

Mississippi River Microplastics on the Menu

As the Mississippi River tributaries drift across 31 states, they pick up an assortment of passengers. Fertilizers, pesticides, animal waste and sewage all travel down the river toward Louisiana. One pollutant, often ignored, but equally detrimental to water quality, is plastic. A plastic bottle tossed in Minnesota can travel the entire length of the river with Louisiana as the last stop before the Gulf on the landfill-like tour. And unlike other trash, plastic does not decompose; it only breaks into smaller pieces.

"We are pulsing massive amounts of plastic into our waterways and no one has looked at the implications. It's a chronic environmental stressor," said Mark Benfield, professor at Louisiana State University. His lab is one of the first to look at plastics in the river and what impacts they are having.

Benfield spent much of his career studying marine zooplankton, but has long been interested in plastics, especially microplastics (defined as less than 5 millimeters, smaller than a Mardi Gras bead). It took a class field trip with students to really expose the pervasiveness of the problem. In 2015, Benfield and his students began collecting plankton samples. They pulled up one sample and found plastic in it. Then another. And another. All day long, samples with plastic were brought on board.

Since then, Benfield and others in his lab have been using Louisiana Sea Grant support to collect and examine samples. Aboard a small johnboat dodging shipping vessels, Benfield and post-doctoral research scientist, Matt Kupchik pull samples both north and south of Baton Rouge and New Orleans. "There is a lot of plastic in the river. And there is a heck of a lot going into our estuaries and the Gulf," observed Benfield.

Most of the plastic is really small – on the order of 10 - 100 micrometers, similar in size to many single-celled algae. Too small to pick up. "The sizes are literally infinite. The plastic breaks down into smaller and smaller pieces. The only limitation for collecting them is our current technology," said Kupchik.

Using a combination of nets, pumps, filters, acid digestions and cross-polarized microscopes, they have confirmed both the presence and abundance of microplastics in the Mississippi River. These ubiquitous, microscopic plastics are problematic, because in addition to being a physical pollutant, plastics leach toxic chemicals like bisphenols, phthalates, styrene and other plasticizers into our waters and our bodies.

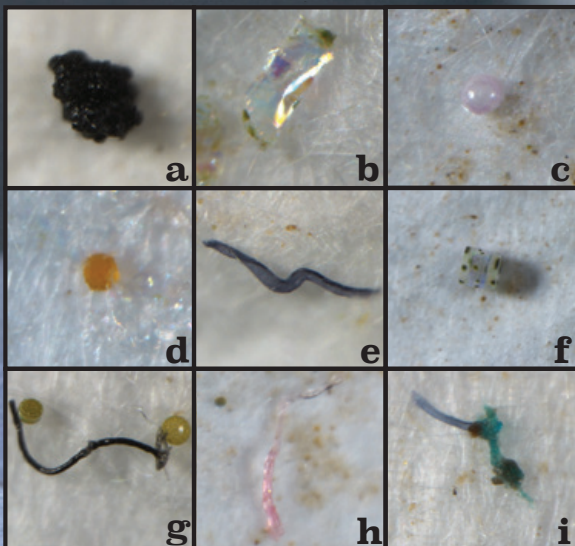
The worst offenders are fibers. These small threads are shed every time you wash fleece, polyester and other synthetic fabrics. Given their flexibility, size and appearance to organic materials, they are also the hardest to collect. "To their credit, a lot of plastic is trapped by wastewater treatment plants, but the fibers still find a way through," said Benfield.

Thus far Benfield's lab has sampled in the summer, fall and winter. Water sampling trips as short as 10 minutes yield nets full of plastic. The real test will be this spring as large quantities of plastic-laden water chug down the Mississippi River and into our waterways.

Can You Spot the Plastic?

Some are microplastics and some are naturally occurring organic matter.

Answer key inside.



