

Aylett Lipford displaying bird locations after a callback survey.

Oil Spills, Coastal Restoration and Secretive Marshbirds

Secretive marshbirds are a cryptic group of wetland-dependent species that inhabit our coastal marshes. Clapper Rail, King Rail (and King/Clapper hybrids), Least Bittern, Purple Gallinule and Common Gallinule are common breeders in the coastal marshes of Louisiana. Coastal marshes are also frequently impacted by oil spills, but limited information exists to determine the magnitude of oil spill effects on marsh birds. Furthermore, Louisiana is about to spend \$50 billion to restore portions of our coast, but information is needed to develop restoration guidelines to ensure secretive marshbirds benefit from the coastal investment.

Aylett Lipford (M.S.; King and Nyman) and Leah Moran (Ph.D.; King and Nyman) are conducting a series of studies across the eastern half of Louisiana's coastal zone to help address these information needs. More than 280 sampling points, including 40 on restored sites, were selected for intensive study. A set of four points are co-located with selected Coastal Resource Monitoring Stations (CRMS) and have been sampled from March through June since spring 2021. The students and their six



Leah Moran, right, and Lindsay Miller band a Common Gallinule and fit it with a satellite transmitter.

technicians play calls of each species following an established protocol to elicit responses or callbacks from the birds. All the calls within a 100-meter radius circle are recorded. Each point is visited four times during the spring period. Water depths and other flood characteristics are downloaded from the CRMS stations, and vegetation data are collected. The students are also capturing and putting GPS satellite transmitters on King and Clapper Rail and Purple and Common Gallinule. Sounds easy right? Well ...

Have you ever walked in Louisiana's marshes? It is not uncommon for the students to slog into waist or even chest-deep mud to get to their point only to be greeted by

bellowing alligators. Of course, mosquitoes and gnats are common companions as well. And you can only imagine the number of boat and trailer issues that occur with daily use of four boats for four months. The environment has also created sampling challenges. Standard vegetation surveys are not possible considering the difficulty of walking transects on many of these sites. Drones have been deployed to help, but occasionally these drones malfunction and they are not waterproof. The students have continued to adapt their techniques and the information gathered is invaluable.

The students have already seen some changes within their first two seasons, with a decrease in detections for most species in 2021. One possible reason for this decline may be due to damage and impacts of Hurricane Ida, as some entire sites were lost during the storm. However there have also been dramatic differences in rainfall between the two years, and marshes are naturally dynamic, so identifying the drivers of variability bird detections will take time.

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DIRECTOR'S COMMENTS



Allen Rutherford

Welcome to the LSU School of Renewable Natural Resources! We have come out of the COVID-19 period stronger for the experience. Many meetings and lecture opportunities are now routinely online. On the positive side, because we were forced to teach online, we can envision using online teaching moving forward.

The faculty and students in the School continue to be distinguished by receiving awards for their research, teaching and outreach activities. Faculty continue to maintain productive research programs with more than \$4 million in grants and contracts (approximately \$300,000/research full-time equivalent), 51 national and international presentations, and 81 referred publications in the past year. Graduate students are routinely awarded research grants and noted for outstanding presentations at regional and national meetings. Even our undergraduates have received research grants and have been awarded for their outstanding work. One of our undergraduates, Lexi LaGrone, was recognized in the LSU Tiger Twelve Class of 2022. LSU's Tiger Twelve program recognizes 12 undergraduate seniors who have contributed to campus life and positively impacted the Baton Rouge community. LaGrone is a Stamps Scholar, and she received the Dean Carolyn Collins Award in 2019 and the Laborde Leadership Scholarship from the College of

Agriculture in 2021. She also participated in Louisiana Wildlife Federation's Edgar Veillon Conservation Leadership Corps. In 2021, LaGrone was named a National Udall Scholar. There are many more honors and awards afforded to the School's faculty and students; all are tributes to their quality.

Over the last few years, we have heard that we no longer teach forestry at LSU. While we changed the school's name in 2000, we continue to conduct a comprehensive program in forestry, wildlife and fisheries. Our undergraduate degree program is a B.S. in natural resource ecology and management. Under this degree, we have nine areas of concentration (AOC) that include:

1. Forest Resource Management
2. Forest Enterprise
3. Wildlife Habitat Conservation and Management
4. Conservation Biology
5. Ecological Restoration
6. Wetland Science
7. Wildlife Ecology
8. Fisheries and Aquaculture
9. Pre-Veterinary Medicine – Wildlife and Fisheries

The first six AOCs are accredited by the Society of American Foresters (SAF), and the program at LSU has held SAF accreditation since 1937. I encourage you to look at the School's curriculum on our web page (<https://www.lsu.edu/rnr/>) and courses we teach (<https://www.lsu.edu/rnr/academics/course-descriptions.php>). If you ever have questions about our program, do not hesitate to contact me.

We thought by now we would have vacated the RNR building for badly needed building repairs. Late last fall, bid solicitations were released, but the lowest bid was more than twice the allocated state infrastructure funds. With that, the replacement of the roof, the heating and cooling system, and the

building's chemical hoods were placed on hold. The current plan is to divide the infrastructure needs into multiple phases. Phase 1, which includes a new roof, lobby windows, soffit replacement and boiler installation, will begin this summer. The good news is that we will remain in place during Phase 1.

We continue to ask each of you to give back to your School. Your donations, regardless of size, allow us to enhance our programs. With alum funding, we can send students to professional meetings, purchase vans to get students to the field, buy equipment to train students on the latest hardware and software, make needed building renovations, and many other educational enhancements. Your gifts make a difference!

On a personal note, many of you know that I currently serve as the executive associate dean of the College of Agriculture. This allows me to be involved in programs that impact the School and other units in the College and AgCenter.

We would love each of you to be more involved in the School. As always, if you haven't done so recently, please take a moment to update your RNR Alumni profile at https://lsu.qualtrics.com/jfe/form/SV_cv7wpSdSBg8OFsE?Q_JFE=qdg. Feel free to connect with me on LinkedIn or send your questions and ideas to me at druther@lsu.edu or call 225-954-0995.

Stay positive, and best of luck!

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Electrofishing at Oyster Reefs

Oyster reefs are considered a great spot for fishing because their complex habitat provides refuge and foraging grounds for recreationally important fish species. However, research studies have found it difficult to effectively sample oyster reefs with traditional sample gear, which often gets caught and tangled on oyster reefs or fails to sample within the matrix of the reef. Electrofishing is generally a technique used in freshwater fisheries sampling. It uses electric current to momentarily stun nekton and has become a viable nonlethal sampling method in estuarine (salty) habitats.

In collaboration with the Louisiana Department of Wildlife and Fisheries and with the help of LDWF manager Sean Kinney,

Melanie Bates (R.A., RNR) and Dr. Megan La Peyre (U.S. Geological Survey/RNR), along with Dr. Steve Midway (LSU Department of Oceanography and Coastal Sciences) have been exploring electrofishing at oyster reefs in West Cove in Louisiana's Calcasieu Lake. Sampling efforts in 2022 demonstrated that electrofishing appears to be a viable method to capture fish species associated with oyster reefs, when water salinity ranges as high as 20. Comparison of results with other common gear indicates that electrofishing is more effective at capturing fish species and less effective at capturing crustaceans in higher salinity waters. If electrofishing proves viable in estuarine environments, this approach may provide new insight into fish use and abundance of complex habitats.

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In spring 2023, the students start their third and final field season. Remote sensing techniques are being used to identify vegetation and hydrologic characteristics of each of the points. In addition, numerous water-level recorders have been deployed to validate water depths at sampling points with those of the CRMS recorders. Lipford also deployed water-level recorders on the restored sites and will compare hydrologic characteristics on restored sites with those of nearby natural marshes. Her avian data also goes beyond secretive marshbirds as she has

recorded all species of birds on restored sites versus nearby natural sites to better assess the effectiveness of restoration for avian communities. Moran is using telemetry data to better understand daily habitat use patterns and the effects of water-level changes on each of the species. Models will also be developed to evaluate how habitat characteristics affect the presence and relative abundance of birds across the marsh system.

We thank the Louisiana Technical Implementation Group and the Louisiana Department of Wildlife and Fisheries for project funding. ■

School of Renewable Natural Resources Research Matters - 2023

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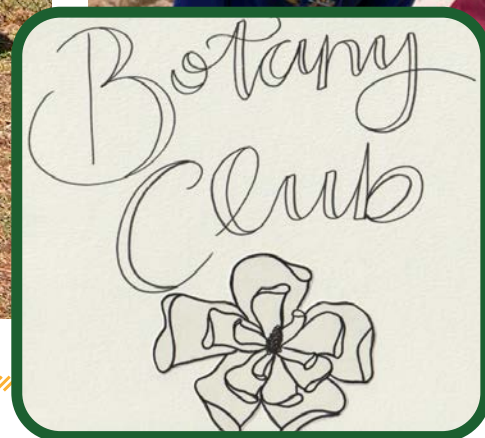
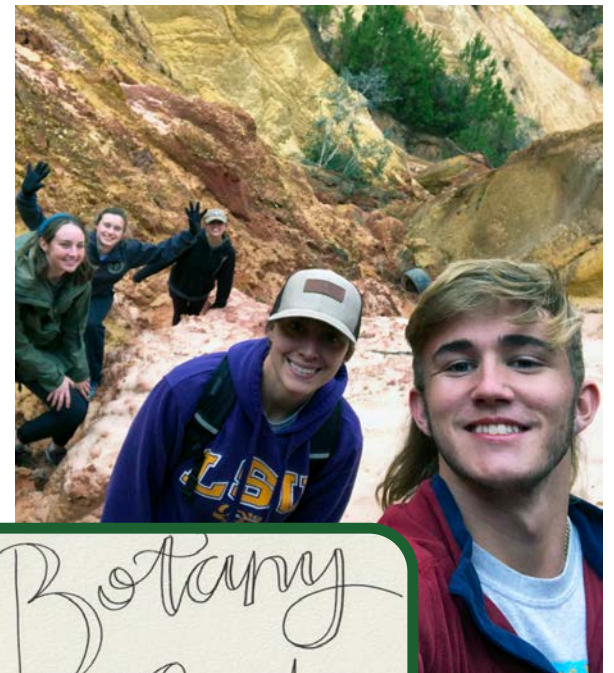
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GO FORTH AND BOTANIZE



At left, members of the Botany Club help Forest Park Middle School plant a vegetable garden. Right, members of the Botany Club explore Red Bluff.

