North Carolina
Coastal Conference
November 7–8, 2022
McKimmon Center, NC State University, Raleigh, NC

#NCCoastalConf
ncseagrant.org

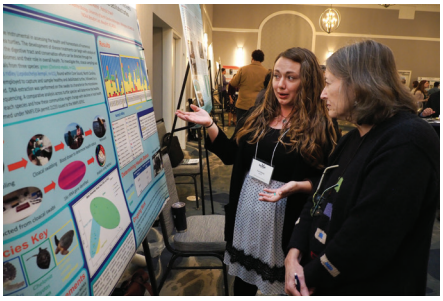
photo credit: NCDOT

Sea Grant
North Carolina

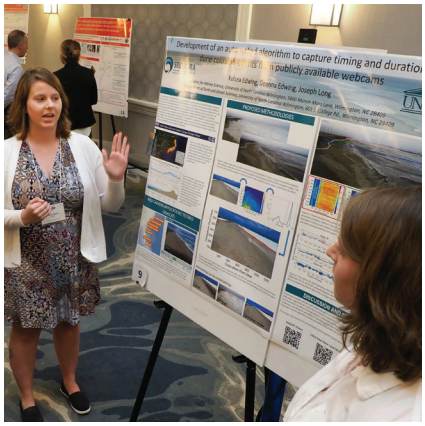
Welcome to the 2022 North Carolina Coastal Conference!

Thank you for joining North Carolina Sea Grant and our many partners who have supported this year's NC Coastal Conference. This event is an opportunity to engage with fellow participants and future collaborators committed to the vibrancy of our state's coastal communities, environments, and economies. We're looking forward to thought-provoking presentations and discussions with researchers, agency and business experts, community leaders, educators, students, and all who are interested in coastal topics.

Even a quick glance at the agenda on page 7 will reveal a range of real-world issues relevant to our coast and the watersheds that feed our estuaries and ocean. Highlights include successes in interdisciplinary research, community engagement, and cross-disciplinary programs in the STEM fields, the arts, education, and the humanities. The NC Coastal Conference always brings new energy and enthusiasm that arises as participants network with partners from academia, government, non-profits, businesses, and local communities.



We are especially thankful for our guest speakers, who bring state, national, and international experience and perspectives. And we thank our hosts at NC State University for this central location for our statewide audience, as well as for a venue with outstanding online streaming to broaden the reach of this year's conference. Our sponsors also are critical to the success of the conference, and we deeply appreciate their support. (See page 2.)



We hope that you will be pleased to see some old friends and colleagues here, possibly even for the first time in several years, as the height of the COVID pandemic had put many events on hold — including this conference. But we also hope that you will reach out to new faces, as they too are potential partners for future endeavors. Researchers will be presenting innovative techniques and findings with new applications in your field. State and federal agency officials will be looking for opportunities to engage new community partners. Local community officials and leaders from organizations and businesses will have great stories to share, as well as crucial knowledge about their needs and experiences on the ground.

Our time together — to listen and learn from one another — is critically important to continue to move forward collaboratively on the challenges and opportunities we have in front of us. Please look for me at the breaks. I would love to learn more about what brought you to the NC Coastal Conference and how we can partner together moving forward.

Sincerely,

Susan White

Susan N. White
Executive Director, North Carolina Sea Grant

Table of Contents

Follow us on Facebook and Twitter • Share your conference experience with #NCCoastConf

@NCSeaGrant @SeaGrantNC @NCSeaGrant

Credit for Professional Development Hours, Continuing Education Units, and Hours for the Environmental Education Certificate

The North Carolina Coastal Conference provides opportunities to earn credit for Professional Development Hours, Continuing Education Units, and Hours for the Environmental Education Certification Program:

- Up to 10 Hours under Criteria III of the NC Environmental Education Certification Program
- Up to 1 Continuing Education Unit. Teachers should contact their local LEA for more information.
- 9.5 CECs for certified floodplain managers
- 8 PDH credits to soil scientists (approved for 1.5 hrs for each of the 5 concurrent sessions except for I.A., and 0.5 hrs for the poster session. Must visit the registration desk for a sign-in sheet.)
- 10 PDH credits for professional engineers/land surveyors
- 10 PDH credits for licensed geologists

In order to receive any type of credit for the conference, you must fulfill the following requirements:

- Register and complete payment for the event in advance.
- In lieu of a signature, we will collect a sponsor evaluation from each person seeking credit. For those attending in-person, complete this form at the registration desk. Virtual attendees can send a completed sponsor evaluation to Anna A. Martin at *anna_arnold@ncsu.edu*. Those attending both days only need to submit a single form.
- Complete the online conference evaluation at *go.ncsu.edu/win-25* (and you could win a $25 gift card, too).

Once these requirements have been met, you will receive an electronic certificate of completion. Please allow several days for processing.

Our organization is an approved sponsor for NCBELS (License # S-0302) and NC Board for Licensing of Geologists (pre-approved provider list). NC Sea Grant is currently seeking approval from the NC Board of Landscape Architects for credit approval.

Note: While NC Sea Grant offers Professional Development Credit for this program, it is up to each professional to determine if the content is relevant to his/her individual practice and suitable for his/her continuing education. Upon completion and return of required paperwork, each attendee will receive an electronic certificate for their records and self-reporting.

Thank You to Our Sponsors!

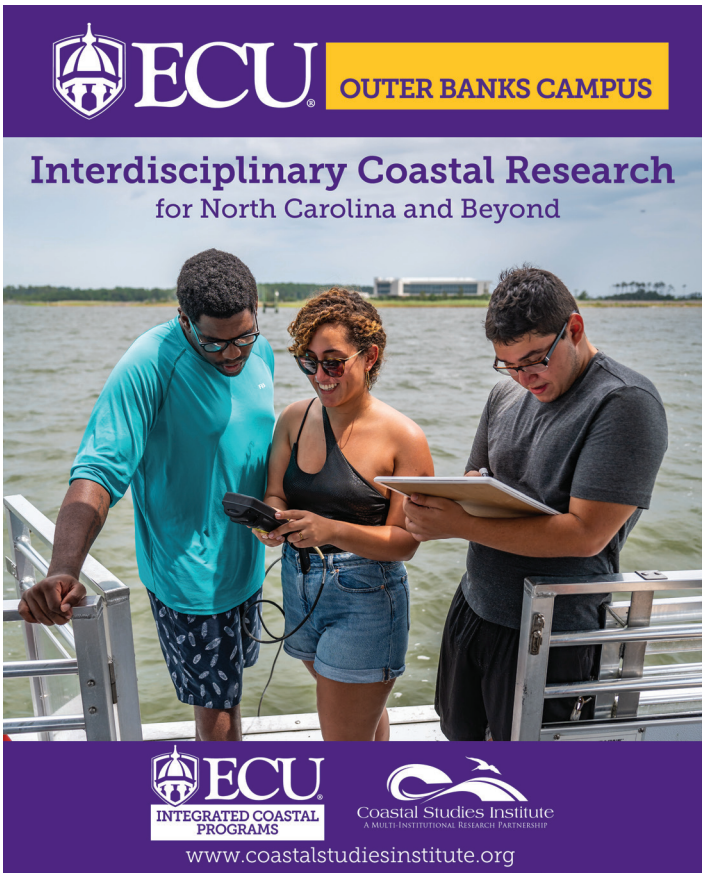
Emerald Level

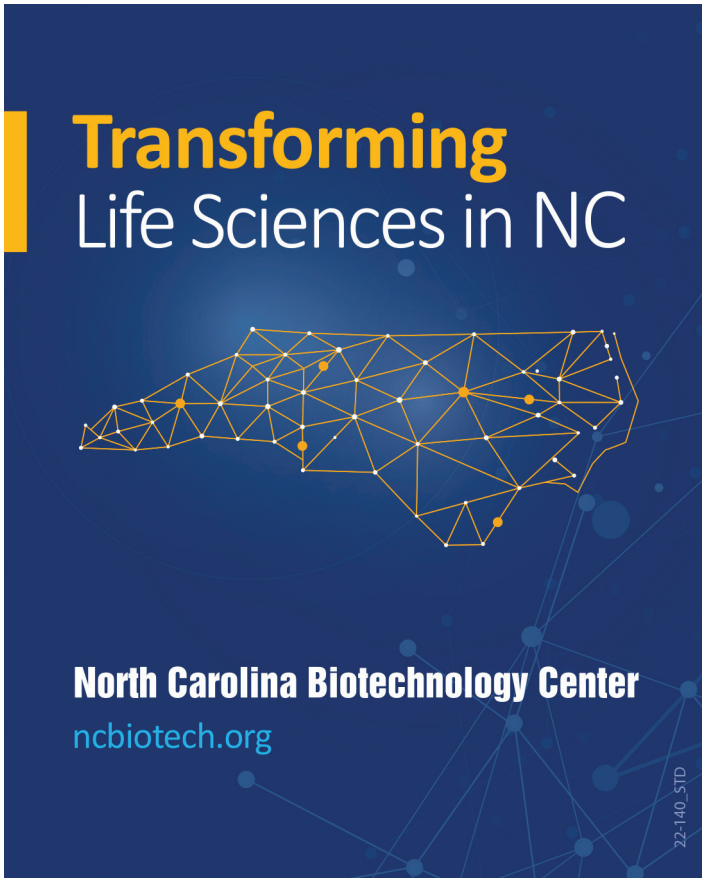
Thank You to Our Sponsors!

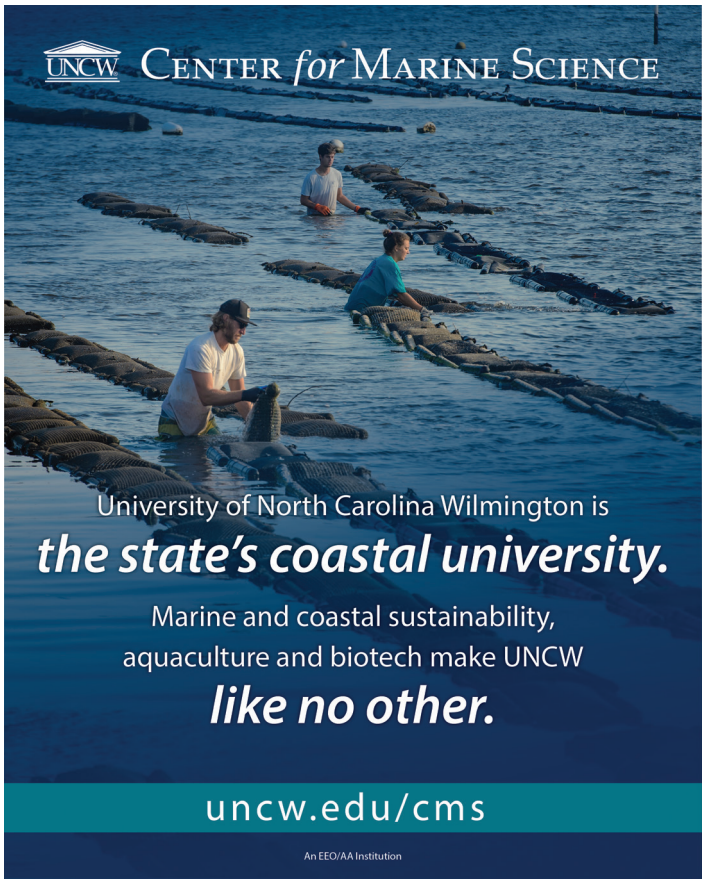
Emerald Level

Thank You to Our Sponsors!

Sapphire Level







Thank You to Our Sponsors!

Crystal Level

Thank You to Our Exhibitors!

Agenda

Monday, November 7	
8:00 a.m.	**Registration Opens** *Speakers and attendees check in, set up posters and exhibits in Room 2A/B, and enjoy coffee and morning refreshments.*
9:00 – 9:35 a.m. **Room 2C**	**Welcome and Opening Remarks** **Susan White**, Executive Director *North Carolina Sea Grant, the North Carolina Water Resources Research Institute, and NC Space Grant* **Elizabeth S. Biser**, Secretary *North Carolina Department of Environmental Quality* **Jonathan Pennock**, Director *National Sea Grant College Program*
9:35 – 10:15 a.m. **Room 2C**	**Opening Plenary** **Elizabeth Frankenberg**, Director *Carolina Center for Population Aging and Health (UNC-Chapel Hill)*
10:15 – 10:30 a.m.	***Networking Break in Room 2 A/B***
10:30 a.m. – noon	**Concurrent Session I**
Room 3	***Developing Community Viability*** (Scott Baker, North Carolina Sea Grant, moderator) **Eric Herbst**, North Carolina Sea Grant *The North Carolina Shellfish Farming Academy: An Aquaculture Training and Workforce Development Initiative* **Holly Benton**, NC State University and North Carolina Sea Grant *Labor Volatility in a Time of Crisis: Examining NC Coastal Communities During COVID-19* **Ann Savage**, NC State University *Critical Elements of a Community-Driven Disaster Recovery and Resilience Information Hub* **David Griffith**, East Carolina University *Sound Values: Livelihood Constellations, Networks, and Communicating Risk Along North Carolina's Coast*
Room 4	***Innovations in Wastewater Treatment*** (Jane Harrison, North Carolina Sea Grant, moderator) **Julia Harrison**, NC State University *Using In-Situ Sensing Data to Predict Fecal Contamination in Estuarine Waters*

Agenda *(continued)...*

	Jane Harrison, North Carolina Sea Grant *Tipping Points: Onsite Wastewater Treatment and Climate Change* **Holly Miller**, Tetra Tech *Town of Nags Head Decentralized Wastewater Management Plan Update* **Patrick Carroll**, UNC Wilmington *Multi-Trophic Waste Management for Marine Finfish Aquaculture in Land-Based Recirculating Aquaculture Systems Using the Salt-Tolerant Halophyte Salicornia Virginica*
Room 6	***Planning for a Resilient Future*** (Chris Ellis, NOAA, moderator) **Brian Byfield**, N.C. Office of Recovery and Resiliency *Lessons from Regional Resilience Planning in North Carolina* **Lisa Montefiore**, NC State University *From National to Local Scales: Integrated Approaches for Mapping Coastal and Estuarine Vulnerability to Projected Change* **Narcisa Pricope**, UNC Wilmington *Wetland Vulnerability Metrics as a Rapid Indicator in Identifying Nature-Based Solutions to Mitigate Coastal Flooding* **Mike O'Driscoll**, East Carolina University *Developing Coastal Plain Ecological Flow Guidance in the Albemarle-Pamlico Basin: Examples from Trent River*
12:00 – 1:30 p.m.	***Lunch and Networking Break in Room 2C***
1:30 – 3:00 p.m.	**Concurrent Session II**
Room 3	***Buying Time Along the Coast*** (Sara Mirabilio, North Carolina Sea Grant, moderator) **Karen Amspacher**, Saltwater Connections *"Buying Time" Down East* **Lydia Sellers**, Duke University *Landscape-level changes in Coastal NC: Using a documentary to understand perceptions of change* **Karl Dudman**, Oxford University *Institutional Blind Spots in Community Engagement* **Georgette Tso**, East Carolina University *Wave Attenuation Over Oyster Reef Breakwaters on Waterfront Properties in NC*
Room 4	***Bridging the Gap: Prioritizing Equity*** (Christy Perrin, North Carolina Sea Grant, moderator) **Bethany Cutts**, NC State University *Shifting Terrains: Society-Nature and Hazard Information for Fair-Minded Transdisciplinary Impact*

Agenda *(continued)...*

	Frank López, North Carolina Sea Grant *Hurricane Florence Aftermath in New Bern: Extension Support for Recovery* **Hannah Tuckman**, UNC-Chapel Hill *The Use of Mobile and Social Media Data to Improve Disaster Management* **Isabella Kemp**, NOAA Hollings Scholar *Defining and Identifying Vulnerable Communities: A Practical Guide for Weather Forecast Offices*
Room 6	***Research Applications at the Intersection of Ecosystem and Community Resilience*** (Cayla Cothron, North Carolina Sea Grant, moderator) **Anne Smiley** and **Helena Garcia**, UNC-Chapel Hill *An Interdisciplinary Approach to Quantifying Flood Mitigating Ecosystem Services and Identifying Beneficiaries in New Bern, NC* **Curtis Smalling**, Audubon NC *Integrating the Needs of Coastal Birds and Vulnerable Communities in Climate Resilience Planning* **Adam Gold**, Environmental Defense Fund *North Carolina's Adaptation Journey to Flood Resilience* **Mallory Eastland**, South Atlantic Salt Marsh Initiative *Marsh Forward: A Collaborative Effort to Conserve the Salt Marsh in the Southeast*
3:00 – 3:15 p.m.	***Networking Break in Room 2 A/B***
3:15 – 4:45 p.m.	**Concurrent Session III**
Room 3	***Coastal Resilience and Sustainability for Rural Communities*** Erin Seekamp, NC State University
Room 4	***Near-Term Monitoring and Data Needs for Assessing Sea Level Rise Impacts*** Natalie Nelson, NC State University
Room 6	***Lightning Talks*** (Frank Lopez, North Carolina Sea Grant, moderator) Presenters: **Lin Xiong**, East Carolina University, **Mackenzie Douglas**, UNC-Chapel Hill, **Evan Ferguson**, Cape Hatteras Secondary School**, Megan Geesin**, East Carolina University, **Frank Graff**, UNC-TV, **Josh Himmelstein**, UNC-Chapel Hill, **David Lagomasino**, East Carolina University, **Ryan Mitchell**, DRMP, **Ashley Oliver**, North Carolina Sea Grant, **Nick Corak**, Wake Forest University
5:00 – 7:00 p.m.	***Poster Session and Reception in Room 2 A/B*** *Join us for research poster presentations and a chance to network with conference participants and exhibitors. Enjoy heavy hors d'oeuvres, wine, and beer.*