All images courtesy of **LSU** College of the Coast & Environment Zooplankton Ecology Laboratory



PHOTO BY ANTOSKABAR (FLICKR)



▼1



▼2



▼3



▼4



▼5



▼6



▼7

LA DIA Fellow Applications Open

In an ongoing effort to build stronger relationships between faculty and communities, Louisiana Sea Grant (LSG) has been working with select research faculty, known as LA DIA Fellows, on how to incorporate their science into meaningful results. Over the course of three retreats, Fellows explore innovative solutions to coastal challenges in Louisiana and beyond.

During the first two retreats, LA DIA Fellows received communication training in addition to engaging with community members from southeastern coastal parishes. In May, they will travel to the Chenier Plain to get a more complete picture of Louisiana's coast.

LSG invites early tenure track faculty at all Louisiana universities to learn more about the Louisiana coast. The year-long LA DIA fellowships will broaden the Fellows' knowledge of coastal concerns, hone their science communication skills and expand their ability to address coastal challenges through applied research. Fellowship applications for the 2017-2018 academic year are due April 14.

For application information, visit www.lseagrant.org/outreach/ladia/fellowships/.

Featured photos are some highlights from the 2016-17 class:

1. Fellows learn about the impacts of levee systems with South Lafourche Levee District manager Windell Curole.
2. The Pointe-au-Chien tribe shared both their coastal land loss stories and their lunch during a field trip to the community center.
3. Louisiana State Representative Jerome "Zee" Zeringue provides feedback to Carol Wilson and Beth Stauffer on best practices for discussing their research with communities.
4. Liz Skilton and Beth Stauffer look out over an off-bottom oyster hatchery operated by Louisiana Sea Grant.
5. Consultant Amy Clipp gives insight on writing for general audiences as the fellows prepare for recorded interviews.
6. Achim Herrmann sees the land loss crisis first-hand during a guided boat tour from Pointe-au-Chien leaders.
7. Jimmy Nelson tours the boats from Camardelle Seafood in Grand Isle with Marine Extension agent Rusty Gaudé.

Microplastic ID Answer Key

From Front Cover

- | | | | | |
|------------|---|------------|------------|------------|
| a. Plastic | b. Natural | c. Plastic | d. Natural | e. Plastic |
| f. Natural | g. Both: Black - plastic, Green - diatoms | | | |
| h. Plastic | i. Plastic | | | |

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,” according to Matt Bethel, LSG assistant executive director for research. “Participating in the program increases 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.”

Each UROP student is required to produce a written final report of research accomplishments and to present their findings during an LSG-sponsored event. UROP students also submit abstracts of their research results for a poster session or similar event at a statewide conference related to coastal issues. Students are further 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 faculty support will be considered.

The following students were selected for 2017:

Cameron Belding, biology major,
Nicholls State University

Faculty Advisor: Raj Boopathy, Department of
Biological Sciences

*Presence of Antibiotic Resistant Bacteria and
Antibiotic Resistance Genes in the Coastal Waters
of Southeast Louisiana*

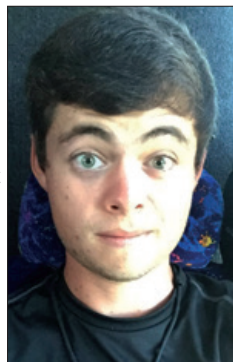
Belding will monitor southeast Louisiana's coastal waters for antibiotic resistant bacteria (ARB) and antibiotic resistance genes (ARG). Specific objectives are to monitor fecal coliform levels, quantify the abundance of bacteria, observe how the presence of ARGs varies by location and educate the public on the importance of coastal water quality.



Brandon Champagne, coastal environmental science major, Louisiana
State University

Faculty Advisor: Kehui (Kevin) Xu, Department of
Oceanography and Coastal Sciences
*Calibrations of Optical and Acoustic Sensors for
Coastal Protection and Restoration Research*

In order to establish a relationship between turbidity and suspended sediment concentration (SSC), Champagne will calibrate optical and acoustic sensors for comparison with SSC to find the best ways to determine calibration curves. The effects of sediment grain size on the sensitivity of optical and acoustic sensors will also be compared. This technology can have a broad impact on sediment delivery, transport and deposition in various types of coastal protection and restoration projects.



