receive funding in the range of \$1,500-\$2,500.

"UROP is a wonderful opportunity for undergraduates," said Matt Bethel, LSG assistant executive director for research. "Participating in the program can increase their competitiveness as graduate students and help them make career-related decisions. It also allows students to establish a working relationship with a faculty mentor."

In addition to performing their project under the guidance of a faculty member, each UROP student is required to produce a written final report of research accomplishments and to present their findings at LSU during an LSG-sponsored event. UROP students are expected to submit abstracts of their research results for a poster session or similar event at a statewide conference related to coastal issues. Students also are encouraged to present their findings at national and international symposia and to publish in peer-reviewed scientific journals.

UROP applications are accepted each fall (due date is typically early December) for projects starting the following March. Full-time undergraduate students at all Louisiana colleges and universities are eligible. Junior- and senior-level students may be better prepared to conduct research projects, but an application from any student who has the support of a faculty mentor will be considered.

#### The following students were selected for 2015:

**Richard Grabert,** marine biology major, Nicholls State University Faculty advisor: Raj Boopathy, Department of Biological Sciences *Tracking the Presence of Vibro Pathogens in Louisiana Seafood* 



The primary goal of the project is to monitor Louisiana seafood for the presence of various *vibrio* species for a period of one year in oysters, shrimp, fin fish and crab. The specific objectives are to monitor four species of *Vibrio*, namely, *V. vulnificus*, *V. parahaemolyticus*, *V. harveyi*, and *V. chlorae*. A second objective is to compare conventional culture based methods with a modern molecular mother using *vibrio* specific primer. A third objective is to observe seasonal differences in *vibrio* populations in Louisiana seafood. A

fourth objective is to educate the public in a proper ways of cooking seafood to avoid *vibrio* infection.

**Kathalina Tran,** ecology & evolutionary biology major, Tulane University Faculty advisor: Sunshine Van Bael, Department of Ecology and Evolutionary Biology

The Symbionts of Bald Cypress Trees along a Salt Gradient

The project objective is to collect, curate and identify the fungal and bacterial endophytes associated with bald cypress roots and leaves from four sites where bald cypress grows naturally in southeast Louisiana. Sodium levels in the soil will be measured to correlate endophyte communities with salinity. Additionally, a greenhouse experiment will be conducted to test how the presence or absence of symbionts affects the biomass and growth rates of new seedlings, rates of photosynthesis and root morphology.

**Taylor Weakley,** coastal environmental science major, LSU Faculty advisor: Sibel Bargu, Department of Oceanography and

Coastal Sciences



Evaluating How Rising Sea Surface Temperature Alters Estuarine Phytoplankton Growth

The overall objective is to investigate important, yet poorly understood, processes impacts or – potential shifts in phytoplankton communities and the bioaccumulation and bio magnification of persistent organic pollutants (POPs) in coastal/estuarine

food web systems to changing climate-regimes. To fulfill the objective, the researcher will quantify phytoplankton species shifts, zooplankton grazing preferences, and the bio magnification of toxic organic contaminants (e.g., methylmercury) at the base of the estuarine food web under current and predicted sea surface temperatures and pCO2 conditions.

**Abigail Hagen,** biology/pre-med major, Nicholls State University Faculty advisor: Enmin Zou, Department of Biological Sciences

Effects of Triclosan on Activities of Epidermal Chitinolythic Enzymes in the Fiddler Crab Uca pulilator: An Initial Mechanistic Look into the Inhibition of Crustacean Molting by this Pesticide

The project goal is to gain insight into the mechanism for inhibition of crustacean molting by the pesticide Triclosan (TCS) using the fiddler crab, *Uca pugilator*. The proposed research intends to address the question of whether TCS' inhibition of crustacean molting involves suppression of activities of molting enzymes in the epidermis. Results of this project will enhance understanding of the effects of pesticide use on marine species.

#### Megan Chestnut,

biological engineering major, LSU
Faculty advisor: Terrence Tiersch, Aquaculture Research Station
Fabrication and Quality Control Testing of a Novel Sperm Counting
Device for Marine Species



The project goal is to create an economical device that can be mass produced and will standardize the method for determining sperm concentration and motility during on-site cryopreservation. There are four objectives for this project. The first is to fabricate a reproducible and inexpensive novel counting chamber device using polydimethylsiloxane (PDMS). The second objective is to evaluate fabrication precision and device reproducibility. The third objective is to

determine the accuracy and precision of the PDMS-based counting chamber in estimating the concentration of sperm cells. The last objective is to determine the accuracy and precision of the PDMS-based counting chamber in estimating the motility of sperm cells.

**Michael Mahoney,** ecology and evolutionary biology major, Tulane University Faculty advisor: Jordan Karubian, Department of Ecology and Evolutionary Biology

Effects of the Hypoxic Zone on Important Trophic Dynamics in the Gulf of Mexico

Analysis of telemetry data conducted by the Karubian lab thus far indicates that prey distribution is likely a major determinant of pelican foraging behavior. The extent of individual foraging areas is also correlated to some degree with the extent of the dead zone in a given year, suggesting that

over dispersion of menhaden could lead to decreased efficiency in pelican foraging (i.e. more dives per foraging trip and/or increased travel time). Using telemetry, fisheries data and environmental imagery in tandem, patterns will be revealed across multiple trophic levels to understand how hypoxia influences the demography of a top predator, with implications for other Gulf species as well as regions affected by hypoxia worldwide.