Agenda *(continued)...*

Tuesday, November 8	
8:00 a.m.	**Registration Opens** *Enjoy coffee and morning refreshments.*
9:00 – 9:25 a.m. **Room 2C**	**Welcome and Opening Speakers** **Susan White**, Executive Director *North Carolina Sea Grant, the North Carolina Water Resources Research Institute, and North Carolina Space Grant* **Randy Woodson**, Chancellor *NC State University* **Mladen Vouk**, Vice Chancellor for Research *NC State University*
9:25 – 9:45 a.m.	***Networking Break in Room 2 A/B***
9:45 – 11:45 a.m.	**Concurrent Session IV**
Room 3	***Enhancing the Resilience of the North Carolina Seafood Industry*** (Barry Nash, North Carolina Sea Grant, moderator) **Eric Edwards**, NC State University *Economic Impact of the Commercial Fishing Industry in North Carolina* **Sara Mirabilio**, North Carolina Sea Grant *Refinement and Testing of a Microprocessor-Based Shark Bycatch Reduction Device (M-B BRD) Using an Academic-Industry Partnership* **Ann Savage**, NC State University *Leveraging Direct-to-Consumer Marketing & Tourism to Diversify Income Streams for Seafood Producers* **Angel Cruz**, NC State University *Supporting Fisheries with Student Interns* **Scott Baker**, North Carolina Sea Grant *Sea Grant's Angler Outreach: What's Working and Where Do We Go Next?*
Room 4	***Management of Seagrass Habitat and the Blue Crab Fishery Under Changing Climate*** (Whitney Jenkins, North Carolina National Estuarine Research Reserve, moderator) **Jessie Jarvis**, **Martin Posey**, **Troy Alphin**, **Michael Wheeler**, and **George Easterly**, UNC Wilmington, and **Anne Deaton**, NC Division of Marine Fisheries

Agenda *(continued)...*

Room 6	***Cross Cutting Coastal Resilience Efforts and Building Strategic Climate Partnerships*** (Sarah Spiegler, North Carolina Sea Grant, moderator) **Jacob Boyd**, NC Division of Marine Fisheries, **Andrea Webster**, NC Office of Recovery and Resiliency, **Mackenzie Todd**, NC Division of Coastal Management, **Lora Eddy**, The Nature Conservancy, **Holly White**, NC Office of Recovery and Resiliency
11:45 a.m. – 1:15 p.m.	***Lunch in Room 2C*** *Enjoy the Poster Awards Ceremony. Feast on striped bass from Locals Seafood, courtesy of StriperHub. And hear a presentation from StriperHub's Ben Reading.You can help the StriperHub team learn more by rating your striped bass lunch using the QR code on the inside back cover of this program.*
1:15 – 3:05 p.m.	**Concurrent Session V**
Room 3	***The Big Picture: Healthy Coastal Ecosystems*** (Erika Young, North Carolina Sea Grant, moderator) **Erin Voigt**, NC State University *Spatial Variation in Nursery Habitat Use by Juvenile Blue Crabs in a Shallow, Wind-Driven Estuary* **Stacy Trackenberg**, East Carolina University *Assessing Faunal Community Composition in Newly Restored Seagrass Beds Across a Depth Gradient* **Alexander Smith**, UNC Wilmington *Least Tern (Sternula antillarum) Disturbance Responses to Human-Related Activities on Hatteras Island* **Nick Funnell**, UNC-Chapel Hill *Determining the Ecological Impacts of Shellfish Relay in North Carolina* **Megan Carr**, NC State University *Quantifying Bacterial Water Quality Impacts of Sunny-Day Floods*
Room 4	***Marsh Interface: Edges of the Land and Sea*** (John Fear, North Carolina Sea Grant, moderator) **Antonio Rodriguez**, UNC-Chapel Hill *Salt Marsh Ontogeny Drives the Wide Range of Carbon Accumulation Rates* **Mollie Yacano**, UNC-Chapel Hill *Impact of Eradication Methods on Nitrogen Cycling Associated with Invasive Phragmites Australis* **Molly Bost**, NOAA *Response of Fringing Salt Marsh Accretion and Carbon Burial to Land-Use Change of Tidal Creek Watersheds*

Agenda *(continued)...*

	Christina Salerno, UNC Wilmington *Predation Amplifies the Effects of Parasite Infection on the Personality of a Keystone Grazer* **Sean Charles**, East Carolina University *Sediment and Marsh Vulnerability in Sediment-Starved Marshes in Currituck Sound, NC*
Room 6	***Emerging Technologies for Coastal Change*** (Gloria Putnam, North Carolina Sea Grant, moderator) **Ryan Mieras**, UNC Wilmington *Continuous Beach Morphology Observations Under Active Storm Forcing Using Compact 3D LiDAR Scanners* **Joe Long**, UNC Wilmington *Building a Webcam Observing Network to Support Coastal Communities* **Logan Howard**, National Weather Service *The Impact of the Gulf Stream on Marine Forecasting* **Matthew Scalora**, National Weather Service *New Wave Information Included in the NWS Coastal Waters Forecast* **Krissy Hopkins**, USGS *Can Green Stormwater Infrastructure Reduce Stream Stressor Impacts in Suburbanizing Landscapes?*

The 2022 North Carolina Coastal Conference adjourns at 3:05 p.m. to allow some time to vote.
Thank you for participating.

Please take a short survey to give us feedback about the conference, and you'll have a chance to win a $25 gift card.
Use this QR code or visit *go.ncsu.edu/win-25*.

Guest Speakers

Alphabetical by Speaker Last Name

Elizabeth S. Biser, Secretary, NC Department of Environmental Quality

Governor Roy Cooper named Elizabeth S. Biser as Secretary of the North Carolina Department of Environmental Quality in June 2021. She is the first woman confirmed to serve as DEQ Secretary. Secretary Biser oversees the state agency whose mission is to protect North Carolina's environment and natural resources. The organization has offices from the mountains to the coast and administers regulatory and public assistance programs aimed at protecting the quality of North Carolina's air, water and land, its coastal fisheries, and the public's health. Secretary Biser has experience representing public, private and non-profit organizations on a wide variety of issues. She previously served as Director of Legislative and Intergovernmental Affairs when the agency was known as the North Carolina Department of Environment and Natural Resources, and most recently served as the President of Biser Strategies LLC and the Senior Policy Advisor of the Recycling Partnership. Previously, she was the Vice President of Policy and Public Affairs of the Recycling Partnership, and Government Relations & Policy Advisor of Brooks, Pierce, McLendon, Humphrey & Leonard, LLP. She holds a Bachelor of Arts and a Master of Public Administration from the University of North Carolina at Chapel Hill.

Elizabeth Frankenberg
Cary C. Boshamer Distinguished Professor of Sociology at the University of North Carolina at Chapel Hill and a Fellow of the Carolina Population Center

Dr. Frankenberg's research focuses on individual and family response to change and the role of community, broadly construed, in individual behaviors and outcomes across the life course. She has led teams to develop and implement innovative and ambitious designs for data collection to support her own research and that of the scientific and policy communities more broadly. One of these, the Study of the Tsunami Aftermath and Recovery (STAR), assesses the social, economic, demographic, and health impacts of the December 26, 2004 earthquake and tsunami in Indonesia in order to measure population-level response to a disaster over fifteen years. This project integrates innovative measures from satellite imagery and biomarkers with more traditional modes of survey research. New work as part of the Dynamics of Extreme Events, People, and Places (DEEPPP) project, extends these approaches to North Carolina. Dr. Frankenberg is trained in demography, sociology, and public policy.

Jonathan Pennock
NOAA National Sea Grant College Program

Jonathan Pennock is the director of the National Sea Grant College Pro-gram. Prior to joining NOAA, he was the director of the New Hampshire Sea Grant Program and the deputy director of the School of Marine Science and Ocean Engineering at the University of New Hampshire. Pennock is a nationally known coastal scientist with expertise in oceanography and estuarine sciences. His research has focused on understanding human impacts on coastal marine food webs. He has a doctorate in oceanography and master's in marine studies from the University of Delaware, and a bachelor's in biology from Earlham College.

Guest Speakers *(continued)...*

Benjamin J. Reading
Faculty Liaison /
Director of the NC State Pamlico Aquaculture Field Laboratory (Aurora, NC) and also the Lake Wheeler Field Laboratory Fish Barn (Raleigh, NC) for NC State College of Agriculture and Life Sciences.
NC State University

He is National Coordinator for: 1) National Breeding Program for the US Hybrid Striped Bass Industry (with USDA ARS), 2) Aquaculture for USDA NIFA NRSP-8 National Animal Genome Program, and 3) NOAA / NC Sea Grant StriperHub. He also is a Technical Committee Member of the USDA NIFA Southern Regional Aquaculture Center (SRAC). Dr. Reading has had over $12 million in research grants and contracts funded while at NC State in addition to helping lead the NRSP-8 Multistate Hatch. He has over 50 scientific research publications and book chapters and over 180 professional presentations. He also has served in the past and at present as a subject matter expert for the USDA, NOAA, and DHS / ODNI (US Intelligence Community) regarding security of US seafood supply chains, importation of seafood products, and US aquaculture production. He has former leadership training from US Army ROTC (Leadership Education and Training, Brevetted 2nd Lieutenant) and is a Foundation for Food and Agriculture (FFAR) New Innovator in Food and Agriculture. Dr. Reading teaches AEC 510: Machine Learning Approaches in Biological Sciences and AEC 441/442: Biology of Fishes.

Mladen Vouk
Chief Research Officer, Mladen Vouk oversees all research activities at NC State University

Under his leadership, units reporting to the Office of Research and Innovation manage research administration, the university's intellectual properties, and industry and government agency alliances on the university's award-winning research campus. Vouk is a highly respected computer scientist and an IEEE Fellow who has received the IEEE Distinguished Service Award, the IEEE Golden Core Award and the IFIP Silver Core award. A faculty member at NC State for more than 30 years, Vouk served as head of the Department of Computer Science from 2004 to 2016. He is co-inventor of NC State's Virtual Computing Laboratory, one of the world's first cloud computing systems, and co-founder of NC State's Computer Science Software Systems and Engineering Laboratory. He formerly served as technical director of the Center for Advanced Computing and Communication and was the associate vice provost for information technology from 2002 to 2012. He has been the director of NC State's Data Science Initiative since 2014 and was the associate vice chancellor for research and administration from 2016 to 2018. Vouk is the author or co-author of more than 300 publications. He has conducted groundbreaking research in software engineering, scientific computing and analytics, information technology and education, and high-performance computing. Vouk earned a Ph.D. in solid-state physics at King's College London and a master's degree in computer science at NC State.

Guest Speakers *(continued)...*

Susan White
Executive Director for North Carolina Sea Grant, the Water Resources Research Institute for the University of North Carolina, and North Carolina Space Grant

All three programs provide targeted research, outreach and education projects to address critical issues in the state and within the region. Sea Grant, with funding from the National Oceanic and Atmospheric Administration, and WRRI, with funding from the U.S. Geological Survey, focus on coastal, ocean and water resource topics for ecosystems and communities. Space Grant projects, with funding from the National Aeronautics and Space Administration, include partnerships with the aerospace industry. In fall 2017, White was named chair of the N.C. Sediment Control Commission by Gov. Roy Cooper. She previously was director of NOAA's Hollings Marine Laboratory in Charleston, S.C. Formerly the national research coordinator for NOAA's Estuarine Reserves Division and National Estuarine Research Reserve System, she has served on national and regional steering committees on topics including technology transfer, integrated drought monitoring and early warning, and climate's connections to health. White earned a doctorate from the University of Georgia and a bachelor's degree from Duke University.

Randy Woodson
Chancellor
NC State University

Randy Woodson became North Carolina State University's 14th chancellor in April 2010. Woodson leads the largest university in North Carolina, with more than 37,000 students and a $1.6 billion budget. Under his leadership, the university created, implemented and completed The Pathway to the Future, a strategic plan that elevated NC State's recognition among the nation's top public research universities. In 2021, NC State created the "Wolfpack 2030: Powering the Extraordinary" strategic plan to build on this momentum and carry the university even further. NC State has become a lead university for two National Science Foundation Engineering Research Centers and one Manufacturing USA institute (and a partner in six others). Under Woodson's leadership, NC State has become a preeminent research enterprise known for solving real-world challenges — a true Think and Do university. Leading by example to tackle the world's grand challenges, Woodson also chairs the APLU Commission of Global Food Security and serves on the U.S. Council of Competitiveness Executive Committee. A nationally recognized scholar and academic leader, Chancellor Woodson came to NC State having most recently served as provost and executive vice chancellor for academic affairs at Purdue University. An internationally renowned plant molecular biologist specializing in reproductive processes in agricultural crops, he earned his undergraduate degree in horticulture from the University of Arkansas and his M.S. and Ph.D. degrees in plant physiology from Cornell University.

Concurrent Session Abstracts

Alphabetical by Presenter Last Name

"Buying Time" Down East

Presenter: **Karen Amspacher**, Saltwater Connections, kwamspacher@gmail.com

Down East Carteret County is now living with what we could only talk about a few years ago. The multimedia project, RISING NC, gave us a glimpse of where we were five years ago with images and carefully worded text from interviews to focus on "change" across the sounds of North Carolina. That work, the photography, interviews, exhibition and accompanying programming, has served as the pre-Florence foundation for the reality we are now living. Now Sea Level, that Down East community's legal name and its elevation, is a flood-zone several times a year. The skyline of Davis looks like a graveyard of "ghosts" with dying trees. Stacy marsh looks as if it has been sandblasted with black paint and Marshallberg's "Through the Woods" cemetery is edging closer to the shore. What we feared is here, but very few people who live and work here have any clue as to what this means. Conversations with institutional and academic partners have been evolving over the past year. Researchers are working to navigate the link between storms and rising tides to learn more of the long-term impacts of the past 20 years of hurricanes, frequent flooding, and a changing landscape. Projects are being designed to document the ever-increasing pace of the changes RISING forecasted. A growing list of scientists, researchers, planners and Down East residents are emerging to identify community-based efforts to raise awareness among local families and leaders as to the threats these changes are already bringing to these rural coastal communities and the underlying challenge is daunting: How can the cultural independence and innate resilience of these fishing communities accept, adapt and respond to a future of rising tides and disappearing landscapes? And if we do acknowledge what the science tells us, what are our realistic and acceptable options for "buying time" here, in Down East Carteret County, where generations of families have faced uncertain futures for centuries and managed to retain their sacred stand here "at the water's edge?"

Sea Grant's Angler Outreach: What's Working and Where Do We Go Next?

Presenter: **M. Scott Baker, Jr.**, North Carolina Sea Grant, bakers@uncw.edu
Co-author: Sara E. Mirabilio

Increasing the public's understanding of the marine environment and encouraging sustainability of those resources is a central tenant to the Sea Grant mission. With respect to saltwater angling, this can be difficult considering the massive number of stakeholders: 850,000 coastal recreational fisheries license holders, ~1.1 M non-resident saltwater anglers, >700 licensed saltwater for-hire fishing operators, and the broader public simply interested in fisheries and seafood. To address the educational interests of the broader angling public, the science blog www.hooklinescience.com was created in December 2018. To date, 167 science summaries have received >84,000 unique pageviews with 28% of viewership coming from North Carolinians. To appease those constituents seeking detailed knowledge about NC fisheries science and management issues, four offerings of our 6-class, 12-hour Fisheries Science Class have engaged over 140 participants, mostly resident saltwater anglers. In addition to continuing these programs, our next effort is to determine the education and business needs of NC's saltwater for-hire fishing operators. Aspects of these projects and others will be highlighted in an effort to determine what works… and what doesn't.

Labor Volatility in a Time of Crisis: Examining NC Coastal Communities During COVID-19

Presenter: **Holly Benton**, NC Sea Grant, hjbenton@ncsu.edu

Governmental responses to the COVID-19 pandemic resulted in significant disruptions to traditional labor market patterns and practices. Drawing on both quantitative and qualitative data, this research examines labor volatility in NC coastal communities during COVID-19. Specifically, this research attempts to identify and understand how government responses at various scales impacted labor market patterns and practices in NC coastal communities. This presentation highlights insights for future uncertainties and disruptions.

Response of Fringing Salt Marsh Accretion and Carbon Burial to Land-Use Change of Tidal Creek Watersheds

Presenter: **Molly Bost**, NOAA, University of North Carolina at Chapel Hill Institute of Marine Sciences, molly.bost@noaa.gov
Co-authors: Antonio B. Rodriguez, Brent A. McKee

Saltmarsh accretion that keeps pace with relative sea-level rise (RSLR) promotes habitat resilience and a growing carbon stock, but hinges on various biogeomorphic feedback loops that respond to changing sediment supply, accelerating RSLR, elevation, and stem density. In the late 20th century, most of the watersheds occupying the lower coastal plain of North America experienced land-cover change. Many saltmarshes show slow rates of vertical accretion over that period suggesting degradation attributed to reduced upstream sediment loads. We investigated a potential dichotomy between the accretion on tidal creek bay bottoms and adjacent fringing saltmarshes in response to land-cover change in 12 small coastal watersheds by coupling 210Pb-derived sedimentation and carbon accumulation rates with watershed land-cover change since 1959. Accumulation rates at marsh sites within lower relief watersheds of smaller tidal ranges, shorter inundation times, higher stem densities and where land-cover changes were dominated by increased cleared forest area. Of the 12 sites in this study, 8 experienced accelerated mass accumulation rates (MAR) post Major Land Cover Change (MLCC), but only 2 marsh sites in this study exhibit sediment accumulation rates after a MLCC that exceed RSLR. This suggests that these marshes could be a product of the sites being accommodation limited as they are above mean sea level. This work supports the disconnect found in previous research that estuaries are accumulating sediment at sustainable rates while their fringing saltmarshes illuminate the complexities associated with sedimentation regimes in small local watersheds.