Devin Comba, coastal environmental science major, Louisiana State
University

Faculty Advisor: Morgan Kelly, Department of Biology

Epigenetic Effects of Salinity in the Eastern Oyster Crassostrea virginica

The objective of this project is to learn how eastern oysters respond to changes in salinity by altering their gene expression through methylation - the addition of a single carbon and three hydrogen atoms (called a methyl group). Methylation is a vital metabolic process that happens in every cell and every organ. Methylation patterns will be measured and compared according to salinity levels for wild and labreared oysters. Comba is testing for adaptive responses to salinity stress that could be passed on from one generation of oyster to the next, conferring increased salinity tolerance to stocks originating from more stressful habitats.

Brendan Copley, civil engineering major,
Louisiana State University

Faculty Advisors: Navid H. Jafari and Q. Jim Chen,
Department of Civil and Environmental
Engineering

*Integrating Marsh Soil Strength and Failure
Progression in Marsh Edge Erosion Models for
Coastal Louisiana*

Copley's first objective is to determine the relationship of soil shear strength on erosional resistance. His second objective is to put into place a continuously monitored site with the purpose of developing a mechanistic erosion model.

This information collected will aid in the creation of an improved marsh edge erosion model to more effectively predict the impacts of coastal protection and restoration plans.



Morganne Guidry, environmental science major, University of Louisiana
at Lafayette

Faculty Advisor: Jenneke Visser, School of Geosciences

Effects of Flooding Height, Duration and Timing on Spartina patens

This study will test the effects of major sediment diversions on the common marsh grass *Spartina patens* during the dormant season. Guidry's primary objective is to determine if the negative effects of flooding in marsh areas near diversion sites can be reduced by adjusting the timing of diversions.

Alexandra R. Powajbo, chemical engineering major, Louisiana State
University

Faculty Advisor: Mark C. Benfield, Department of
Oceanography and Coastal Sciences
*Microplastic Abundances and Spatial Extent Across
the LSU Campus Using Citizen Science*

Through the development of a smart phone application and a crowd sourced citizen-science program, Powajbo will determine hotspots on the LSU campus for microplastic pollution. After determining what types of plastics are most common in such places, solutions to microplastic pollution will be developed for recommendation to the Campus Sustainability Committee. Additional objectives are to increase environmental literacy and education in the LSU community and increase participation in citizen science programs.



Kristen Rosamond, environmental studies/psychology major, Tulane University
Faculty Advisor: Jordan Karubian, Department of Ecology and Evolutionary Biology
Social Information Use and Foraging Behaviors of the Brown Pelican (Pelecanus occidentalis) in the Northern Gulf of Mexico

The degree to which social information influences brown pelicans' individual foraging behaviors, specifically in regards to Gulf menhaden, is not well known. Rosamond hopes to determine differences in individual use of social information to locate prey and the effects it has on foraging and breeding success. Microvideo camera technology and GPS telemetry will be used to assess foraging strategies and social interactions during a critical breeding period.



Then, Now and Next: Lagniappe's 40th Anniversary

For four decades, the *Lagniappe* fisheries newsletter has been a source of information for Louisiana's commercial and recreational fishers. The publication, a joint effort of Louisiana Sea Grant and the LSU AgCenter, commemorates 40 years this March and boasts more than 1,400 subscribers.

Lagniappe – which updates fishermen about new regulations, important events and species information – has had just three editors guide its content. The first author and editor, then fisheries assistant area agent Jerald Horst, admitted that relationships with fisherman were tough to build in the 1970s. Strangers at the docks were “generally met with suspicions of either being a game warden or the IRS,” he said.