The LSU student chapter of the Botanical Society of America, the Botany Club at LSU, is composed of students from several LSU colleges and departments. Despite members being from all areas of study, there is one thing that connects them all — plants. The shared admiration for plants allows for further exploration in botanical studies, volunteer work and land stewardship.

This past year, members of the Botany Club helped students at Forest Park Middle School plant a new vegetable garden, explored Red Bluff and held two successful club fundraisers. The Botany Club plans to have more botanizing trips and continue promoting native plants in campus landscaping.

BOTANY CLUB OFFICERS:

- President:** Hannah Cauley-March
- Vice President:** Olivia LaRochelle
- Social Media Manager:** Zachary Sides
- Secretary:** Nick Ramsey
- Treasurer:** Tanner Sparks
- Faculty Advisors:** Drs. Chris Reid and Hallie Dozier



Aquaculture and Fisheries Club members attend the kayak cleanup in fall of 2022 at the LSU Lakes.

LSU Aquaculture and Fisheries Club Year in Review

The LSU Aquaculture and Fisheries Club is dedicated to and passionate about fishes and aquatic invertebrates in Louisiana and around the world. The club helps students gain necessary technical skills through hands-on activities to advance their careers and invites a variety of guest speakers to the meetings to better understand aquaculture and fisheries science fields.

In 2022, the club hosted two guest speakers during the semester to give students

an introduction to different areas in the field. Students also participated in native fish dissections and sample collections, and the club hosted a community service event where students volunteered to kayak around the LSU Lakes to clean up garbage and debris. Upcoming events for 2023 include graduate students' thesis presentations, a surgery and suture demo, and a microscope workshop to teach students how to age otoliths.

To keep up with the news and events, join the club's GroupMe at https://groupme.com/join_group/55291313/i5MuNWNV.

Xi Sigma Pi News

Zachary Sides won the 2022 Xi Sigma Pi Outstanding Sophomore award, which is given to an RNR junior in the wildlife habitat/forest management options. Our traditional Apple Pie Seminar was held on Nov. 1, 2022, featuring Jeff Cravey, of IFCO Seedlings. The title of his talk was "Who is IFCO and what

do they do: Into seedlings and genetic breeding of the seedlings." Dr. Jim Bergan, climate mitigation manager of Delta Land Services, LLC, provided the Apple Pie Seminar on Feb. 28, 2023. Bergan spoke about "Afforestation as a Pathway to Climate Mitigation in the Lower Mississippi Alluvial Valley."

Xi Sigma Pi is a national forestry honor society. All RNR students with an interest

in forestry and a minimum 3.0 GPA for undergraduate students or 3.5 GPA for graduate students are eligible for membership. The current officers of Chapter Nu of Xi Sigma Pi are Eden Regan (forester), Andrew Guidry (ranger) and Lauren Hamilton (secretary-fiscal agent). Dr. Quang Cao is the faculty advisor.



Will Fitterer cuts his way to first place in the men's bow sawing competition with a time of 7.7 seconds, the second-best time in Southern Forestry Conclave history. Cheering him on are Chloe Crawford, Csanyi Matusicky, Brad Chauvin and Meredith Owens.

Timber Tigers Help Tennessee with Conclave

Finally! After two years of sabbatical due to COVID-19, the annual Southern Forestry Conclave resumed, hosted by the University of Tennessee at Knoxville in March 2022. It happened to coincide with LSU's spring break, so members of the Society of American Foresters at LSU (also known as the Timber Tigers) decided to drive up two days early to help them prepare.

This turned out to be an enjoyable experience, and the students developed a closer bond than expected. The Tennessee Volunteers had only nine students working to host the event, so the help was warmly welcomed. Almost none of the students had experience with Conclave, so it was a learning process for all.

Mary Ann Ligenza won first place in tree diameter estimation, and Will Fitterer won first in the men's bow sawing competition. Dekka Ducote won second place in the log birling competition, which was held in a pond, and members earned several third place awards.

The chapter has been very active, including participation in logger sports at Winnfield's Forest Festival, campouts in Lee Memorial Forest and Kisatchie National Forest for Fullerton Sawmill Days, hosting knife throwing and crosscut sawing for the public at Arbor Day at the LSU AgCenter's Burden Farm, a successful Christmas tree sale, and competing in Conclave in March 2023 hosted by Louisiana Tech University.



Tiger Chapter Ducks Unlimited members attend Ducks Unlimited National Collegiate Leadership Conference. Pictured are Elena Templet, Russell Egnew, Katie Miranda, Jackson McCain, Mary Katherine Piel (co-chair), Tabitha Lobell (co-chair), Jelks Duncan, Jillian Rizzuto, Joseph Randall and the chapter's adviser, Dr. Kevin Ringelman.

Tiger Chapter Ducks Unlimited Receives Recognition

Tiger Chapter Ducks Unlimited, sponsored by the LSU School of Renewable Natural Resources, sent nine students to the Ducks Unlimited Third Term National Collegiate Leadership Conference in Memphis, Tennessee, last August. TCDU was recognized as a Gold All-American Chapter, for having raised more than \$100,000 for wetlands conservation and supporting coastal marsh restoration projects in Louisiana. The chapter has more than 80 active members from across the LSU campus.



Zhiwei Guo (M.S.; King) cores a hole in a pimple mound to collect soils for analysis and install a water well at Powderhorn Wildlife Management Area in Texas.

Exploring Woody Encroachment and Hydrologic Processes in Coastal Prairie of Texas

Woody encroachment into grasslands is a global issue that can have significant effects on the local hydrologic cycle, including drying of wetlands and soils. In coastal Texas, overgrazing and lack of fire led to invasion of thousands of acres of coastal prairie by dense stands of runner live oak. Substantial acreages of woody invasion exist within the current range of the wild Whooping Cranes. Whooping Cranes are wet grassland species, thus this large-scale habitat conversion has raised concerns among many biologists.

This problem captured the interest of Zhiwei Guo (M.S.; King), a former employee of the International Crane Foundation's China Program. The International Crane Foundation initially funded Guo to study at LSU but conduct research in China. However, the COVID-19 pandemic and its associated travel challenges caused a shift in focus. An RNR class trip to Powderhorn Wildlife Management Area near Port O'Connor, Texas, and Aransas National Wildlife Refuge brought this issue to the forefront as an alternative study.

At Powderhorn, Texas Parks and Wildlife aerially applies Spike, a pelleted herbicide that is absorbed by runner live oak and kills the trees. Because the prairie had not been plowed, the prairie grass response has been remarkable. The coastal prairie landscape in that area includes thousands of pimple mounds, many of which are embedded within a substantial acreage of wetlands. Guo, together with Drs. Sammy King and Richard Keim, is trying to understand how the presence of woody vegetation on pimple mounds affects soil moisture and groundwater levels. Guo hypothesizes that trees use more water than grasses, thus pimple mounds and surrounding wetlands with trees are drier than those with only prairie grasses. His approach compares canopy interception and throughfall on pimple mounds covered with runner live oak and those with only prairie grasses in an untreated area. Guo also plans to use remote sensing to look at pre- and post-treatment effects on soil moisture in wetlands both on public and private lands and see whether treatment extends the hydroperiod of wetlands. His results could help improve land management within the region.



Team members testing bycatch reduction devices include, from left, Sara Stewart, of Texas Sea Grant; Merritt McCall, of Louisiana Sea Grant; Laura Picariello, of TXSG; Julie Lively, of RNR/LASG; Tiffany Pasco, of LASG; and Matt Kammann, of TXSG. They worked with Shelly, a leatherback turtle simulator, aboard the R/V Caretta in June 2022.

Reducing Trawl Bycatch in the Gulf of Mexico

Dr. Julie Lively (RNR/ Sea Grant), Tiffany Pasco (Sea Grant), and their counterparts from Texas Sea Grant and Texas A&M University assisted the National Oceanic and Atmospheric Administration (NOAA) during a gear characterization survey and proof-of-concept test as part of the Better Bycatch Reduction Device (BRD) program for the Gulf of Mexico project. Currently, federal law states that one out of the five possible certified bycatch reduction devices must be installed in each shrimp trawl used in the Gulf of Mexico. New BRDs would give more options to the fleet and hopefully achieve greater reduction in bycatch of important species such as Red Snapper.

Despite setbacks from the COVID-19 pandemic, the project team and NOAA representatives were able to survey the federal shrimp trawl fleet during dockside visits to observe BRDs and identify new or novel bycatch reduction efforts. Two promising types were chosen from the fleet while an additional international device was selected to move to NOAA testing. During subsequent tests on the NOAA ship R/V Caretta, researchers observed how well new BRD designs functioned in a towed net. This allowed for real-time adjustments as a device's position in a net can affect the waterflow around it or change net dimensions. Devices then moved to proof-of-concept testing off the Mississippi coast. Here, the R/V Caretta towed one experimental gear net and one control net to observe differences in their capture efficiencies for shrimp and bycatch. RNR and Sea Grant researchers aided in outreach efforts and data collection during the at-sea trials. Successful BRDs from these trials are scheduled for industry testing on an active commercial vessel starting in the spring of 2023.