Concurrent Session Abstracts *(continued)...*

Lessons from Regional Resilience Planning in North Carolina

Presenter: **Brian Byfield**, NC Office of Recovery and Resiliency, brian.byfield@ncdps.gov
Co-authors: Chloe Donohoe, Amanda Martin, Andrea Webster

Communities on the coast and across our state are on the frontlines of flooding, extreme storms, record temperatures and landslides. A resilient North Carolina depends on our communities, economies and ecosystems being able to rebound, positively adapt to, and thrive amid changing conditions and challenges. Community leaders and residents agree that improving local resilience requires access to expertise, technical support for analysis and planning, and funding to implement measures that advance long-term resilience. The NC Resilient Communities Program responds to these needs through two distinct agency-led programs: RISE, led by the North Carolina Office of Recovery and Resiliency (NCORR), and the Resilient Coastal Communities Program, led by the North Carolina Department of Environmental Quality's Division of Coastal Management. The proposed presentation will focus on the RISE, which takes a regional approach to building resilience. Through RISE, nine regions in the eastern half of the state have developed a regional climate vulnerability assessment, and each of these regions is in the process of developing a Regional Resilience Project Portfolio, a set of 5 to 10 priority projects that advance resilience in the region. In this presentation, staff from RISE will discuss unique aspects of the program, including emphasis on leadership development and the regional lens. Staff will also report on challenges that the program has faced, and their implications for coastal resilience work in the future.

Quantifying Bacterial Water Quality Impacts of Sunny-Day Floods

Presenter: **Megan Carr**, NC State University, mmcarr@ncsu.edu
Co-authors: Natalie Nelson, Angela Harris

The increasing height of high tides from sea-level rise pose unknown water quality risks for coastal communities. These high tides inundate stormwater systems and rise up to roadways causing tidal or "sunny-day" flooding. Most sunny-day flooding research has focused on the hazards posed to homes and infrastructure through flooding, but receding tidal waters may also present water quality hazards as a pathway for nearshore contamination. The objective of this study was to determine whether and to what extent receding tidal floodwaters drive nearshore fecal bacteria contamination. *Enterococcus spp*. levels were monitored for a two-month period in the summer of 2022 at three stormwater outfall locations located along a tidal creek in Beaufort, North Carolina. Water quality samples were collected daily (n = 163) and during sunny-day flooding conditions (n = 89) at high, ebbing, and low tide stages. Results show that the highest and most prolonged levels of *Enterococcus spp*. in nearshore waters are primarily driven by rainfall runoff. Samples collected during sunny-day floods showed elevated *Enterococcus spp*. levels during the ebbing tidal stage, indicating that an inundated stormwater system may cause temporary nearshore contamination when tidal floodwaters recede. Additional data are needed from a range of sites, across varying levels of tidal flooding severity, and in proximity to different stormwater infrastructure designs to conclusively assess the extent to which sunny-day floods create unsafe water quality conditions, but our preliminary results demonstrate how interactions between tides, rainfall, and infrastructure are worthy of further investigation, particularly in the context of rising sea levels.

Multi-trophic Waste Management for Marine Finfish Aquaculture in Land-based Recirculating Aquaculture Systems Using the Salt-tolerant Halophyte *Salicornia virginica*

Presenter: **Patrick Carroll**, University of North Carolina Wilmington, Center for Marine Science, carrollp@uncw.edu
Co-authors: Wade Watanabe, Md Shah Alam

Recirculating aquaculture system (RAS) technology provides significant economic opportunity for the state of North Carolina to produce fish locally for consumer markets. RAS produce highly concentrated, nutrient rich effluent which can more easily be treated before discharge to the environment. For intensive land-based culture of marine fish to expand in the US, viable waste treatment options must be developed. The use of geo-textile bags (GeoTube) for solids removal coupled with *Salicornia virginica* for nutrient removal may be a viable option to treat the waste. A study to determine the growth rate and nutrient removal capacity of *S. virginica* grown in varying concentrations of aquaculture effluent is ongoing at UNCW. Clarified effluent was used to grow *S. virginica* at 3 concentrations, 100%, 50% and 0% (seawater) effluent and a control with 100% effluent and no plant. Each replicate plant was contained in a lysimeter which consisted of a 15-L container supporting a grow cup suspended above the treatment medium. *S. virginica* growth and nutrient uptake (Total Nitrogen (TN) and Phosphorous (P)) were monitored. After 86 days, *S. virginica* has shown distinct differences in growth among the different treatments. Plants grown with 100% effluent grew significantly larger than plants grown on 50% effluent. Both 100% and 50% effluent treatments grew significantly larger than the 0% effluent treatment. Nutrient removal by the Salicornia lysimeter in the 100%, 50%, 0% effluent and control treatments has reached 41.7, 17.22, -2.88, and 19.92 mg/d and 8.07, 4.42, -0.23, and -0.44 mg/d of TN and P, respectively.

Sediment and Marsh Vulnerability in Sediment-Starved Marshes in Currituck Sound NC, USA

Presenter: **Sean Charles**, East Carolina University, charlesse20@ecu.edu
Co-authors: David Lagomasino, Lin Xiong, Amanda Payton, Jason Dail, Cat Bower, Robert Fearn

Marshes in the Currituck Sound in Northeast North Carolina are particularly vulnerable to deterioration and loss from sea level rise. Sediment deposition can increase marsh elevation as sea level rises, but Currituck Sound is a back-barrier estuarine system disconnected from riverine and oceanic sediment sources that experiences minimal astronomical tides and is vulnerable to vegetation mortality due to saltwater intrusion. Marshes in Currituck Sound were historically maintained by sediment inputs from paleo-inlets that closed by 1830, leaving marshes separated by 40 km from Oregon Inlet (the closest marine sediment source). Similarly, marsh resilience is positively influenced by tidal range, which is minimal in Currituck Sound.

High tides allow sediment deposition and provide water and nutrient inputs for vegetation, while low tides improve biogeochemical conditions for plant roots (by providing oxygen and flushing toxic byproducts of anaerobic decomposition). Finally, oligohaline marsh vegetation is particularly sensitive to saltwater intrusion. These vulnerable ecosystems experience both erosion along marsh edges and the conversion of marsh interiors to ponds and mudflats. Within these sediment-starved, vulnerable ecosystem we have established field sites in deteriorating and stable marshes to quantify 1) the importance of sediment deposition for marsh elevation and 2) the influence of biophysical conditions (water depth, weather conditions, submerged aquatic and emergent vegetation and bathymetry). This study will identify areas of vulnerability and help prioritize appropriate areas for restoration.

Research Applications at the Intersection of Ecosystem and Community Resilience

Moderator: **Cayla Cothron**, NC Sea Grant, cdcothro@ncsu.edu
Co-author: Sarah Spiegler

Impacts of a changing climate are not new to North Carolina, and researchers have been working to document and understand the changing conditions impacting ecosystems along the NC coast for many decades. The state has felt unprecedented damage from hurricanes Matthew, Florence, and Dorian in the past decade, and with one of the most vulnerable coastlines to sea level rise on the Atlantic Coast, more intense storms, greater rainfall, rising seas, and non-climate stressors will continue to raise the starting baseline for impacts to communities and natural systems. Resilience can offer a holistic framework to address current and future challenges in these interconnected environments, and connecting and translating science to resource management and decision-making is critical to proactively planning for the resilience of communities, ecosystems, and economies in the face of climate change. This session will seek to foster practical knowledge transfer of best available science related to the impacts of climate change on coastal ecosystems and communities in NC and challenges and successes in application. Presentations will highlight collaborative efforts to bridge the gap between research and decision-making including end users throughout the process, and raise awareness of best available science and information for use by researchers, resource managers, and communities.

Supporting Fisheries with Student Interns

Presenter: **Angel Cruz**, North Carolina Local Food Council, North Carolina State University Center for Environmental Farming Systems, aecruz@ncsu.edu
Co-author: Barry Nash

The COVID-19 pandemic and resulting lockdowns changed the way food is accessed and prepared. Fisheries were hit especially hard with seafood sales across the nation decreasing dramatically during the early months of the pandemic. To compensate for the loss of foodservice revenue, many producers pivoted to direct marketing to remain viable during the pandemic. However, not everyone had the time, skills and familiarity with technology to adapt to this new market. The North Carolina Local Food Council (NCLFC; https://www.nclocalfoodcouncil.org/) is a statewide, collaborative network where council members channel their expertise and resources into coordinated responses that help small-scale food producers operate efficiently and profitably. This NCLFC partnered with NC Sea Grant to develop a novel internship program to partner university students with local seafood business to help develop websites, social media tools and other online platforms to facilitate connections with consumers locally and regionally. This presentation will outline how the internship works to match unique student skill sets with specific businesses, as well as impacts of the internship program on both students and local seafood. We will also share the future direction of the program and opportunities to connect.

Shifting Terrains: Society-Nature and Hazard Information for Fair-minded Transdisciplinary Impact

Presenter: **Bethany B. Cutts**, NC State University, bbcutts@ncsu.edu
Co-authors: Olivia Vilá, Laura A. Bray, Angela Harris, Gracie Hornsby, Hannah Goins, Sallie McLean, Margaret Crites, Angela Allen, Nathan McMenamin, Taleek Harlee

In the immediate aftermath of disaster, survivors and policy makers need rapid biophysical data collection to make sense of new hazard landscapes. The mass transport of soils and sediments are an example of an impact from extreme flooding with the potential to circulate fecal bacteria, heavy metals, and other contaminants to new locations in new combinations. Yet there is very little knowledge about how disaster survivors make sense of soil-related hazards in light of the larger suite of more visible and more acute hazards they may be negotiating. To address this gap, we complete a transdisciplinary methodology that includes surveys, interviews, and soil fecal contaminant and heavy metal measurements. Interviews in Robeson County, NC reveal six distinct ways flood survivors linked environmental pollutants to potential health problems: floodwater, indoor mold, residue on personal items, drinking water quality, wildlife, and soil contamination. Drawing from our results, we (1) Describe factors that contribute to hazard perceptibility among flood survivors; (2) Evaluate the soil hazard level and the social influence of soil data collection on the relationship between hazard perceptibility and actionable knowledge; and (3) Propose principles for fair-minded transdisciplinary research engagement that contributes to community disaster recovery based on our findings.

Institutional Blindspots in Community Engagement

Presenter: **Karl Dudman**, University of Oxford, karldudman@hotmail.com

As research, management and policy relating to coastal flooding increasingly looks to public stakeholders for crucial input, approval, and legitimacy, institutions are recognizing the importance of relationships with coastal communities vulnerable to these and other climate impacts. While a number of productive partnerships and collaborations have been established in recent years to help channel benefits of research, funding and resilience projects to the coast's climate-vulnerable populations, not all types of community enjoy equal visibility. Areas that are rural, unincorporated, and/or have a weaker public consensus around the climate change narrative often present challenges for external collaborators with climate-related projects. While this is commonly attributed to some form of deficit in public

Concurrent Session Abstracts *(continued)...*

knowledge and perceptions, there is comparatively little attention to the role that institutions also play in this process. As this talk will suggest, "disengagement" by communities is not often one-sided, and can be better understood as a combination of mutual engagement challenges. There is a need to understand better the hidden values and assumptions internal to institutions, in addition to the cultural dynamics present within coastal communities. Karl Dudman, a PhD student in anthropology from the University of Oxford, has been conducting fieldwork in North Carolina as a Fulbright scholar since summer 2021. This talk will summarize some key findings and recommendations from a year of interviews and comparative research among residents of coastal Carteret County and practitioners from state agencies, academia, advocacy and government.

Economic Impact of the Commercial Fishing Industry in North Carolina

Presenter: **Eric Edwards**, NC State University, eric.edwards@ncsu.edu

I will discuss a 2019-2020 economic impact assessment evaluating the contribution of the wild-caught commercial seafood industry to the economy of North Carolina and a 2021 economic impact assessment of the commercial mariculture industry. Our results include the impact of the wild-caught fishing industry on four sectors: commercial harvesting, seafood dealers and processors, and establishments that sell NC seafood to consumers: restaurants and retailers. Overall, NC seafood contributes almost $300M to the states GDP, the most commonly used measure of total economic output, and over 5500 jobs. The commercial harvesting sector has the largest statewide impact at $155M. The restaurant and retail sectors have been growing, as more NC seafood is served to more NC consumers. While commercial fishing takes place on the coast, most of the restaurant and retail impact occurs inland. North Carolina's shellfish industry provides over $27 million in economic impact and 532 jobs. Until 2016, this sector's impact was primarily due to the harvest of wild clams and oysters. More recently, wild harvests have declined and cultivated oysters now represent over half of the total economic impact of shellfish in the state. Our estimates suggest farmed oysters contribute over $14 million to state GDP and 271 jobs. Growing inland consumer demand for oysters, especially from restaurants, is increasing the economic impact of the industry across the state.

Determining the Ecological Impacts of Shellfish Relay in North Carolina

Presenter: **Nick Funnell**, UNC Institute of Marine Sciences, nfunnell@email.unc.edu
Co-authors: F. Joel Fodrie, Zofia Anchondo, Stevenson Weeks, Ira Long Christian Bayer

Shellfish relaying is the regulated practice of transplanting oysters or clams from closed polluted waters to private leases where they can depurate. This provides shellfishers (and ultimately the consumer public) access to an otherwise inaccessible resource. While representing a modest component of lease production (~14% of NC's wild harvest, 2002-2017), relaying is a contentious practice among shellfishers and coastal stakeholders. Critics argue that the removal of shellfish from defacto sanctuaries disturbs and further degrades areas that are dependent on the water filtration services shellfish provide. Advocates believe this disturbance becomes a net benefit over time, suggesting that periodic reef disaggregation increases the abundance and health of oysters by creating space for recruitment and growth while reducing predator refugia. In this study, we tested the disturbance-recovery-driven ecological impacts of shellfish relay by comparing designated relay subsites to paired sanctuary reef patches. After one year, relayed reefs (576 ± 159.46 oysters/m^2) had not yet recovered to pre-relay levels (986.67 ± 87.93 oysters/m^2). The density of oysters in relayed reefs was less than before but still substantially exceeded the basic ecological threshold for a healthy reef (10 oysters/m^2) and closely resembled the unrelayed pairs (625.07 ± 235.81 oysters/m^2). Overall, oyster recruitment and predator load did not differ between relayed and unrelayed sites, suggesting that the proposed ecosystem recovery drivers did not manifest within one year. The modest recovery of relayed reefs indicates that typical relaying activity constitutes a moderate pulse disturbance that neither bolsters nor decimates reef health in this time frame.

Sound Values: Livelihood Constellations, Networks and Communicating Risk Along North Carolina's Coast

Presenter: **David Griffith**, ECU Department of Coastal Studies, griffithd@ecu.edu

Socio ecological trends along North Carolina's coast include frequent damaging storms, sea level rise, gentrification, increasing immigration, and the evolution of commercial fishing fleets as they struggle against seafood imports, adapt to fisheries and environmental regulations, deal with unstable inlets, and witness marina space transform from commercial to recreational use. Positive consequences of these trends include the revitalization of small-town commercial districts in coastal plain communities as new immigrants establish businesses, the development of community-based fisheries, a younger generation of commercial fishermen who have come of age with an ever-changing regulatory environment, and the continuing opportunities afforded by the coastal plain's fisheries, farms, and forests. Negative consequences include drownings from rip currents, the loss of real estate from coastal erosion, and exaggerated environmental risks like the mid-1990s *Pfiesteria* hysteria. These trends have also reorganized settlement patterns and commercial opportunities, creating labor camps out of trailer parks and alternative markets and production sites for merchants and craftspeople from various points along the socioeconomic spectrum, such as swap meets, fishers', farmers', and artisans' markets, and mechanics' workshops—all attempts to diversify income and reduce risk. Drawing on interviews, social network analysis, cultural mapping, oral histories, and ethnographic methods, this work will examine relationships among these trends along North Carolina's coast, considering the roles of *livelihoods constellations*—or the generation of value from multiple social, cultural, economic, and ecological activities—in how people perceive, communicate, and respond to the risks and opportunities of a dynamic coast.

Concurrent Session Abstracts *(continued)...*

Tipping Points: Onsite Wastewater Treatment and Climate Change

Presenter: **Jane Harrison**, NC Sea Grant, jlharr10@ncsu.edu
Co-authors: Michael O'Driscoll, Charles Humphrey, Guy Iverson, Lauren Vorhees, Eric Edwards, Iain Burnett, Jared Bowden, Katie Hill

The Carolina coast faces increasing environmental impacts from a changing climate, leading to critical infrastructure challenges. One such problem that deserves attention is onsite wastewater treatment. As climate changes, onsite wastewater treatment systems (OWTS) are increasingly vulnerable to malfunction or even failure if exposed to storm surges, sea level and groundwater level rise, and heavy rainfall – events that are predicted to increase in frequency and severity. Understanding how OWTS are functioning in a changing climate along the Carolina coast involves ongoing research by a team from East Carolina University. Concurrently, research partners from NC Sea Grant, NC State University and University of Georgia are investigating industry and regulatory approaches, as well as economic and legal constraints and opportunities. This presentation will focus on recommendations that illuminate pathways for coastal municipalities, government, and households to develop adaptation strategies for OWTS in the face of rising sea levels and a changing climate.

Using In-Situ Sensing Data to Predict Fecal Contamination in Estuarine Waters

Presenter: **Julia Harrison**, NC State University, jmharr26@ncsu.edu
Co-authors: Natalie Nelson, Angela Harris, Chris Osburn

Fecal indicator bacteria (FIB) are used to assess the safety of coastal waters for recreation and shellfish harvest. However, current FIB monitoring is infrequent, leading to significant time lags between changes in fecal loading and the closing/reopening of waters to the public. These time lags may lead to human exposure to pathogens or economic loss of tourism and aquaculture. To supplement monitoring, high-frequency multi-parameter sondes could be used to measure a suite of water quality covariates in real-time, and feed models that predict FIB concentrations. This study sought to assess the feasibility of such a monitoring system with the following objectives: (1) collect FIB and sonde data over dynamic conditions, (2) develop statistical models to predict FIB using sonde data, (3) identify sonde covariates that best predict FIB concentrations. An EXO2 sonde was deployed in the Newport River Estuary, recording measurements for tryptophan-like fluorescence (TLF), salinity, temperature, dissolved oxygen, fDOM, turbidity, total algae, and pH. Grab samples for FIB enumeration, specifically Enterococci (ENT), were collected daily and bi-hourly during 4 intensive field campaigns to capture baseline and storm-flow conditions in high resolution. The sonde and ENT data were used to develop statistical and machine learning models that estimate ENT concentrations. The best performing model used a random forest algorithm including all the sonde covariates as predictors (testing R2 = 0.67). TLF, salinity, temperature, and FDOM were the most important predictors. These results highlight the potential for sondes to predict FIB and reduce the time lag between water sampling and closures.