When the first *Lagniappe* newsletter arrived in 1977, it featured a short introduction from Horst.

“Dear friends,” it reads. “I’ve been promising to put out a newsletter for several months now and this is finally it.” Horst goes on to explain his goal with *Lagniappe* is to “extend information to people concerned with the seafood industry,” and to “include subjects of interest to all segments of the industry.”

However, reaching those in the seafood industry was no easy feat. During the early years, he explained, there weren't many ways to reach large numbers of people. Fishermen typically spent most of their time away from their homes, and sometimes there was a literacy issue, he said.

Work hours in the fishing industry are long, Horst added, and women often headed the household while their husbands were away. That's when he decided to add *Lagniappe's* signature recipe, “The Gumbo Pot,” to capitalize on the influence of the fishermen's wives.

“The addition of the monthly recipe was designed specifically to attract women readers,” he said. “I knew if I wanted to get something important to commercial fisherman, I had to give the information to the people in the family that were the best readers, too – the wives.”

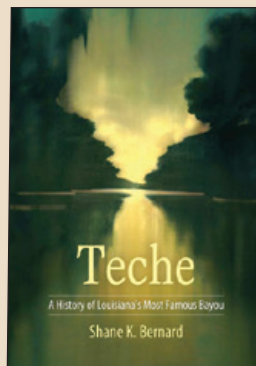
In 2006, Horst retired from the Extension service as state-wide fisheries specialist, leaving *Lagniappe* in the hands of its second editor, then fisheries associate area agent Glenn Thomas. Julie Anderson Lively, associate professor in the LSU School of Renewable Natural Resources and state-wide fisheries specialist, took over as *Lagniappe* editor in 2010.

To read the complete story, visit www.laseagrant.org/2017/lagniappes-40th/.

Third Coast Books Receive LEH Award

The Louisiana Endowment for the Humanities (LEH) recognized two outstanding historical works as 2017 Books of the Year. Both are part of Louisiana Sea Grant's Third Coast Series. The titles are:

- *Teche: A History of Louisiana's Most Famous Bayou*, by Shane K. Bernard.
- *Hard Scrabble to Hallelujah, Volume I: Legacies of Terrebonne Parish, Louisiana*, by Christopher Everette Cenac, with Claire Domangue Joller



Teche examines this legendary waterway of the American Deep South. Bernard delves into the bayou's history – both its geologic formation as a vestige of the Mississippi and Red Rivers and its cultural significance as a settlement for prehistoric Native Americans and French, Spanish, and, eventually, Anglo-American pioneers. He surveys the coming of indigo, cotton and sugar; steam-powered sugar mills and riverboats; and the brutal institution of slavery. He also details the impact of the Civil War on the Teche, depicting the running battles up and down the bayou and the sporadic

gunboat duels, when ironclads clashed in the narrow confines of the dark, sluggish waterway.

A Cajun from Lafayette, Bernard holds degrees in English and History from the University of Louisiana at Lafayette and a doctorate in History from Texas A&M University. Bernard serves as historian and curator to the McIlhenny Co., maker of Tabasco brand products since 1868.

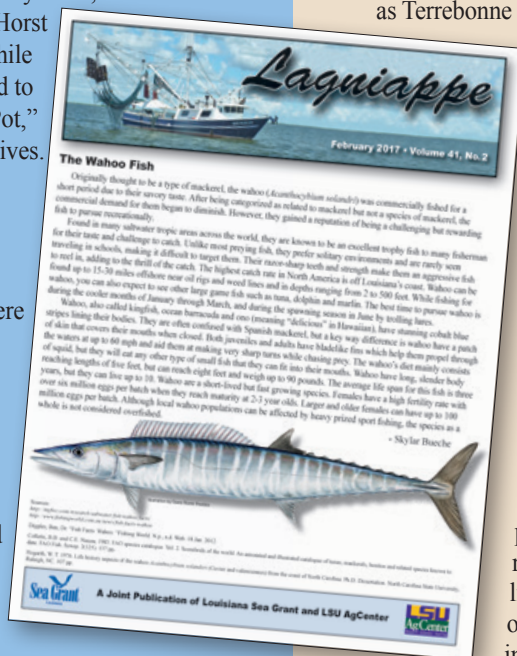
Hard Scrabble is the first time that known history and new information have been combined into a single written record about one of the most important eras in the coastal bayou parish of Terrebonne. The book makes clear the unique geographical, topographical and sociological conditions that beckoned the first settlers who developed the large sugar plantations. This first of four planned volumes chronicles the founders and their estates along Bayou Terrebonne, from its headwaters to its most southerly reaches near the Gulf of Mexico.



