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Progression Magazine, 2021 Summer

Coastal Carolina University

COASTAL CAROLINA UNIVERSITY

progression MAGAZINE

SUMMER 2021

KEEPING UP WITH THE EDUCATIONAL MOMENTUM OF THE GUPTA COLLEGE OF SCIENCE

Atlantic Sturgeon

The Grand Strand's Living Fossil

SUNKEN SHIPS

PLASTIC CRISIS

CLEAN WATER

progression

SUMMER 2021

A message from the dean

In this issue of *Progression,* a magazine of the Gupta College of Science at Coastal Carolina University, we highlight some of the work performed in freshwater environments by our students, faculty, and staff. While our college is well-known for its marine-related work, fresh-water ecosystems play an important role in the health of coastal environments.

We also continue our series of interviews with members of our advising team. These individuals play an important role in the success of our students, making sure they get off to a good start in their chosen field of study before transitioning into our faculty-led major advising program.

I would also mention that we have begun a regular video series titled "This Week on Mars." This weekly program, appearing on the college's YouTube channel, features faculty member, Ian Hewitt, updating us on the Perseverance rover

Should you have any questions concerning our programs in science, or want more information on any of the articles, please do not hesitate to contact me or the specific authors. My phone number and e-mail are listed below; you can also follow me on Twitter at @CCUScienceDean.

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ALUMNI INFORMATION
coastal.edu/alumni

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PROGRESSION MAGAZINE
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Editor and Associate Dean
Gupta College of Science

GUPTA COLLEGE OF SCIENCE AT COASTAL CAROLINA UNIVERSITY
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COASTAL CAROLINA UNIVERSITY
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progression contents

SUMMER 2021

DEPARTMENT OF BIOLOGY

John Hutchens, Ph.D.
Department Chair

The Department of Biology is home to about 500 undergraduate biology majors, 10 graduate students, 15 full-time faculty, and 10 lecturers. Undergraduate students earn a Bachelor of Science in biology. We also offer other programs of study that prepare students for entry into various health professions. Our department participates in the Master of Science in coastal marine and wetland studies and offers courses for graduate students in education.

Students have access to professors with expertise ranging from molecules to ecosystems. Faculty provide excellent opportunities for learning inside the classroom and out. Our faculty have varied research interests, and undergraduates can participate in that research.

Visit coastal.edu/biology.
John Hutchens can be reached at jjhutche@coastal.edu or 843.349.2169.

DEPARTMENT OF KINESIOLOGY

Gregory F. Martel, Ph.D.
Department Chair

The Department of Kinesiology at CCU is a dynamic unit of faculty, staff, and students who study and promote human movement (kinesiology) as applied to a variety of physical activity, sport, and therapeutic settings. The department houses a major in exercise and sport science (EXSS), minors in EXSS and sport coaching, Physically Active Living Skills (PALS) classes, and Community Fitness Testing program. Nationally, regionally, and locally, there has been an increase in demand for kinesiology-related services and programs; this is reflected in the rapid growth of the EXSS major since beginning at CCU in January 2008. The EXSS major is now the third largest on campus. Our role is to provide students with the knowledge, skills, abilities, and attitudes for effective leadership in the field of kinesiology. We excel by providing quality teaching and by engaging students in hands-on research, community service projects, and field-based learning and leadership opportunities.

Visit coastal.edu/knes.
Greg Martel can be reached at gmartel@coastal.edu or 843.349.2957.

DEPARTMENT OF CHEMISTRY

Paul Richardson, Ph.D.
Department Chair

Our department offers two Bachelor of Science degrees: chemistry and biochemistry. Our students often work with faculty on various chemistry research projects. Whether you are here for a course in science as part of the Core Curriculum or you are interested in becoming a chemistry or biochemistry major, please contact us with any questions.

Visit coastal.edu/chem.
Paul Richardson can be reached at prichar@coastal.edu or 843.349.2598.

DEPARTMENT OF HEALTH SCIENCES

Fredanna M'Cormack McGough, Ph.D.
Department Chair

The Department of Health Sciences is home to programs that incorporate evidence-based best practices for disease prevention, health assessment, health management, quality care, and patient safety. Through community collaborations and diverse faculty research interests, students can participate in research activities that connect theory to practice. The department offers Bachelor of Science degrees in public health, health administration (completion program), and nursing (2+2 Nursing Residential program and RN-to-BSN completion program). The 2+2 Nursing Residential program is a collaborative between CCU and Horry-Georgetown Technical College and is for first-time freshmen only.

The nursing completion program is committed to advancing the education of registered nurses to meet the local and global growing health care needs. The health administration completion program builds on foundation courses in associate degree and other four-year degree programs. The public health program focuses on the art and science of promoting healthy communities and healthy behaviors.

Visit coastal.edu/healthsciences.
Fredanna M'Cormack McGough can be reached at fmcorma@coastal.edu or 843.349.2991.

DEPARTMENT OF COMPUTING SCIENCES

Jean French, Ph.D.
Department Chair

The Department of Computing Sciences offers three undergraduate degrees, serving roughly 400 actively enrolled majors in computer science, information systems, and information technology. The department offers minors in web application development, scientific computing, and computer science. Both the computer science and information systems major programs are accredited by the Accreditation Board for Engineering and Technology Inc. The department also offers a completely online Master of Science in information systems technology, which has a dual concentration in both security and data analytics. The department supports the University Core Curriculum and other majors and minors of study with course offerings in web development, programming, and business applications.

Visit coastal.edu/computing.
Jean French can be reached at jennis@coastal.edu or 843.234.3430.

DEPARTMENT OF MARINE SCIENCE

Craig Gilman, Ph.D.
Department Chair

The Department of Marine Science offers one of the largest undergraduate marine science programs on the East Coast. In addition to undergraduate studies, the department houses the Coastal Marine and Wetland Studies master's program and the Marine Science: Coastal and Marine Systems Science doctoral program. Lecture, laboratory, and field experiences are integrated to provide students with an outstanding and well-rounded education. With our ideal location near the coast and collection of research-active faculty committed to undergraduate and graduate education, our strength is in providing individual attention and hands-on opportunities.

Visit coastal.edu/marine.
Craig Gilman can be reached at gilman@coastal.edu or 843.349.2228.

DEPARTMENT OF RECREATION AND SPORT MANAGEMENT

Donald Rockey, Ph.D.
Department Chair

The Department of Recreation and Sport Management enrolls more than 300 students as well as houses a graduate program in sport management. Recreation and sport management professionals create, plan, market, implement, and evaluate leisure and recreational activities in both the private and public sectors, as well as in both nonprofit and for-profit industries. In other words, our work is your play. The program works with the CCU Department of Athletics in several capacities and events, training students in specialized ticketing technology and sales techniques.

The faculty have a wide range of experience in the field, which they bring to the classroom to enhance students' abilities to connect theory and practices. In addition, faculty maintain very active research agendas in which students frequently assist.

Visit coastal.edu/rsm.
Donald Rockey can be reached at drockey@coastal.edu or 843.349.2989.

DEPARTMENT OF PSYCHOLOGY

Andrew Terranova, Ph.D.
Department Chair

The Department of Psychology enrolls more than 500 undergraduates. We offer a Bachelor of Science degree and emphasize the scientific nature of psychology and experimental research methods. Our 13 full-time faculty have expertise in a wide variety of areas, including experimental, social, developmental, cognitive, biological, school, and clinical psychology. Our faculty are excellent teachers and active researchers in the field, presenting at conferences, contributing articles and books to the research literature, and sharing their findings and expertise with the media. Through our research methods sequence, students gain extensive knowledge and experience by designing and conducting research. Motivated majors may find additional opportunities to join faculty research labs as research assistants.

Visit coastal.edu/psych.
Andrew Terranova can be reached at terranova@coastal.edu or 843.349.4034.

DEPARTMENT OF MATHEMATICS AND STATISTICS

Keshav Jagannathan, Ph.D.
Department Chair

The goal of the Department of Mathematics and Statistics is to improve students' mathematical understanding and competence. However, we also strive to illustrate the importance of mathematics, both as an interesting and challenging subject on its own, and as a tool that can be applied to other disciplines. Our two degree programs (applied mathematics and statistics) are designed to develop a high degree of mathematical proficiency, as well as extensive reasoning and problem-solving skills. We recognize the interdisciplinary nature of the modern mathematical world. Therefore, students may choose to concentrate their studies in analysis, applied mathematics, discrete mathematics, mathematics for secondary education, or statistics while still obtaining a solid mathematical background.

Visit coastal.edu/math.
Keshav Jagannathan can be reached at kjaganna@coastal.edu or 843.349.2249.

DEPARTMENT OF PHYSICS AND ENGINEERING SCIENCE

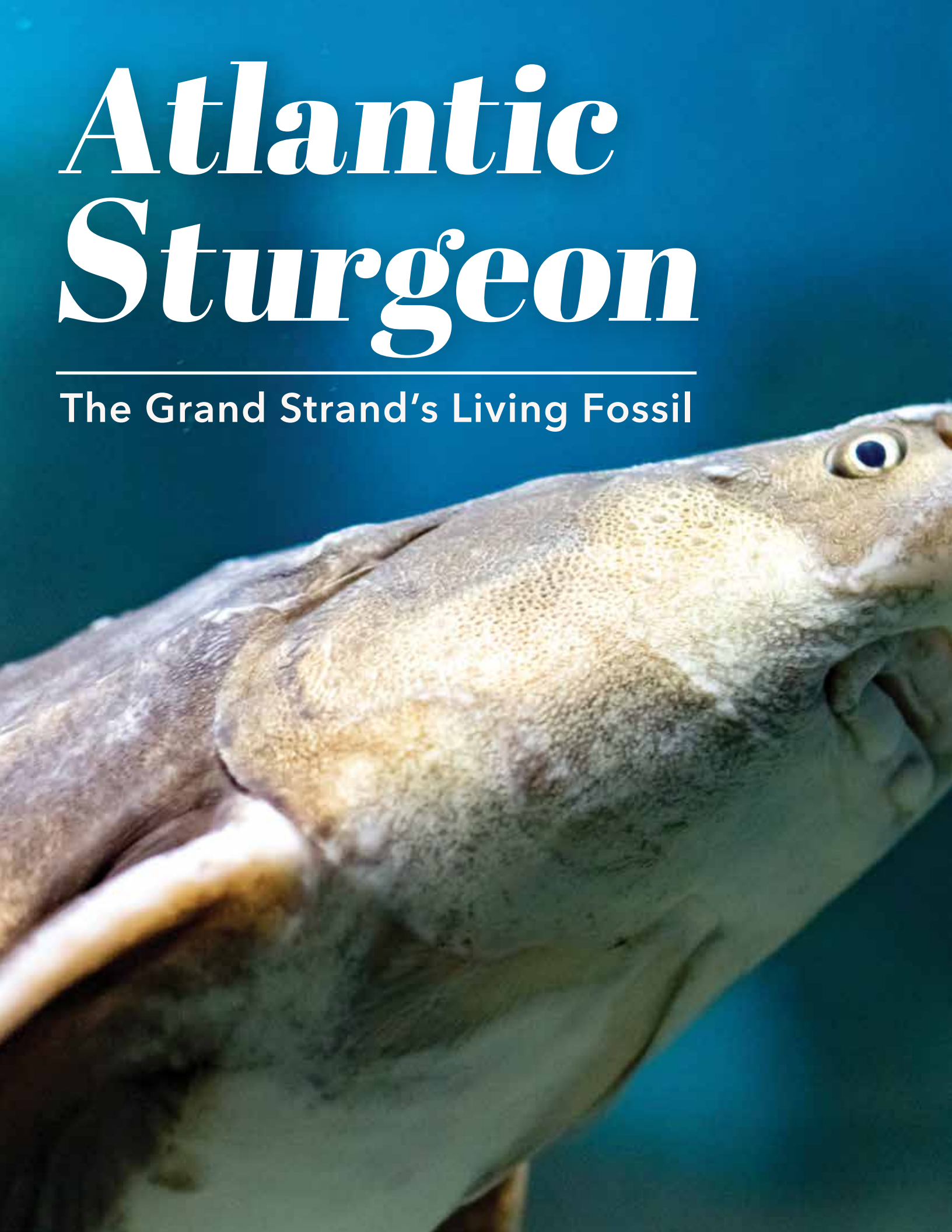
G. Wesley Hitt, Ph.D.
Department Chair

The Department of Physics and Engineering Science faculty and staff create an atmosphere of learning and scholarly work, applying the scientific method from a liberal arts approach. The faculty is committed to developing strong student competencies in physical and engineering science and its applications in a technology-rich, interactive, student-centered learning environment and to preparing students to successfully compete for employment or to succeed in graduate school. We take pride in our high-quality teaching using current pedagogic techniques, our proactive mentoring and advising, and our outreach to the local community. We strive to be a focal point for disciplinary scholarship and expertise within the college, and to collaborate with our colleagues in the college to actively contribute to the advancement of science. The faculty supports the goals of the University's Core Curriculum through general education courses in physics and astronomy.

Visit coastal.edu/phys.
Wes Hitt can be reached at ghitt@coastal.edu or 843.349.4047.