The North Carolina Shellfish Farming Academy: An Aquaculture Training and Workforce Development Initiative

Presenter: **Eric Herbst**, NC Sea Grant, NC State University Center for Marine Sciences and Technology, echerbst@ncsu.edu
Co-authors: Bryan L. Snyder, David S. Cerino, Charles R. Weirich, Frank M. López

Workforce development programs are fundamental for the growth and expansion of any industry, including shellfish aquaculture. Abundant natural resources present significant potential for the expansion of the shellfish aquaculture industry in the Carolinas and Georgia. However, one barrier to further industry development in these three states was a lack of training opportunities for prospective shellfish growers. The North Carolina Shellfish Farming Academy (NCSFA) directly addresses this barrier and is the product of a regional project "Developing a Framework to Expand Comprehensive Training Opportunities for Prospective Shellfish Growers in North Carolina, South Carolina, and Georgia" funded by NOAA Sea Grant's "New Aquaculture Opportunities 2019, NOAA-OAR-SG-2019-2005960." NCSFA is an 8-week course comprised of 24 hours of classroom instruction and 24 hours of hands-on field experience. The course is offered through the Carteret Community College Department of Continuing Education and is designed to prepare students for entry into the NC shellfish aquaculture industry. This paper will cover the partnerships, capacity building, resources and solutions for the challenges presented in the creation, launch and sustained delivery of the North Carolina Shellfish Farming Academy.

Can Green Stormwater Infrastructure Reduce Stream Stressor Impacts in Suburbanizing Landscapes?

Presenter: **Krissy Hopkins**, U.S. Geological Survey, South Atlantic Water Science Center, khopkins@usgs.gov
Co-author: Rosemary M. Fanelli

Multiple factors contribute to the degradation of aquatic ecosystems in urban and suburban areas. This study assessed if green stormwater infrastructure practices could minimize the impacts of new suburban development in Clarksburg, Maryland, USA. Analyses included assessments of hydrologic alteration and changes in water quality, topography, and benthic macroinvertebrate communities over the last 15-20 years; as three treatment watersheds transitioned from agriculture to suburban development with a high density (>100 stormwater controls per square kilometer) of distributed stormwater control measures. Results were compared to nearby urban and forested control watersheds. Results indicated that streamflow alteration did occur as a result of development, however, runoff volumes and peak flows were mitigated by the stormwater control measures for small storms in the treatment watersheds. Baseflow temporarily increased during the construction phase of development. Water-quality changes from development and stormwater control implementation included declines in baseflow nitrate concentrations but limited changes to nitrate export and increases in specific conductance. Substantial topographic changes occurring during development including upland flattening, increased valley entrenchment, and deposition in the riparian zone despite buffer protections. Ecological monitoring indicated that even though index of biotic integrity scores rebounded in some treatment watersheds, sensitive benthic

macroinvertebrate families did not recover. Observed sediment deposition in riparian areas, elevated ion concentrations, and loss of sensitive biota point to the need for additional research into new stormwater management technologies that target these ecosystem stressors, especially during the construction phase of development.

The Impact of the Gulf Stream on Marine Forecasting

Presenter: **Logan Howard**, NWS Forecast Office Newport/ Morehead City, NC, logan.howard@noaa.gov
Co-authors: Carl Barnes, Ryan Ellis

Wind is one of the most important hazards to marine customers. Numerical model wind solutions over water are often of poor quality due to limited observations and coarse model resolution. Off the North Carolina coast, the confluence of the Labrador Current and the Gulf Stream creates a significant gradient in sea surface temperature that is poorly captured in models, a problem unique to forecasters at the NWS Newport office. NDBC buoys and NWS soundings were used to collect wind profile and sea surface temperature data for the past four years. A wind-speed ratio (WSR) between the surface and the 925 hPa level was developed to represent the mixed layer, and a relationship was found between WSR and lapse rate showing mixing efficiency. Additional variability in WSR captured by wind direction, time, and season were examined, but only wind direction demonstrated significance. These relationships were collected and organized into a climatological database. Conclusions based on analysis of these data are being incorporated into a tool for forecasters to use operationally in AWIPS. The forecaster will select the desired wind guidance aloft, then, based on the database of in-situ mixing efficiency developed, the tool will pick the appropriate WSR, and marine wind grids will be automatically generated. The grids will include a most-likely scenario, a high-end scenario, and a low-end scenario – providing forecasters with much-needed probabilistic guidance that incorporates both dynamic and statistical modeling. The forecaster can use or combine these grids as desired for the final public forecast grid.

Management of Seagrass Habitat and the Blue Crab Fishery Under Changing Climate

Moderator: **Whitney Jenkins**, N.C. Coastal Reserve and National Estuarine Research Reserve, whitney.jenkins@ncdenr.gov

Presenters: **Jessie Jarvis**, UNCW; **Martin Posey**, UNCW; **Troy Alphin**, UNCW; **Michael Wheeler**, UNCW; **George Easterly**, UNCW; **Anne Deaton**, NC DMF

Through the N.C. Sea Grant funded project titled “Changing Submerged Aquatic Vegetation (SAV) Communities and Impacts on Blue Crabs: Potential Ecosystem and Fisheries Impacts of Climate Change,” researchers from UNC Wilmington engaged stakeholders in a collaborative process to identify biological and environmental metrics for SAV and juvenile blue crabs. These metrics are necessary for developing N.C. specific ecological vulnerability indicators (EVIs) for these valuable resources. At this panel, the project team will share results related to juvenile blue crabs, submerged aquatic vegetation (SAV), and how this work fits into habitat management directed by the Coastal Habitat Protection Plan (CHPP). Panelists will include staff from the agencies implementing the CHPP and other coastal resource managers. Through small group interactions, the panel will engage session participants in discussion on research needs and management actions related to juvenile blue crabs and SAV, to help inform CHPP actions to manage these resources under changing climate conditions. Discussion questions will include which ecological indicators are most important to measure when protecting SAV habitat and juvenile blue crabs, how to monitor these indicators in existing monitoring programs, and what water quality parameters are most important when managing SAV.

Defining and Identifying Vulnerable Communities: A Practical Guide for Weather Forecast Offices

Presenter: **Isabella Kemp**, NOAA, mkemp0599@gmail.com
Co-authors: Ryan Ellis, Casey Dail, Shane Kearns

Efforts to define and map vulnerable communities remain challenging but necessary for National Weather Service (NWS) forecasters to provide better impact based decision support to core partners and local community leaders. What follows is one approach for Weather Forecast Offices (WFOs) to define and identify vulnerable communities which relies on both social science based quantitative datasets and qualitative interviews with emergency managers. This work considers six counties within the County Warning Area (CWA) of the Newport/Morehead City WFO and takes a sub-county level approach to vulnerability. Three vulnerable communities within each county are identified from data tools “Neighborhoods at Risk” by Headwaters Economics and “Resilience Analysis and Planning Tool” by FEMA. Accompanying these quantitatively identified vulnerable communities are qualitative interviews with emergency managers from three inland and three coastal counties within the CWA. An interactive map is created using GIS that combines feedback from emergency managers and data on vulnerable communities obtained through the databases listed above. This map can be used by warning coordination meteorologists (WCMs) and operational meteorologists alike to gain general knowledge of CWA vulnerabilities, target outreach to vulnerable communities, and customize data to meet specific needs of emergency managers. While the current study considers just six of fifteen counties within one CWA, it serves as a proof of concept for the remaining counties within the warning area and other WFOs within the NWS.

Building a Webcam Observing Network to Support Coastal Communities

Presenter: **Joe Long**, UNCW, longjw@uncw.edu
Co-authors: Gregory Dusek, Debra Hernandez, Megan Treml, Dwayne Porter, Alex Pang, Kyle Wilcox, Jeremy Cothran, Louisa Schandera, Lauren Showalter, Josh Rhoades

Over the last several decades, coastal imagery has been developed as a remote sensing tool capable of filling critical gaps in our observing capabilities in the coastal environment. Uses for imagery data range from coastal morphological change to surf zone hydrodynamics, beach attendance and safety, identification of weather events, and detecting marine debris. Unfortunately, the cameras used to provide these data have to-date been limited to a small number of locations, despite the ubiquitous placement of low-cost webcams in coastal environments for recreational/informational use. Webcams for

Concurrent Session Abstracts *(continued)...*

Coastal Observations and Operational Support (WebCOOS) is a NOAA funded collaborative project between academic scientists, the Southeast Coastal Ocean Observing Regional Association (SECOORA), and a combination of local, state, and federal agencies. The project aims to develop a coastal observation network using low-cost, consumer grade, webcams to address significant gaps in the nation's ability to monitor various weather, ocean, ecological and public health hazard. Here, we present the development of the WebCOOS network in the southeastern US. The hardware and data infrastructure developed to collect, transmit, store and disseminate video and still imagery will be presented. We will discuss the community framework and the role that community engagement has played in developing the network. Examples of downstream imagery products that can be used to validate models, inform public safety, and create community awareness include rip current detection, coastal morphological change and counting beach attendance or vessel traffic. Finally, a vision for the scaling of WebCOOS to a sustained national network will be introduced.

Hurricane Florence Aftermath in New Bern: Extension Support for Recovery

Presenter: **Frank López**, NC Sea Grant, NC Water Resources Research Institute, fmlopez@ncsu.edu
Co-authors: David Salvesen, Tom Barrie, Tatiana Height

In New Bern alone, Hurricane Florence was responsible for approximately $100 million in damages, mostly due to flooding. Funding from the National Sea Grant office allowed NC Sea Grant to reach out to New Bern to assess where Sea Grant extension support was needed. Consistently, the two topics that came up as high priorities were access to affordable housing and options for vacant parcels. We focused on the Duffyfield neighborhood near downtown. Duffyfield has had several flooding disasters and has over 40% vacant properties. Our first stage of assistance has included partnership development (e.g., the New Bern Boys & Girls Club (NBB&GC), New Bern Habitat for Humanity). The Stanley White Recreation Center (SWRC) is a key part of the history of Duffyfield. The Center is being relocated from its current site to a site outside the floodplain, which caused concerns in the neighborhood. A 2020 UNC-Chapel Hill capstone team worked with the NBB&GC through a series of educational modules on storytelling, climate change, flood mitigation, and floodplains. The students also conducted surveys and interviews of community members and NBB&GC students to help inform potential plans for the new and old recreation center site as ways to connect the sites. They also researched case studies of cities with parks that were proactive in managing floodwater and provided several recommendations for improving accessibility, safety, flood resilience, and connectivity. In 2021, a NC State College of Design studio provided several design options for affordable housing as part of Duffyfield's redevelopment.

Continuous Beach Morphology Observations Under Active Storm Forcing Using Compact 3D LiDAR Scanners

Presenter: **Ryan Mieras**, UNCW, mierasr@uncw.edu

Winter Storm Kenan impacted the Outer Banks of North Carolina from 29 – 30 January 2022. Kenan was preceded by two other significant erosive events in January 2022, which cumulatively led to major erosion, dune scarping, overwash, and ocean/soundside inundation. The Nearshore Extreme Event Reconnaissance (NEER) Association deployed a field team to Rodanthe, NC ahead of the storm to observe the impacts on the barrier island communities. One house collapsed into the surf zone, 10 days after Kenan passing, due to continued post-storm erosion. An array of instruments was installed pre-storm to measure hydro-morphodynamics before, during, and after the storm. Beach morphology from the dune-dike system to the shoreline, and 45 m in the longshore, was measured every four minutes (0.25 m grid resolution) using two Blickfeld Cube 1 solid-state, compact 3D LiDAR scanners from 29 January to 3 February. Cross-shore wave transformation was measured with two RBRsolo3D |wave16 loggers installed on pier pilings next to the LiDAR fields of view (FoVs). The majority of the erosion and beach scarp transgression within the LiDAR FoVs occurred during two consecutive storm high tides, with the second high tide leading to a breach of the dune-dike system 100 m south of the LiDARs. Wave runup and total water level estimates will be derived from LiDAR point clouds and two pier-mounted wave gauges. Longshore and cross-shore morphodynamic behavior will be derived from the LiDAR scans. The hydro-morphodynamic feedbacks leading to significant erosion during the storm, followed by post-storm berm recovery will be analyzed.

Town of Nags Head Decentralized Wastewater Management Plan Update

Presenter: **Holly Miller**, Tetra Tech, holly.miller@tetratech.com

Many coastal communities rely on private onsite wastewater treatment or septic systems. The systems are being threatened by increases in SLR, ocean over wash, high-intensity short-duration storms, hurricanes, nor'easters, and increasing groundwater table elevations. These challenges can impact septic systems causing a short-term failure or the need for a full replacement. In some cases, the challenges are so great that a property is no longer viable for residential usage and a buy-out is necessary. Additionally, Hazard Mitigation Plans may not include or identify septic systems as part of the communities' critical infrastructure leaving a gap for potential funding sources. The Town of Nags Head Decentralized Wastewater Management Plan update was led by Tetra Tech with collaboration by East Carolina University Coastal Studies Institute (ECU CSI) to collect groundwater table elevation data. The groundwater collection data was used to determine depth of groundwater table elevations and potential risk to septic systems. Additionally, Tetra Tech reviewed the entire Todd D. Krafft Septic Health Initiative, water quality data, and developed future conditions planning. The identified risk data will then be used by the Town to increase education and outreach, conduct additional groundwater and water quality sampling, and consider advanced treatment or cluster systems to ensure viability of residential homes. This presentation will detail the proactive changes the Town of Nags Head is making to the DWMP and SHI to ensure the long-term viability of coastal onsite wastewater treatment systems and future community resiliency.

Concurrent Session Abstracts *(continued)...*

Refinement and Testing of a Microprocessor-Based Shark Bycatch Reduction Device (M-B BRD) Using an Academic-Industry Partnership

Presenter: **Sara Mirabilio**, NC Sea Grant, semirabi@ncsu.edu
Co-authors: Richard Brill, Peter Bushnel, Amanda Wilson

Reducing shark bycatch in U.S. pelagic longline fisheries is a NOAA Fisheries management priority as multiple coastal-pelagic species are overfished and/or experiencing overfishing. We contend shark bycatch can be reduced by taking advantage of the unique sensory biology of elasmobranch fishes, specifically their ability to perceive electric fields of less than five nanovolt per centimeter. Such signals are, however, undetectable by targeted teleost fishes which lack the electrosensory system (Ampullae of Lorenzini) of elasmobranch fishes. A National Sea Grant Office award (NA19OAR4170413) funded development of an industry-deployable, microprocessor-based, shark bycatch reduction device (M-B BRD). We evaluated its performance using a 150-hook, three-mile, bottom longline deployed from a commercial fishing vessel operating in coastal waters from Oregon to Hatteras inlets (North Carolina). Over the course of 15 fishing days (Aug. 2 – Oct. 1, 2021), a total of 141 sharks (across nine species) were captured with all but 34 on hooks near M-B BRDs that emitted no electric pulse (controls). This ratio is significantly different from the expected 1:1 ratio ($p=0.0000000007$). Although effectiveness was species-specific, in aggregate the presence of an active M-B BRD reduced shark catch by greater than 50%. These data support the hypothesis that weak electric stimuli generated by a M-B BRD can reduce shark bycatch in longline fisheries. Further, with a M-B BRD shark bycatch could be reduced without imposition of time-area closures, significant gear modifications, or mandated hook types, and with little or no effect on catches of non-electrosensitive target teleost fishes (e.g., swordfish and tunas).

From National to Local Scales: Integrated Approaches for Mapping Coastal and Estuarine Vulnerability to Projected Change

Presenter: **Lise Montefiore**, NC State University, lrmontef@ncsu.edu
Co-author: Natalie G. Nelson

Considered as the “nurseries of the sea”, estuaries are unique ecosystems that provide valuable assets to national and local economies. However, their integrity and the socio-economic services they provide are differentially threatened by adverse effects of anthropogenically-driven local and global change (e.g., land-use change, climate change, sea level rise). Understanding the factors that make the systems vulnerable is required to make sound decisions and allocate resources efficiently to reduce the vulnerability of estuarine and coastal systems and communities. Vulnerability assessment is an integrated approach that can be used as an informal spatial planning instrument to identify, quantify, and prioritize vulnerabilities within a system and between systems. Several vulnerability assessments have been developed nationwide to identify vulnerable coastal and estuarine systems and regions to flooding from sea level rise, ocean acidification and warming, and projected water quality change. The present work aims to detail the key components of vulnerability assessments, summarize previous national vulnerability findings for North Carolina’s estuarine and coastal systems, and present where further work should be pursued to improve vulnerability assessments.

Fisheries and Aquaculture: Expanding and Enhancing the Competitiveness of the North Carolina Seafood Industry

Moderator: **Barry Nash**, NC Sea Grant, barry_nash@ncsu.edu

Presenters: **Eric Edwards**, NC State University; **Sara Mirabilio**, NC Sea Grant; **Ann Savage**, NC State University; **Angel Cruz**, NC State University; **Scott Baker**, NC Sea Grant

With increasing U.S. population growth and rising rates of seafood consumption, maintaining and expanding a domestic supply of seafood is paramount. North Carolina waters provide seafood to consumers via the commercial wild-caught fishing industry, a developing marine aquaculture sector, and recreational fishing. A safe and sustainable seafood supply means each of these industries must be responsive to social and environmental needs, along with changing market expectations. The objective of this session is to profile how Sea Grant and its research partners are helping our marine industries quantify their economic impacts to the state’s economy, improve harvest efficiencies, engage in e-commerce, and improve recreational fishers’ compliance with regulations to boost conservation efforts.