**Emily Nall,** biological sciences major, LSU Faculty advisor: J. Cameron Thrash, Department of Biological Sciences Characterization of a Novel Bacterial Isolate from Louisiana Coastal Waters with the Potential for Hydration Degradation



This project objective is to complete physiological characterization of LSUCC41, including growth optima, carbon sources, etc. Another objective is to complete genomic characterization of LSUCC41 (which represents a member of a new family of *Gammaproteobacteria*), including comparative analyses with HIMB30, bacteria common in the marine environment that is not harmful to human health

**Brandeus Davis**, applied coastal environmental science major, LSU Faculty advisor: Michael Polito, Department of Oceanography and Coastal Sciences

Impact of Climate-Driven Shifts in Vegetation on Carbon Dynamics in Marsh Food Webs



The project will analyze the isotopic composition of primary producers (saltmarsh and mangroves, benthic microalgae, sediment organic matter) and available benthic consumers (nematodes, crabs, snails and bivalves) to determine how mangrove expansion may influence the basal carbon sources that fuel commercially and recreationally important coastal food webs. This will help inform how

further winter warming and increases in mangroves will affect Louisiana's coastal ecosystems.

**Michael Gruden,** coastal sciences, chemistry and psychology major, LSU. Faculty advisor: Mark Benefield, Department of Oceanography

and Coastal Sciences



Documenting Spatial Distributions of Gelatinous Zooplankton in Louisiana Estuarine Environments with an Advanced Camera System (ZOOVIS)

The project has two phases. The first will involve construction of a smaller version of ZOOVIS (zooplankton visualization system) suitable for estuarine deployment from a small boat. The original

ZOOVIS system was designed to operate to depths of 2,000 meters and is unnecessarily heavy and large for the estuarine work. The second phase will be to survey a transect from LUMCON facilities to the mouth of Terrebonne Bay in order to quantify the spatial pattern of gelatinous and other zooplankton in the system.

### Become a Louisiana Sea Grant LaDIA Faculty Fellow

Louisiana Sea Grant is offering one-year fellowships to faculty whose careers are focused on coastal innovation. Applications are being accepted through April 15.

LaDIA (Discovery-Integration-Application) fellows will participate in three, three-day retreats over the course of the 2015-16 academic year. "The retreats are designed to broaden fellows' knowledge of coastal concerns, hone fellows' communication skills, and expand their ability to address coastal challenges," said Robert Twilley, Louisiana Sea Grant executive director.

Faculty members from any Louisiana university or college may apply. Applicants can be from a wide range of fields, including traditional environmental sciences such as biology, chemistry and engineering, to policy, design, architecture, urban planning and environmental justice. Fellows must commit to attending all three expense-paid retreats.

"The retreats will be led by national leaders in the fields of science communication, public policy and outreach," said Twilley. "Sea Grant marine extension agents also will provide their perspectives on how coastal issues affect communities, and there will be opportunities to network with local leaders."

For more information or application materials, visit www. laseagrant.org/outreach/ladia/, or contact Katie Lea at klea@lsu.edu.

#### Sea Grant Kiosk Available to Libraries, Museums

Louisiana Sea Grant is again loaning a video kiosk to public libraries and museums.

"The kiosk contains several short films Sea Grant produced about the cultural and environmental history of the coastal zone," said Roy Kron, LSG communications director. "The films are available online, but loaning the kiosk to libraries lets us reach children and adults who might otherwise not see them."

The videos include:

• A History of Louisiana Dried Shrimp, which recounts the dried shrimp industry's growth nationally and internationally.

• Edens on the Edge is a documentary that portrays the sheer

phenomenal beauty of the state's coastal refuges, wildlife and landscape, while serving as a reminder that many of these habitats are threatened due to forces such as erosion, land subsidence and sea level rise.

• The Telling

Tide chronicles
the work from four high schools
along the coast that were invited
to participate in a one-year
oral history project aimed
at engaging students in
scrutinizing their community

heritage, the land they have grown up on, and what they stand to lose as Louisiana's coast disappears.

Libraries and museums interested in borrowing the kiosk should contact Kron at *rkron@lsu.edu*.



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## Louisiana Sea Grant Seeks Public Comment for Program Review

The Louisiana Sea Grant College Program (LSG) will have its scheduled four-year review on June 16-17, 2015, in the Energy, Coast & Environment Building on the LSU Baton Rouge campus.

A federal Site Review Team convened by the Director of the National Sea Grant College Program will review and discuss LSG management and organization, stakeholder engagement and collaborative network/National Oceanic and Atmospheric Administration (NOAA) activities.

People who would like to offer comments to the review team on these aspects of the program are invited to submit written statements no later than Friday, June 12, 2015. Comments should be e-mailed to the National Sea Grant College Program at oar.sg.feedback@noaa.gov.

Following the site visit, the review team will produce a report to the National Sea Grant College Program and LSG. The review is part of a larger effort by the National Sea Grant College Program to foster increased cooperation among the 33 Sea Grant Programs nationwide and to understand how local and regional programs and priorities relate to NOAA national needs and priorities.

Louisiana Sea Grant is an ocean and coastal research, extension, outreach and education program. Its administrative office is located at Louisiana State University's Baton Rouge campus, and it has extension, outreach and education offices in parishes throughout the Louisiana Coastal Zone. Louisiana Sea Grant is funded by NOAA, Louisiana State University, Louisiana coastal parishes, a variety of local, state and federal competitive grants and by private endowments. LSG personnel provide training, education, expert advice and assistance on healthy ecosystems and habitats, resilient communities and economies, sustainable fisheries and aquaculture, and education and workforce development. Sea Grant-funded scientists conduct research to help find solutions to these types of coastal issues.

For more information about the review, contact Katie Lea at *klea@lsu.edu*.