Atlantic Sturgeon

The Grand Strand's Living Fossil

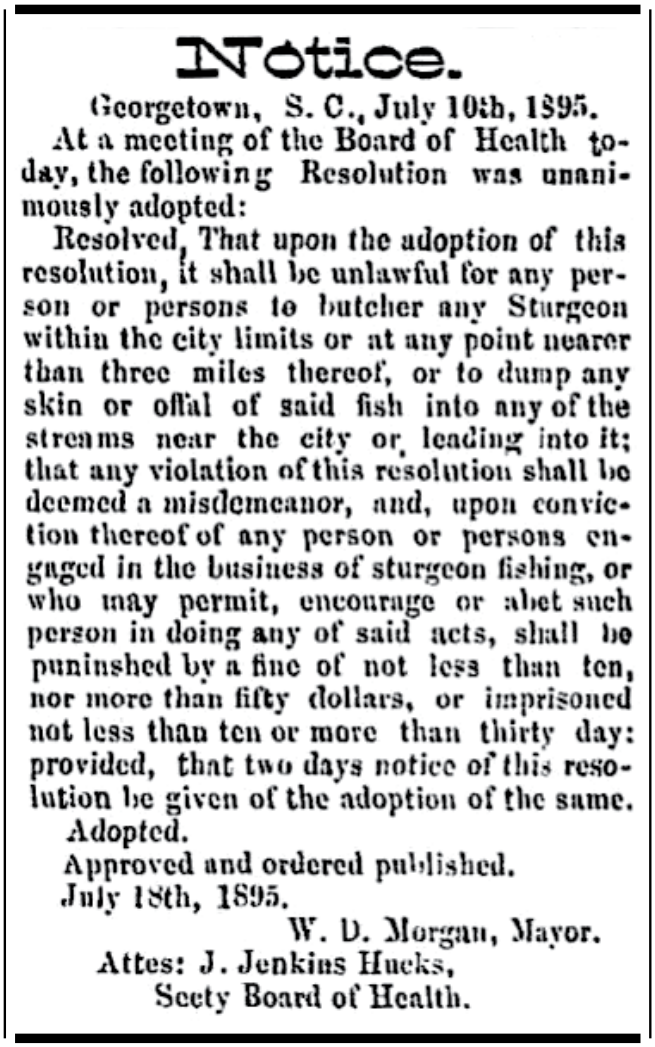


by **Derek Crane, Ph.D.,** *assistant professor, Department of Biology*

STURGEONS ARE ONE OF THE OLDEST GROUPS OF VERTEBRATE SPECIES ON EARTH, WITH AN EVOLUTIONARY HISTORY DATING BACK AT LEAST 200 MILLION YEARS.

Today, there are about 25 species, all living in the northern hemisphere, where they have been intertwined with our own human history. Sturgeons are culturally important globally because they historically were, and in some place still are, a food fish. Several sturgeon species, particularly Atlantic, White, and Lake sturgeons, are revered by Native Americans because of their historical importance as a food resource. Closer to home, Atlantic Sturgeon were used for food in the Jamestown settlement and may have saved early settlers from starvation when other foods were scarce. Beginning in the 19th century, sturgeons were associated with luxury and commercial fisheries; caviar and smoked sturgeon meat were considered delicacies and demanded high prices.

Although sturgeons are undoubtedly tough animals, lack of knowledge about their life histories combined with intense exploitation during the late 19th-20th centuries led to drastic



Notice.

Georgetown, S. C., July 10th, 1895.

At a meeting of the Board of Health today, the following Resolution was unanimously adopted:

Resolved, That upon the adoption of this resolution, it shall be unlawful for any person or persons to butcher any Sturgeon within the city limits or at any point nearer than three miles thereof, or to dump any skin or offal of said fish into any of the streams near the city or leading into it; that any violation of this resolution shall be deemed a misdemeanor, and, upon conviction thereof of any person or persons engaged in the business of sturgeon fishing, or who may permit, encourage or abet such person in doing any of said acts, shall be punished by a fine of not less than ten, nor more than fifty dollars, or imprisoned not less than ten or more than thirty day: provided, that two days notice of this resolution be given of the adoption of the same.

Adopted.

Approved and ordered published.

July 18th, 1895.

W. D. Morgan, Mayor.

Attes: J. Jenkins Hucks,
Secty Board of Health.

One of the first public laws related to sturgeon fishing and harvest in South Carolina. Georgetown Semi-Weekly Times: Volume 30, Number 49 – Aug. 24, 1895. Courtesy of Georgetown County Digital Library.

Young Atlantic Sturgeon captured in the Sampit River during recent sampling by the South Carolina Department of Natural Resources.
Photo: Danielle Carty, SCDNR (ESA permit No. 20528-02)

population declines — an organism that had persisted through cataclysmic events, shifting continents, and changing climates was on the brink of disappearing from less than a century of commercial fishing, construction of dams that blocked spawning migrations, habitat loss, and pollution. Fishing-associated declines in Atlantic Sturgeon populations occurred because they are late bloomers and tend to have long generation times. Some Atlantic Sturgeon reproducing in rivers of the Southeastern U.S. may start spawning as young as 5 years old for males and 10 years old for females, but in more northern areas of the U.S. and Canada, individuals commonly don't mature until they are in their late teens (or older)! Additionally, individual female Atlantic Sturgeon do not spawn every year. Therefore, fishes with this type of life history, such as sturgeons and many shark species, cannot handle high rates of harvest because harvested fish cannot be quickly replaced by new individuals entering a population.

To develop the knowledge necessary to conserve and promote recovery of Atlantic Sturgeon populations, the Atlantic States Marine Fisheries Commission established research and data collection priorities for the species. One of the priorities is to estimate how many young Atlantic Sturgeon are entering different populations each year, and this is where CCU's involvement in Atlantic Sturgeon research begins. My graduate student, Molly Takacs, and I are collaborating with SCDNR biologists Bill Post, Ellen Waldrop, Danielle Carty, and Caroline DeVries to find out how many 1-year-old sturgeon are in Winyah Bay and the rivers draining into it in a given year. Determining the number of young fish in a population can help us understand how populations change over time, and the effect of environmental disturbances (e.g., major floods) on the reproductive success of spawning adults. It turns out that 1 year old is a good age for investigating reproductive success of Atlantic Sturgeon because younger fish tend to die at high rates naturally,

COMMERCIAL LANDINGS OF ATLANTIC STURGEON PEAKED IN SOUTH CAROLINA AT ABOUT 480,000 LBS. IN 1897, WHICH WAS LESS THAN 30 YEARS AFTER FISHING FOR THE SPECIES BEGAN IN THE STATE.

CCU Coastal Marine and Wetland Studies student, Molly Takacs, getting ready to release a young Atlantic Sturgeon (ESA permit No. 20528-02).

and sturgeon that are 2 years old begin migrating out of their natal rivers to coastal waters, estuaries, and sometimes other rivers.

Although the vast majority of Atlantic Sturgeon we encounter hatch from eggs deposited in the Great Pee Dee River (the other rivers draining into Winyah Bay naturally do not have good spawning habitat), young sturgeon like to move and can be found from the upper portions of Winyah Bay through the lower reaches of the Black, Sampit, Waccamaw, and Great Pee Dee rivers. To estimate the abundance of Atlantic Sturgeon in this system, we are capturing them with nets and implanting them with small passive integrated transponders, which are the same as microchips commonly implanted in family pets in case they get lost. Because each individual collected is implanted with a unique identifier, we will know when any previously tagged fish is recaptured during our sampling. Based on the capture history of individual fish, we can use mathematical models to estimate how many young fish are in the area in a given year. The large area that young sturgeon may occupy in the Winyah Bay watershed makes the study complex and challenging, but also exciting because this is our first opportunity to study young fish in this important population. On most days, sampling will require two boats and four crew members, working hard to set and pull nets during the slack tide period. As I tell my ecology students, a lot of resources are often needed to find out one (important) number for a population! So, if you find yourself on water near Winyah Bay this spring and fall, you may see us in search of baby sturgeon.

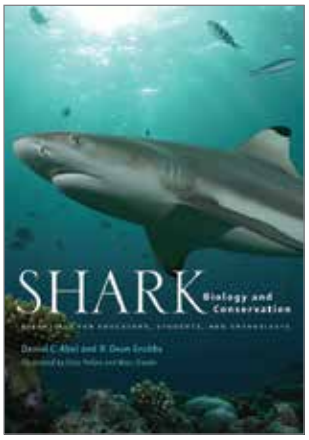
TO ESTIMATE THE ABUNDANCE OF ATLANTIC STURGEON IN THIS SYSTEM, WE ARE CAPTURING THEM WITH NETS AND IMPLANTING THEM WITH SMALL PASSIVE INTEGRATED TRANSPONDERS, WHICH ARE THE SAME AS MICROCHIPS COMMONLY IMPLANTED IN FAMILY PETS IN CASE THEY GET LOST.

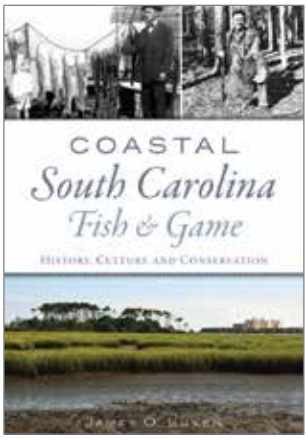
And, if you are lucky, you might get a glimpse of an adult sturgeon leaping, as they are known to do.

This work is part of a National Marine Fisheries Service funded study, and all sampling is conducted under ESA permit No. 20528-02.

VIEW ADDITIONAL VIDEO CONTENT.

RECENTLY PUBLISHED BOOKS





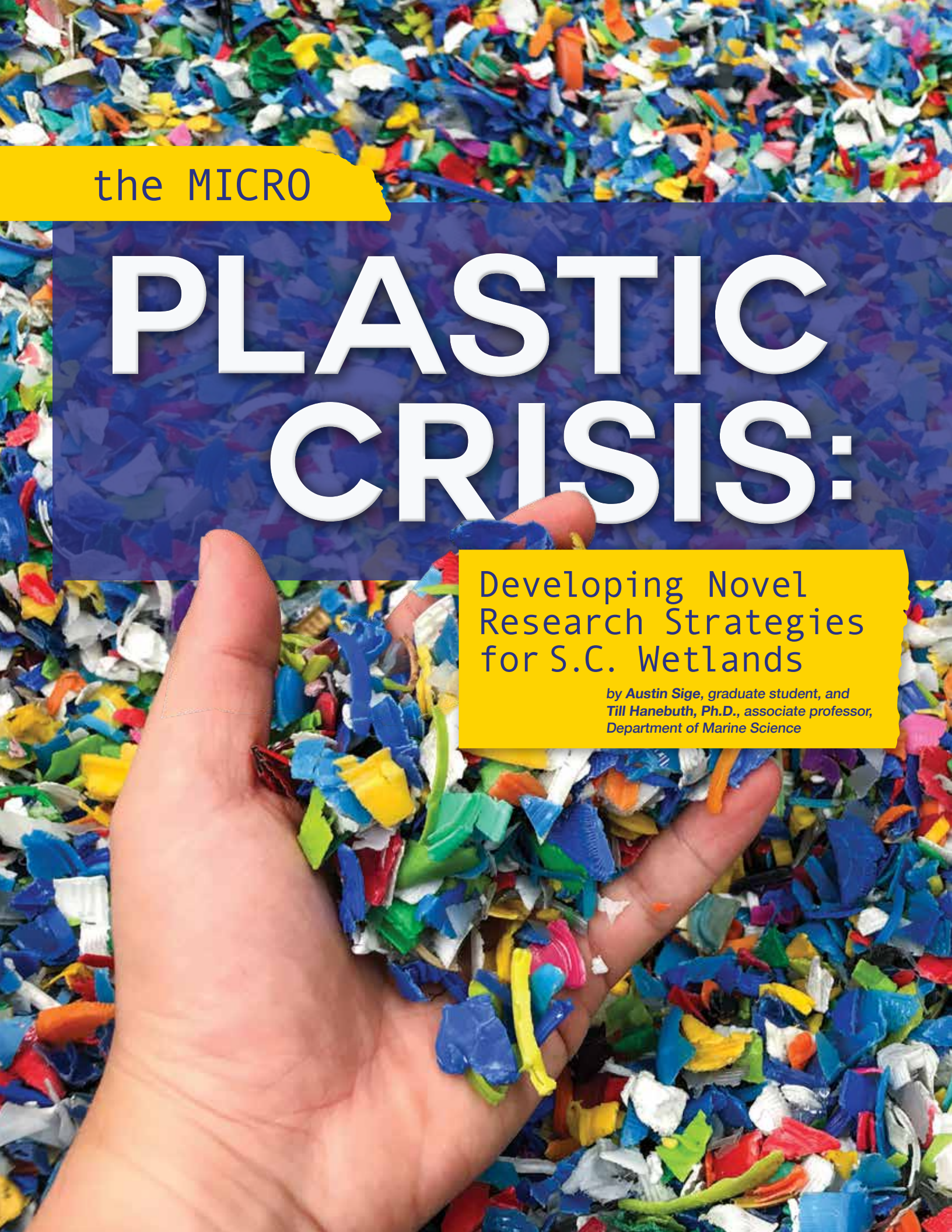
Two recently published books written by CCU faculty deal with fish and wildlife conservation.

Fascination with sharks is widespread. A book recently published by Johns Hopkins University Press and co-authored by **Dan Abel, Ph.D.** (Department of Marine Science) provides extensive information on natural history, biology, behavior, and conservation of sharks. The book, titled ***Shark Biology and Conservation: Essentials for Educators, Students, and Enthusiasts,*** provides numerous photographs and a literature summary, as well as results of Abel's long-term research project on coastal South Carolina sharks.