Dr. Cenac is a practicing orthopedic surgeon in Houma and has served as Terrebonne Parish coroner. Joller is a Terrebonne Parish native and received awards from the National Catholic Press Association and the Louisiana Press Association for her newspaper columns.

Both books can be purchased from the University Press of Mississippi at www.upress.state.ms.us. The Third Coast Series is designed to publish research outside the realm of peer-reviewed academic journals. These book-length formats are aimed at policy makers, coastal residents and the general public.

LEH is a non-profit organization dedicated to providing educational opportunities to all residents of the state. Its mission is to provide access to and an appreciation of Louisiana's rich, shared and diverse historical, literary and cultural heritage through: grant-supported outreach programs; early childhood education, family literacy and adult reading initiatives; teacher professional development institutes; publications; film and radio documentaries; museum exhibitions; public lectures; library projects; *Louisiana Cultural Vistas* magazine, and other diverse public humanities programming. For more information on the organization, visit www.leh.org.



Adverse Water Quality Conditions Could Threaten Oysters

In Breton Sound, two opposing forces are poised to meet. Coming from the north are Louisiana's proposed river diversions. Moving up from the south is the ever-rising Gulf of Mexico. At the intersection of these two influences sits the important oyster.

The potential meeting of diversions and the Gulf creates unique conditions throughout the sound. River diversions carry freshwater and sediment from the Mississippi River. Gulf waters are much the opposite. So, what happens when the two meet?

A group of scientists from the United States Geological Survey (USGS) and Louisiana State University recently teamed up to tackle these water quality questions. Their publication in *Estuaries and Coasts* examines estuarine water quality conditions and compares changes under different scenarios of sea level rise and river diversion. The results were at times unexpected and provide needed information for resource managers.

When large diversions drive freshwater flows into Breton Sound, there is a dramatic reduction in salinity. The researchers found that large diversions have the ability to lower salinity by two-thirds – an amount that would be felt by most estuary species.

It seems logical to assume that the encroachment of the Gulf of Mexico would increase salinity, but not in Breton Sound. Surprisingly, salinity would decrease in the heart of the estuary despite increases in the head and toe. This indicates that something unique is at play.

"Diversions and sea level rise are critical driving forces to estuarine water quality," said lead author Hongqing Wang of USGS. "We learned that their interactions are complicated. There is tremendous interplay between the elements in the estuary, resulting in salinity fluctuating greatly over space and time."

The researchers also examined water clarity and phytoplankton populations. Large diversions carry suspended sediments that make the water cloudier, while the rising Gulf added to the turbidity. Murkier waters limit the sunlight needed for photosynthesis, posing a challenge to phytoplankton and other aquatic vegetation.

Within the sound, the greatest water quality fluctuations occurred in the middle section, which is prime oyster habitat. Louisiana oysters thrive in salinities between 5-15 parts per thousand (PPT). With large diversions, the salinity can drop below 4 PPT. Excess sediment and dwindling phytoplankton also were documented with diversions, equally bad news for oysters.

Large diversions have the power to significantly change the water quality throughout the sound. "Hydrology influences everything," said Megan La Peyre of the USGS Louisiana Cooperative Fish and Wildlife Research Unit, LSU Agricultural Center. "Understanding these interactions is important for resource management."