Near-Term Monitoring and Data Needs for Assessing Sea-Level Rise Impacts

Moderator: **Natalie Nelson**, NC State University, nnelson4@ncsu.edu

Presenters: **Natalie Nelson**, NC State University; **Megan Carr**, NC State University; **Thomas Thelen**, NC State University

Models predict that coastal communities in North Carolina are increasingly prone to sea-level rise and chronic tidal flooding. By 2050, communities along the NC coast are expected to observe water levels 1-1.75 feet above the 2000 average sea level, resulting in roughly 40 to 155 days of hide tide flooding annually. These higher water levels will increase the frequency of chronic flooding experienced in coastal communities, demanding innovative solutions. Do communities have the resources to monitor and understand the impacts associated with their exposure to accelerating rates of coastal flooding? Should various monitoring strategies be applied to fit each community’s industry and infrastructure needs? In this moderated panel discussion, we will engage 4-5 stakeholders and experts – from researchers to town planners and resource managers – and hear their perspectives on the data and infrastructure they feel are needed to document, understand, and respond to near-term sea-level rise impacts. We will investigate what they perceive as barriers to collecting data on flooding and building out monitoring capacity. The panel will begin with brief presentations (2-3 minutes) by each of the panelists, followed by a question and answer period. Questions will initially be posed by panel co-conveners, graduate students Megan Carr and Thomas Thelen, and then by members of the audience.

Concurrent Session Abstracts *(continued)...*

Developing Coastal Plain Ecological Flow Guidance in the Albemarle-Pamlico Basin: Examples from the Trent River

Presenter: **Michael O'Driscoll**, ECU, odriscollm@ecu.edu
Co-authors: Robert Christian, Guy Iverson, Jacob Petersen-Perlman, Rebecca Asch

Ecological flows define the quantity and timing of streamflow necessary to maintain ecological integrity in river systems. Progress has been made on quantifying the ecological flow needs for North Carolina's inland rivers. However, there is limited understanding of the ecological flow requirements for coastal rivers and estuaries. Flow characteristics in coastal rivers and estuaries are more complex due to the effects of wind and tides. Low flows can affect ecosystem processes in these settings due to their influence on saltwater intrusion, water level, sediment, oxygen and nutrient dynamics, residence time, and connectivity with aquatic and wetland habitats. This pilot project focused on the Trent River, a tributary to the Neuse River Estuary. Current efforts are centered on understanding water level and specific conductivity dynamics in the riverine-estuarine transition zone, effects of low flows and increased salinity on wetland habitat and fish communities, influence of water use on low flows, stakeholder preferences regarding potential policy actions, and the integration of natural and social science results. Historical and recent data on flows, water levels, water quality, and fauna have been assessed relative to periods with low flows. As expected, upstream results indicated that low flows greatly influenced river stage variability and the extent of aquatic habitat. Near sea level, the influence of flow on stage variability was diminished due to downstream controls on water levels. In the riverine-estuarine transition zone, low-flows can largely influence inland saltwater intrusion, and this aspect is important to consider in watershed management.

Wetland Vulnerability Metrics as a Rapid Indicator in Identifying Nature-Based Solutions to Mitigate Coastal Flooding

Presenter: **Narcisa Pricope**, UNCW, pricopen@uncw.edu
Co-author: Greer Shivers

Flood mitigation in low-gradient, tidally-influenced and rapidly urbanizing coastal locations remains a priority across a range of stakeholders and communities. Wetland ecosystems act as a natural flood buffer for coastal storms and sea level rise (SLR) while simultaneously providing social benefits to urban dwellers. Nature-based solutions (NBSs) are a type of green infrastructure that can contribute to flood mitigation through the management and restoration of the ecosystems. We propose that wetland vulnerability assessments can be used as a rapid method to quantify changes in ecosystem dynamics and flood exposure and to prioritize potential locations of NBSs implementation. We quantified exposure risk using 100- and 500-yr flood hazard areas, 1-10ft of sea level rise scenarios, and high tide flooding and sensitivity using time series analyses of Landsat 8-derived multispectral indices as proxies for wetland condition at sub-watershed scales. We posit that wetland areas that are both highly vulnerable to recurrent flooding and degrading over time would make good candidate locations for NBS prioritization, especially when they co-occur on government-owned parcels. In collaboration with local governmental agencies responsible for flood mitigation in the City of New Bern and New Hanover County, North Carolina, we conducted field verification campaigns and leveraged local expert knowledge to identify optimal NBS priority areas. Our results identified a total of 8 government owned parcels containing highly vulnerable wetland areas in the City of New Bern and 108 in New Hanover County. We present a rapid method of identifying potential priority areas for nature-based solutions to mitigate coastal flooding.

StriperHub: Striped Bass (*Morone saxatilis*) Aquaculture

Presenter: **Benjamin J. Reading**, NC State University Department of Applied Ecology, bjreadin@ncsu.edu
Co-authors: Linnea K. Andersen, Jason Abernathy, David L. Berlinsky, Greg Bolton, Russell J. Borski, David Cerino, Michael Ciaramella, Robert W. Clark, Michael O. Frinsko, S. Adam Fuller, Steve Gabel, Bartholomew W. Green, Steve Hall, Eric Herbst, Michael Hopper, Linas W. Kenter, Frank Lopez, Barry Nash, Matthew Parker, Kwamena Quagrainie, Steve Rawles, Hanping Wang

StriperHub is one of the NOAA National Sea Grant Aquaculture Hubs coordinated by North Carolina Sea Grant. The StriperHub integrates Sea Grant programs (IL/IN, OH, MD, NC, NY, NH), industry partners, government researchers (NOAA and USDA), policymakers, cooperative extension agents, and academic scientists to consolidate and streamline striped bass (*Morone saxatilis*) aquaculture efforts in the US through demonstration of commercial-level culture, economics, and marketing. By value, 90% of seafood products consumed in the US are imported, totaling over $16 billion in the trade deficit and half of these imported fish are reared in aquaculture operations. The Sea Grant StriperHub centered in North Carolina will help to address this deficit by developing striped bass as a candidate aquaculture species to strengthen the domestic seafood industry and boost the economies of coastal and rural communities throughout the US. This collaboration will define striped bass markets and economics of production, develop education and training programs, clarify regulatory permitting and licensing procedures, and promote comprehensive outreach and visibility among likely producers and consumers of this new seafood product, which is now available in markets along the Eastern US Coast. Specific program goals are to: 1) Identify domestic producers for commercial production and provide an adequate supply of fish to consistently supply markets; 2) Demonstrate profitability through production, marketing and economics; 3) Clarify regulatory permitting and licensing procedures; and 4) Promote comprehensive extension, marketing, training, and educational visibility to consumers and stakeholders.

Salt Marsh Ontogeny Drives the Wide Range of Carbon Accumulation Rates

Presenter: **Antonio Rodriguez**, UNC, abrodrig@email.unc.edu
Co-authors: Carson B. Miller, Molly C. Bost, Brent A. McKee, Nathan D. McTigue

Salt marsh has a great capacity for accumulating and storing atmospherically relevant carbon in its soil, mainly due to rapid sedimentation of carbon-rich sediment and conditions that promote preservation of organic carbon. Measurements of salt marsh carbon accumulation rates (CAR) vary globally and regionally creating large uncertainty in monetizing carbon credits or appraising the value of restoration projects. The large range

of salt marsh CAR could be masking well-defined patterns related to ontogeny, landscape setting, and sea-level rise. This study used the entire salt marsh sedimentary unit for measuring CAR in North Carolina and includes transgressive (n=3) and regressive (n=4) sites. During a period of slow sea-level rise, CAR increased linearly through time at both regressive and transgressive sites; however, during the subsequent period of more rapid sea-level rise, CAR was high and variable at marsh edges. High CAR at marsh edges was driven by high sediment accommodation and accumulation at the landward edge of transgressive marshes and at the seaward edge of regressive marshes. The carbon density of both transgressive and regressive salt marshes increased in a landward direction. This highlights the importance of the upland edge for building stocks and likely reflects a decrease in lithogenic sediment in a landward direction. Explaining the drivers of salt marsh CAR variability, beyond broad regional groupings and time scales of interest, is important for accurate carbon pricing, expectations for the effectiveness of restoration projects at mitigating greenhouse-gas emissions and impacts of coastal landscape conversion.

Predation Amplifies the Effects of Parasite Infection on the Personality of a Keystone Grazer

Presenter: **Christina M. Salerno**, UNCW, cms8486@uncw.edu
Co-authors: Julia C. Buck, Stephanie J. Kamel

Parasites can alter species interactions either by modifying infected host behavior or by influencing behavioral responses in uninfected individuals. Salt marsh ecosystems are characterized by a predator-prey interaction between the keystone grazer, *Littoraria irrorata*, and its main predator, *Callinectes sapidus*, both integral players in mediating the productivity of marshes. *Littoraria* also acts as the first intermediate host for at least four species of digenetic trematode. Parasite infection has been shown to decrease grazing and climbing in populations of *Littoraria*, though effects on their response to predators has not been investigated. Moreover, how infection might influence among-individual variation in behavior (animal personality) is unknown. Here we ask how trematode infection affects the expression of boldness in the antipredator responses of *Littoraria* in both the absence and presence of predator cues. We find that parasite infection itself does not appear to directly induce behavioral changes: infected snails show no evidence of decreased climbing or differences in refuge use as compared to their uninfected counterparts. However, we find that infected individuals exposed to predator cues showed the strongest expression of behavioral types. Therefore, infection may drive the expression of condition-dependent personality differences evident only under high-risk conditions. Additionally, uninfected bold individuals grouped with an infected individual were more responsive to predation risk. Here parasites are influencing personality indirectly by inducing avoidance behaviors in healthy individuals, though only in high-risk environments. Given the ecological importance of this predator-prey relationship, trematode infection can act as an important, though indirect, determinant of overall salt marsh health.

Critical Elements of a Community-Driven Disaster Recovery and Resilience Information Hub

Presenter: **Ann E. Savage**, NC State University, aesavage@ncsu.edu
Co-authors: Whitney Knollenberg, Erin Seekamp, Bethany Cutts, Zack Russell

Following Hurricane Dorian's (2019) landfall, historic flooding and widespread damage occurred across coastal North Carolina. Two barrier islands, Ocracoke and Hatteras, were among the hardest hit and the eight (8) communities south of the Oregon Inlet were isolated from mainland response efforts. Our research team conducted in-depth interviews with 51 tourism industry stakeholders, community leaders, and broader county and state emergency responders. After uncovering pathways of near-term decision making and identifying a broader network of actors and information sources, our research team established a baseline for understanding disaster recovery in remote tourism-dependent communities. Importantly, we uncovered the need for a centralized location to integrate and disseminate response and recovery resources; facilitate sharing of strategies to enhance recovery preparedness; and foster learning and partnerships among coastal communities to build longer-term resilience. In May 2022, we hosted focus groups in these communities to explore key inter-community and regional components (e.g., resources, information pathways, community interactions, and knowledge brokers) needed to create a virtual community-based disaster preparedness, response, and recovery hub. We analyzed existing community-based planning resources and designed our focus groups to develop a blueprint for such an information hub. During this presentation, we will share the emergent blueprint (e.g., platforms, functions, management), as well as how community cohesion and inter-community support can be leveraged to enhance coastal resilience.

Leveraging Direct-to-Consumer Marketing and Tourism to Diversify Income Streams for Seafood Producers

Presenter: **Ann E. Savage**, NC State Tourism Extension, aesavage@ncsu.edu
Co-authors: Jane Harrison, NC Sea Grant; Barry Nash, NC Sea Grant; Eleanor Baker, NC Department of Agriculture & Consumer Services; Julie Schmidt, Yellow Dog

This presentation will summarize ongoing work to cultivate direct-to-consumer marketing strategies for the seafood industry. A project led by NC Sea Grant, NC Department of Agriculture & Consumer Services, NC State Tourism Extension and the marketing firm Yellow Dog is underway to offset ongoing weakness in the seafood sector, and leverage tourism to increase public awareness of and demand for N.C. seafood. Because the majority of seafood consumers have little knowledge of product origin, the seafood industry can benefit from synergies with local agriculture and food tourism – sectors that can raise awareness and increase consumer demand for N.C. seafood. The project expands the presence and use of the Visit NC Farm App – a mobile technology for phones and tablets that consumers download to locate local-food retailers, farms hosting visitors, and seasonal events celebrating local food anywhere in North Carolina. The project also expands awareness of the NC Oyster Trail, a marketing program that educates the public about the culinary options

and ecosystem benefits of sustainable shellfish mariculture. As seafood producers continue to develop new direct sales and tourism ventures, the project team evaluates how those ventures increase sales and revenues. Our presentation will describe the marketing assistance, training, and network building being provided to N.C. commercial fishers and marine aquaculture producers who are wading into direct marketing through the tourism sector.

New Wave Information Included in the NWS Coastal Waters Forecast

Presenter: **Matthew Scalora**, NWS Forecast Office Wilmington, NC, matthew.scalora@noaa.gov
Co-authors: Mark Willis, Darren Wright

The National Oceanic and Atmospheric Administration's (NOAA) National Weather Service (NWS) National Wave Team and Marine Services Program has developed a new experimental product (https://www.weather.gov/marine/wavedetail) that provides added wave detail with more clarity for marine users and partners to support better decision making. Multiple coexisting wave systems are common at any point in the ocean, each containing its unique height, period, and direction. Details on each of these wave systems provide valuable information for marine customers. For example, a very short period wave system moving parallel to the coast may provide significant hazards to small and flat bottom vessels leaving an inlet. Meanwhile, longer period waves moving towards the shore produce shoaling hazards near the coast. There are a multitude of similar scenarios that are of interest to various marine users. Mariners need significant wave height to quickly gauge the accuracy of a forecast based on buoy observations, and they also need the height, period, and direction of the wave systems that make up the significant wave height. Based on feedback and advancements in the Nearshore Wave Prediction System (NWPS) (https://polar.ncep.noaa.gov/nwps), the proposed updated wave component of the Coastal Waters Forecast (CWF) includes significant wave height and the option to include additional wave detail of the main wave systems. The NWS currently has several different ways of describing waves. The new experimental product will offer more consistency of the CWF across the nation while providing mariners with valuable enhanced wave information.

Setting a Coastal Resilience and Sustainability Agenda for Rural Communities

Moderator: **Erin Seekamp**, NC State University, elseekam@ncsu.edu
Co-author: Amanda Mueller

North Carolina faces numerous threats to the resources and heritages that have traditionally sustained communities in the coastal plain and on our shorelines, such as: coastal hazards and infrastructure damage, salinization and declining productivity of agricultural lands, contaminants in ground and surface waters, pathogens in mariculture and changing water temperatures altering fish stocks. Rural coastal community vibrancy is further complicated by policies and processes that perpetuate climate and environmental injustices, as well as rising outmigration of younger generations. Sustainable energy and tourism development, for example, are potential solutions but they are also embedded with uncertainties and risks to both communities and ecosystems. With so many threats, it is time to begin identifying which are the most important and urgent to address for building coastal resilience and sustainability. This interactive session seeks to craft an engaged research and education agenda on coastal resilience and sustainability informed by conference attendees with various perspectives of key needs. The audience will be asked to share what they believe to be the greatest information and training needs and will be guided through a facilitated discussion to determine the best ways creatively engage communities in finding innovative and entrepreneurial approaches to enhancing coastal resilience and sustainability. Managers, practitioners, policymakers, and researchers interested in thinking about how to "bounce forward" when addressing coastal threats are encouraged to attend this session.

Landscape-level Changes in Coastal NC: Using a Documentary to Understand Perceptions of Change

Presenter: **Lydia Sellers**, Duke University, lydia.sellers@duke.edu
Co-authors: Karen Amspacher, Liz DeMattia, Sarah Spiegler

Coastal landscapes and coastal communities across the globe are experiencing many changes. One area in NC that is undergoing such change is the Down East communities of Carteret County. This area has been witness to sunny day flooding, habitat changes, back-to-back hurricanes, and increased storm intensity. Our project takes a landscape-level approach and uses imagery to understand how and if the Down East landscapes have changed, and what local communities feel about those changes. Using aerial images and satellite photos from the 1930s and 2021 we are comparing community locations over time to see how and if these culturally important community locations have changed. After collecting images, they were stitched together in a documentary and the documentary be used as an exhibit at the Core Sound Waterfowl Museum & Heritage Center (CSWM&HC). In addition to creating the documentary, we plan to hold focus groups with community members to understand what they see and feel after watching the documentary. These focus groups will allow the CSWM&HC to understand how their community views and feels about the landscape-level changes within their community and supports the CSWM&HC in their work of preserving and supporting communities at the frontlines of landscape-level changes.

Least Tern (*Sternula antillarum*) Disturbance Responses to Human-related Activities on Hatteras Island, NC

Presenter: **Alexander Smith**, UNCW, aos4927@uncw.edu
Co-author: Raymond M. Danner

Breeding Least Terns (*Sternula antillarum*) exhibit behavioral responses to human-related and non-human-related sources of disturbance. Our goal is to determine wildlife buffer distances to adequately protect breeding Least Terns (LETE) in Cape Hatteras National Seashore. On Hatteras Island in 2021, we recorded potential sources of disturbance in eight colonies and opportunistically observed disturbance behavior responses of birds at multiple nests. In 2022, we experimentally tested behavioral responses of LETE to pedestrians and off-road vehicles (ORVs) that approach or pass by three colonies.