Abel, D.C. and R.D. Grubbs. 2020. ***Shark Biology and Conservation: Essentials for Educators, Students, and Enthusiasts***. Johns Hopkins University Press. 448 pp. ISBN-10: 1421438364

Collapses of fish and game populations due to unregulated harvest and habitat destruction in coastal South Carolina were common. These issues, and others related to historical conservation of wildlife, are examined in a book recently published by The History Press and written by **James Luken, Ph.D.** (Gupta College of Science). The book, titled ***Coastal South Carolina Fish and Game: History, Culture and Conservation,*** considers the impacts of Native Americans, colonists, plantation owners, African Americans, persons fishing and hunting for sport and profit, and state and federal governments. The events described in this book culminate in one of the most extensive wildlife conservation systems on the East Coast.

Luken, J.O. 2021. ***Coastal South Carolina Fish and Game: History, Culture and Conservation***. The History Press, Charleston, 175 pp. ISBN-978-1-4671-4682-1



the MICRO PLASTIC CRISIS:

Developing Novel Research Strategies for S.C. Wetlands

*by **Austin Sige**, graduate student, and **Till Hanebuth, Ph.D.**, associate professor, Department of Marine Science*

Research in the lab focuses on methods of separating plastics from sediments.

If you have ever owned a stuffed animal, used an exfoliating facewash, or even done your laundry, then you have been exposed to microplastics. Microplastic is any piece of plastic that is less than 5 millimeters (2 inches) in length. That means that the beads you throw away when your dog tears open a stuffed animal, the grainy compounds in your face wash that rinse down the drain, and the polyester fibers coming off your clothes during the spin cycle are all contributing factors to the earth's microplastic problem. Microplastics can also arise when much bigger plastic items such as plastic bottles, industrial sheets, fishing bobbers, face masks, and bed sheets break apart. Everyday plastic pollution that we commonly see on the side of the roads, in the widespread swamps, marshes, and waterways here in South Carolina, or hear about floating in large masses in the ocean, can all turn into myriads of microplastic fragments as ultraviolet radiation, physical destruction, and chemical degradation wear them apart.

After entering an organism, microplastics can block parts of the digestive tract and fill up stomachs, ultimately negatively influencing behavior, growth, reproduction, and eating patterns, and may result in death. Humans can also directly ingest and inhale microplastics or consume an animal that has ingested them. Potential negative effects of microplastics on humans are yet to be well-documented, but it is scientifically known that some of the chemicals added to plastics, thought to colorize, soften, and strengthen the material, are negatively linked with health, reproduction, and child development.

As well as being the earth's largest carbon sink, the ocean is also becoming the most prominent plastic sink. The role of coastal environments, such as marshes and tidal wetlands, as temporary microplastic sinks is sparsely understood and addressing this issue is technically challenging. Microplastics enter into coastal lowland swamps and marshes directly from the mainland or are pumped in daily by the tides. These tidal wetlands are comprised of fine-grain sediment and organic matter that create a heterogeneous, highly cohesive, and bio/geochemically reactive environment, excellent at trapping microplastics. The particular stickiness of the marsh material makes the removal of microplastics exceedingly difficult and is the main reason they have rarely been surveyed so far.

Our microplastics team in the Coastal Geosystems Research Lab works towards developing an innovative separation line, allowing for the extraction and concentration

of the various types of microplastics from cohesive marsh and swamp sediment. Research has shown successful yields upwards of 90% retrieval when using a multi-step separation procedure to remove microplastics. However, these procedures typically work with sand, and occasionally sludge, but do not work well with problematic marsh substrates. Our team aims to establish and optimize a novel separation procedure, which will be one of the first of its kind and will hopefully serve a vital role in future microplastic studies.

Our separation procedure follows a three-step structure as extracted from previous research: elutriation, chemical digestion, and density separation. Though the basic steps are the same, each step must be adjusted, evaluated, and optimized for cohesive material, which is a very arduous task. We recently constructed an elutriation column that is over 6 feet in height. Compressed air injected into the water column generates a highly turbulent environment, with a goal of effectively breaking apart and suspending material to be collected in sieves. Most of the leftover material remains in the column, while the caught product containing the microplastics, organic matter, and some residual sediment is collected from the top or bottom of the column, based on its particular density. We are currently working on optimizing the air pressure, overflow time, and settling times, as well as pretreating the material via a chemical-physical combination of Calgon (washing powder detergent), in an ultra-sonic bath, and on a shaking table to reach a higher degree of sediment suspension. Chemical digestion follows elutriation and aims to digest the organic material that remains in the elutriated product. This chemical treatment primarily uses a modified application of the Fenton's reagent, a solution of hydrogen peroxide (H_2O_2) and iron(II)sulfate ($FeSO_4$). We are currently working on optimizing the reaction timing, temperature control, fluid volumes, and microplastic collection process to obtain the most cautious but effective digestion of the organic matter, while preserving the microplastics. Entering the final density separation, ideally, the sample will only contain the various types of microplastics, with their individual densities, and also some remaining clastic sediment. This process uses two to three fluids of various density to separate plastics from the leftover sediment, while also sorting different plastic types from one another. We have currently created a prototype of our future density column and plan to adjust the design and construct multiple columns in the future, each dedicated to a specific fluid and density. The final product of the separation line will contain only microplastics that will be subjected to quantitative and qualitative analysis via microscopy in our shielded microplastic chamber, including an automated counting software, a scanning electron microprobe (SEM), which is currently arriving at CCU, and a Fourier-transform infrared spectrometer (FTIR), which is available in the

Microplastics team collecting sediment samples in the field.

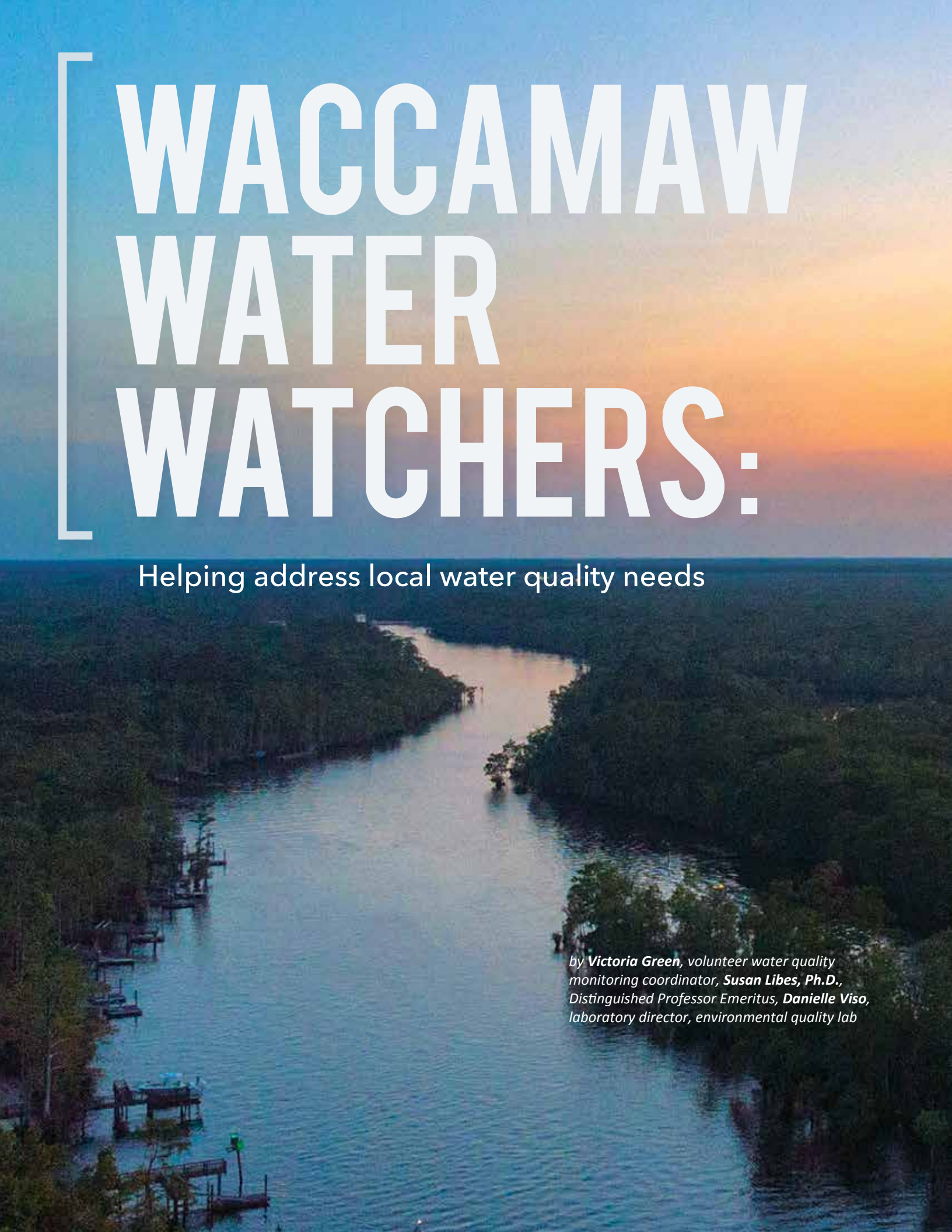
Department of Chemistry at CCU. Every step in this elaborate process must be kept clean to prevent unintended, but hardly avoidable, additional contamination by microplastics in our air, tap water, and surroundings. This means that all clothing, masks, and circulating microplastics must be controlled to the greatest degree possible; any fluid must be filtered several times, and any substance used needs to be shielded even from airflow.

The work done by our microplastics team is a pioneer effort and will hopefully shine some light on the microplastics crisis. Microplastics in swamp and marsh deposits will eventually enter the ocean, or have come from the ocean; therefore, understanding their quantity and composition is crucial in working towards cleaner oceans and wetlands. Through our separation procedure and future scientific analysis, following standardized NOAA guidelines, our goal is to trace the microplastics back to their original and local anthropogenic sources. From the beginning, it was clear that most of the man-made floating debris in our coastal region stems from very local sources, such as residential areas, industrial sites, and tourist activities. With a sink-to-source approach, we can identify local microplastic pathways and potentially address the problem before it begins. This concept, backed by continued research in the field, can mediate the influx of industrially-, residentially-, and recreationally-linked plastics that are entering coastal and ocean habitats.

Plastics on a beach will break down into even smaller particles, and eventually will be transported to the ocean.

WACCAMAW WATER WATCHERS:

Helping address local water quality needs



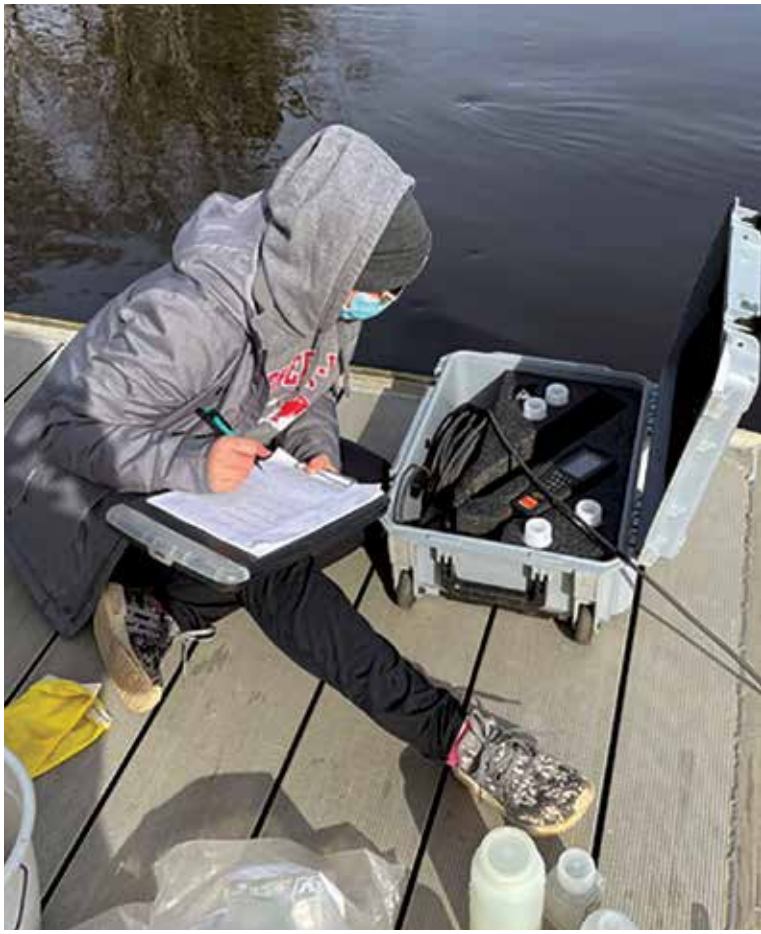
*by **Victoria Green**, volunteer water quality monitoring coordinator, **Susan Libes, Ph.D.**, Distinguished Professor Emeritus, **Danielle Viso**, laboratory director, environmental quality lab*

Coastal Carolina University students and faculty couldn't have a better natural laboratory than the Waccamaw River.

The river is right on our doorstep. As a blackwater river, it has an unusual natural chemistry that supports species of fish and freshwater mussels found nowhere else. It is cherished by the communities who live around it, like the "Historic Rivertown" of Conway. These communities seek to protect the river's natural beauty, its cultural place, and its ecology. CCU is helping with this protection while providing students hands-on training in watershed science and management focused on water quality.