Quantifying Branch Phenology, Gas Exchange and Hydraulics Under Contrasting Light Conditions

The mechanism of mortality of lower tree branches is still poorly understood. This hinders our ability to predict the location of the live crown base and why some species are capable of retaining more branches than others, as well as how different stressors affect canopy dynamics. Two leading hypotheses of mortality in trees — hydraulic failure and carbon starvation — may explain branch mortality. According to the hydraulic failure hypothesis, trees die when there is high xylem water tension that increases the risk of cavitation and eventual loss of xylem conductivity. This happens when root water uptake is significantly less than the atmospheric evaporative demand. On the other hand, the carbon starvation hypothesis posits that stomatal closure minimizes hydraulic failure, causing insufficient carbon assimilation and eventual starvation as more storage is used up for maintenance of metabolism and defense.

To explain the conditions that determine the location of the live crown base, Adelodun Majekobaje (Ph.D.; Dean) is studying the two hypotheses to determine if the mortality of lower branches in loblolly pine (*Pinus taeda*) is due to photosynthesis or cavitation. He subjected 6-year-old loblolly pine branches to three treatments of full light, 30% shade and 60% shade levels, and monitored the phenology, gas exchange, spectral properties and water relations of the branches throughout the growing season. Results from this study will help improve our prediction of the location of the live crown base, hence, crown size. Growth and biomass of other parts of a tree are a function of its crown size. Thus, crown dimensions often serve as predictors in process-based forest growth models. Improved prediction of crown size will ultimately lead to improved process-based models predicting stem growth and mortality.

American Put Option and Timber Management

Timber production is inherently a risky business. Constant fluctuations in stumpage price create uncertainty in management outcomes. Over the years, rotation age determination under uncertainty has remained one of the key topics in forest management and economics. To address this problem, Dr. Sun J. Chang has focused his research efforts on a concept — the put option — developed in business and finance to handle uncertainty in timber management outcomes caused by fluctuations in stumpage price over time.

Conceptually, a put option enables its owner to have the choice but not the obligation of selling a specified amount of an asset such as timber for a specific price, or strike price, by a particular expiration date. The American put option allows the owner of the put option to exercise it any time over its duration. In forestry, it enables timberland owners to sell the timber stand at the price guaranteed by the option any time over the length of the rotation. Moreover, such a purchase establishes the option value for the timber stand at various ages based on the spot price of the stumpage, the desired stumpage price at the end of the option, stumpage price volatility and the interest rate. Given these option values, timberland owners establish the reservation prices to guide their harvest decisions.

Results from the more than half million simulations indicate that by employing the put option, forestland owners could realize higher harvest revenue and increase the land expectation value by about 40%, and the rotation age on average would lengthen when compared with the case under the assumption of stumpage certainty. More importantly, the application of the put option in forest management will transform forestland owners from passive price takers to active price setters in managing their timberlands.



Example of how shade was created to investigate the mechanism of branch death in loblolly pine trees.

RNR Faculty Help Establish Forested Wetlands Observatory

School of Renewable Natural Resources faculty members Drs. Richard Keim, Andy Nyman and Ashley Long are spearheading the activities in the recently established Forested Wetlands Observatory (FWO), a new public-private partnership of the LSU AgCenter dedicated to research, teaching and extension on topics of importance for forested wetlands. The FWO, which is being created from a portion of the Reproductive Biology Center on Central Research Station near Baton Rouge, is a complex of more than 1,100 acres of forested wetlands and former forested wetlands previously converted to row crop agriculture. The project was initiated with the call for proposals from candidate private partners in November 2018 and the signing of a contract with the successful bidder, Spanish Lake Restoration, LLC, in February 2020.

Through our private partner, most of the site will be restored to forested wetlands by re-establishing the forest and restoring the hydrological conditions that existed prior to artificial drainage for row crops. Accompanying the restoration work will be the research, teaching and extension observatory. Researchers will evaluate efficacy of restoration treatments and use those treatments to test hypotheses about how forested wetlands function. The site will continue to be used as a field laboratory site for classes in the School of Renewable Natural Resources and other units in the College of Agriculture, as it has been for many years. The observatory will also be an important extension resource, where landowners and natural resource professionals can observe forested wetland management, ecology and hydrology. Restoration activities have not yet begun, and the site is being monitored for physical and ecological processes in anticipation of restoration treatments.

The FWO is being funded by a public-private partnership — the first of its kind in



Restoration of forested wetlands will include planting seedlings in formerly cultivated fields.

Louisiana — as a wetland mitigation bank, in which restoration treatments will generate wetland restoration credits to be sold to local land developers who require them to offset permitted wetland degradation elsewhere. This system of mitigation banking has been established by the U.S. Army Corps of Engineers, which uses it to provide flexibility for land development while simultaneously achieving the goal of no net loss of wetland functions as required under the Water Quality Act. Wetland mitigation allows landowners to retain ownership and some uses of their land, and also is extremely important in urbanizing south Louisiana where most development includes at least some wetlands. The public-private partnership structure of the FWO allows professional wetland mitigation bankers to perform the necessary regulatory and financial services, while the AgCenter and LSU focus on science, teaching and extension.



A water monitoring station emerges from receding floodwaters. Extensive instrumentation will make the Forested Wetlands Observatory an attractive site for a range of scientific objectives.

Landowners Join Resources for Fire

Back in the 1990s, nearly all Certified Prescribed Burners (Forestland) were foresters, wildland fire fighters and technicians who burned frequently as professionals. Since then, many non-industrial private forest (NIPF) landowners have become burn certified. In the last 20 years, about one-third of the attendees at prescribed burner certification workshops have been NIPF landowners. These are people like you and me who own a hundred acres of timberland and are interested in returning fire to the landscape.

For most NIPF landowners, the major holdback is resources — having enough people on a burn to burn safely and maybe share specialized equipment. For the past 20 years, there has been consistent talk about forming burn cooperatives, but no

action. The concept of a burn cooperative is essentially that a group of neighbors with similar burn interests help burn each other's properties. Parish-level forest landowner associations appear to be a natural vehicle for this concept.

On Feb. 24, 2022, the Southwest Louisiana Prescribed Burn Association held its first annual meeting, utilizing the Learn to Burn workshop as its technical topic. The primary organizers were Cecilia Richmond, wildlife manager with the Louisiana Department of Wildlife and Fisheries' Leesville office, and Keith Hawkins, area extension forester with the LSU AgCenter's DeRidder office.

The meeting started out at noon with a demonstration burn conducted by the Kisatchie National Forest at the Fullerton Lake Recreation Complex. The group first conducted a pre-fire briefing, reviewed the maps, burn plan and fire weather. Then the

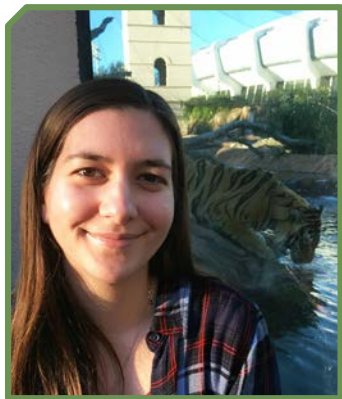
group met at the Kisatchie's Vernon District Work Center to review topics such as fire timing and effects, fire weather, ignition techniques, fire safety, burn plans, burn laws and technical assistance.

Time will tell how successful landowner burn cooperatives will be. A major hurdle to overcome is that the people in the burn crews may be inconsistent, necessitating a constant educational component. By contrast, crew members in agency crews and burn contractors work together almost daily, resulting in naturally better efficiency and safety.

Many people have become interested in becoming Certified Prescribed Burners, including members of the Louisiana National Guard and NIPF landowners associated with Quail Forever. Contact Cornelis de Hoop at cdehoop@lsu.edu or call 225-978-6806 if you are interested in being notified when a three-day Certified Prescribed Burner workshop is planned.

Genomic Research on Captive United States Tigers

Tigers are loved by so many people, but this has not stopped them from becoming highly endangered. The world has lost 96% of its tigers in the last century, with three of the nine tiger subspecies having already gone extinct. Given the dire need for tiger conservation, LSU has joined a concerted effort to fund tiger conservation research as part of the Tigers United University Consortium along with three other land-grant universities with tiger mascots.



Alessandra Bresnan with LSU's own tiger mascot, Mike the Tiger.

Surprisingly, there are more tigers in captivity in the U.S. than in the wild, with a majority of these tigers bred for commercial reasons, such as cub petting. These tigers, called generics, have unknown origins or are hybrids of different subspecies, are believed to be highly inbred, and often exhibit health issues attributed to inbreeding, such as being cross-eyed or bow-legged.

Alessandra Bresnan (Ph.D.; Dr. Sabrina Taylor's Conservation Genetics Lab) is using whole genome sequencing, the most powerful and comprehensive form of DNA sequencing available, to study captive tiger populations in the U.S., including these generic tigers. Thanks to a collaboration with professors at Texas A&M University, Bresnan has collected and sequenced 187 generic tigers, and has begun to process the genomes by aligning them to a tiger reference genome. She expects her analyses to identify the different subspecies that have been hybridized together to generate these generics, as well as assess their inbreeding levels.