The primary behavioral response(s) of breeding Least Terns to disturbances are agitation initiation distance (AID), flight initiation distance (FID), and flight duration. Preliminary results from 2021 show that the most prevalent potential sources of disturbance around our target colonies were pedestrians and natural factors (e.g., predatory birds and mammals, and intraspecific aggression), except for one roadside colony where vehicles were most prevalent. The intensities of disturbance response behaviors were greater when responding to human-related sources compared to non-human-related sources. Based on our 2022 data, non-direct pedestrian approaches and passes elicited a response in 55% of the trials, whereas non-direct ORV approaches and passes elicited a response in 14% of the trials. Though off-road vehicles elicited a response less frequently than pedestrians, LETE responded to ORVs at greater distances, on average. Utilizing GLMMs, we found little evidence for habituation across approach and pass trials in a day ($\Delta AID < 2$) and little evidence for habituation across each of the field seasons ($\Delta AID < 2$).

Cross-Cutting Coastal Resilience Efforts and Building Strategic Climate Partnerships in NC

Moderators: **Sarah Spiegler**, NC Sea Grant, sespiegl@ncsu.edu
Co-authors: Cayla Cothron, Jacob Boyd
Presenters: **Jacob Boyd**, NC DMF; **Mackenzie Todd**, NC DCM; **Andrea Webster**, NCORR; **Lora Eddy**, TNC; **Holly White**, NCORR

The complexity involved in effective climate adaptation requires building strategic partnerships and working across multiple geographies, disciplines, and governance jurisdictions. Climate change is the defining environmental challenge facing the communities (both human and ecological) that Sea Grant serves. In 2018, Hurricane Florence caused $24 billion in damages in North Carolina. Since Florence, the climate resilience efforts and building of strategic partnerships in NC have been broad and far-reaching. This includes Gov. Cooper's 2018 Executive Order 80 (NC's Commitment to Address Climate Change and Transition to a Clean Energy Economy), the creation of the NC Office of Recovery and Resilience (NCORR) in 2019, the publication of the 2020 NC Climate Risk Assessment and Resilience plan, and the many resulting efforts that were prioritized by the 2020 plan. Challenges and success stories post-Florence include cross cutting climate resilience efforts, including the various recommendations and plans that are being implemented across and in-partnership between agencies, organizations, and communities in North Carolina. As national and state attention has become more focused and explicit regarding the urgent need for climate adaptation there has been an increase in available resources and service providers. Partnership efforts and collaboration are critical to climate adaptation efforts, because no one agency will be able to tackle such an immense challenge on their own. It is more critical than ever that federal, state, local, university and communities' partners engage in strategic partnerships to complement and amplify the climate adaptation and resilience efforts in North Carolina.

Assessing Faunal Community Composition in Newly Restored Seagrass Beds Across a Depth Gradient

Presenter: **Stacy N. Trackenberg**, ECU, trackenbergs18@students.ecu.edu
Co-authors: Dawsyn Smith, Rachel K. Gittman

Seagrass meadows provide valuable habitat for faunal communities. Accelerating loss of seagrasses globally has subsequently prompted increased restoration efforts. While minimum and maximum depths for successful seagrass restoration are known, data linking restoration depth to restoration success and faunal community assembly are lacking. To investigate how depth impacts restoration success and faunal community composition, we restored Halodule wrightii in subtidal and intertidal plots near Harkers Island, North Carolina. Bi-monthly from June through October 2021, we monitored seagrass expansion in the restored plots and sampled faunal abundances and squid-pop consumption rates in restored plots, bare sand, and natural seagrass controls. We continued to monitor seagrass expansion one year post restoration from June through October 2022. Our intertidal restoration plots had a higher proportion of survived clumps than subtidal plots and clumps in intertidal plots persisted one year post restoration. We found higher faunal abundances in seagrass control plots compared to intertidal restored and bare control plots. Within our restored and control plots our shallow control plots had the highest faunal abundances. We found lower consumption rates of squid-pops in intertidal plots with lowest consumption in the restored intertidal plots, potentially indicating a refuge capacity of restored seagrasses intertidally. Seagrass is a critical habitat for economically important fishes in North Carolina. Greater understanding of the degree to which restoration depth impacts fish communities will provide insight into how best to sustain and enhance habitat functions.

Wave Attenuation Over Oyster Reef Breakwaters on Waterfront Properties in NC

Presenter: **Georgette Tso**, ECU, georgettelouise@gmail.com
Co-authors: Siddharth Narayan, Rachel Gittman, Jana Haddad

Oyster reefs are valued as nature-based coastal defenses for their ability to attenuate waves, meaning the reduction of incoming wave heights and energies. Oyster reefs that are successful at attenuating waves can reduce coastal erosion, protect marsh vegetation, reduce risk of flooding, and protect vulnerable coastal communities against the threat of sea-level rise. Oyster reefs are also valued for their numerous ecological ecosystem services, which include water filtration, increasing local primary production, and buffering against estuarine acidification. Unfortunately, it is difficult to achieve both wave attenuation success and ecological success when deploying oyster reef breakwaters. Reefs that sit at higher elevations relative to the local tidal range are more effective at wave attenuation, but oyster reefs that sit at lower elevations are more ecologically successful since oysters require long inundation times to thrive, thus posing a design optimization problem. In Newport, Gloucester, and Harker's Island, NC, oyster reef breakwaters and oyster bags were built in front of five waterfront homes. Wave gauges were deployed landward and seaward of each breakwater, oyster bag, and reference site (control) during June and August of 2022. Spectral analysis was used to

calculate wave heights and energies from the raw pressure data collected by the wave gauges. Percent wave attenuation and inundation time calculated across different oyster reef treatments will be used to develop guidance on oyster reef breakwater design for maximum wave attenuation capabilities.

The Use of Mobile and Social Media Data to Improve Disaster Management

Presenter: **Hannah Tuckman**, The Water Institute, sokolh@live.unc.edu

If I were to tell you Twitter saves lives, would you believe me? Well, look to Texas during Hurricane Harvey where people turned to twitter for response efforts when the 911 systems were overwhelmed or could not be reached due to connectivity problems. In addition to Twitter being used for community-based response, social media can be used in coastal emergencies to analyze the severity of disaster, fundraise after a disaster, and determining mental health concerns post-disaster. During a coastal natural hazard incident, all systems within an affected community are stressed, including those that are already stressed for vulnerable populations. Vulnerable groups like non-native speakers, elderly, ill, electricity-dependent, and disabled people can find their vulnerabilities exacerbated during a disaster. Communication and accessibility avenues can be difficult to navigate in the uncertainty that results from an emergency. With the rise of technology in everyday life, there is a unique opportunity to utilize mobile and social media data to make all phases of an emergency more efficient and effective. This presentation will focus on the applicability of mobile phone and social media data before, during, and post-disaster to enable efficient disaster management. We will explore how these emerging tools have the ability to help the most vulnerable and traditionally overlooked populations, as well as identify potential barriers to access that will be created. We will look at examples from across the globe, and provide recommendations for moral and innovative uses of emergency management globally.

Spatial Variation in Nursery Habitat Use by Juvenile Blue Crabs in a Shallow, Wind-Driven Estuary

Presenter: **Erin Voigt**, NC State University Department of Marine, Earth, and Atmospheric Sciences, epvoigt@ncsu.edu
Co-author: Dave Eggleston

Nursery habitats are often targeted by conservation policies and restoration practices. Managers must choose where to focus limited resources, which is complicated when juveniles utilize multiple habitats. This is particularly applicable to the NC blue crab (*Callinectes sapidus*), which uses three main habitats, low salinity ephemeral *Ruppia maritima* seagrass beds, high salinity mixed species seagrass beds, and shallow marsh detrital habitat (SDH). Spatial variation in early juvenile blue crab instars (2.2-20 mm) density and size-class was quantified within the Albemarle-Pamlico estuarine system (APES) together with potential explanatory variables driving spatial variation in crab density and size. Despite being 25-40 km from the source of megalopae, juvenile crab density was nearly four times greater in ephemeral *R. maritima* habitats on the western shore of the APES than adjacent SDH or eastern mixed species seagrass beds. Increased density in western habitats may be partially a result of hurricane-driven transport across the sound resulting in increased recruitment to the western coast of APES. Evidence for hurricane-driven transport as opposed to secondary density-dependent distribution in crabs across eastern and western habitats. Local-scale factors also affected spatial distribution. In the eastern mixed species beds, crab density decreased by approximately 7 crabs every 10km from the inlet, whereas crab density in western *R. maritima* beds increased 10-fold between locations with the lowest shoot density (~14,000m^{-2}) to that with the highest (~54,000m^{-2}). This study highlights how dispersal patterns may affect nursery habitat use by blue crabs, when multiple habitats are present in a seascape.

Impact of Eradication Methods on Nitrogen Cycling Associated with Invasive *Phragmites australis*

Presenter: **Mollie R. Yacano**, UNC Institute of Marine Sciences, moyacano@live.unc.edu
Co-authors: Michael Piehler, Suzanne Thompson

The European haplotype of *Phragmites australis* is an aggressive and widespread invasive plant species throughout North America. *P. australis*, historically viewed as a nuisance and targeted for eradicated, has recently been identified as providing ecosystem functions such as carbon storage, sediment accretion, shoreline stabilization, and nitrogen removal. Our previous work established that *P. australis* enhances sediment denitrification relative to native salt marsh species, but it is currently unknown how commonly used eradication methods such as herbicide application and mechanical removal may impact this ecosystem function. We hypothesized denitrification in sediments associated with *P. australis* would be negatively impacted by herbicide application and mechanical removal. We created experimental eradication plots treated with mechanical removal, herbicide application, and a combination of both methods in the Rachel Carson and Currituck Banks National Estuarine Research Reserves, respectively representing a fully saline and brackish marsh environment. We conducted seasonal sampling following eradication to measure sediment gas (N_2 and O_2) fluxes in control and eradication plots using flow through incubations with a membrane inlet mass spectrometer. Differences were not observed between net denitrification rates in *P. australis* sediments from different treatment plots; however, there were significant differences between sites on seasonal and annual time scales. An opportunistic king tide event at the marine site provided the opportunity to assess the ecosystem function during periods of prolonged inundation. These results provide context to decision making regarding *P. australis* management across the coastal landscapes in Eastern North Carolina.

Lightning Talk Abstracts

Alphabetical by Presenter Last Name

Quantifying the Effects of Prescribed Fire on Vegetation Density in North Carolina's Piedmont and Coastal Regions

Presenter: **Nicholas K Corak**, Wake Forest University, corank18@wfu.edu
Co-authors: Max Hazlin, Matthew Barnes, Paul Carchipulla-Morales, Lauren Lowman

Prescribed fire is used by land managers across ecosystems of North Carolina (NC) as a management tool to lessen fuel loads and mitigate the potential for catastrophic events. In the fire-adapted longleaf pine savannas in the Coastal Plains, fire is used to remove competition for young longleaf seedlings and other native ground plants. In one grassland region in the Piedmont, fire is used to maintain the nesting grounds for migrating birds. In many NC ecosystems, fire is a necessary component of the system. This project investigates how fire affects vegetation regrowth across different regions and plant types throughout NC. We use leaf area index (LAI), a measurement of vegetation density, as a proxy for vegetation growth stage. Our preliminary results from grasslands and pine forests in the NC Piedmont suggest that ground measurements of LAI differ from remotely sensed values throughout the growing season. The ultimate goal of this work is to improve estimates of vegetation growth stage from satellite remote sensing for fire-affected regions.

A Temporal Analysis of Vegetation Dynamics and Community Perceptions of Buxton Woods

Presenters: **Mackenzie Douglas**, UNC's Coastal Studies Institute, md8558@live.unc.edu; **Sunwoo Yoon**, **Nathalie Uriarte-Ayala**, **Anna Jahr**
Co-authors: Jane Bailey, Blakely Durham, Francesca Fradianni, Joseph Hernandez-Lopez, Rebekah Littauer, Kenan Reeder, Jason Reynolds

Maritime forests provide essential protection and resource provisioning socio-ecological services to barrier islands. Buxton Woods on Hatteras Island, NC is the largest contiguous maritime forest on the east coast. In 1988, a 152-acre tract of the Buxton Woods was protected by the state of North Carolina. Through continued efforts Buxton Woods is now a 1,000 acre dedicated North Carolina Coastal Reserve site. This study characterized stakeholder perceptions of change in the Buxton Woods and explored the vegetative composition and structure. We interviewed 11 residents and stakeholders with past and/or present connections to Buxton Woods. After a quantitative analysis of the interviews via NVIVO, we found that residents value the woods for similar reasons and have a shared awareness of disturbances and changes in the woods. However, they disagreed on the accessibility and management of the woods. To explore the composition and structure of the vegetation, we resampled three of the plots established in 1988 using the Carolina Vegetative Survey (CVS). Resampling the plots revealed several notable changes in community composition, including losses and gains of individual species, decrease in large canopy trees, and an increase in herbaceous species. Despite these changes, species richness remained relatively constant. Our coupled human-natural approach provides a strong foundation for future research on resilience, succession, management, and changes in maritime forests, and specifically, Buxton Woods.

Picture the Future

Presenter: **Evan Ferguson**, Cape Hatteras Secondary School of Coastal Studies, fergusonev@daretolearn.org

Evan Ferguson will talk about youth climate activism. CHSS youth will build on a previous youth-led initiative, Student Perspectives on Coastal Change (Coastwatch 2020). Under North American Marine Alliance, CHSS students will exhibit at Farm Aid festival in Raleigh, NC, September 24. The exhibit is part of the "Homegrown Village" where festivalgoers will speak with youth about views and solutions to issues on the NC coast and consider what climate change means and ways to effect positive change. In preparation for Farm Aid, students will participate in a climate change selfie campaign in September 2022. The youth selfies will be displayed at the Farm Aid exhibit. In addition, Evan will work with NC Sea Grant and local photographers to compile and display visuals of our changing barrier island, Cape Hatteras, to bring home the real impacts of climate change on the NC Coast. These impactful displays will show the plight of climate change and sea level rise on our community. At Farm Aid, youth will share experiences and personal accounts of the challenges of our rising seas. These experiences might include; damage due to flooding/hurricanes, inaccessibility of NC HWY 12 during weather events and its impact on daily life, impacts on the fishing industry, career choices based on experiences, views on the future. Selfie backgrounds hung behind the exhibit will feature impactful image and the phrases: Climate Change is or I Can Make a Difference By. Visitors can take selfies and use a hashtag to track engagement.

Evaluating Ecosystem Benefits and Trade-offs on Commercially and Recreationally Valuable Species of Oyster Breakwater Substrates

Presenter: **Megan Geesin**, ECU, geesinm21@students.ecu.edu
Co-authors: Rachel Gittman, April Blakeslee

Coastal habitats like oyster reefs and salt marshes provide important ecosystem services including shoreline stabilization, water purification, and carbon sequestration. However, these habitats are threatened by anthropogenic impacts including land development, over exploitation, and climate change. To protect and restore these habitats, a number of restoration projects have been conducted, including construction of "living shorelines" for coastal protection. Living shorelines encompass a continuum of protection approaches ranging from planted wetland species, to wetland plantings coupled with offshore engineered breakwaters. Living shorelines dissipate wave energy, reduce erosion, and provide habitat for species important to fisheries. There are a growing number of commercially available breakwater substrates and designs, but research evaluating the differences in coastal protection and ecological function provided by different substrates and designs is lacking. To study the ecosystem benefits and trade-offs of breakwater substrates and designs on commercially and recreationally valuable species, the faunal communities in and around concrete-centric and oyster shell bag breakwaters were rigorously sampled in coastal North Carolina. Targeted species include blue crabs (*Callinectes sapidus*), stone crabs (*Menippe spp.*), eastern oysters (*Crassostrea virginica*), hard clams (*Mercinaria mercinaria*), and other ecologically

important marine fauna (e.g. mussels, juvenile and resident fishes, and mud crabs). We hypothesized that the abundances and size distributions of the target species would be greater on concrete-centric substrates when compared to oyster shell bags.

You're Researching What? Talking Science with Non-Scientists

Presenter: **Frank Graff**, PBS North Carolina, fgraff@pbsnc.org

We're living in a time when attention spans are short, results are expected immediately, videos have flashy graphics and even faster pacing, and "alternative facts" are a thing, which means experts aren't always valued. In short, it's a challenging time to communicate science at a time when communicating science is more important than ever. Whether you are a researcher/scientist, a science communicator, or a government official, this lightning talk will provide you with concrete tips to help deliver science information and concepts in a clear and understandable way. The talk will combine practical, audience participation examples with information. Most important, it will help you craft science information in a way that is relatable to the average viewer/reader. First example: answer the WIFFM question. What's in it for me? Frank Graff is the producer/host of PBS North Carolina's science program, Sci NC, which is focused on science happenings in North Carolina. He is a multiple Emmy award winning reporter with more than 30 years' experience in news reporting. He joined PBS NC nine years ago and helped launch its science project.

Distribution of Suspended-Sediment Loads Across North Carolina's Saltmarshes; Wetland Stability Explored Through Modern Measurement Systems

Presenter: **Joshua Himmelstein**, UNC, himmelstein@unc.edu
Co-authors: Antonio B Rodriguez, Emily Eidam, David Go

Marshes act as metronomes of sea-level rise, recording changes in inundation within their soils. When flooded for too long, marshes drown – yet without water delivering sediment and nutrients they cannot thrive. The ecosystem services they provide, such as nutrient-load filtering, nursery fish habitat, and storm surge attenuation hinge on their ability to keep pace with rising sea levels. Humans often directly and indirectly change these systems; anthropogenic reworking of small coastal watersheds has yielded elevated sediment loads. Long-term monitoring of North Carolina's saltmarshes and creeks suggests a local disconnect whereby subtidal environments are infilling with sediment while adjacent intertidal marshes are lowering relative to sea level. Elevated levees on the edge of a saltmarsh may factor into this disconnect, acting as barriers to sediment-laden flows and/or inhibitors of healthy drainage. To explore the effect of levees on suspended sediment gradients from channels into the marsh, we deployed low-cost (~$200), high-accuracy optical backscatter turbidity sensors (OpenOBS) in an edge-normal transect at four distinct sites. Spatiotemporally dense measurements from these sensors are converted to total suspended solids (mg L^{-1}) through lab calibration and resolve the impacts of modified levees on sediment delivery to marsh interiors. This research evaluates the use of affordable and widely deployable sensors to monitor marsh sustainability. To responsibly inform future conservation efforts such as the beneficial reuse of dredged material, we must better understand how sediment is distributed across wetlands.