A watershed is the land area that channels rainfall and snowmelt to creeks, streams, and rivers, and eventually to outflow points such as reservoirs, bays, and the ocean. Most people looking at the black waters of the Waccamaw River for the first time think, "This water is dirty! There must be a pollution problem!" Not so! The water quality in the river is generally excellent (with rare exceptions, such as mercury contamination in its fish). The dark color of the water is natural and produced in the same way as the color in a cup of strongly brewed tea – from contact of the river water with leaf litter ("tea leaves") and other organic matter lying in the floodplain swamps and riverbanks. This organic matter is naturally degraded by microbes that consume oxygen, so the river naturally has low levels of oxygen. Fish and aquatic animals have adapted to this but have trouble when additional organic matter enters the river, such as from flooding, discharge of treated sewage effluent, or runoff of polluted stormwater. In some cases, oxygen can reach levels low enough to cause fish kills.

Polluted stormwater runoff is bringing other pollutants into some parts of the Waccamaw River, including fecal bacteria, nutrients, and eroded soil. Local municipalities have requested assistance from CCU in helping detect and eliminate these kinds of water quality problems. To address this, CCU established a state-certified Environmental Quality Lab (EQL) in 1991. With increasing demand for its services, a new facility was built in the Coastal Science Center in 2009 with support from the Horry County Commission on Higher Education.



EQL undergraduate research technician Brooke Dunnery conducts field tests along the Waccamaw River (top). *Graduate student Ivy Spratling* (above) *conducts monitoring as part of her graduate internship experience.*

The Waccamaw River is one of 18 sites being monitored by EQL students and faculty.

The EQL now provides educational and research opportunities to students and faculty under the aegis of the Burroughs & Chapin Center for Marine and Wetland Studies.

Most of the water quality work in the Waccamaw is now being done from a watershed perspective, in response to a request from the USEPA in 1996 that municipalities use this approach for managing their water resources. In the case of the Waccamaw River, which flows across two states, this approach requires collaborative work between several counties in North Carolina and two counties (Horry and Georgetown) in South Carolina. To help facilitate this style of environmental management, CCU established the Waccamaw Watershed Academy (WWA) in 2004. Shortly thereafter, the WWA, working in partnership with Horry County and the City of Conway, began drafting South Carolina's first watershed management plan. This plan was developed for the Kingston Lake Watershed, which includes the only urbanized lands along the Waccamaw. It contains action items to remedy polluted runoff, which was first identified by investigative work performed by the EQL from 1999 to 2002. In 2011, Horry County institutionalized the use of the watershed approach by hiring its first watershed planner. In 2007, local municipalities began developing and implementing stormwater management programs under a new requirement mandated by the federal Clean Water Act. The goal of these programs is to reduce polluted stormwater runoff. The local municipalities turned to CCU's EQL and WWA for assistance in meeting these new needs. For the Waccamaw, this is being done in a watershed framework through: (1) long-term water quality monitoring programs, (2) investigative work that identifies how and where pollutants are entering the river, and (3) assessing novel remediation efforts aimed at eliminating these sources. The latter include novel stormwater treatment practices like artificial wetlands and floodplain restoration. In all these efforts, CCU students play important roles, with many using their experiences to complete graduate and undergraduate theses and internships.

The goals of the monitoring programs on the Waccamaw are to establish what is normal to read and to alert the local municipalities when an emerging pollution problem is detected. The longest-running of these is a volunteer water quality monitoring program, established in 2006 in partnership with the Waccamaw Riverkeeper. This program engages about 50 volunteers who monitor 18 sites, from Lake Waccamaw in North Carolina to Winyah Bay in South Carolina. To compliment the volunteer-collected data, the EQL's staff scientists have been monitoring seven sites on the Waccamaw since 2008. Schedules are coordinated so sampling is conducted weekly throughout the year. Many sampling sites are co-located with in situ monitoring performed by the U.S. Geological Survey. The data from these programs collectively provide a comprehensive view of the river's water quality on a nearly constant basis. All results are available online at the links provided on the next page.

The end of the Waccamaw's 140-mile journey is Winyah Bay, a tidal estuary that discharges into the Atlantic Ocean. Winyah Bay receives waters from four other rivers (Little and Big Pee Dee, Sampit, and Black) and the Atlantic Intracoastal Waterway. The entire drainage area, called the Pee Dee River Basin, creates a large enough discharge to make Winyah Bay the third largest estuary on the east coast. This discharge carries natural materials and pollutants into the coastal ocean, so a true watershed approach considers

This program engages about 50 volunteers who monitor 18 sites, from Lake Waccamaw in North Carolina to Winyah Bay in South Carolina.

the impacts of this discharge on the health of the coastal waters. To meet local needs in this regard, the EQL has been measuring water quality at several saltwater fishing piers on the Grand Strand since 2006 using in situ sensors. The lab has also been measuring fecal bacteria weekly in surf zone waters since 1997. The ocean monitoring is focused on the same water quality issues as in the river – low oxygen, sediment, and fecal bacteria contamination. The WWA similarly runs volunteer monitoring programs in the coastal communities of Murrells Inlet, Surfside Beach, and Briarcliffe Acres.

What does the future hold for the Waccamaw? Following a period of historic drought from 2000 to 2012, rainfall has been much higher than normal, causing frequent riverine floods, increased stormwater runoff, and a rising water table. Other long-term trends impacting water quality include rising sea level, land development practices like the removal of trees, and installation of hard surfaces such as roads and roofs. Through the long-term monitoring programs, we are documenting trends such as decreasing levels of oxygen, dissolved solids, and pH, all of which can have negative impacts on animals, particularly freshwater mussels such as the one endemic to the Waccamaw River. On the short-term, water quality impacts are seen immediately following rain events, as the river receives discharges of sediment and fecal bacteria. The ultimate source of this sediment is erosion, which threatens properties but also causes water quality problems like turbid waters.

In helping the EQL and WWA meet local needs for water quality monitoring and research, graduate and undergraduate students gain important training. These new skills help our graduates pursue careers in the water sector, where jobs are growing in number. This growth is partly due to increasing management challenges caused by population growth, climate change and aging infrastructure, and partly due to the need for replacing a large cohort of retiring professionals.

It's never been a better time to get involved in protecting and improving our water resources. To learn more, reach out and contact us.

EQL undergraduate research technician Lissett Diaz collects water samples from the Waccamaw River.

CONTACT INFORMATION

Environmental Quality Lab: Danielle Viso (dviso@coastal.edu), 843-349-6980

Waccamaw Watershed Academy: Susan Libes (susan@coastal.edu), 843-349-4028

Volunteer Monitoring Programs: Victoria Green (vgreen@coastal.edu), 843-349-6666

Waccamaw Riverkeeper: Cara Schildtknecht (riverkeeper@winyahrivers.org), 843-349-4007

Coastal Waccamaw Stormwater Education Consortium: Monica Gray (mgray2@coastal.edu), 843-349-6601

INTERNET RESOURCES

Environmental Quality Lab: https://www.coastal.edu/eql/

Waccamaw Watershed Academy: https://www.coastal.edu/wwa/

Volunteer Monitoring Programs: https://www.coastal.edu/wwa/vm/

Coastal Waccamaw Stormwater Education Consortium: http://cwsec-sc.org/

Winyah Rivers Alliance: https://winyahrivers.org/

U.S. Geological Survey: https://waterdata.usgs.gov/sc/nwis/rt

SUNKEN SHIPS?

SURVEYING THE SAMPIT RIVER FOR NAVIGATION

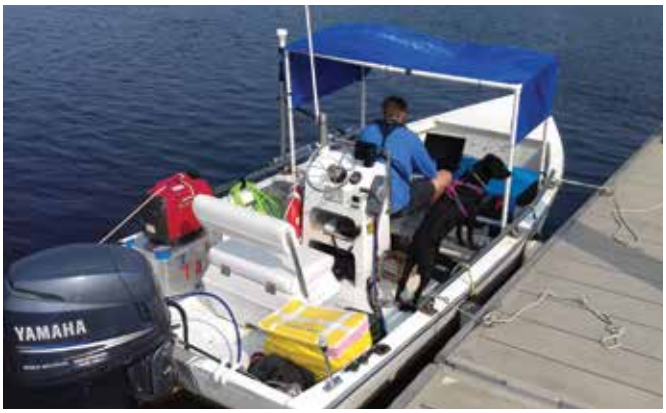
Story and photos by John Durica, graduate student, and Till Hanebuth, Ph.D., associate professor, Department of Marine Science

Many people dream of finding buried treasure, but most of the time that remains just a dream. For us in the Coastal Geosystems Research Lab, however, treasure can take many different forms, ranging from sunken ships and drowned trees to river bottom bedforms made of sand.

You may be wondering how we can see what is on the bottom of the river. This is achieved through the use of multibeam bathymetry. If you have ever looked at a modern nautical chart, then you have seen the result of many multibeam surveys. Bathymetry is the measurement of water depth below a vessel-mounted acoustic sensor and is tied to GPS coordinates. A single survey consists of millions of these measurement points, which are collected as the survey vessel moves around the study area in a systematic gridded pattern. These echosounder systems range in size from massive deep-ocean instruments to small shallow-water devices like the one (shallow-water sidescan sonar) we attach to our CCU vessels to map coastal South Carolina waterways.

Specifically, our surveys have taken us to the Santee River, Winyah Bay, and, more recently, the Sampit River. Our efforts focused on the navigability of the Sampit River over 5 miles from its mouth in Winyah Bay up to a proposed industrial site. The main invisible threats to commercial barge navigation that we were searching for include sunken boats, stationary or migrating sand bars and shoals, fallen trees, collapsed docks, or any other obstruction in the main river channel. Another question was where exactly is the main channel located in this naturally meandering river system?

Once the data were collected and processed, we were able to inspect the river bottom for any hazards to navigation, as well as for channel location and width. Despite multiple boats strewn throughout the fringes of the surrounding marsh, they do not present a primary hazard to navigation. Scientifically, the more interesting discoveries are the multiple bars and shoals in both the middle and along the bank of the Sampit River. The central bars are bound on both sides by marked channels, which is an unusual pattern for a natural fluvial system. The explanation for these features stems from the Sampit River's minor contribution, only about 4%, to the overall freshwater discharge to Winyah Bay. Instead, the Sampit River's water flow is dominated by the tidal forces, leading to high current velocities and reversing flow directions four times a day. In fact, the Sampit River should be considered an over-dimensioned tidal creek rather than a true fluvial river. Shoals with their upper spit attached to the bank seem to indicate that the ebb (outgoing) current exceeds the flood (incoming) current, suggesting a net sand transport in downstream direction. A future survey would be needed to illustrate if these bars and shoals are stationary, or if they migrate and change their appearance over time. We thank Georgetown County for funding this study. Any treasures of the Civil War still remain to be uncovered.



CCU's small boat is equipped with sonar for mapping the Sampit River.

Figure 1: *Bathymetric depths along the lower Sampit River.*

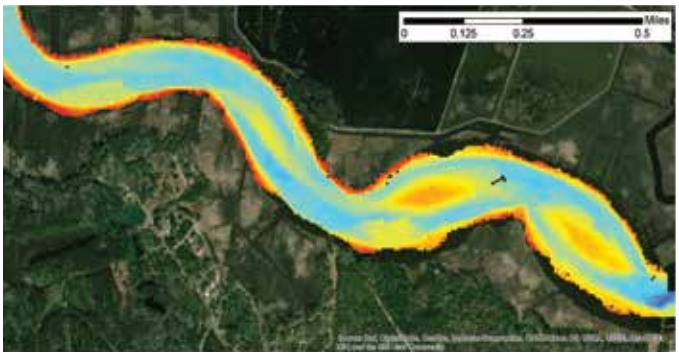
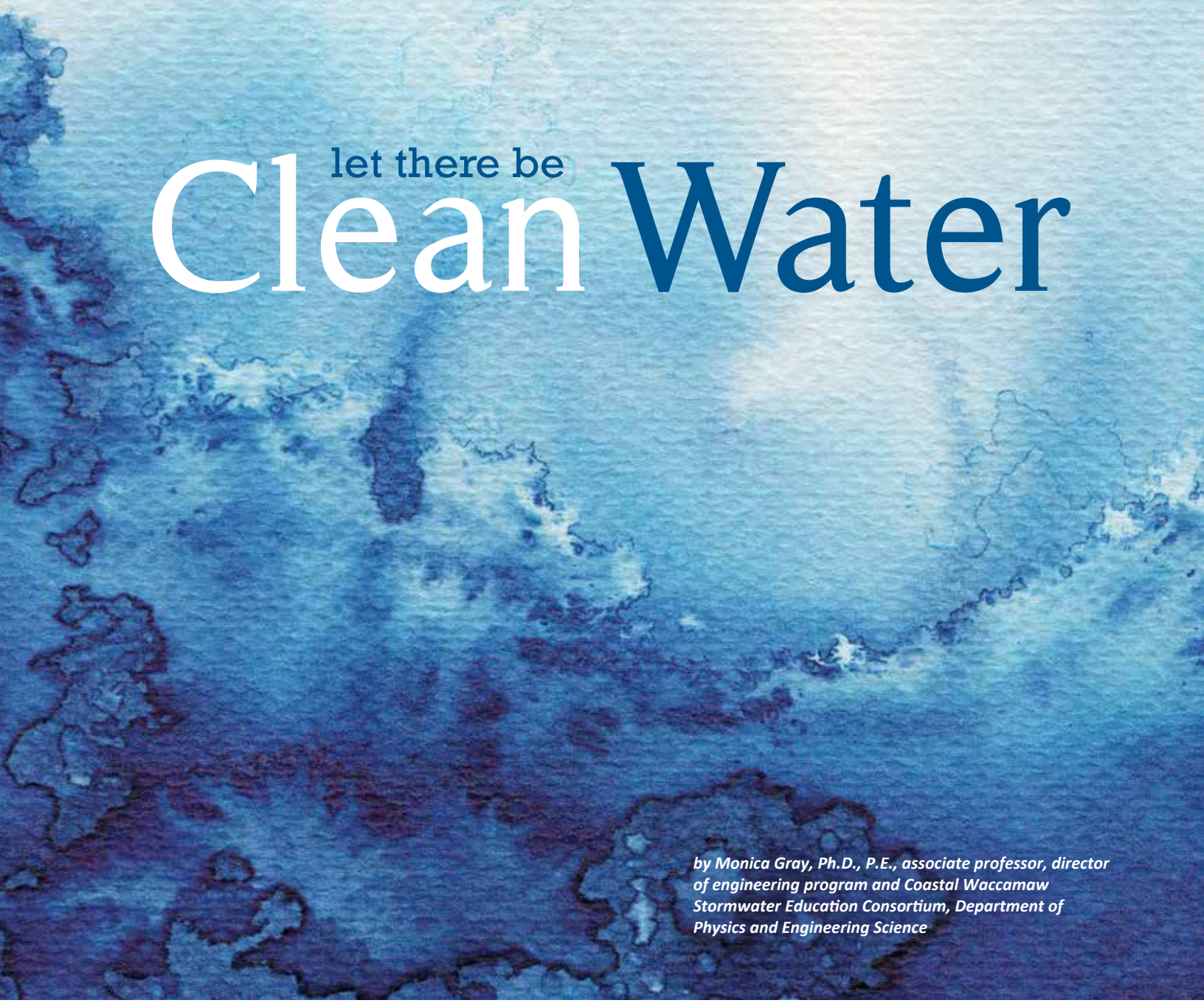