A small proportion of captive tigers in the U.S. are maintained in Association of Zoos and Aquariums accredited zoos through species survival plans (SSP). In SSPs, subspecies are not interbred, and their breeding is carefully managed to avoid inbreeding, ensuring that the population has the maximum genetic diversity possible. This is done with pedigrees, but with an animal's entire genome, we can assess relatedness of individuals, helping to improve kinship estimates based on pedigrees. To that end, Bresnan has gathered and sequenced the genomes of 127 tiger samples from the three different tiger subspecies managed by the SSPs in the United States.

Bresnan's research will be used to increase the knowledge we have regarding individuals in zoo populations, helping ensure that captive tiger populations are as robust as possible in case we need to tap them as genetic resources if tigers continue to decline or go extinct in the wild. By sequencing generic tigers, her research will also help shed light on the genetic consequences of breeding tigers for commercial purposes. Bresnan hopes that in unlocking the full genomes of captive tigers in the U.S., she will provide information that can be used as a foundation for future tiger conservation.



Sweetgum and water tupelo seedlings were grown in a greenhouse to test the effects of flooding on stomatal behavior.

Predicting Responses to Flooding in Sweetgum and Water Tupelo

Throughout the southeastern United States, dams and levees together with increasing intensity of rainfall events have altered flooding regimes. Predicting how changes in flood regimes affect forests is a pressing challenge for research and management. Marisa Brennan (M.S.) and Dr. Brett Wolfe are studying how flooding affects water movement in trees. Trees move vast quantities of water from the soil to the atmosphere during transpiration. This water movement is controlled by microscopic pores on leaves, called stomata, which can open and close. Importantly, trees also take up carbon dioxide for photosynthesis through stomata. Because of this, stomatal behavior has big impacts on tree health, and scaling up, forest health and Earth's water and carbon cycles. The underlying physiology of stomatal behavior is not well understood, but models have been developed

that are effective at predicting how stomata respond to environmental conditions. These models work well in water-deficit scenarios (i.e., drought), but they have rarely been applied to flooding scenarios.

This past summer Brennan ran a greenhouse experiment on flooded and unflooded saplings of sweetgum and water tupelo (*Liquidambar styraciflua* and *Nyssa aquatica*) to better understand stomatal behavior in these species. She is currently using these data to modify an existing model of stomatal behavior to test whether responses to flooding can be accurately predicted. The ability to predict the behavior of these pores in response to flooding will improve our forecasts of tree performance and forest health in the changing hydrological landscape.



After



Before

A 3D printing farm (top) at the Aquatic Germplasm and Genetic Resources center has been established with the efforts of an interdisciplinary team of graduate students (e.g., Allyssa Oune, SRNR, right) and undergraduates (e.g., Cameron Bonds, left). The facility was originally a cattle barn (bottom) and was renovated with NIH funding.

New 3D Printing Farm to Support Emerging Open-hardware Movement

A new farm, one without feed, water or animals – instead with 3D printers — has begun operation at the Aquatic Germplasm and Genetic Resources Center (AGGRC, www.aggrc.com). The mission of the AGGRC is to provide global leadership in development of germplasm repositories to safeguard aquatic genetic resources that are critical for conservation, biomedical research, food security and fisheries management. Despite thousands of publications regarding germplasm cryopreservation, repository development is globally still at a beginning phase facing a big problem: There is a lack of standardized approaches to effectively translate research to useful practices. To address this, innovators at AGGRC are leading an open-hardware movement to support development and sharing of 3D printed devices to enable community-level cryopreservation and standardization. This involves integration with international public platforms for 3D printing innovation and distribution such as NIH 3D (3d.nih.gov) established by the National Institutes of Health (NIH). The AGGRC has created more than 20 categories of devices to be distributed to testing groups for prototyping and development of new communities of users, makers and developers. With NIH funding, a cattle barn of the former LSU Dairy Improvement Center has been renovated into an advanced fabrication facility including an 850-square-foot 3D printing farm and a 1,700-square-foot machine shop. The planning and operation of the printing farm is coordinated by a team of graduate and undergraduate students, with junior mechanical engineering student Cameron Bonds as the day-to-day manager. This team is highly interdisciplinary, including students majoring in renewable natural resources, mechanical engineering, industrial engineering, electrical engineering and interior design. This was also the focus of a class (RNR 7029 instructed by Dr. Yue Liu) in the fall of 2022 to plan, set up, arrange and manage the facility. Currently, the farm has 32 3D printers capable of fabricating hundreds of devices weekly. This has become an essential interdisciplinary addition to the AGGRC to promote development of worldwide open technology and advancement of aquatic genetic resources.

Visiting Fisheries Professor at the AGGRC

In January, the Aquatic Germplasm and Genetic Resources Center (www.aggrc.com) welcomed Dr. Danilo Pedro Streit Jr. as a visiting professor for one year. Streit is the head professor of the Department of Animal Science and coordinator of the Aquaculture Laboratory of the Universidade Federal do Rio Grande do Sul in Porto Alegre in southern Brazil.

“I came in search of improving the understanding of the systematization of application of germplasm banks of aquatic species, based on the long experience of professor Tiersch and his team,” Streit said.

He is also learning the role of fabrication technologies, such as 3D printing on cryopreservation processes. He has a long experience with cryopreservation in fishes and states that, “seeing life happen after freezing is always amazing.” Streit’s visit will strengthen the AGGRC collaboration with institutions in other countries and assist the transfer of technology and knowledge around the world.



Dr. Danilo Streit Jr.

Nest Predators of Mottled Ducks Revealed

Mottled Ducks, colloquially called summer ducks by Louisiana locals due to their nonmigratory nature, are a unique and secretive dabbling duck endemic to the western Gulf Coast of the United States. When the roughly 2.2 million wintering ducks in Louisiana migrate north each spring, Mottled Ducks stay behind to nest and fulfill their annual cycle. However, Mottled Ducks are not faring well in Louisiana. Breeding bird surveys conducted between 2009–2018 indicate that while the Texas population is relatively stable, Louisiana Mottled Ducks declined by more than two-thirds. With most dabbling ducks, populations are driven by nest survival rates, and nest depredations drive nest survival, so it may be that Louisiana’s predators are the cause of Louisiana’s declining Mottled Duck population.

Alex Dopkin (M.S.; Ringelman) is working in collaboration with Louisiana Department of Wildlife and Fisheries and Ducks Unlimited to better understand the role of nest predators in declining Mottled Duck numbers. In 2021 and 2022, Alex deployed 490 artificial Mottled Duck nests (nest bowls constructed and baited with poultry eggs and duck scent), half of which were monitored by trail cameras, to identify nest predators and evaluate the relative rates of nest survival in important nesting habitats across the southwest Louisiana landscape. Alex also deployed an array of trail cameras to develop predator species distribution models. This should provide a holistic understanding of the predator community in southwest Louisiana and its potential impact on Mottled Duck nest success.

More than 6.3 million photos of wildlife (and vegetation) were collected during the two field seasons. Already, photos are shedding light on what is occurring in the Louisiana marshes and agricultural lands. Far more than just the usual raccoons, predators such as coyotes and opossums are making a meal of nests. American alligators have also been documented stalking nests, presumably waiting for a nesting hen to return, before settling for the eggs. American mink are a top nest predator in the marshes, frequently pulling eggs out of the nest for consumption. Cameras also captured the first recorded case of a King Rail depredating eggs. Purple Gallinule, Clapper Rail, corvids, and snakes also depredated nests. Alex expects more will be revealed as he and his team of student workers and interns continue to sort through the photos.



Left: Raccoon paws reaching for an egg from an artificial Mottled Duck nest in the sawgrass at Coastal Club private property. Right: Juvenile Clapper Rail depredating a nest in the cordgrass at Rockefeller Wildlife Refuge.

Prey Selection by Common Nighthawks During Breeding, Wintering

Prey selection has long been a topic of intrigue for ecologists because of its implications for the conservation of species. Predators with specialized diets, for instance, are more vulnerable to extinction than predators that are more flexible in what they can consume. Many of the species that have gone extinct in the last century have highly specialized dietary or habitat needs, and, as humans altered the landscape, these species were unable to meet their survival needs.

Species that migrate long distances may be even more vulnerable because they are exposed to anthropogenic influences at every stop they make. One migratory bird species, the Common Nighthawk, feeds exclusively on flying insects at dusk and dawn. Once one of the most abundant species breeding in North America, Common Nighthawk populations have declined by 50% in the last 50 years. Insect population declines and habitat loss are likely to blame for this, but it is unknown whether Common Nighthawks are most influenced by these effects during the breeding season in North America, during migration through Central America or during nonbreeding periods in South America.

Eliza Stein (M.S.; Taylor) is investigating Common Nighthawk prey selection in their breeding grounds in central Florida and in their nonbreeding grounds in northern Argentina. Stein captured Common Nighthawks in both locations over the course of two years and collected fecal samples from the birds, from which she then extracted DNA to identify the insects the birds had consumed (known as DNA metabarcoding). She also surveyed flying insects to assess prey availability, which will be compared to Common Nighthawk diets to determine how selective these birds are in each location. In Florida, she is also studying how prescribed fire frequency and seasonality affect insect communities for Common Nighthawks and other insectivores.

With a better idea of prey selection throughout the year, conservation efforts can be more effectively directed toward the times and places when Common Nighthawks are most vulnerable. Stein and her colleagues also hope that their findings can be used to support the conservation of other migratory birds.



Eliza Stein holds a Common Nighthawk after banding it and collecting a fecal sample.