Assessing Spatial and Temporal Controls on Sediment Transport in North Carolina Sounds

Presenter: **David Lagomasino**, ECU Integrated Coastal Programs, lagomasinod19@ecu.edu
Co-authors: Catherine Bowler, Robert Fearn, Donal C. O'Brien, Jr., Sean Charles

Marsh sediment accretion is a combination of in situ organic accumulation and mineral sediment input during inundation. Sea level is a fundamental control on many factors that contribute to the stability of marsh environments, including the frequency, duration, and depth of inundation. It is during inundation whereby sediment deposition primarily occurs. But for part Albemarle-Pamlico Estuarine System, marsh inundation is dependent upon events (e.g., storms) and seasonal wind patterns as a result of minimal astronomical tides (<10 cm). Because of its size and remoteness, there is also limited information on how water and sediment dynamics are changing across eastern North Carolina, two major drivers of marsh resilience. Developing a sediment budget that resolves spatial and temporal controls on sediment flux in a marsh complex is considered the most important metric of marsh resilience and is vital for assessing the viability of marsh restoration plans. Therefore, we need a better understanding of the processes controlling sediment deposition and, ultimately, marsh accretion in the APES to forecast marsh sustainability with changing land use, climate, and sea level rise. As part of several initiatives, the Coastal Studies Institute in partnership with Audubon and other collaborators are building a long-term network of hydrological and sedimentological stations in coastal NC marsh ecosystems to help address these issues and help inform and guide habitat restoration. We invite researchers across NC to build upon and leverage the existing infrastructure of marsh boardwalks, rSETs, groundwater and surface piezometers, in order to address more complex interactions coastal dynamics.

Titusville Causeway Shoreline Restoration

Presenter: **Ryan Mitchell**, DRMP, rmitchell@drmp.com
Co-author: Carter Henne

The Titusville Causeway is located along Florida's "Space Coast" in Brevard County. It is one of only 2 roadways that crosses the Indian River Lagoon providing access to NASA's Kennedy Space Center. The Causeway is also located in a critical habitat area for many plant and wildlife species. The Florida Fish and Wildlife Conservation Commission believes that this section of Causeway is the single largest spawning site for horseshoe crabs in the State. Due to several large storm events, hurricanes, and substantial southerly wind driven wave energy, the shoreline along the Causeway has sustained frequent erosion and shoreline de-stabilization. This project proposes to restore over 2,000 feet of shoreline through sand renourishment and vegetation and provide erosion protection with offshore wave attenuating structures. Numerical wave modeling analysis has indicated that the attenuation structures will reduce the wave-energy by over 80% as comparted to the existing condition. Unlike typical coastal protection designs constructed of riprap or

concrete seawalls, these attenuating structures are a series of hollow concrete pyramids that deflect and dissipate wave-energy. The project will also include a seagrass restoration component to provide additional ecosystem function to the project area and Indian River Lagoon. The anticipated acreage of seagrass restoration was based on existing water depth within the study area and concluded to be 4.6 acres, respectively. In addition to seagrass meadow restoration, the re-introduction of native clams throughout the seagrass beds will provide an increased biological function throughout the project area.

South Atlantic Reef Fish Extension/Communication Fellowship

Presenter: **Ashley Oliver**, Sea Grant, South Atlantic Fishery Management Council, ashley.oliver@safmc.net

With more fish being released in South Atlantic federal waters, reducing discard mortality rates has become increasingly important, especially for snapper and grouper species. The Gulf of Mexico Reef Fish Extension project awarded the South Atlantic Sea Grants (North Carolina, South Carolina, Georgia, and Florida) funds to create a fellowship position focusing on best fishing practices outreach and education throughout the South Atlantic region. The South Atlantic Sea Grants partnered with the South Atlantic Fishery Management Council, creating a first-of-its-kind fellowship position. The fellow has been traveling around the South Atlantic region to tackle shops and marinas spreading awareness of ways to improve the survivorship of released fish and discussing complex reef fish issues with stakeholders. Along with these one-on-one conversations, the fellow has been working with media personnel on charter trips which allow them to experience survivorship issues firsthand and learn how anglers can reduce discard mortality. Over the last year, the fellow traveled to portions of each South Atlantic state and observed distinct differences in how the fishing communities respond to management. Understanding these differences allows Sea Grant and other management agencies to tailor their outreach efforts more effectively. Going into the second year of the fellowship, more tackle shop outreach, charter trips, and seminars will be done, taking into account these differences, to further spread the message on how to increase survivorship of released snapper and grouper.

Quantifying Impacts of Dune Restoration Efforts on Coastal Resilience in North Carolina with a Terrestrial Laser Scanner (TLS)

Presenter: **Lin Xiong**, ECU Coastal Studies Institute, xiongl21@ecu.edu
Co-authors: David Lagomasino, Amanda Payton, Shalimar Moreno

In the Outer Banks of North Carolina, beach and dune ecosystems support millions of annual visitors and a ~2.3-billion-dollar tourism industry. But beaches and dunes are subjected to acute and chronic erosion due to climate change, sea level rise, and increases in coastal development, population, and tourism. Beach renourishment projects and dune stabilization initiatives are often underway to build a more resilient coastline. Better Beaches OBX (BBOBX) has planted beach grass and placed recycled Christmas trees along the dune line to help stabilize and build dunes in the Outer Banks for the past several years. However, there are no measures of the effectiveness of these dune stabilization initiatives, which are key interests for BBOBX and local towns. Here, we quantify the changes in dune topography in and around the beach planting sites to understand how dune restoration allows sandy beaches to adapt to sea level rise. Our lab has developed a Coastal Laser Scanner system that integrates a GNSS receiver, a TLS (Riegl VZ400i), a Scan-and-Go lift, onboard computing, and a UTV to conduct rapid and repeat hyper-resolution topographic surveys at planted and non-planted beachfront dunes. The result shows rapid sand accumulations in restoration sites. Dune elevation can increase up to ~1 m from August 2021 to March 2022 at a restoration site close to Grouse St, Nags Head. Our study provides seed data for leveraged funding, provides training opportunities for students, and reinforces community partnerships between the ECU Outer Banks Campus, BBOBX, and the Town of Nags Head.

Poster List

Alphabetical by Presenter Last Name

** denotes student presenter*

1. Computing Changes in Vegetation Phenology for Fire-Affected Areas in North Carolina Using Leaf Area Index Derived from Satellite Remote Sensing and Ground Observations

*Presenter: **Matthew Barnes**, Wake Forest University, barnma20@wfu.edu
Co-authors: Paul Carchipulla-Morales, Nick Corak, Lauren Lowman

2. Space Use of Swamp Sparrows (*Melospiza georgiana*) in Winter: Testing Roles of Habitat Specialization, Competition, and Food Availability

*Presenter: **Allie Best**, UNCW, ajb1411@uncw.edu
Co-authors: Jeffrey Walters, Raymond Danner

3. The Use of Drones in Quantifying Large Marine Debris Distribution in Microtidal Marshes

*Presenter: **Carolina Branan**, NC State University and Center for Marine Sciences and Technology, cebranan@ncsu.edu
Co-authors: Alyssa Quackenbush, David B. Eggleston, Erin P. Voigt

4. Using Webcam Imagery for Shoreline Change Assessment

*Presenter: **Jeremy E. Braun**, UNCW Department of Earth and Ocean Sciences, jeb2694@uncw.edu
Co-author: Joseph W. Long

5. Outcomes from the Summer Ventures Course in Applied Coastal Science and Engineering

Presenter: **Philip Bresnahan**, UNCW, bresnahanp@uncw.edu
Co-authors: Lauren Thompson, Stephen O'Neil, Drew Davey, Erin Moran

6. Groundwater Nitrate Contamination of Wells in the Cape Fear Watershed

*Presenter: **Juliana Cerny**, University of Virginia, jrc6frm@virginia.edu
Co-authors: Randall Etheridge, Ariane L Peralta

7. Occurrence and Distribution of Legacy and Replacement Per- and Poly- Fluoroalkyl Substances in Tidal Creeks of Southeastern North Carolina

*Presenter: **Emily Corbitt**, UNCW Center for Marine Science, erc6940@uncw.edu
Co-authors: Lynn A. Leonard, Ralph N. Mead

8. The Freshwater Snare that Lasts Hundreds of Years: A Case Study of Derelict Fishing Line Accumulation Along the Shoreline of Jordan Lake, NC

*Presenter: **Irene Doyle**, NC State University, irdoyle@ncsu.edu
Co-author: Zakiya Leggett

9. Examining the Relationship Between Quantifiable Coastal Features and Washover on a Regional Scale

*Presenter: **Eve Eisemann**, UNC Institute of Marine Sciences, eeisemann@unc.edu
Co-authors: Tony Rodriguez, professor, Davin Wallace, Shara Gremillion, Laura Moore

10. The SEACOW: A Low-Cost Sensor for Exchange of Atmospheric CO_2 with Water

*Presenter: **Elizabeth Farquhar**, UNCW, ef8613@uncw.edu
Co-author: Phil Bresnahan

11. PFAS Perceptions in the Cape Fear Region

*Presenter: **Genevieve Guerry**, ECU, guerryg19@students.ecu.edu
Co-author: Jamie DeWitt

12. Hydrologic Modeling to Predict Streamflow Changes as a Response to Future Climate, Urban Growth, and Water Use in the Coastal Carolinas, USA

Presenter: **Laura Gurley**, U.S. Geological Survey, lgurley@usgs.gov
Co-authors: Cassandra A. Pfeifle, Georgina M. Sanchez

13. Production Economics of Black Sea Bass in a Recirculating Aquaculture System and Sensitivity to Genetically Induced Growth Increases and Alteration of Protein Source in Aquafeed

*Presenter: **Kaitlyn Hudson**, UNCW, kh4156@uncw.edu
Co-authors: Wade O. Watanabe, Christopher F. Dumas, Md Shah Alam, Patrick Carroll

14. Forest Regeneration in Bottomland Swamps Following Clearcutting and Shovel Logging in North Carolina

Presenter: **Albert Lang**, NC Forest Service, NC Department of Agriculture & Consumer Services, aj.lang@ncagr.gov

15. Smart Zoning for Coastal Flood Resilience and Adaptation

*Presenter: **Margaret Lawrimore**, NC State University, malawrim@ncsu.edu
Co-authors: Georgina M. Sanchez, Ross K. Meentemeyer

16. Quantifying Variability in Areal Extent and Percent Cover of North Carolina (USA) Seagrass Meadows Using Unmanned Aerial Vehicles (UAV)

*Presenter: **Madison Lytle**, UNCW, mal6582@uncw.edu
Co-authors: J. Jarvis, B. Puckett, W. Judson Kenworthy

17. Titusville Causeway Multi-Trophic Restoration and Living Shoreline Resiliency Action Project

Presenter: **Ryan Mitchell**, DRMP, RMitchell@drmp.com

Poster List *(continued)...*

18. Preference Heterogeneity of Coastal Gray, Green and Hybrid Infrastructure Against Sea-Level Rise: A Choice Experiment Application in Japan

*Presenter: **Yui Omori**, Kyoto University, yomori@ncsu.edu

19. Integrating Ecosystem Services Into Flood Resilience Planning in New Bern, North Carolina

*Presenter: **Jackie Ruiz**, UNC, jackie26@email.unc.edu
Co-authors: Anne Smiley, Helena Garcia, Lauren Grimley, Antonia Sebastian, Phil Berke, Miyuki Hino

20. Issues and Initiatives in Public Health for North Carolina's Coastal Communities

*Presenter: **Cotie San**, NC Sea Grant, cotiesan@unc.edu

21. Unraveling the Genomic Features of Estuarine Picocyanobacteria from the Neuse River and Pamlico Sound

*Presenter: **Joel J. Sanchez**, NC State University Department of Marine, Earth and Atmospheric Sciences, jjsanche@ncsu.edu
Co-authors: Ryan W. Paerl

22. Quantifying Carbon Burial Dynamics in North Carolina Seagrass Beds

*Presenter: **Yasamin Sharifi**, UNC Institute of Marine Science, ysharifi@unc.edu
Co-authors: Tony Rodriguez, Professor, Brent McKee

23. Internships Are Vital to Undergraduates

*Presenter: **Cassi Shires**, NC State University, cpshires@ncsu.edu

24. Characterizing Behavior: The Effect of Individual Personality on the Response to Environmental Stimuli of the Blue Crab, *Callinectes sapidus*

*Presenter: **Savannah Kilgore Simpson**, UNCW Center for Marine Science, skk3732@uncw.edu
Co-authors: Stephanie J. Kamel, Christina M. Salerno

25. An Examination of Cold Tolerance in *Halodule wrightii*: Is There a Latitudinal Gradient from Florida to North Carolina, USA?

*Presenter: **Lindsey Stevenson**, UNCW, lvs7489@uncw.edu
Co-authors: Bradley Furman, Kelly Darnell, Jessie Jarvis

26. Using Models to Assess Movement of Sediments in Connected Beach-Dune Environments

*Presenter: **Matthew B. Vincent**, UNCW, mbv4297@uncw.edu
Co-authors: Joseph W. Long, Andrea D. Hawkes

27. A Method to Assess and Value Floodplain Attenuation Services in the Schuylkill Watershed

Presenter: **Jacqueline Welles**, U.S. Geological Survey, jwelles@contractor.usgs.gov
Co-authors: Kristina Hopkins, Emily Pindilli

28. Seasonal Dynamics of Seagrass Assemblages in Northeast Pamlico Sound

Presenter: **Dylan Whitt**, ECU, whittd18@students.ecu.edu
Co-authors: James Walter Morley

Poster Abstracts

Alphabetical by Presenter Last Name

** denotes student presenter*

Computing Changes in Vegetation Phenology for Fire-Affected Areas in North Carolina Using Leaf Area Index Derived from Satellite Remote Sensing and Ground Observations

*Presenter: **Matthew Barnes**, Wake Forest University, barnma20@wfu.edu
Co-authors: Paul Carchipulla-Morales, Nick Corak, Lauren Lowman

While heavily destructive to natural and built environments, fire is crucial for some ecosystems and can help foster growth and prosperity through a process known as ecological succession. Evaluating the plant life cycle (i.e. phenology) in these scenarios is crucial to understanding the process as a whole, while also giving important insights into how to use prescribed fire for land management. We used leaf area index (LAI) as our measure of vegetation growth stage. For this work, we collected ground-based measurements of LAI in the Piedmont and Coastal Plains regions of North Carolina. Using Landsat-8 and MODIS (Moderatea Resolution Imaging Spectroradiometer) satellite data within a data-fusion machine learning algorithm, we quantified changes in vegetation phenology for fire-affected regions in North Carolina across diverse ecosystem types (i.e., pine forests, grasslands, and coastal wetlands). LAI estimated from ground-based measurements were compared to simulated LAI from the machine learning algorithm and the MODIS LAI product. Initial results show that the satellite data matches seasonal trends from ground observations across the different ecosystems in North Carolina. However, there are clear differences in LAI estimates related to the spatial scale of each instrument. Landsat (30 m) and MODIS (500 m) tend to underestimate LAI compared to ground-based point measurements in grasslands, but overestimate for conifer stands. Our results demonstrate the importance of understanding subgrid scale heterogeneity for land managers interested in using satellite remote sensing data to monitor vegetation regrowth for fire-affected areas.

Space Use of Swamp Sparrows (*Melospiza georgiana*) in Winter: Testing Roles of Habitat Specialization, Competition, and Food Availability

*Presenter: **Allie Best**, UNCW, ajb1411@uncw.edu
Co-authors: Jeffrey Walters, Raymond Danner

Marsh birds are of great conservation concern due to ongoing loss of wetlands. Habitat availability and quality in the winter are known to limit the population sizes of some species, however, we know little about specific habitat needs in winter for many marsh species. Space-use patterns are a crucial component to understand habitat needs and therefore develop conservation plans. We conducted a telemetry study to understand the wintering movements and habitat needs of Swamp Sparrows (*Melospiza georgiana*). We attached radio transmitters to 54 Swamp Sparrows in coastal North Carolina during non-migratory wintering months (January–March) of 2008–2010 and tracked their movements across marshes and adjacent croplands for an average of 14 days per individual. In 2010, we conducted a plot-wide food addition experiment with a before-after-control-impact (BACI) design to test if food availability influences the size of home ranges. We hypothesized that high densities of food allow for smaller home ranges by reducing the area needed for foraging. We further hypothesized that competition and dominance hierarchies between age and sex classes leads to competitive exclusion from high quality habitats and therefore influence home range sizes. We estimated home range sizes as 50% and 95% kernel densities and describe home ranges in relation to habitat types, food treatment, age, and sex. Individuals maintained home ranges throughout the winter and across winters and commuted between distinct roosting and foraging locations. These results will provide new information to aid in conservation planning for marsh birds in winter.

The Use of Drones in Quantifying Large Marine Debris Distribution in Microtidal Marshes

*Presenter: **Carolina Branan**, NC State University and Center for Marine Sciences and Technology, cebranan@ncsu.edu
Co-authors: Alyssa Quackenbush, David B. Eggleston, Erin P. Voigt

Marine debris is a significant threat to ecosystems because it can entangle organisms and leach harmful chemicals, which can biomagnify through food webs. Within salt marshes large marine debris can smother marshes grasses causing vegetation loss and attempts to remove it can be more damaging due to trampling. The objectives of this study are to test how effective drones are at locating marine debris in marshes and for spatiotemporal variation of large marine debris along sites in Pamlico Sound. This project uses drones as a non-invasive method of monitoring marsh debris. We completed synchronous ground and drone surveys of debris in 2019 and 2020 to measure debris type and density. Additionally, we calculated how debris size and area, and ground type effected the probability of debris being located in drone surveys. We found that large brightly colored debris located on wrack had the greatest likelihood of being located. Furthermore, the amount of debris varied significantly across sites and years but did not consistently correlate with predictor variables. Ground surveys produced greater estimates of marine debris density and contained smaller sized debris, while drone surveys mostly captured large debris. There was no relationship between debris density measured in ground surveys vs drone surveys of the same site. Drone surveys may be a good alternative for locating large debris, which is most likely to cause smothering damage, but are not accurate at predicting overall debris density. The efficacy data provided by this study will inform managers implementing drone surveys at their sites.