Figure 2: *Two major sand bars in the center of the river and various shoals along its outer bands. The configuration with two channels on either side of the major bars indicates the tidal dominance of this river.*

Figure 3: *Bank-attached shoals at the lee sides of inner bend sides, suggesting the importance of the ebb flow for net sand transport down the stream.*

Figure 5: *Navigability of the Sampit River where green indicates water depths greater than the required commercial 15 ft. (5 m.) and red shows access limits for barges (≤ 15 ft. of water depth).*



let there be Clean Water

by Monica Gray, Ph.D., P.E., associate professor, director of engineering program and Coastal Waccamaw Stormwater Education Consortium, Department of Physics and Engineering Science

URBAN WATER CYCLE

You might be familiar with the hydrologic (water) cycle, but did you know that there is also an urban water cycle (UWC)? In the UWC, source water is collected and treated at water treatment plants. From these plants, water is distributed to homes and businesses through a network of pressurized pipes. We use treated water in our daily lives for cooking, showering, etc. Used water or wastewater contains pollutants and is sent down our drains. Wastewater typically flows by gravity through the sewer system to a wastewater treatment plant, where it is treated and returned to a waterbody, which is a water source for the local or downstream community. Because water sources are so important to our health and well-being, it is important to protect them from pollutants. Stormwater runoff is a major cause of source pollution in the UWC.

STORMWATER AND URBANIZATION

If an area is undisturbed (e.g., forest), rainfall is slowed by the trees and plants. Most of it soaks into the ground and experiences some treatment as it slowly makes its way to rivers or oceans. When an area experiences population growth and economic development, there is a substantial increase in impervious surfaces (e.g., rooftops, roads, and parking lots), which are major pathways for stormwater runoff. Waterproof concrete, asphalt, and roofing surfaces alter natural rainfall drainage patterns. This reduction in infiltration and creation of artificial flow highways generates large volumes of stormwater runoff, which carries pollutants such as lawn fertilizer, pet waste, motor oil, and gas to waterbodies. In some parts of the country, both wastewater and stormwater are carried to wastewater treatment plants in combined sewers. Thus,

One of the main objectives of the Clean Water Act is to promote public health by reducing pollution in the nation's water bodies.

stormwater also gets treated before being released to the environment. In our region, stormwater and wastewater are conveyed in separate sewer systems and stormwater does not undergo treatment. Therefore, urban stormwater runoff and its constituent anthropogenic pollutants can inevitably find their way into the drinking water source and/or recreational waters of local and downstream communities.

Coastal communities are more susceptible to storms and concomitant runoff because their close proximity to the sea means higher rainfall intensity than in land areas. Further, not only are coastal regions susceptible to fresh water pollution, but their coastal waters represent a significant tourist attraction and economic resource. These challenges are especially relevant to South Carolina's coastal plain. Horry County is one of eight coastal counties in South Carolina and is the second fastest-growing metropolitan area in the country. Population and housing development have doubled in the last three decades and are on pace to double in the next 20 years. The county is also part of the Grand Strand, which attracts about 18 million tourists annually.

STORMWATER REGULATIONS

One of the main objectives of the Clean Water Act is to promote public health by reducing pollution in the nation's water bodies. This act authorized the National Pollutant Discharge Elimination System (NPDES) Permit Program, which made it illegal to discharge any pollutant as a point source into waters of the United States without a permit. Stormwater runoff flows are defined by the South Carolina Department of Health and Environmental Control (SC DHEC) as point sources, and therefore require NPDES permitting. The NPDES Phase II Stormwater Rule Program focuses on Municipal Separate Storm Sewer Systems (MS4s). MS4s are defined as a conveyance or systems of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains) owned or operated by a state, city, town, borough, county, parish, district, association, or other public body. SC DHEC is authorized to designate an area or institution (e.g., a university) a MS4 if the population of the surrounding area increases such that it is categorized as an urbanized area (50,000 or more people) as defined by the latest U.S. Census. Under NPDES Phase II, MS4s must develop, implement, and enforce a stormwater management program designed to reduce the amount of pollutant discharges. The permit requires this goal be achieved through the implementation of six minimum control measures:

1. Public education and outreach on stormwater impacts (e.g., integrating stormwater impacts in K-12 and college curriculum).
2. Public involvement and participation (e.g., volunteer water quality monitoring of rivers and beaches).
3. Illicit discharge detection and elimination (e.g., volunteer water quality monitoring of rivers and beaches and public education).
4. Construction site stormwater runoff control.
5. Post-construction stormwater management in new development and redevelopment.
6. Pollution prevention and good housekeeping for municipal operations.

CCU student collecting ocean water samples at Waties Island.

CCU students collecting water samples from a stormwater retention pond.

All students participating in the CCU campus monitoring program are trained in laboratory procedures, field measurement protocol, and meter calibration.

The Coastal Waccamaw Stormwater Education Consortium (CWSEC) was formed in 2004 to facilitate regional collaboration of stormwater educational efforts in response to current and future requirements. Consortium members include six citizen science education agencies and eight MS4s serving Horry and Georgetown counties (see Table 1). The mandate of the consortium is to help local governments implement control measures. For example, the consortium implemented a robust volunteer water quality program that regularly monitors three sites on CCU's campus and 11 sites on the Waccamaw River, as well as 15 sites along Grand Strand beaches from Briarcliffe Acres to Murrells Inlet.

(Table 1): *Coastal Waccamaw Stormwater Education Consortium Members.*

CITIZEN SCIENCE EDUCATIONAL PROVIDERS	MUNICIPAL SEPARATE STORM SEWER SYSTEMS (MS4s)
Coastal Carolina University Waccamaw Watershed Academy	Horry County
Clemson's Carolina Clear	City of Conway
Murrells Inlet 2020	Georgetown County
North Inlet-Winyah Bay National Estuarine Research Reserve (NERR) Coastal Training Program & Public Education Program	Town of Surfside Beach
South Carolina Sea Grant Consortium	City of North Myrtle Beach
Winyah Rivers Foundation Waccamaw Riverkeeper Program	City of Conway
	Town of Atlantic Beach
	Town of Briarcliffe Acres

CCU'S CAMPUS STORMWATER MONITORING PROGRAM AND ENGINEERING PROGRAM COLLABORATION

The goal of the engineering program at CCU is to train future leaders who will develop and implement sustainable solutions to global challenges by engaging students in real-world, community-based projects. The CWSEC and engineering program have embarked on a partnership to leverage the consortium's mandate and the engineering program's goals. An example collaboration is CCU's campus monitoring program, which was started in 2009 to meet requirements of a wetlands permit issued to enable the construction of Wall Pond. Throughout the academic year, engineering and other students provided assessments of water quality conditions in the stormwater ditches (at U.S. 501 and S.C. 544) and retention ponds, all of which drain to the Waccamaw River. Water quality in the Waccamaw is characterized by low dissolved oxygen and high fecal coliform, especially after storms. Water quality and protection of the Waccamaw is therefore of public health importance. All students participating in the CCU campus monitoring program are trained in laboratory procedures, field measurement protocol, and meter calibration. Parameters monitored include nitrogen, fecal bacteria, turbidity, pH, conductivity, and temperature. A program description and data portal is available at coastal.edu/wwa/vm/.

PREPARING FOR THE FUTURE

The University's master plan projects include continued development of its 600 acres to facilitate up to 12,500 students. This would mean increased impervious surfaces. Concurrently, the population of the surrounding area is expected to increase. It is therefore possible that in the future, CCU could be designated an MS4. Clemson University is a prescient case study, whereby, as a result of its inclusion in the Greenville urbanized area, SC DHEC designated it an MS4. Through the partnership between the engineering program and consortium, the groundwork for compliance with MCM [1], [2] and [3] have been laid and can be enhanced and leveraged to fulfill potential NDPES Phase II Permit requirements.

CONTACT INFORMATION

Coastal Waccamaw Stormwater Education Consortium, contact Monica Gray, mgray2@coastal.edu, 843-349-6601.

(Top): *CCU student presenting results of water quality monitoring.*
(Bottom): *CCU student processing water samples from the Waccamaw River.*

Kenneth E. Swain with the 2015 Swain Scholars. Also pictured are Michael Roberts, Ph.D. and Sharon Thompson, Ph.D.

Remembering Mr. SWAIN

by Sharon Thompson, Ph.D., *Department of Health Sciences*

Horry County lost a remarkable leader and philanthropist when Kenneth Swain passed away on Jan. 24, 2021, and I lost a good friend. Since beginning my work as coordinator of the Swain Scholars program 10 years ago, I had come to know "Mr. Swain" quite well. When I think of Mr. Swain, I envision him smiling broadly, wearing his teal sport coat and a bow tie.

When Mr. Swain came to our campus to discuss the creation of the Swain Scholars program, his idea was truly visionary. There are many internship-type programs around our country in higher education. Mr. Swain's idea for the Swain Scholars program is quite unique because these undergraduate students achieve more than volunteer or internship experiences. In the first year of the program, the students conduct needs assessments, through research and interviews with local leaders, to identify health problems in our county. They then partner with local agencies and/or municipalities to conduct research on this identified health problem, analyze the results, provide education and advocacy, and share their research findings with other local agencies and/or municipalities for grants or advocacy. In addition to sharing their research findings with local groups, they also present their research at national conferences. Several Swain Scholars "teams" have also written manuscripts that have been published in peer-reviewed journals. When I think about all of the amazing opportunities these students have had and I have experienced as the coordinator of this program, I am grateful to Mr. Swain. I have been at Coastal Carolina University for 30 years, and working with the Swain Scholars program is the most rewarding aspect of my professional career.

Mr. Swain has done so much more than donate money to our university to begin this program. It was important for him to get to know all of the Swain Scholars on a personal level. Every December, our group of Swain Scholars and the dean of the Gupta College of Science, Mike Roberts, had lunch with him on campus. Then in May, my husband and I would host the group at our home for dinner. Mr. Swain had an incredible memory and would ask me questions about the students after each event. He could remember where they were from and their majors. He truly cared about all of them.

Kenneth E. Swain with his Pomeranian show dogs.

A few years ago, I received a phone call from Mr. Swain and he told me that he wanted me to help him write a resumé. At this time, the Swain Scholars were conducting a county-wide study of bicycle safety, which was a collaborative effort with local public entities. He wanted a resumé so that he could apply to be on a city bicycle committee to support the Swain Scholars' work. We spent several hours working on the resumé, and, while I helped him craft this, I was truly amazed by what he had accomplished as an Air Force officer, Korean War veteran, commander of the South Carolina Atomic and Nuclear Veterans group, a former South Carolina Health and Environmental Control employee, and local pharmacist. Unfortunately, he was not chosen to serve on this committee, likely due to his lack of experience in the area of bicycle safety; however, the fact that he wanted to support the students' work meant so much to them and to me.

Mr. Swain was very proud of his Pomeranian show dogs and spent a great deal of time breeding his male, Sun Fun Sandy, and showing these dogs. A photo of him with two of his American Kennel Club Pomeranians hangs in Swain Hall. I walk past it often and smile when I see it.