Axolotl Ultrasound for Research, Conservation

The axolotl (*Ambystoma mexicanum*) is a critically endangered amphibian species that has drawn international attention in recent years. Their fascinating ability to regenerate body parts and internal organs makes them an important biomedical research model species, but breeding them in large numbers in captivity can be costly and inefficient. The Aquatic Germplasm and Genetic Resources Center (AGGRC, <https://aggrc.com>) is looking for new techniques for reproductive characterization and sperm cryopreservation for this amazing animal. Nicholas Coxe, a 2022 M.S. graduate from RNR and current research associate at AGGRC, is exploring methods for hand-held ultrasound imaging to identify reproductive structures in male and female axolotls. Coxe's M.S. research (with Dr. Megan LaPeyre) addressed oyster physiology and provided a great foundation to study other aquatic species. With practice, Coxe and his colleagues should be able to identify sex, sexual maturity and oocyte (egg) maturation in axolotls and potentially other amphibian species. This work will be useful for cryopreservation studies and will benefit amphibian research and conservation.



Nicholas Coxe performs an ultrasound on a female axolotl. A cross-sectional view of the internal structures, including oocytes, can be seen on the display tablet.

Boosting Education with an *Aplysia* Outreach Package

The California sea hare (*Aplysia californica*) is a biomedical model used in the fields of neurobiology and electrophysiology to study learning, memory, and recently, hypoxia tolerance. The Aquatic Germplasm and Genetic Resources Center (AGGRC, aggrc.com) is assisting the National Resource for Aplysia (NRA, University of Miami) by custom development of cryopreservation technology for them to create their own repository. A germplasm repository can preserve genetic lines and support husbandry efforts. Allyssa Oune, a graduate student in RNR at the AGGRC, is researching and developing an *Aplysia* outreach package to communicate current practices to the research community and students. This package is intended to be helpful in visualizing the life cycle and egg strand anatomy for people of all ages who want to learn about *Aplysia*. The package includes computer-aided design (CAD) files, a video and images of the *Aplysia* life cycle. Anyone with a 3D printer can use the CAD files to print models of the developmental stages. The models can also be edited and customized for multiple purposes. The video and images are supplements to the models, aiding the maker and the audience. The outreach package was showcased to more than 1,900 children and adults at the 2022 Louisiana Sea Grant Ocean Commotion. Although less than 1% of visitors knew what an *Aplysia* was before visiting the booth, more than 80% of the children reported learning something with the help of the package and descriptions given by AGGRC personnel.



*Left: Allyssa Oune, left, and AGGRC personnel preparing to explain *Aplysia californica* with the outreach package at Louisiana Sea Grant Ocean Commotion. Right: A range of 3D models.*



New Project to Advance Protection of Aquatic Genetic Resources

The Aquatic Germplasm and Genetic Resources Center (www.aggrc.com) is an interdisciplinary environment where students and professionals from diverse specialties including natural resources, biology, engineering (e.g., biological, biomedical, industrial, electrical, civil, environmental, chemical), veterinary, digital arts and communications collaborate to advance preservation and use of aquatic germplasm and genetic resources. The AGGRC is working to develop a platform to distribute open hardware for advancement of germplasm repositories through a new Phase I project funded by the National Science Foundation to create open-source environments. This will involve use of consumer-level fabrication devices such as 3D printers and distribution of designs as electronic files. Additional user support will be provided through fabrication files and instructions, quick-start guides, manuals for production and use, training curriculum, databases, and other information that will allow small and large laboratories, stock centers, schools, aquaculture producers, conservation professionals and the general public to produce and use devices that can standardize processing and storage of quality materials. This will reduce the cost through widespread availability of practical cryopreservation technology and will ensure genetic diversity is protected against climate change, catastrophes, disease and other perils.

Barometric Pressure Sensors Reveal Unprecedented Details of Bird Migration

Light-level geolocators rocked ornithology when they appeared about 25 years ago. By recording light levels and time for months on a device small enough to be carried by warblers, this technology became the standard tool for determining the latitude (based on daylength) and longitude (based on timing of sunrise and sunset) of migrating birds. Even so, the errors associated with these estimates have been a limitation, especially for birds that migrate near the equinox, when there is minimal variation in daylength with latitude, species that migrate short distances, or species that use thick cover. M.S. student Garrett Rhyne wanted to study migratory connectivity in Swainson's Warbler, an important question given their disjunct wintering populations on mainland Central America and in the Caribbean, combined with their similarly disjunct populations breeding in the Gulf Coastal Plain and Appalachian Piedmont, areas facing distinctly different futures due to direct human activities and climate change.

Swainson's Warblers are secretive understory birds that migrate near the equinox and don't go very far, so Rhyne's best approach with light-level geolocators was to tag birds on the breeding grounds with hopes that the geolocators would provide enough data from the winter to know where the birds spent those months. A team of collaborators from across the bird's range helped with the tagging. Getting the data also required recapturing the birds the following year to remove the tags. Fortunately, Rhyne had the chance to deploy newly designed tags that included not just the light-level sensors, but also barometric pressure sensors. He hoped the additional data would help reveal when birds were actively migrating, as pressure goes down when birds go up, and also reflects the elevation of overwintering birds, which could help refine ambiguous distribution maps based on light.

He was able to do much better when he teamed up with Cornell researcher Raphaël Nussbaumer, who had developed a method to use atmospheric data to make very precise atmospheric pressure maps. In one of the first applications of this technology to birds, Rhyne was able to combine pressure data from birds with Nussbaumer's maps to pinpoint Swainson's Warbler wintering locations from the Bahamas



Garrett Rhyne holds a Swainson's Warbler captured at Sherburne Wildlife Management Area. The bird is tagged with a sensor that records time-stamped light levels and barometric pressure. With luck for both the bird and the researcher, data will be recovered after the bird successfully migrates and is recaptured at Sherburne.

to Guatemala, including a bird pegged to the flyspeck Swan Islands between Honduras and the Cayman Islands. He was also able to determine exactly when birds made migratory movements, even identifying local movements at stopover sites as birds prepared for the next legs of their migration. These details are possible with satellite transmitters on large birds, but even that approach can't reach the temporal precision of pressure data. News of this approach has reached other ornithologists; Rhyne will be participating in a symposium on advances in studying migration at the American Ornithological Society meeting in August. Once he shares his results, look for a flurry of new studies and major advances in our understanding of songbird migration.

Identifying Breeding Season Origins and Regional Productivity of Waterfowl With Stable Isotope Ecology

If you have lived in Louisiana for very long, then you know that ducks and geese are a pretty big deal. Hundreds of thousands of waterfowl arrive to the inland and coastal wetlands and agricultural fields throughout the state for the winter months, and tens of thousands of consumptive and nonconsumptive users alike enjoy their presence. On average, waterfowl hunters contribute nearly \$60 million annually to the state economy of Louisiana. But the state of waterfowl in Louisiana seems to be changing. Continentally, waterfowl population size is cyclical. When lots of quality breeding and wintering habitat exists on the landscape, waterfowl populations generally go up. When habitat quality and quantity decline, so does waterfowl abundance. Right now, continental waterfowl populations are on the tail end of a pretty large boom in abundance. According to breeding surveys conducted by the U.S. Fish and Wildlife Service, breeding waterfowl populations have been growing since the mid-2000s. During this time, however, waterfowl abundance in many wetlands of Louisiana did not increase. This could have many causes, but knowing the breeding area of birds that winter in Louisiana could help identify habitat concerns specific to their breeding areas or along the migration route that may be partly or wholly responsible for population limitation. Are there unique areas throughout the breeding region that are important ecologically for ducks that winter in Louisiana? How strong is the link between breeding regions and the choice to winter in Louisiana? We do not know.

These questions are the impetus for Shannon Stemaly's (M.S.; Fowler) research funded by the Louisiana Department of Wildlife and Fisheries. Stemaly will locate a harvested duck's breeding region with band-recovery data and stable isotope signatures of water in feathers. Stable isotopes can be used to estimate breeding origin because water has different but predictable biogeochemical signatures across the United States, and when a bird annually produces new feathers, that biogeochemical signature is locked up in the bird's feathers. Stemaly is working with local duck clubs across south Louisiana and portions of the state within the Mississippi



Shannon Stemaly processes duck wings from a variety of waterfowl species.

Alluvial Valley to collect feathers of harvested ducks during the waterfowl season and analyze them for this unique biogeochemical marker to infer breeding origin location. Stemaly wrapped up the first of two years of data collection during the 2022-2023 hunting season and cumulatively collected thousands of samples from Mallards, Blue-winged Teal, Green-winged Teal, Gadwall and Lesser Scaup. Stay tuned for future articles discussing the upcoming results.



Dr. Garrett Hopper Joins RNR Faculty

We are pleased to announce that Dr. Garrett Hopper will join the fisheries faculty in summer 2023 and will teach ichthyology and biology of fishes beginning in 2024. His research focuses on the ecology of freshwater fish and mussel assemblages and understanding the relationships between biodiversity and aquatic ecosystem function. In his role as a postdoctoral researcher at the University of Alabama, Hopper has been involved in projects investigating functional trait, genetic and microbiome diversity in freshwater mussels across the southern U.S.

Hopper earned a B.S. in natural resource ecology and management from Oklahoma State University. While in Oklahoma he also worked for the Oklahoma Department of Wildlife Conservation as a technician helping to manage reservoir sportfish populations. Hopper received his M.S. in biology from Kansas State University studying trait variation in populations of darters in the Ozark Highlands, and his Ph.D. in biology from Kansas State studying how fish and freshwater mussels influence ecosystem function.



Dr. Garrett Hopper

Keim Has Productive Sabbatical in Luxembourg

For calendar year 2022, Richard Keim was on sabbatical, in residence at the Luxembourg Institute of Science and Technology (LIST) in Belvaux, Luxembourg.