Oysters need somewhat salty, clear, chlorophyll-rich waters, supplied by the Gulf of Mexico. But they also need healthy wetland habitat, which could disappear without river diversions. This creates a complicated balancing act, one that will be repeated time and again. "Predicting the impacts of climate change in deltas is important both locally and globally," said Wang. "Rivers feed into deltas all over the world." And deltas help feed people all over the world.



The Caernarvon Freshwater Diversion structure, located at the head of Breton Sound Estuary, is located 15 miles downstream from New Orleans. Photo courtesy U.S. Army Corps of Engineers.

Message from the Executive Director

While the National Sea Grant Program wraps-up its golden anniversary activities this spring, Louisiana Sea Grant is looking forward to two significant anniversaries in 2017.

Lagniappe – our fisheries newsletter – marks 40 years of publication in March. In the four decades since now retired Extension agent Jerald Horst hammered out the first newsletter on a typewriter, *Lagniappe* has had only three editors – showing remarkable consistency. Now produced electronically, this monthly communication keeps the state's seafood industry informed on important issues.

One of the most popular features of the publication is "The Gumbo Pot" – a seafood recipe. Over the course of 40 years, nearly 500 recipes have been published in *Lagniappe*. And as all three editors can attest, an edition without a recipe spawns phone calls, letters and emails of concern.

Another milestone, Ocean Commotion will celebrate its 20th anniversary this fall. Originally held in the LSU Field House, the coastal stewardship fair for K-8th graders has since moved to the Pete Maravich Assembly Center. This one-day event draws 2,000 students who learn about coastal marshes and wetlands, invasive species, local ecosystems, boating safety and the state's natural history in a hands-on environment. Some of those students come back years later as exhibitors.

These programs are just two examples of Louisiana Sea Grant's long-term commitment to our coastal communities, industries, consumers and residents. And along with these outreach and education efforts, Sea Grant sponsors university-based research designed to make our coast a more sustainable place to live and work.

We are here to serve you through research, education and outreach.



Robert Twilley, Ph.D.

*Executive Director
Louisiana Sea Grant College Program*



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Coastal Clips

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Sea Grant-Supported Students Graduate

Four students supported by Louisiana Sea Grant completed graduate degrees in 2016. The list includes:

- Courtney Erin Elliton, Master of Science, Louisiana State University, Department of Oceanography and Coastal Sciences. Thesis: *Interactions among Hydrology, Sediment and Vegetation in Accreting Wax Lake Delta: Physical and Biogeochemical Implications to Coastal Louisiana Restoration*. Major professor: Kehui Xu.
- Derek Stephen Goff, Master of Science, Louisiana State University Department of Geology and Geophysics. Thesis: *Study of Resistivity and Shear Wave Velocity as a Predictive Tool of Sediment in Levee Foundation Soils, Louisiana Gulf Coast Levee System*. Major professor: Juan Lorenzo.
- Tara Lambeth, Doctor of Philosophy, University of New Orleans Urban Studies. Dissertation: *Coastal Louisiana: Adaptive Capacity in the Face of Climate Change*. Major professor: Pamela Jenkins.
- Brian M. Levine, Master of Science, Louisiana State University, Department of Oceanography and Coastal Sciences. Thesis: *Implications of the Long-term Presence of Crude Oil from the Deepwater Horizon Spill on Salt Marsh Biogeochemistry*. Major professor: John White.
- Phillip Thomas Westbrook, Master of Science, Louisiana State University, School of Renewable Natural Resources. Thesis: *Bioassimilation, Burial and Sediment Denitrification at Shallow-Water and Deep-Water Oyster Reefs in Two Louisiana Estuaries*. Major professor: Megan La Peyre.

To obtain copies of the above theses and dissertations, please contact Dani DiIullo at ddiullo@lsu.edu.