During the COVID-19 pandemic, Mr. Swain was not able to leave his assisted care center or have visitors, so we began writing letters. I would always get a laugh when I would see how he signed his letters: "your old, old friend, and jailbird, Ken." Mr. Swain was a very social person and missed being able to get out into our local community.

Prior to moving to the assisted care center, Mr. Swain invited my husband and me to his birthday party, which was held at his house. The guests were mostly friends from his Ocean View Baptist Church Sunday school class. This was a group he clearly enjoyed, and he appreciated the attention - they were all women, as he was the sole male in the class. Although he gave millions of dollars to Coastal Carolina University and many other educational institutions and nonprofits, Mr. Swain had a small, humble, yet beautiful, home and drove a white Prius. Rather than using his money to purchase extravagant personal goods, he used his wealth to make Horry County a better place.

Over the past decade, Mr. Swain suffered through many illnesses, hospitalizations, and other health setbacks, yet he was always smiling, ready to tell a story or engage a group in jovial laughter, and he was never prideful or arrogant. Usually when I get a voicemail message on my phone, I delete it right after I listen to the message. The only voicemail message that has been saved on my phone is from Mr. Swain on September 7, 2020. Every now and then, I have found myself playing it since he passed. I will keep it saved so I can continue to hear his cheerful voice.

Mr. Kenneth Swain may not be on this earth anymore, but his legacy to make this world a better place will live on through his extraordinary gift to Coastal Carolina University and to many other agencies and higher education institutions. Thank you, Mr. Swain, for the giving of your positive spirit and the sharing of your resources to shape the lives of college students and to enhance the quality of life in Horry County.

CCU students studying at Swain Hall.

Memories of Kenneth E. Swain

Swain Scholars

Many people aspire to make a difference in the lives of others. The Swain Scholars were supported by Mr. Swain to fulfill this aspiration through implementing community health programs. Few people ever impact as many lives as Mr. Swain has. Mr. Swain's contributions to the Coastal Carolina University and Horry County community are unmatched. As a member of that community since I was 2 years old, I was honored to be a Swain Scholar and have a chance to learn selfless generosity from Mr. Swain.

Chelsea Thomas,
Law Student at Seton Hall University School of Law
Coastal Carolina University, B.S. Biology, 2015, M.A. Writing

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The opportunity provided by Mr. Swain has encouraged me to consider not what my education can do for me, but what my education can do for my community. Through his words and actions, Mr. Swain has demonstrated what it means to foster growth in the community by giving back. I am incredibly thankful to call myself a Swain Scholar and hope to one day pass on the generosity that Mr. Swain provided to me.

Briana Laws Polk, D.M.D.,
General Dentist for United States Air Force
Coastal Carolina University, B.S. Biochemistry, 2016

I am very thankful to have met Mr. Kenneth Swain and to have been a part of the Swain Scholar program during my time at Coastal Carolina. This experience allowed me to develop and learn new skills outside the classroom. To this day, Mr. Swain's generosity and support have had a profound impact in my life as I was able to achieve my career goals. I feel fortunate to be where I am today, and I believe the Swain Scholars program and Mr. Swain played a vital role.

Miguel Mendoza, Pharm. D.,
Clinical Pharmacist
Coastal Carolina University, B.S. Biology, 2012

Mr. Swain provided me with a unique and special opportunity that I am eternally grateful for. He was a great inspiration and amazing support. The Swain Scholars program meant, and still means, the world to me. I was able to experience things that I never thought I would and was able to accomplish things that I never thought I could.

Amber Rahman Eddy,
Occupational Therapy Doctoral Degree Student, University of Las Vegas
Coastal Carolina University, B.S. Exercise and Sport Science, 2019

There are not many individuals who have made such a significant impact on a community as Mr. Swain has made at Coastal Carolina University. His generosity not only provided Swain Scholars financial assistance with tuition, but it also allowed them the opportunity to impact others in the community by implementing a health outreach program designed to improve the quality of life of Horry County residents. He provided students with the means to make a difference and "pay it forward," and this was perhaps the greatest gift he could have ever offered. His influence did not simply affect Swain Scholars, however, as his generosity also provided Coastal with a science building for conducting research and furthering education in the sciences. His love for this community and education impacted more people, both directly and indirectly, than he could have ever imagined, and we will be forever grateful to him.

Ina Troutman, PA-C,
Physician Assistant, Conway Medical Center Pediatrics
Coastal Carolina University, B.S. Biology, 2014

Mr. Swain's generosity and commitment to the Swain Scholars program provided me with an amazing opportunity to work alongside other CCU Swain Scholars who were dedicated to researching current issues in the community and making a positive change. In addition to the research skills that I acquired, the connections and friendships that I made throughout this program will last a lifetime. I am so thankful for the scholarship and the opportunity that Mr. Swain provided as well as the chance to build a relationship with him. He was so intelligent and caring. He was invested in every single Swain Scholar who came through his program. He would always check in to see how our projects were going as well as what we had going on in our personal lives, outside of the Swain Scholar program. Mr. Swain had so much passion for CCU and the local community, which did not go unnoticed. I will forever be grateful for being chosen as the first sociology Swain Scholar.

Rachael Trudon,
Motion Recruitment, Charlotte, N.C.
Coastal Carolina University, B.A. Sociology, 2019

When I first received the Swain Scholarship, I did not know Mr. Swain. I began to learn about him and his impact upon Coastal Carolina University and the larger community. Through family and friends, I not only met Mr. Swain but came to know him a little as well. I found him to be not only deeply interested in the projects of the Swain Scholars, but each scholar as well. He looked you in the eye, shook your hand, and spoke in kindness. My life was just one of those blessed by his generosity, compassion, and concern for the overall well-being of our school and community. The CCU community is the better for having Mr. Swain as a dynamic part of its history. He left not only an indelible fingerprint upon the souls of many, but will continue to redirect and transform lives of students to come. I am proud to be a part of Mr. Swain's legacy. He made a difference.

Nancy Phillips,
B.S. Biology, 2018, Support Specialist, Eastern Carolina Housing Organization

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Mr. Swain was truly an exemplary man, and it was his generous contribution to Coastal Carolina University that afforded me the incredible opportunity to be a part of the Swain Scholars program. The Swain Scholars program provided me with immense personal and professional growth during my time at CCU. I am certain that the foundational skills in public health research and analytics that I had the opportunity to develop as a Swain Scholar ultimately sparked the passion and drive that led to a career in

Memories of Kenneth E. Swain

public policy in Washington, D.C. I am eternally grateful to Mr. Swain, the Swain Scholars program, and Dr. Thompson for the wonderful opportunity to thrive and grow beyond measure. I will always have a special place in my heart for the irreplaceable journey and opportunity that Mr. Swain provided.

Kerry Dittmeier,
M.P.H. Georgetown University, Government Affairs Consultant
Coastal Carolina University, B.S. Public Health, 2017

Mr. Swain was so kind to all of us in the scholarship program. It meant so much that he genuinely cared about his recipients and always wanted to know how we were doing in school and in our careers. I was honored to be a part of a program that carried a legacy with how thoughtful he was. His scholarship allowed me to focus on my studies so that I could further my education, and I will never forget that.

M. Christine Po, PA-C,
Physician Assistant, Atlanta Dermatology and Laser Surgery
Coastal Carolina University, B.S. Public Health, 2013

In my time working through the Swain Scholars program, I have come to know Mr. Swain as an unconditionally kind, generous, and caring man. The first time I met Mr. Swain, we spoke at length about our families, our homes, and the importance of the program. Although the time I was able to spend with him was limited, he was always an absolute joy to be with. I am so incredibly grateful for the time I was able to spend getting to know Mr. Swain and for the wonderful opportunity he has provided me and so many other students through the Swain Scholars program.

Jonah Nordeen,
Coastal Carolina University, B.S. Biochemistry, 2021

Mr. Swain had a warm and inviting presence that was lovely to be around. His passion for the Swain Scholars program shined brightly in my few but meaningful encounters with him. I am deeply grateful for the scholarship given on his behalf. It is something I will forever cherish because of its help toward my education and its representation of Mr. Swain's legacy. His impact on my college experience will always live in my heart.

Armani Sumpter,
Coastal Carolina University, B.S. Public Health, 2021

Mr. Swain was a witty and giving individual who cared about everyone around him. My favorite memory of Mr. Swain was going to lunch at CINO with him and the other Swain Scholars after taking photos with him. I had the chance to sit beside him that day, and we had a great conversation about my grandma, who he also knew. Once we got to talking more, I found out that he knew many members of my family since they grew up in Conway like him. I got to hear about his experience working as a pharmacist in Conway. He also reminded me of how I am lucky to have the grandmother that I have and to always cherish and appreciate her. Every time that I saw him after that day, he made sure to ask about my grandmother and how she was doing. I will always remember Mr. Swain for his ability to always put others before himself, even on his bad days. He will forever be missed by the CCU community, and the Swain Scholars are forever grateful for his generous heart and willingness to make a difference in our community.

Caroline Durham,
Coastal Carolina University, B.S. Public Health, 2021

Michael H. Roberts

When I introduced myself to one of Ken Swain's family members at his funeral in late January of this year, the first thing she said was, "Ken loved the students he met at Coastal." She was referring, of course, to the students who were a part of the Swain Scholars program: a unique scholarship program, created by Mr. Swain, that emphasizes public health research.

His commitment to the program was not distant and abstract. He actively engaged with the students, whether it was at one of the regular lunch meetings or at the dinners hosted at the home of the program's director, Dr. Sharon Thompson.

At all these meetings, he made it clear how much he enjoyed interacting with the students who were the recipients of his named scholarship. Due to his warm and engaging personality, the students loved interacting with him. As is clear from the testimonials by the Swain Scholars – both current and past – in this issue of *Progression*, Mr. Swain had a profound effect on these students and upon our university.

He will be missed, but, in the legacy he created, his interests in public health education – and his love for the University and its students – will live on forever.

Michael H. Roberts, Ph.D.
Dean, Gupta College of Science
Vice President for Emerging Initiatives

Kenneth E. Swain pictured with the 2012 Swain Scholars, Sharon Thompson, Ph.D., and Michael Roberts, Ph.D.

Q & A

KELLI MOSES-DOLFI

Academic advisor in the Gupta College of Science.

Q. What is your current position in the Gupta College of Science?

A. I am one of the First-Year Academic Advisors within the Gupta College of Science. Typically, I work with my advisees until they reach 30 or more credits and move to a Faculty Advisor within their major. In some cases, like with exercise and sport science majors, I continue working with them until they earn 60 credits because that department has a robust mentor format for students in their sophomore year. Once an exercise and sport science major earns 60 credits, then they move to a faculty advisor. I started at CCU in July 2007, during summer orientation. I feel fortunate to have seen the changes and development over the years, especially the addition of several buildings around campus. When I first started here, I attended regional conferences and many professionals were not familiar with our school at all. Now, we enjoy national recognition, and I am so proud of our growth.

Q. What background led you to this position?

A. As a first-year college student, I really had no idea what I wanted to study. As a result, I changed my major four or five times and felt lost. I wanted to be one of those students who was focused and knew exactly which career to pursue. My difficulty was that I liked so many different areas and had trouble seeing myself doing only one thing. I can truly empathize with my advisees who feel disconnected and discouraged. For me, the joy of advising is helping a student problem solve. I love it when an advisee comes in my office excited about a particular class or instructor.

Throughout my career, I have worked in several settings, including a group home, public school, and multiple colleges and universities. Although I no longer practice, I am a licensed counselor in South Carolina.

Q. In a "typical" semester, what does your job entail?

A. Luckily, my job varies quite a bit depending on the academic calendar. During the summer months, I am focused on orientation and helping new students get adjusted to campus and become familiar with the needed classes for their major. Fall tends to be the busiest time of year because in addition to individual appointments with my advisees, I also teach a class called University 110: First-Year Experience.

Once students arrive on campus in the fall, the advisors help with the adjustment to college life and answer academic questions as well as questions that relate to being successful in the first semester of college. I try to meet individually with my entire caseload (normally between 250-300 students) to help them select spring classes, teach them about the registration process, and show them how to create a schedule. Meeting with students and getting to learn about their backgrounds and career and personal goals is my favorite part of my job. I am always learning from my students.

> FOR ME, THE JOY OF ADVISING IS HELPING A STUDENT PROBLEM SOLVE. I LOVE IT WHEN AN ADVISEE COMES IN MY OFFICE EXCITED ABOUT A PARTICULAR CLASS OR INSTRUCTOR.
>
> *– Kelli Moses-Dolfi*

Q. How has COVID-19 affected your job?

A. There have been both positive and negative aspects to this experience. At first, I was very worried about staying in touch with my advisees because it felt more like an emergency situation. I did not have experience advising or teaching virtually. Once we had a plan in place to manage how to deliver our services, I begin learning new technologies and methods of working with students in a virtual setting and am now more comfortable in that mode. Before COVID, when a student came to my office, not only did I listen to the words, but I paid a lot of attention to nonverbal cues or what the student did not say. I was really afraid of losing that connection once I started advising online. However, I now notice other things that give me information about my advisees. Certainly, I have met a lot of pets, roommates, and sometimes have even had a parent involved in a Zoom call. I am able to gain information from how their room is organized, or even where they choose to meet with me. Institutionally, we have begun to develop more digital approval processes in order to reduce the number of office visits a student must make. This is something I think will continue long after the need for social distancing. In some ways, COVID has forced us to look more closely at the student perspective in terms of ease of use and to modify some of our existing policies to make the student experience more convenient.