The major objective of the visit was a field experiment to make novel observations of isotopic composition of water to better understand the physical processes controlling water storage, release and evaporation

from forest canopies during rainfall. This is basic research to understand the physics of how rain moves through forest canopies, which is an important part of the water cycle: about 20% of rainfall evaporates from the surface of wet forest canopies before it ever reaches the ground. Current understanding is not sufficient for predicting how that important process will be modified by climate change, despite the importance of the water cycle in climate. The isotopic composition



Collecting stemflow during a precipitation event in a beech forest.

of water in rainfall, drip and in storage on trees depends on evaporation, condensation and mixing, thus giving a window into the physical processes controlling evaporation.

The reasons for the collaboration with the Catchment and Ecohydrology Group at LIST were the scientific and technical expertise of the group in isotope hydrology and ecohydrology, as well as crucial equipment needed for the experiment. Aside from the main experiment, collaborative work also included taking measurements of how trees take up water directly through the leaves during rainfall and establishing basic instrumentation on a field site for future work in forest ecohydrology.

Aside from the experiments in collaboration with LIST, Keim also used the opportunity to present a talk at the 18th Biennial Conference of the Euromediterranean Network of Experimental and Representative Basins in Portoferraio, Italy, and at invited seminars at the University of Luxembourg and the University of Bonn, Germany.

Lutz Assists Agricultural Marketing Resource Center

From January through May, Dr. Greg Lutz assisted the Agricultural Marketing Resource Center (AgMRC) in updating and greatly expanding their online aquaculture materials. Located at Iowa State University and largely funded by the U.S. Department of Agriculture's Rural Development program, the AgMRC provides independent producers and processors with critical information needed to build successful value-added agricultural enterprises. For the past 15 years the AgMRC has served a nationwide agriculture audience through its web platform and relationship with other land-grant universities and technical assistance providers from across the country.

In line with the AgMRC's overarching goals, the web resources developed by Lutz were intended to make value-added market, economic and business information available to aquaculture producers, many of whom operate relatively small enterprises. The most recent data available from the USDA indicates that more than one-third of the nation's aquaculture producers have annual sales of less than \$25,000. Industry-wide, 85% of businesses reported sales of less than \$500,000, highlighting the importance of marketing and management skills for aquaculture producers.

Altogether, a total of 30 web pages were written or updated, addressing information needs of a variety of aquaculture producers throughout the country. Materials addressing finfish production and marketing included American eel, baitfish, bluegill and sunfish, catfish, crappie, goldfish, hybrid striped bass, koi and carp, largemouth bass, redfish, salmon, sturgeon, tilapia, trout, walleye and yellow perch. Nonfish topics included abalone, alligators, bullfrogs, clams, crawfish (and other crayfishes), freshwater prawns, marine shrimp, oysters and turtles.

Other webpages addressed aquaponics, recirculating aquaculture systems, offshore aquaculture, fee fishing and pond leases and a general overview of business considerations for U.S. aquaculture. During the first 11 months of 2022, the aquaculture section of the AgMRC site had 17,508 page visits, and traffic is expected to grow as aquaculture producers become increasingly aware of this resource.





Blue wildebeest and plains zebras at a northern Namibian waterhole in August. At this time of year, there had been no rain for more than four months. Birds in the background appear to be Cape Starlings, a species that probably requires supplemental water to persist year-round in this landscape.

Avian Ecology in an Arid Landscape

Much of the research in the School focuses on swamps, marshes and streams that are often subject to intense storms and flooding, resulting in high humidity and all those pesky mosquitoes that emerge from the water. In many other parts of the world, water is still a university and public focus, but instead of too much water, there is not enough. Dr. Phil Stouffer is learning about that reverse perspective, spending the 2022-2023 academic year in a very dry place as a visiting scholar in the Natural Resources Department at the Namibia University of Science and Technology (NUST) in Africa.



Part of a swarm of thousands of Red-billed Queleas visiting a waterhole just south of Etosha National Park, Namibia. These birds can be crop pests, and there is concern that they can transmit avian disease. Is their hyperabundance facilitated by supplemental water? The brown piles barely visible in the background reveal the recent presence of elephants, the major agents of vegetation structural change near waterholes.

Namibia has large populations of many characteristic African mammals, including rhinoceroses, elephants, lions, leopards and multiple antelopes. Research at NUST aims to understand how to effectively manage their populations to balance wild animal movements with livestock grazing, the main agricultural activity in most of the country. When it doesn't rain at all for six months at a time every year, cattle require water provisioning, and wildlife managers are similarly interested in maintaining waterholes for wildlife targeted by trophy hunters or nonconsumptive tourists. Fences work some of the time to keep wildlife and cattle apart, but in northern Namibia elephants can be unstoppable in their quest to get to a waterhole, and aggregations of elephants and other large herbivores (including cattle) at waterholes can dramatically alter vegetation. In recent decades, climate change is linked to less predictable rains, making water provisioning even more important.

Although wildlife research and teaching at NUST is focused on large mammals, Stouffer was invited to add an ornithological component to ongoing projects, examining how water provisioning and subsequent mammal aggregations have altered bird communities in arid landscapes. For example, Red-billed Queleas aggregate in the tens of thousands at waterholes. Sabota Larks, on the other hand, seldom visit water. Some work has been done on the remarkable physiology of birds that can go for months at a time without any liquid water, but little is known about bird community properties in this landscape. For example, how much is habitat reduced for specialists like larks due to vegetation alteration by elephants? Does water provisioning inflate populations of generalist species that require water at the expense of specialists that do not?

Working with NUST students, Stouffer has been sampling birds just south of the famous Etosha National Park in areas continuous with the park, with extensive elephant presence, and areas where fences are actively maintained to exclude elephants. The team is sampling bird communities at various distances from multiple waterholes and is also using passive audio recorders to assess the overall soundscape and provide archived material for long-term study. It will be particularly important to provide baseline abundance estimates for species that might be physiologically compromised as climate change leads to hotter and drier conditions. Combined with extensive long-term work with mammals, vegetation and human-wildlife conflict, this additional research with birds can broaden ecological knowledge in this fascinating landscape.

Wu and Research Team Land Major Infrastructure Development Grant for LSU AgCenter's Louisiana Institute for Bioproducts and Bioprocessing (LIBBi)

Dr. Qinglin Wu, along with team members Dr. Gillian Eggleston and Dr. Giovanna Aita, of the Audubon Sugar Institute; Dr. Dorin Boldor, Dr. Cristina Sabliov and Dr. Todd Monroe, of Biological and Agricultural Engineering; and Dr. Achyut Adhikari, of Nutrition and Food Sciences, secured a grant of \$999,865 for the LSU AgCenter from the Louisiana Board of Regents (LA BOR) for developing research facilities for the Louisiana Institute for Bioproducts and Bioprocessing (LIBBi). The LSU AgCenter provided an additional \$174,526 match for the project.

LIBBi is a LA BOR approved institute for research, education and outreach initiatives within the LSU AgCenter. LIBBi links Louisiana's strong production agriculture with emerging bioproduct and bioprocessing initiatives, thereby expanding and strengthening our state's role in developing novel bioproducts/energy and economic base for Louisiana crop producers. The LIBBi scientists have worked together and been able to successfully compete for federal, state and industry grants to support their research programs. Research infrastructure development has always been a priority to enhance our competitive position at the national level and to provide training and educational opportunities for professionals in emerging bioproduct and bioprocessing industries.

The long-term goal for this project is to develop the LIBBi platform as a centralized facility within the LSU AgCenter and LSU Baton Rouge campus for coordinating research, teaching and technology transfer efforts in biocompounds, biopolymers, functional foods and nanomaterials from sustainable resources in Louisiana. Scientists propose to equip LIBBi with three main facilities — Biomass Processing and Fractionation Facility, BioMaterial Characterization Facility and Bio-based Products Development Facility. The equipment considered represents state-of-the-art technologies for advanced biomass cell wall breakdown, chemical imaging and material characterization. The facility will provide an essential tool for developing advanced biomaterials, functional foods and energy that address emerging industrial and research needs, teaching students the fundamental concepts of complex biomaterial and bioprocessing through LSU Colleges of Agriculture and Engineering and supporting industrial manufacturing in Louisiana.



Dr. Luke Laborde of the School of Renewable Natural Resources was the recipient of the Honorary American FFA Degree from the National FFA Organization. Presenting the award are Dr. Eric Smith, Executive Director, Louisiana AgEd, and Cade Lejeune, Executive Secretary, Louisiana FFA.

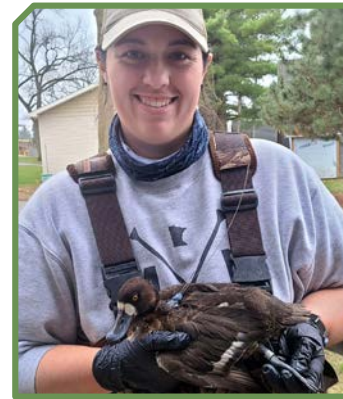


GRADUATE NEWS

NEW STUDENTS



Joe Brown (M.S.; Kaller) is identifying potential invasive invertebrates and their risks. He will be focusing on the aquarium trade, which is an important pathway for invasive aquatic organisms.



Victoria Drake (M.S.; Ringelman) is conducting aerial waterfowl surveys in northeast Louisiana to formulate a more statistically robust survey method for wintering waterfowl in the Lower Mississippi Alluvial Valley.



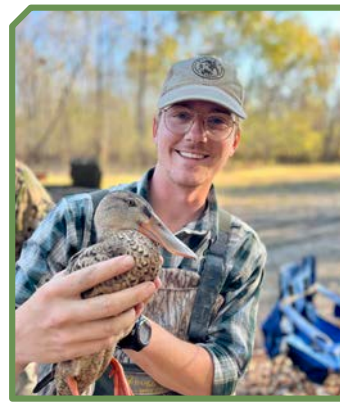
Maruf Hossain (Ph.D.; Wolfe) is studying functional traits and drought responses of bottomland hardwood trees.