Q. How can a student get maximum benefit from the advising process?

A. I view academic advising as an ongoing relationship I have with my students. For it to work, my advisee has to trust my guidance but should also feel like they can ask questions and take ownership of their individual academic plan. As students grow and develop, sometimes career goals change, and that has to be acknowledged and accepted as part of the process. It is okay to change your mind and change your major. Sometimes students select a major while they are in high school and really do not know much about the coursework. Or, perhaps they take a class as part of a core requirement and develop a passion for a subject far different than what they originally planned.

Each student has unique abilities and interests, and part of my job is to help them articulate how those particular skills can translate into a career and life after CCU.

Q. Do you have any tips or suggestions for students as they navigate life at CCU?

A. College life is typically a time of transition in terms of independence from family, a focus to future career ambitions, and the ability to make personal decisions while accepting increasing responsibility. I know COVID has interrupted some of this. Still, I would encourage students to be patient. Hopefully, campus life will return to a more normal situation soon. However, many of my advisees have learned other important skills like being flexible and adaptable and being forced to be more creative in connecting with others.

In my experience, good students know how to use their strengths but also have an awareness of their weaknesses and are willing to reach out for help. Our academic coaching and tutoring teams have been very innovative delivering their services virtually and at varied times, so students have access to assistance without being on campus.

Kelli Moses-Dolfi can be contacted at 843-349-6541 or kmoses@coastal.edu.

GUPTA COLLEGE OF SCIENCE ADVISING CENTER

SCIENCE ANNEX II 210
107 CHANTICLEER DRIVE

OFFICE HOURS
M-F: 8 A.M. TO 5 P.M.

CCU FACULTY RESEARCH PROJECTS

Derek Crane, Ph.D.
Department of Biology
Received $7,855 in supplemental funding from the South Carolina Department of Natural Resources for his project on the identification of environmental and biological factors limiting occurrence of the Sandhills Chub.

Paul Gayes, Ph.D.
Burroughs and Chapin Center for Marine and Wetland Studies
Received $21,935 from the Horry County Higher Education Commission for his project entitled *Amplification of the Burroughs and Chapin Center for Marine and Wetland Studies Observation-Modeling-Technology Initiatives in Support of University and Community Interests and Needs*.

Paul Gayes, Ph.D.
Burroughs and Chapin Center for Marine and Wetland Studies

Len Pietrafesa, Ph.D.
Burroughs and Chapin Center for Marine and Wetland Studies

Shaowu Bao, Ph.D.
Department of Marine Science
Were awarded $58,789 from the U.S. Department of Energy through a sub-contract with Savannah River Nuclear Solutions, LLC for their Sea Breeze Research project.

Siming Guo, Ph.D.
Department of Physics and Engineering Science

Monica Gray, Ph.D.
Department of Physics and Engineering Science

Roi Gurka, Ph.D.
Department of Physics and Engineering Science

Wes Hitt, Ph.D.
Department of Physics and Engineering Science

Xiangxiong Kong, Ph.D.
Department of Physics and Engineering Science

Richard Murray, M.S.
Department of Physics and Engineering Science
Received $19,563 from the Horry County Higher Education Commission for their project entitled *CCU Department of Physics and Engineering Science Makerspace*.

Wes Hitt, Ph.D.
Department of Physics and Engineering Science
Received an additional $4,000 from NASA through the College of Charleston for the Space Grant Campus Director project.

Bryan Wakefield, Ph.D.
Department of Chemistry
Received $149,681 in funding from the National Institutes of Health through the University of South Carolina for the SC IDeA Networks of Biomedical Research Excellence (SC INBRE) project.

CCU STUDENT RESEARCH PROJECTS

Molly Takacs
Graduate Student-Coastal Marine and Wetland Studies
Received a $2,000 award from the Savannah Presbytery M. K. Pentecost Ecology Fund for her project on the abundance and growth of juvenile Atlantic and Shortnose sturgeons in the Winyah Bay System.

Katie Maddox
Graduate Student-Coastal Marine and Wetland Studies
Received a $4,650 Bill Terrell Graduate Research Grant from the Georgia Ornithological Society for her project on *Foraging Success and Nest Predation in Loggerhead Shrikes of Two Habitats in northeastern S.C.*

CCU FACULTY AND STUDENT PUBLICATIONS

Banovetz, M.T., Lake, R., Blackwell, A A., Osterlund, J R., Schaeffer, **E.A., Yoder, R.M.**, & Wallace, D.G. (in press). Effects of acquired vestibular pathology on the organization of mouse exploratory behavior. Experimental Brain Research. doi: 10.1007/s00221-020-06032-1 (Department of Psychology)

Cato, K.D. and **Holskey, M.P.** 2021. Evaluation. In Rivera, R. R. & Fitzpatrick, J. J. (Eds.), The PEACE model evidence-based practice guide for clinical nurses (pp. 137-149). Sigma Theta Tau. (Department of Health Sciences)

Cayot, T.E., Robinson, S.G., Davis, L.E., Bender, P.A., Thistlethwaite, J.R. Broeder, C. E. and **Lauver, J.D.** 2021. Estimating the lactate threshold using wireless near-infrared spectroscopy and threshold detection analyses. International Journal of Exercise Science: Vol. 14 : 4, 284 - 294.

Hanebuth T.J.J., Kudrass H.R., Zander A.M., Neumann-Denzau G, Akhter H.S. and Zahid A. 2021. Stepwise, earthquake-driven coastal subsidence in southwestern Bangladesh (Sundarbans) since the 8th century deduced from submerged in-situ kiln remnants and mangrove stumps. Natural Hazards (in press) (Department of Marine Science)

Harding, J.H. 2020. Observations on age and growth of the eastern oyster *Crassostrea virginica* in South Carolina saltmarsh tidal creeks. Journal of Shellfish Research 39:619-631. (Department of Marine Science)

Holskey, M. and Rivera, R. 2020. Optimizing nurse engagement: using liberating structures for nursing professional practice model development. Journal of Nursing Administration; 50 (9). 468-473. doi:10.1097/NNA.0000000000000918 (Department of Health Sciences)

Long J.H.*, **Hanebuth T.J.J.** and Lüdmann T.H. 2020. The quaternary stratigraphic architecture of a low-accommodation, passive-margin continental shelf (Santee Delta Region, South Carolina, U.S.A.). Journal of Sedimentary Research 90:1549-1571. (Department of Marine Science)

Luken, J.O. 2021. *Coastal South Carolina Fish and Game: History, Culture and Conservation*. The History Press, Charleston, SC., 175 pp. (Gupta College of Science)

Rotarius T.R., **Lauver J.D.,** Thistlethwaite J.R. and Scheuermann B.W. 2021. Muscle blood flow is independent of conduit artery diameter following prior vasodilation in males. Physiological Reports 2021 Jan;9(1):e14698. doi: 10.14814/phy2.14698. (Department of Kinesiology)

Schlosser, J.A. 2020. *Prison Stories: Women Scholars' Experiences Doing Research Behind Bars*. 1st ed., Rowman & Littlefield. Hardback: ISBN 978-1-7936-0060-8 ebook: ISBN 978-1-7936-0061-5 (Department of Sociology)

Scott, E.J.* and **Pettijohn, T.F. II.** 2021. Effect of exercise and sham exercise trackers on perceived workout intensity and mood in college students. Journal of Psychological Research, 3(1), 1-6. https://doi.org/10.30564/jpr.v3i1.2541 (Department of Psychology)

Waite N., Goetschius J. and **Lauver J.D.** 2020. Effect of grade and surface type on peak tibial acceleration in trained distance runners. Journal of Applied Biomechanics 2020 Oct 6:1-4. doi: 10.1123/jab.2020-0096. Epub ahead of print. PMID: 33022655. (Department of Kinesiology)

–CCU authors in **bold**.
–CCU student *****.

COASTAL CAROLINA UNIVERSITY®

FALL 2020

PRESIDENT'S HONOR LIST

BIOCHEMISTRY

Nicole Frantz
Christina Gentile
Trinity Hanna
James Heldmann
Klea Hoxha
Charlize Johnson
Kim Lenart
Carson Mickey
Sara Nibar
Jonah Nordeen
(dual degree in psychology)
Michael Orlando
Anna Tingler

BIOLOGY

Catherine Austin
Mallorie Brown
Killian Bucci
Lady Cabral
Barijana Caldas
Andres Castillo
(dual degree in chemistry)
Wesley Caudle
Katelyn Cilino
Chase Cortese
Katelyn Covert
Kendall Coyle
Megan Cyterski
Natalie Cyterski
Isabella DeMark
Allison Donham
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Kendall Hale
MacKenna Higgins
Rebecca Hight
Mackenzie Kim
Lauren King
An Ly
Megan Majewski
Calli McCall
Veronica Mohr
Abbey Montoya
Kaylee Petraccione
Cameryn Powell
Ella Schad
Brooke Schuler
Savannah Simpson
Gregory Thompson
Olivia Thompson
Caitlyn Weinstein

CHEMISTRY

Josiah Dozler

COMPUTER SCIENCE

Aiden Bailey
Gavin Bailey
Jasmine Baykal
Ashtyn Carpenter
Kyler Febbroriello
Logan Glover
Christopher Grigsby
Ellie Hanford
Auston Hefling
Devin McClure
Jordan Penza
Tam Thang
Sean Tronsen

ENGINEERING SCIENCE

Gage Campbell
Jacob Dempski
Nathan Dempski
Lana Flanigan

EXERCISE AND SPORT SCIENCE

Tianna Adams
Nathen Andrews
Caitlyn Baber
Sarah Bryson
Alexis Coleman
Trevor Coleman
Kayla Cyganiewicz
Bryn Daly
Payton Ebersole
Natalie Flowers
Justin Fowlkes
Carleigh Frilles
Emma Gonzalez
Ian Graham
Aydin Imani
Justin Jasper
Makayla Johnson
Kaitlyn Justice
Silas Kelly
(dual degree in management)
Kody Kimball
Paige Lentz
Aidan Looney
Taylor Lyles
Hannah Mabry
Hannah McCallister
Kaley McLaughlin
Anya McSorley
(dual degree in psychology)
Bailey Moore
Nicholas Nietubyc
Alyssia Nix
Kyle Nolan
Alexis Ossi
Matthew Panzica
Brianna Prince
Camille Purdue
(dual degree in public health)
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Makayla Rivera
Sara Roberts
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Jordan Thompson
Jesse Troutman
Gabriella Velleggia
Hannah Walker
Destiny Wallace
Justin Wilson
Katerra Yeager

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Ryan Grant

INFORMATION SYSTEMS

Mason Beattie
Michael Link

INFORMATION TECHNOLOGY

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Johnathan Cassidy
John David
Lee Gandy
Tay'quan Geralds
Jennifer Gregg
Riley O'Brien
Dawson Pickford
Aaron Rice
Tyrek Robinson
Colton Simms

MARINE SCIENCE

Sarah Abel
(dual degree in biology)
Michael Audi
Madeline Bartosh
Abigail Bell
Alden Bittrick
Trevor Bowser
Matthew Brown
Jason Brunicke
Madison Bruno
Austin Bryant
Kristyn Bryant
Abigail Caviris
Mitchell Commins
Caroline Conner
Sydney Davis
Lauren DeJong
Alivia Dettinger
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Sadie Disselkoen
(dual degree in chemistry)
Brooke Dunnery
Nathan Easterling
Kyle Edwards
Hailee Eiker
Andrew Einhorn
Matthew Evans
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Hannah Franz
(dual degree in biology)
Hazel Gillette
(dual degree in biology)
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Genevieve Howley
Lynsey Isner
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Paul Jonas
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Madeleine Kee
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Allison Kladler
James Klein
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Alexia Lawrence
Rylee Lindner
Lily Lombardi

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(dual degree in biology)
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Ezekiel Meyers
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Meghan Music
Mackenzie Neal
Allison Newrones
Mary Olsen
Nathaniel Olsen
Briar Ownby-Connolly
Clio Pappas
Alexia Pistachio Carrasquillo
(dual degree in biology)
Katherine Prandi
Mykayla Purscell
Kennedy Quillen
Cecilia Rivera
(dual degree in interdisciplinary studies)
Ethan Sandy
Lea Schroeder
Madeline Schuetze
Margaret Shoop
(dual degree in languages and intercultural studies)
Cassie Shoupe
Nathan Smith
Abigail Solarz
Grace Strosnider
Brianna Sullivan
Elizabeth Tautges
Natasha Terry
Jacob Vannoy
Katherine Watts
(dual degree in biology)
Keela Wells
Brittany Whitcher

MATHEMATICS

Jason Herman
Jensen Meade
Audrey Nelson
Sarlota Svobodova
(dual degree in finance)

NURSING

Elizabeth Caine
Abbel Carranza
Samantha Mileo
Benjamin Phillips
Davey Schenck

PHYSICS

Grant Mitchell
Camryn Perry

PSYCHOLOGY

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Adam Bretton
Elizabeth Brown
Carol Burke
Kayla Butts
Ashley Chapman
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Caitlynn Dennie
Carlie Dingle
Amy Eacho
Savannah Elliott
Caitlyn Glancy
Julianna Graziani
Grace Hadsell
Hannah Haefner
Meghan Hepner
Mary Jackson
Megan Jacobs
Hailey Jenesky
Natalie Kellam
Gracie Kelly
Juliet Kraus
Samantha Laughman
Hailey Marrero
Alyssa Martin
Troy Mcie
Nicole Michael
McKayla Mills
Jessie Mount
Molly Myers
Mary Newton
Jaliyah Oats
Sarah Parker
Adonya Pertell
(dual degree in sociology)
Dakota Pike
Brett Richardson
Grace Robinette
India Robledo
Symone Scott
Gabrielle Sellers
Margaret Smith
Michael Spickofsky
Devi Spletzer
Sydney Staedt
Grace Sweet
Trinitee Taylor
Grace Thomas
Mackenzie Thompson
Tien Tran
Kaleigh Tunnell
Peyton Usher
Isabella Weatherhead