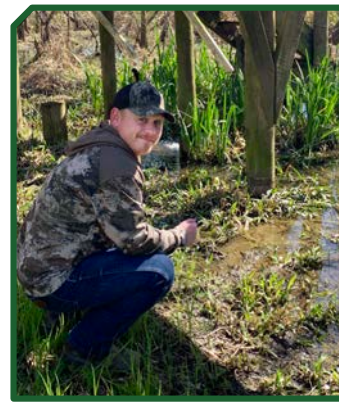
Joseph Kankam (M.S.; Wolfe) is studying how plant hydraulics affect loblolly pine growth.



Starla Phelps (Ph.D.; Ringelman) is examining the breeding ecology and seasonal movements of Black-bellied Whistling Ducks.



Grant Rhodes (M.S.; Ringelman) is using drones to study waterfowl broods and investigate novel survey techniques in the Prairie Pothole Region of Saskatchewan, Canada.



Devin Schexnayder (M.S.; Wolfe) is assessing transpiration of bald cypress trees in inundated wastewater treatment wetlands.



Shannon Stemaly (M.S.; Fowler) is investigating breeding season origin and regional productivity of harvested Louisiana waterfowl with stable isotopes.



Emma Villemarette (M.S.; Lively) is studying ghost fishing via derelict blue crab traps in southern Louisiana.



Yinuo Zhou (Ph.D.; Wolfe) is studying plant-water relations.



Siyah Yongue (M.S.; Lavaud and Archer) is examining the relationship between climate change and eastern oyster behavior, seasonal variability, and predicted changes in salinity and dissolved oxygen concentrations.

2022-2023 RNR SCHOLARSHIPS Undergraduate Student Scholarships

Ag Development for Forestry	Christopher Lambert
Ann Reiley Jones Scholarship	Meredith Owens
Ann Reiley Jones Scholarship	Julia Degeneres
Ann Reiley Jones Scholarship	Evelyn Williams
Billy W. Weaver Scholarship	Christopher Lambert
Edmund B. Burns Scholarship	Ariana Tashakkori
Eric Fabre Memorial Scholarship	Kirsten Sanguinetti
Jerry W. Netterville Jr. Scholarship	Seoul Major-Conyers
Jerry W. Netterville Jr. Scholarship	Marie-Pascale Delahoussaye
Jerry W. Netterville Jr. Scholarship	Emillee Monahan
LA Land Exploration Scholarship	Paul Kraig Oramous
Laborde Leadership Scholarship	Jacob Mills
Lehmann – FWF Alumni Association	Raegan West
Marc Dupuy Jr. Wildlife Conservation Scholarship	Cathryn Coulter
Paul Y. Burns Scholarship	Abby Ligon
Pauline Bateman Stanley Scholarship	Benjamin Schleter
Richard P. Sivicek Undergraduate Scholarship	Kevin Quinet
Thomas Plein Scholarship	Katie Miranda
William A. Knight Forestry Scholarship	Aries Dove
William A. Knight Forestry Scholarship	Matthew deGraauw
William A. Knight Forestry Scholarship	Eli Thomas
William A. Knight Forestry Scholarship	Madison Wray
William A. Knight Forestry Scholarship	Elizabeth Plauche
William A. Knight Forestry Scholarship	Libby Brennan
William A. Knight Forestry Scholarship	Lauren Vogel
William A. Knight Forestry Scholarship	Jackson Lanaux
William A. Knight Forestry Scholarship	Franchesca Ruiz
William A. Knight Forestry Scholarship	Abigail McLeod
William A. Knight Forestry Scholarship	Trinity Harris
William A. Knight Forestry Scholarship	Julie Southerland
William A. Knight Forestry Scholarship	Raeleh Statham
William A. Knight Forestry Scholarship	Jake Grindell
William A. Knight Forestry Scholarship	Adley Bunch
William A. Knight Forestry Scholarship	Kyle Sarpy
William A. Knight Forestry Scholarship	Layla Jackson
William A. Knight Forestry Scholarship	Connor Pittenger
William A. Knight Forestry Scholarship	Marina Mewborn

Louisiana Forestry Foundation Scholarships

Robert and Lynn Billingsley	Joseph LaSavia
Dr. Norwin Linnartz Scholarship	Christopher Lambert
Dr. Tom Hansbrough Scholarship	Jacob Manual
Henrietta Hardtner Hutch Scholarship	Vianne LeBlanc
Henry Hardtner Scholarship	Andrew Serkiz
Burton D. Weaver Scholarship	Colleen Gaffney
Robert H. Crosby Jr. Scholarship	Bradford Chauvin
Jim and Doris Curtis Scholarship	Lauren Hamilton
Joe D. Burns Scholarship	Abbigail Erwin
Jeff Hughes Memorial Scholarship	Eden Regan

Graduate Student Scholarships

Barbara S. Edisen Memorial Scholar	Ade Majekojabe Marisa Brennan
Ben and Pauline Stanley Excellence Award for Outstanding M.S. Student	Eliza Stein Garrett Rhyne
Bob Blackmon Graduate Scholarship	Chloe Crawford
Charles W. Bosch, Jr. Louisiana Wildlife Federation Waterfowl Scholarship	Zachary Loken Alexandre Dopkin
Clark M. Hoffpauer Scholarship for RNR Graduate Students	Alessandra Bresnan
John Barton Sr. Scholarship	Aylett Lipford
John Peter Labouissee III/ Ducks Unlimited, Inc. Scholarship	Dylan Bakner

Les Voyageurs

Les Voyageurs are a carefully selected group of 18 students from the College of Agriculture who represent the college and LSU in recruitment, alumni and development activities.	Joseph Campagna Jacob Mills
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Aylett Lipford (M.S. King and Nyman, left) and Leah Moran (Ph.D. King and Nyman, right) won awards for the Best Student Oral Presentation and Best Student Lightning Talk, respectively, at the 2022 Annual Meeting of the Waterbird Society in Corpus Christi, Texas.

Eliza Stein, an M.S. student in Dr. Sabrina Taylor's lab, received a Wilson Ornithological Society Research Grant of \$1,500, which supports graduate student research in ornithology, and an eDNA Collaborative Microgrant of \$850, which provides materials and supplies to researchers using eDNA to answer ecological questions. Both grants will support Stein's research using DNA metabarcoding to understand Common Nighthawk prey selection in their breeding and nonbreeding habitats.

Kraig Oramous and Ravynn Garcia were awarded A. Wilbert's Sons research internships for a project titled "Effects of Forest Restoration Efforts on Birds and Bats in the Amite River Basin" under the supervision of Dr. Ashley Long.

Chloe Crawford, an M.S. student in Dr. Ashley Long's lab, is examining human dimensions of prescribed fire on private lands in Louisiana. She presented posters to introduce her research and gather preliminary data at the annual meetings of the Louisiana Association of Professional Biologists (LAPB) held at Louisiana Tech University in Ruston, Louisiana, from Aug. 8-12, 2022, and the Louisiana Society of American Foresters (LASAF) held in Alexandria, Louisiana from Oct. 25-27, 2022. She was awarded first place in the student poster competition at the LAPB meeting and third place in the graduate student poster competition at the LASAF meeting.

Michael Gamble, an M.S. student in Dr. Ashley Long's lab, received a Student Membership Award from the American Ornithological Society in 2022.

Graduate students, Anamika Dristi and Zhenwei Wu from Dr. Jun Xu's lab, received travel awards from the Coastal Studies Institute to attend the 2022 American Geophysical Union meeting.

Undergraduate student Jonathan Simak, working with Dr. Jun Xu, received an A. Wilbert's Sons Research Award and a Millard Perkins Undergraduate Research Award.

Marisa Brennan (M.S.; Wolfe) won first place in the graduate student poster contest at the 2022 annual meeting of Louisiana Chapter of the Society of American Foresters.

Alexia "Lexie" LaGrone (B.S. '22) was selected as one of the 2022 LSU Tiger Twelve. LSU's Tiger Twelve is an initiative that highlights a select group of undergraduate seniors who have contributed to LSU campus life and positively impacted the Baton Rouge community. Each spring, 12 distinguished LSU seniors receive this prestigious recognition.

Skylar Liner (M.S.; La Peyre) won second place in the oral student competition at the annual meeting of the Gulf Estuarine Research Society, and Patrick Colclough, working with M.S. student Aylett Lipford and Dr. Andy Nyman, won the best undergraduate poster.

SRNR/FWF Alumni Association Schedules Annual General Meeting and Crawfish Boil for Saturday, April 29

The School of Renewable Natural Resources/Forestry, Wildlife and Fisheries Alumni Association has returned to in person meetings and has scheduled the annual general meeting and crawfish boil for Saturday, April 29.

At the 2022 annual meeting, Dr. Mark Shirley (B.S.F. '77, M.S. '79), state crawfish specialist and aquaculture agent for the Southwest Region of the Louisiana Cooperative Extension Service, and the Ben and Pauline Stanley Family, represented by Larry (B.S.F. '71) and Paul (B.S.F. '71) Stanley, were inducted into the LSU SRNR Hall of Fame.

On behalf of the association, President Rachel Villani presented a check for \$3,100 to the SRNR Director's Excellence Fund. The Association established a goal to increase its contribution to at least \$5,000 in 2023. The Director's Excellence Fund is utilized to fund research, travel and emergency expenses for undergraduate and graduate students in the LSU School of Renewable Natural Resources.