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Heather De la Cruz
Caroline Durham
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Adam Fowler
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Joanie McRae
Katelin Sellers
Shelby Shaffer
Brooke Spence
Taylor Sweigart
Meghan Thomas
Ansleigh Touchberry
Megan Wenzel
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RECREATION AND SPORT MANAGEMENT

Bryson Alexander
Pete Arnold
Megan Bozzi
Payton Clemons
Indeveer Dulku
Robert Floyd
Meghan Ford
Thomas Garces
Taylor Gibson
Sydney Guess
Jason Heon
(dual degree in economics)
Morgan Jackson
Bryan Johnson
Ethan Karl
James Largen
Torrance Marable
Thomas Norris
Sean Rhodes
Preston Robinson
Samuel Rowell
Michaela Schindler
Teana Sherman
Kasper Skraep
Brandon Smith
Kaylie Taylor
Jamison Walker
Joshua Wegrzyn
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Benjamin Wilkerson
Bradley Young
Riley Zana

SOCIOLOGY

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Natalia Dennie LeoGrande
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Danielle Gaddy
Kelsey Gibson
Jillian Margiotta
Felicia Maryash
Robert Massey
Sydney Moss
Jorredan Moultrie
Destinie Myers
Rhoslyn Owens
Celeste Provo
Natasia Singleton
Alexis Wrighton

STATISTICS

Riley Beam
Andrew Elgin

UNDECLARED, SCIENCE

Morgan Donovan
Madison Oxley
Madison Talley

FALL 2020

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Haley Barnabei
Elody Bensch
Tyler Berry
Quinn Blankenship
Kinokia Brown-Strait
Laura Busby
Cheyenne Butler
Alexei Chesnutwood
Lissett Diaz
(dual degree in marine science)
Nakaylee Didder
Alexis Ellis
Nicholas Hanson
Kayla Hunt
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Nevaeh Lirosi
Lindsay Newton
Madaline Plank
Jordan Price
Olivia Shirley
Owen Smith
Korinne Swanson
Lucy Valentik
Kimberly Weaver

BIOLOGY

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Antanique Bellinger
Allison Blechl
Zachary Bomba
Theresa Brick
Nina Brown
Gillian Bushi
Holly Butler
Elizabeth Cole
Tyra Countiss
Jessica Coyne
Shay Craycraft
Tyler Cutaia
(dual degree in psychology)
Kelsey Danford
Elisabeth Daniels
Kaci Dozier
Avery Drouin
Samantha Elsey
Thomas Fielding
Regan Finn
Zarah Fowler
Sydney Fox
Hailey Frick
Madison Gentilo
Myia Gethers
Mackenzie Gibbs
Lauren Gordon
Jacqueline Gould
Alashia Grant
Alicia Rebecka Hansson
Jordan Harrell
Fallyn Harrelson
(dual degree in languages and intercultural studies)
Grace Hayes
Caroline Hopkins
E'Nyzeia Hudson
Ka'Mauri Humes
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Lauryn Johnson
Ebenezre Kassaye
Emma Kinerson
Robert Kotara
Krystal Lamb
Natalie Lasko
Sydney Latlippe
Emma Lehmann
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Johnny Magee
Monica Manley
Tylor Mattress
Michaela McAuley
Lucas McClutchey
Talia McDonald
Makayla McElhaney
Rhyan Mellett
Andrea Mendoza
Timothy Moller
Marteena Morgan-McNeil
Jordan Mozingo
Ajay Patel
Jordan Pearson
Paige Petrizzo
Jaiden Phelps
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Zoie Scates
Tanner Schmittle
Abbey Seigler
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Hunter Sloan
Taylor Small
Avery Snyder
Abigail Spann
Zaria Stephens
Trevor Stevens
Olivia Sundman
Brittany Tanner
Ryan Thomas
Mathilde Tranberg
Lacoya Trapp
Farruhjon Turgunov
(dual degree in mathematics)
Nessan Vanclief
Allena Vest
A'syanti Walker
Ashleigh Wheeler
A'Ja White
Joseph Whitney
Mikayla Whitney
Madyson Whitt
Brook Willenborg
Katie Wilson
Tahliya Wilson
Noor Zalloum

CHEMISTRY

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Cidney Hodges
Kaitlyn Hunt
Kamden Johnson

COMPUTER SCIENCE

Daniel Argoe
Jarod Bowers
Sean Michael Campbell
Jason Carranza
Kevin Chucci
Ryan De la Cruz
Alexander Drake
David Foy
Joseph Garrett
Michael Good
Jorden Hodges
Leslie Horace
Migeljan Imeri
Cole Jiron
Michael Jones
Timothy Kelly
Michael Manicone
Nathan Marshall
Keyshawn Martin
Enoch Mayers
Jeffrey McCarn
Liam McLoughlin
Allyson Narolewski
Blakley Parker
Destiny Poston
Joseph Prendergast
Nicklaus Przybylski
Heath Roberts
Jean Ruiz
Benjamin Sheets
Christian Silvano
Brian Taylor
Jonathan Turrentine
Kyle Wallace
Westley Wooddell
Ethan Wylie
Agit Yesiloz
Ya Zheng

ENGINEERING SCIENCE

James Andrew
Peyton Barber
Savannah Burdette
Quandre Butler
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Carissa Church
Julianna Davis
James Duncan
Blaine Ely
Jackson Growe
Nicole Hegle
Heidrun Hlynsdottir
Ronny Hucks
Ryan Kerns
Kyle LaVoie
Russell Long
Damari Mazyck
Laura McNair
Lindsay Mulligan
Holly Mullins
Isabella Pinkas
Connor Richard
Dylan Rogers
Marshall Shumpert

Jessica Solomon
Devonta Stanley
Thames Stokes
Nikita Tolbert

EXERCISE AND SPORT SCIENCE

Alexandra Abarca
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Claire Alverson
Alexandra Ardizzone
Diamantino Arroz
John Astudillo
Ashley Baker
Madeleine Barefoot
Brian Bechaud
Rose Behrmann
Areyahnna Blackett
Karla Blake
James Bookard
Christopher Brigman
James Brown
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Titus Burch
Kameron Burton
Madeline Campbell
Joy Carlson
Carson Carruthers
Cade Carter
Sarah Cavalli
Ciarra Cedeno
Faith Cervera
McKinley Chapman
Emma Collins
Michael Colonna
Kaylin Conrad
Piper Cote
Samuel Couture
Anthony Cowen
Anthony Critelli
Lisa D'Ambrosio
Iyanla De Jesus
Hannah Dresner
Jordan Dunfee
Nina Edlow
Isabelle Farm
Karis Finklin
(dual degree in biology)
Megan Finn
Taylor Fiorentino
Madison Forren
Gabrielle Freeman
Lara Gabriele
Macey Gathers
Ashley Geils
Samantha Gibbs
Colin Glenn
Noah Glorioso
Aaron Grapperhaus
Aumani Green
Joshua Grossman
Hayleyanne Hagenston
Haleigh Hale
Adam Harley
Nicholas Harrelson
Ailani Hayes
Hannah Hayes
Valeria Henderson
Haleigh Heston
Kurstin Hopkins
Alyssa Jacoby
Adrianna Johnson
Caroline Johnston
Haley Jones
Carina Julian
Amy Kahler
Gloire Kaindu
Aaron Keeler
Jair Kelly
Alyssa Kerns
Stephen Kirkwood
Reagan Knapp
Sarah Kunkle
Alyssa Laubenthal
Michaela Lawlor
Michael Lehman
Gavin Lewis
Amelia Limon
Aidan Liston
Kaylee Lorenzetti
Milissa Lucas
Frantiska Lunackova
Mackenzie Manning
Jake Marine
Kaden Marinovich
Kasey McGrath
Alex Meade
Kristyn Medlin
Riley Melton
Travis Moore
Camryn Morgan
Isaac Murdock
Abagail Nixon
Erin Osborne
Elizabeth Otto
Brian Palomares
Tariney Pepper
Jessica Perrin
Benjamin Pike
Nicolas Planchard
Jeb Redfield
Gianna Rossman
Joseph Sanchez
Abbie Sawyer
Celeste Seidel
Kailynn Shaw
Evan Sheffer
Mia Sheldon
Stephen Shrewsbury
Brali Simmons
Blease Simons
Michael Smith
Aryn Spaulding
Ke'Asia Steadman
Arionna Stevens
Erica Stratten
Gavin Strausbaugh
Kristina Strauss
Leah Stubbs
Brian Sutton
Madison Sweeney
Taylor Tolson
Felix Torres
Kailee Vander Lyke
Christian Walker
Kayla Watkins
Jaden Wilson
Kaitlyn Wojciechowski
Rolan Wooden
Danielle Wright
Ting Yen Yeh
Jake Zazvrskey

HEALTH ADMINISTRATION

Kacy Blevins
Katelyn Cromer
John Kennedy
Tisheonya Kollock
Jessica Matthews
Lauren McCaskill
Amy Miller
Amee Robinson
Sara Kate Tolliver
Kevin Uranyi
Sara Vickers

INFORMATION SYSTEMS

Aaron Baunchalk
Jack Bresnahan
Mary Chambers
(dual degree in information technology)
Clark Dotson
Caleb Fins
Kellen French
Alexander Heiberg
Alayna Johnston
Quinten Keener
Kelsey Lafaso
Taylor Malamut
Elyssa Sexton
William Sloop
Zachary Smith
(dual degree in communication)
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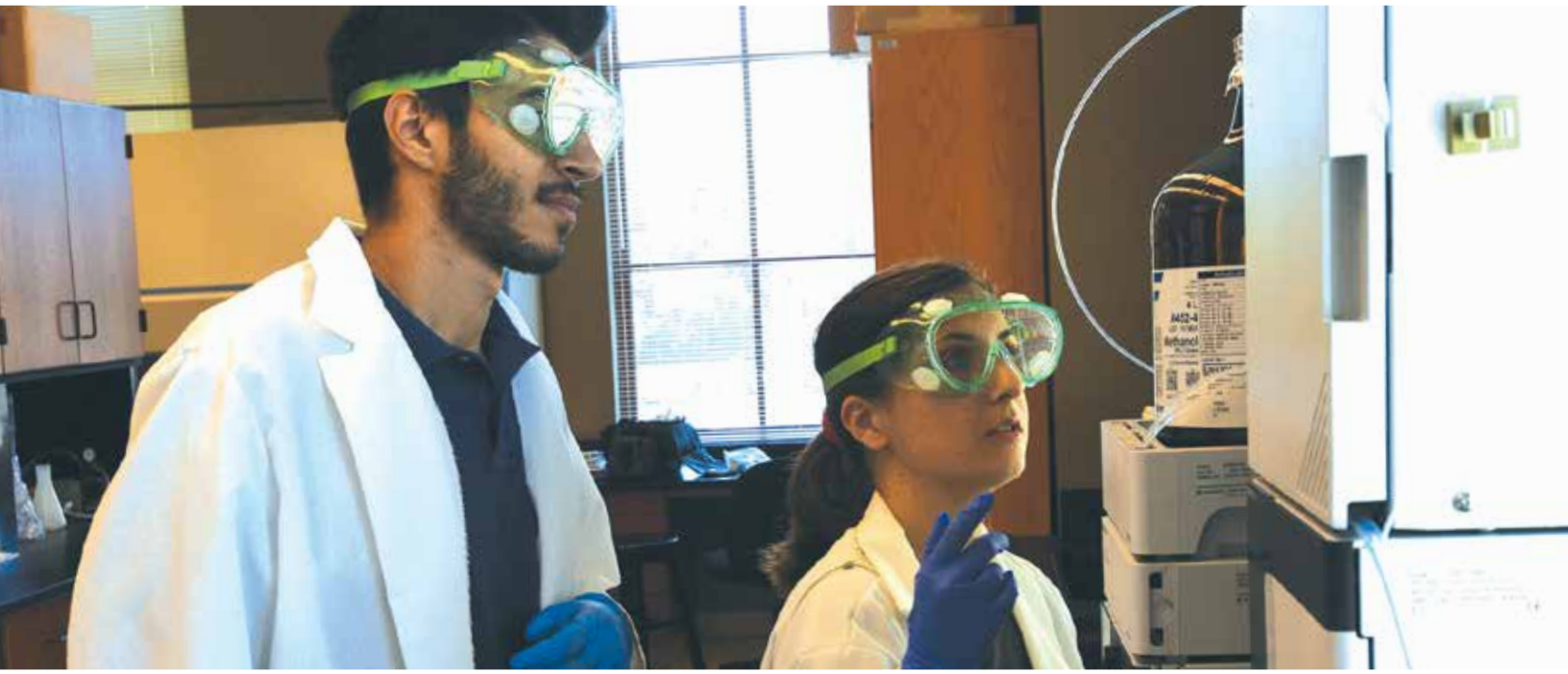

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