Dr. Allen Rutherford, director of the School and executive associate dean of the LSU College of Agriculture, recognized a legacy gift from Donald B. Fisher (B.S.F. '64) who died in 2020. The school also was the beneficiary of the John Peter Labouisse, III/Ducks Unlimited Graduate Scholarship in waterfowl, wetland ecology or wetland management, thanks to a generous donation by his spouse, Diane Sustedal Labouisse. Richard P. Sivicek (B.S.F. '69) has endowed two scholarships – one for an undergraduate and one for a graduate student in the School of Renewable Natural Resources. Sivicek also made a substantial contribution towards the renovation of the SRNR computer lab.

The Bob Blackmon Graduate Scholarship at LSU has been endowed at the Louisiana Forestry Foundation. Blackmon had a distinguished career at LSU and served as the director of the School of Forestry, Wildlife and Fisheries (now the School of Renewable Natural Resources). Anyone wishing to honor Blackmon with a tax-deductible contribution to his named scholarship is invited to do so. Checks should be written to the Louisiana Forestry Foundation and mailed to P.O. Box 5067, Alexandria, LA 71307-5067.

You may renew your 2023 membership in the SRNR/FWF Alumni Association using the renewal insert in this newsletter or online at <http://lsu-srnraa.square.site/>

Suggested dues are \$10 for a basic membership or \$100 for a combined membership in the SRNR/FWF Alumni Association, the LSU College of Agriculture Alumni Association and the LSU Alumni Association. A \$1,000 contribution includes the combined membership, plus a \$900 contribution to the Director's Excellence Fund. Donations of any amount are welcome and needed.

Watch for upcoming announcements for the annual general meeting and crawfish boil. The LSU SRNR Alumni Association is an affiliated chapter of the LSU Alumni Association.

WE WANT TO HEAR FROM YOU!

The alumni news is compiled and written by Luke Laborde. We are continuously working to update and manage our alumni files and database. We welcome information on promotions, career changes, passings and other important life events from all alumni. If you have any news items or address changes that you would like to share, please e-mail Luke at llabor2@lsu.edu.



Students from RNR 3018, *Ecology and Management of Louisiana Wildlife*, view coastal erosion first-hand on the beach at Rockefeller State Wildlife Refuge. When it was dedeed to the state of Louisiana in 1914, the refuge covered 86,000 acres of marsh and coastal habitat. Today, only 71,000 acres remain.



Drs. Sammy King, Michael Kaller and Drew Fowler taught a graduate wetlands class focused on wetlands of Utah, Idaho and Montana. The class is pictured here at Grays Lake National Wildlife Refuge, Idaho.

RNR Graduate Students Study Western Wetlands and Water Conflicts

Several RNR graduate students along with Drs. Sammy King, Michael Kaller and Drew Fowler visited numerous wetlands in Utah, Idaho and Montana. The group visited Bear River, Bear Lake, Grays Lake, Camas, and Red Rock Lakes National Wildlife Refuges, Salt Creek Waterfowl Management Area (Utah), Sterling Wildlife Management Area (Idaho) and tribal lands of the Confederated Salish and Kootenai Tribe. Patrick Donnelly, a spatial ecologist with the Intermountain West Joint Venture and the University of Montana, also provided a lecture on water availability and waterbird conservation in the West.

The first day was centered on the rapidly shrinking Great Salt Lake and the challenges of balancing water allocations for farming, urban development and the lake. Similar issues emerged at virtually all refuges and led to lively discussions about water policy and leadership under difficult situations. Impressive wetland restoration and conservation activities on the Confederated Salish and Kootenai Tribal lands near Missoula, Montana, encouraged the students to look for innovative solutions to conservation challenges.



Students attempt to identify deciduous holly.

Botanical Training at LSU SRNR

The identification of plants is foundational to ecological understanding and management of our forests and wetlands. LSU SRNR puts a significant emphasis on plant identification skills for undergraduates. The hiring of Dr. Chris Reid strengthened RNR's commitment to instilling this knowledge in RNR students as Reid teaches both old and new courses that build students' botanical skills.

Many LSU SRNR (FWS) alumni fondly remember Dendrology ("Dendro"; RNR 2001) with the late Dr. R.E. Noble. Noble's teaching style was unique and rigorous. Dr. Reid has put his own unique stamp on the course while maintaining its historical rigor. Dendro is still arguably the most rigorous of undergraduate RNR courses, and it challenges the tree identification skills of about 80% of SRNR undergraduates.

Ah, but there is more to life than woody plants. Wetland Plants (BIOL/RNR 4020), developed 51 years ago by the late Dr. Robert Chabreck, remains alive and well. Wetland plants, covering mostly herbaceous taxa, serves the LSU RNR fisheries and wetland science concentrations, and anyone else who wants more botanical development. Being cross-listed with biology, nearly half the students in each class tend to be biology majors. Limited space is also available for graduate students.

Since Reid's arrival, he has developed two new botany courses: Horticultural Botany (HORT/RNR 2900) and Upland Plants (RNR 4060). Horticultural botany is not horticulture specific. A more accurate title would be "Introductory Plant Biology." Forestry graduates of the School back in the good old days will recall General Botany, taught in the Botany Department, and later in Biological Sciences. The General Botany course of old is now dead and gone, and HORT/RNR 2900 is intended to fill that content gap. Currently, HORT/RNR 2900 serves students in the medicinal plants concentration in LSU's School of Plant, Environmental and Soil Sciences, and may eventually be required for all horticultural science majors. Many RNR students have also taken Horticultural Botany in the course's two offerings.

Wetlands are important, but so are uplands. Upland Plants is an elective for all RNR concentrations. To take this course, a student must have had prior training in plant identification. Students that take Upland Plants are plant nerds. So far, Reid has found enough nerds to teach Upland Plants twice. The course is modeled on his Field Botany course at University of Louisiana-Monroe, which was taught by the late R. Dale Thomas. Field trip locations are upland-leaning and include longer trips to places like the Tunica Hills and upland longleaf pine settings.

Courses like Dendro and Wetland and Upland Plants focus on practical plant identification and are strongly field-based. All courses instill a solid foundation in plant morphology for those students who apply themselves and perform well. Upper-level courses also emphasize the use of dichotomous keys, enhancing the portability of these courses. Reid is considering adding a graminoid identification course that emphasizes keying. Students that take more than one plant identification course at LSU SRNR, and apply themselves, will stand out in a world in which botanical training has been de-emphasized, and in which "plant blindness" prevails. Furthermore, Reid's reputation among local employers makes the successful completion of his course a plus for any student to have on their resume.

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IN MEMORIAM

William H. Herke (Ph.D. '71)

William "Bill" Herke, a lifelong naturalist, fisheries scientist, and mentor to many students, died at his Baton Rouge home on Thursday, Sept. 29, 2022. Born Nov. 27, 1929, on a farm in Iowa during the Great Depression, Herke was an avid hunter and fisherman, as well as a long-time member of both the American Fisheries Society and the Louisiana Wildlife Federation.



In 1950, Herke enlisted in the Air Force where he served as a medical lab technician until 1954. He graduated with a B.S. and then an M.S. in fisheries from Iowa State University.

In 1963 he became the acting leader of the newly created Louisiana Cooperative Fishery Research Unit at Louisiana State University. In 1971, he completed his Ph.D. dissertation entitled "Use of natural, and semi-impounded, Louisiana tidal marshes as nurseries for fishes and crustaceans." He served for more than thirty years at LSU as an adjunct professor and as assistant leader of LSU's Cooperative Fish and Wildlife Research Unit.

During his career, Herke carefully guided many graduate students and published more than 60 professional papers, mostly on the importance of coastal wetlands as fisheries nursery habitat, and the effects that ubiquitous water management control structures were having on those fisheries. His dedication to Louisiana's fisheries and wetland conservation was recognized with the 1987 Governor's Award for Conservation. In 2001, he was honored with the Louisiana Outdoor Writers Association's Arthur Van Pelt Award for Lifetime Conservation Achievement. He was also a 2021 inductee into the Hall of Fame for LSU's School of Renewable Natural Resources.

Ben Jackson

Ben Douglas Jackson, of Greensboro, Georgia, died Thursday, July 28, 2022, at age 75.

After graduating from Beaumont High School in Beaumont, Texas, he obtained his B.B.A. from Lamar University and his M.S. in forestry and Ph.D. in forest economics from Texas A&M University. He was an associate professor of forestry for 10 years at Louisiana State University before joining the faculty of the University of Georgia in 1990. He retired in 2019, becoming professor emeritus after 28 years of service.

He worked at UGA as a timber harvesting and forestry extension specialist with the University of Georgia Cooperative Extension Service and the Warnell School of Forestry and Natural Resources for 30 years. He was an early national leader and proponent of Logger Education to Advance Professionalism (LEAP), which later led to recognized programs for timber harvesters through such programs as the Sustainable Forestry Initiative.

He was active in several professional organizations including the Society of American Foresters, WEVA, and the Association of Natural Resource Extension Professionals (ANREP), where he was elected president and provided leadership during a time of great growth for the organization.

Jackson is survived by his wife of 36 years, Sheila Morton Jackson, of Greensboro, Georgia.

James Murphy (M.F. '62)

James Murphy, loving and devoted husband of Cecile Perry Murphy, passed away on Dec. 18, 2022. Murphy attended Louisiana Tech for his B.S. and Louisiana State University for his master's degree in forestry. He worked in many fields during his life including forestry, sales and as an entrepreneur who owned and operated a Kwik Kopy printing shop and Champion Transmission shop. After retiring from the transmission business, he continued to work on the farm raising cows and custom hay baling. He loved his family and traveling on vacation out west to places like Yellowstone National Park.