Using Webcam Imagery for Shoreline Change Assessment

*Presenter: **Jeremy E. Braun**, UNCW Department of Earth and Ocean Sciences, jeb2694@uncw.edu
Co-author: Joseph W. Long

The Webcams for Coastal Observations and Operational Support (WebCOOS) project is a collaboration between academic institutions, a regional oceanographic observation program (SECOORA), and a combination of homeowners and local, state, and federal partners. The project aims to develop a coastal observation network using low-cost, consumer-grade, webcams to fill observational gaps for various weather, ocean, ecological,

and public health hazards for coastal municipalities, scientists, and communities. Here we focus on one element of WebCOOS related to consistent tracking of shoreline position from webcam imagery. Traditional methods of collecting shoreline observations (ground-based GPS or airborne LIDAR surveys) are costly, time-intensive, and infrequent. While nearshore video remote sensing has been shown to provide accurate and frequent observations of the shoreline, data are limited to places with dedicated, scientific-grade, calibrated cameras. The ubiquitous use of webcams in coastal settings provides a coastal observation platform capable of providing hourly-to-daily shorelines for use in analyzing storm impacts, monitoring beach nourishment projects, and validating total water level models. In this study, we describe a newly developed, open-source, methodology for processing and identifying shoreline position from non-georectified, consumer-grade, webcam imagery using algorithms that exploit the spectral signatures of nearshore features (e.g. wave runup, swash zone). We compare webcam-derived shoreline change assessments against traditional nearshore video remote sensing methods at Oak Island, NC. Additionally, we discuss the limitations of webcam-based methods and highlight potential applications for both qualitative and quantitative analysis in coastal management.

Outcomes from the Summer Ventures Course in Applied Coastal Science and Engineering

Presenter: **Philip Bresnahan**, UNCW, bresnahanp@uncw.edu
Co-authors: Lauren Thompson, Stephen O'Neil, Drew Davey, Erin Moran

The Applied Coastal Science and Engineering course, offered through UNC Wilmington's Summer Ventures in Science and Mathematics program, enrolled fourteen high school students for a four-week intensive research experience. Summer Ventures is a state-funded program for academically talented North Carolina students, organized by the NC School of Science and Mathematics, and taught at several UNC System schools. In our coastal science and engineering class—hosted by UNCW's Center for Marine Science—students formed four teams, each of which developed their own ideas and methods to answer current coastal questions. The teams developed and deployed novel, low-cost technologies to study topics ranging from estuarine water quality, carbon dioxide, and bathymetry. Students learned science and engineering skills such as water quality observation and best management practices, soldering, wiring, coding, 3D design and printing, data analysis, and field deployment techniques. This poster will highlight key elements of this unique applied learning experience, including several promising education and research outcomes which have led to continued, student-led research with the goal of future submissions to peer-reviewed journals.

Groundwater Nitrate Contamination of Wells in the Cape Fear Watershed

*Presenter: **Juliana Cerny**, University of Virginia, jrc6frm@virginia.edu
Co-authors: Randall Etheridge, Ariane L Peralta

Many North Carolina residents, particularly rural households, rely on private groundwater wells for drinking water. However, the water quality of private wells is unregulated and vulnerable to contamination. The Cape Fear watershed has over 1,200 concentrated animal feeding operations (CAFOs), or hog farms, major sources of nitrogen due to the management of waste in lagoons and application as fertilizer. With climate change leading to more variable precipitation and higher temperatures, this research considers how aquifer nitrate contamination varies based on temperature and precipitation. A SWAT+ model of the Cape Fear River basin was used to estimate total nitrate storage in each aquifer for the years 2002-2019 using inputs of observed weather data, land use data, and land use management. The land use raster was modified in ArcGIS Pro to include CAFOs, the model was run in SWAT+ through QGIS, and the resulting nitrate storage in aquifers was mapped along with locations of private wells and CAFOs. The highest aquifer nitrate occurred in CAFO-dense areas around Duplin and Sampson Counties, so wells drawing from these aquifers have a higher risk of nitrate contamination. This model did not show a direct correlation between aquifer nitrate and precipitation or temperature. Increased precipitation may elevate aquifer nitrate by increasing transport through the landscape up to a certain point, after which additional precipitation dilutes nitrate concentrations. However, these processes are difficult to separate and quantify Overall, environmental variability affects nitrate contamination in aquifers, and the highest-risk aquifers may be predicted using hydrological models.

Occurrence and Distribution of Legacy and Replacement Per- and Poly- Fluoroalkyl Substances in Tidal Creeks of Southeastern North Carolina

*Presenter: **Emily Corbitt**, UNCW Center for Marine Science, erc6940@uncw.edu
Co-authors: Lynn A. Leonard, Ralph N. Mead

Per- and poly- fluoroalkyl substances (PFAS) are anthropogenic organic compounds that are desirable for a variety of applications due to their surfactant properties, water and oil repellency, and thermal stability. Widespread use of these unregulated chemicals, combined with their mobility and resistance to degradation, has led to global distribution of PFAS. Freshwater systems have been extensively researched as they pertain to drinking water concerns; however, there is a paucity of knowledge on PFAS distribution in the coastal zone. These compounds can accumulate in oysters and other marine organisms, so contamination of coastal waters could negatively impact economically important fisheries. The objective of the present research is to determine the occurrence and distribution of PFAS in the near shore environment of southeastern North Carolina. Surface waters were collected from the mouths and headwaters of seven tidal creeks and analyzed for a suite of 14 legacy (e.g. PFOA and PFOS) and replacement (e.g. GenX) PFAS by LC-MS/MS. Preliminary results indicate an average total PFAS concentration of 14.4 ± 3.1 ng/L in the creek headwaters and 5.5 ± 1.4 ng/L in the creek mouths. A change in PFAS distribution was observed between headwaters and mouths with total short chain PFAS (C4-C7) composing 80.1% of total PFAS in the headwaters and 47.2% of the total PFAS in the mouths. Results of this study will allow for constraint of PFAS inputs and cycling within understudied salt marshes. These findings could have serious implications for aquaculture, human exposure, and overall health of North Carolina tidal creeks.

Poster Abstracts *(continued)...*

The Freshwater Snare that Lasts Hundreds of Years: A Case Study of Derelict Fishing Line Accumulation Along the Shoreline of Jordan Lake, NC

*Presenter: **Irene Doyle**, NC State University, irdoyle@ncsu.edu
Co-author: Zakiya Leggett

It might be hard to imagine a world without plastic; it is all around us; it inundates every nook and cranny of our everyday lives. We see it littered along our highways, and there are endless Instagram posts, news articles, and research papers about plastic pollution in our oceans. Photos revealing heaps of plastic pollution littering beaches around the world are scattered throughout the internet. There are multitudes of different types of plastics; plastic utensils, plastic wrappers, and plastic bottles, but some plastics are more harmful to wildlife than others. The vast majority of fishing line is made from plastic, and when it is left as litter in the natural environment, it can become a deadly snare to wildlife. There has been a great deal of research conducted on the topic of derelict fishing gear in the marine environment, but similar research concerning freshwater ecosystems is lacking. For this study, derelict fishing line was collected from twenty fishing sites along the shoreline of Jordan Lake, a popular fishing lake in North Carolina, to determine if the amenities provided at each location might impact how much fishing line accumulated at each site. Of the nine amenities considered, the only amenity that proved to be statistically significant was the presence of a fishing pier. Fishing piers provide easy access to popular fishing locations, allowing anglers to park conveniently and allowing for extended periods of fishing. Meaning there is a possibility for more angler litter to accumulate over an extended period of time.

Examining the Relationship Between Quantifiable Coastal Features and Washover on a Regional Scale

*Presenter: **Eve Eisemann**, UNC Institute of Marine Sciences, eeisemann@unc.edu
Co-authors: Tony Rodriguez, professor, Davin Wallace, Shara Gremillion, Laura Moore

Coastal storms will often lead to foredune erosion and inundation of barrier islands, playing a key role in sediment transport dynamics. Storm-driven washover fans are the primary source of sediment to the interior and back of the barrier. While they allow the island to increase in elevation and move landward as sea-level rises, they also threaten the longevity of communities and infrastructure. In this study, we use pre- and post-hurricane Sandy lidar (Light Detection and Ranging) and satellite imagery to measure morphological and human development parameters (e.g. dune height, and development setback distance) along a 30 km section of coast including the Pea Island National Wildlife Refuge (NWR), and two towns. We then apply a principle component analysis (PCA) to examine relationships between these parameters and washover occurrence. Washover extents vary between the towns and the NWR, with the mean washover distance of 155 m in the developed areas close to previously published value of 169 m. The mean washover extent at the NWR, however, exceeds those previously observed in natural areas. This suggests that human modifications of the dunes aimed at protecting the road may lead to increased washover. Three distinct groupings appear in the PCA, and washover presence clearly dominates two of these. The groupings with the most washover match up geographically with three 'hotspots' of erosion. Understanding how washover deposition varies between developed and undeveloped sections of barriers is important for determining the long-term stability of the islands and the communities they support.

The SEACOW: A Low-Cost Sensor for Exchange of Atmospheric CO_2 with Water

*Presenter: **Elizabeth Farquhar**, UNCW, ef8613@uncw.edu
Co-author: Phil Bresnahan

As atmospheric carbon dioxide (CO_2) continues to rise, scientists and policymakers are increasingly interested in monitoring air–water fluxes and carbon sequestration, including Blue Carbon and Marine Carbon Dioxide Removal. The ocean is one of the world's largest carbon sinks, but closing the ocean carbon budget is logistically difficult and expensive. For instance, measuring the CO_2 flux at the air-sea interface usually requires costly sensors or equipment (>$10,000), which can be inaccessible to many researchers and management. To address this technology gap and to improve our spatiotemporal understanding of air–water CO_2 fluxes, our group has engineered a low-cost CO_2 flux system for ~$1,600 with real-time Internet-of-Things (IoT) capabilities. The Sensor for Exchange of Atmospheric CO_2 with Water (SEACOW) allows researchers to monitor CO_2 fluxes at a higher spatial resolution which has been difficult to attain due to cost and complexity of alternatives. In a controlled gas environment, it reports measurements within 2% of measurements made by a LICOR-850, which is considered an industry standard. It will be especially advantageous in areas where CO_2 fluxes are highly variable in space and time, such as coastal and estuarine systems. Estuarine systems in North Carolina are also home to seagrass meadows, which provide crucial ecosystem services such as carbon sequestration.

PFAS Perceptions in the Cape Fear Region

*Presenter: **Genevieve Guerry**, ECU, guerryg19@students.ecu.edu
Co-author: Jamie DeWitt

Per- and Poly-fluoroalkyl substances (PFAS) are among the most ubiquitous environmental hazards, representing a chemical class that presents a toxic threat to environmental health. Public perceptions and knowledge of these chemicals are important to further disseminate information. A chemical plant located on the banks of the Cape Fear River in North Carolina has been releasing both allowably and intentionally different PFAS compounds into the water for decades. The Cape Fear River is also a major source of drinking water for the growing city of Wilmington, NC, and surrounding communities. Community partners from the Cape Fear River region and Washington. NC shared their perspectives through social media and an in-person survey. Systematic sampling was used for two Facebook groups to understand social media interaction with PFAS news. A convenience sample was taken at a community oyster roast in Washington, NC an area at the time that had no known contamination of PFAS. The survey taken by the non-impacted community demonstrated a high knowledge pertaining to PFAS. This project highlighted the need for stronger partnerships between advocacy organizations and academic researchers since advocacy organizations are where people turn for

information. This work will be a starting point for research into the psychological and physiological changes to chemical hazards in North Carolina.

Hydrologic Modeling to Predict Streamflow Changes as a Response to Future Climate, Urban Growth and Water Use in the Coastal Carolinas, USA

Presenter: **Laura Gurley**, U.S. Geological Survey, lgurley@usgs.gov
Co-authors: Cassandra A. Pfeifle, Georgina M. Sanchez

Supporting rapidly increasing population in the Coastal Carolinas, southeastern USA, relies on an understanding of the current state of coastal water resources and modeling to elucidate future impacts of changing coastal communities and water resources. Changes in climate, urban growth, and water use will place additional stress on societal and ecological systems already competing for water resources. This study developed Soil and Water Assessment Tool (SWAT) models for the Cape Fear and Pee Dee Rivers of the Coastal Carolinas to understand current and future demands on water resources by incorporating likely changes in climate, urban growth, and water use. Historical models were calibrated from 2000 to 2014. Future projections were modeled from 2055 to 2065. Data input to historic models included land use from the 2011 National Land Cover Dataset and gridMET climate data. U.S. Geological Survey water use data (public supply, industrial, irrigation, and golf) were also used. Future model scenarios incorporated three climate models, two urban growth projections, and water use projections for each climate-urban growth pair. Future simulated streamflow differences were more widespread and pronounced under alternative climate scenarios rather than under alternative urban growth scenarios. For an illustrative 36-square mile watershed, alternative climate projections accounted for 29 percent difference in streamflow; alternative urban growth projections accounted for 2.6 percent difference in streamflow. The approaches and new techniques developed as part of this project can be transferred to other growing coastal areas facing similar water availability conflicts.

Production Economics of Black Sea Bass in a Recirculating Aquaculture System and Sensitivity to Genetically Induced Growth Increases and Alteration of Protein Source in Aquafeed

*Presenter: **Kaitlyn Hudson**, UNCW, kh4156@uncw.edu
Co-authors: Wade O. Watanabe, Christopher F. Dumas, Md Shah Alam, Patrick Carroll

Based on the operation of UNCW's pilot marine fish hatchery and RAS growout facility (Wrightsville Beach, NC), a spreadsheet production economics analysis was conducted for a hypothetical commercial scale RAS growout facility for black sea bass, Centropristis striata, in coastal North Carolina, and profitability of alternative production scenarios was explored via sensitivity analysis. Financial performance was measured by assessing farm input costs (e.g. labor, feed, energy), duration of production cycle, time to first harvest, farm gate revenues and returns to owner per production cycle, break-even (BE) prices, discounted payback period, modified internal rate of return (MIRR), and cumulative net present value (NPV). A base case biological growth model was developed through linear regression analysis using empirical growth data from black sea bass raised in RAS at UNCW and at NCSU. Alternative models based on a 12.5% increase per generation in weight-at-age over two generations as might be realized through selective breeding were also investigated. Base case BE price per lb of marketable fish produced was $8.116. In comparison, with selective breeding the benchmark of 75% of the cohort at premium marketable size or larger is reached at 22.8 mos for the F1 generation and 21.7 mos for the F2 generation, at BE prices of $7.662 and $7.289, respectively. When F2 generations were fed plant-based aquafeeds, BE drops to $6.779.

Forest Regeneration in Bottomland Swamps Following Clearcutting and Shovel Logging in North Carolina

Presenter: **Albert Lang**, NC Forest Service, NC Department of Agriculture & Consumer Services, aj.lang@ncagr.gov

A rapid regeneration survey within twenty-four deepwater swamps between stand ages 2 and 14 years in the North Carolina coastal plain was conducted by using a narrow rectangular inventory technique ("strip cruise"). Inventoried tracts predominantly contained cypress (*Taxodium distichum*) and tupelo (*Nyssa* species) before being harvested via clearcutting methods. Single transects on each tract began at coordinates located in the interior of the harvest areas in locations representing general tract conditions. Each transect was perpendicular to the flow of the major stream drainage associated with the harvest area. Counts and measures of dead and live stumps and seed-sourced regeneration were recorded. About 52 percent of desirable timber species stumps tallied had coppice growth. However, coppice alone was not sufficient on any tract to exceed 1112 trees ha^{-1}. Seventy-one percent of tracts had stocking levels (coppice and seed source) at least 1112 trees ha^{-1} of desirable timber species or black willow (*Salix nigra*). Across 24 tracts, 42 percent regenerated cypress and/or tupelo to levels exceeding 1112, trees ha^{-1}. This assessment revealed that forest regeneration success was limited on sites with altered hydrology, rampant invasive species, and/or lack of seed source. In some cases, active forest management may improve the regeneration cohort. Overall, shovel logging methods that were used on evaluated sites appear to be compatible with adequate regeneration of desirable timber species if the proper conditions exist.

Smart Zoning for Coastal Flood Resilience and Adaptation

*Presenter: **Margaret Lawrimore**, NC State University, malawrim@ncsu.edu
Co-authors: Georgina M. Sanchez, Ross K. Meentemeyer

Since 2016, flooding from extreme weather events has caused over $40 billion in damages across eastern North Carolina, as a result coastal municipalities are seeking strategies to reduce current and future flood risk. Land use policies and zoning regulations have been successfully implemented to protect residents and reduce long-term vulnerability to flooding. However, zoning data are limited in scale and availability making regional-scale assessments of zoning regulations in flood-prone areas difficult. In this study, we propose using machine-learning methods to predict zoning codes for North Carolina's Coastal Plain and locate high-risk, overburdened, and under-served communities where adaptive zoning strategies could be implemented for flood adaptation and resilience.

Poster Abstracts *(continued)...*

Quantifying Variability in Areal Extent and Percent Cover of North Carolina (USA) Seagrass Meadows Using Unmanned Aerial Vehicles (UAV)

*Presenter: **Madison Lytle**, UNCW, mal6582@uncw.edu
Co-authors: J. Jarvis, B. Puckett, W. Judson Kenworthy

North Carolina (NC) USA, located along the western Atlantic, has two dominant seagrass species, *Zostera marina* and *Halodule wrightii*. Both are at the edge of their geographic range and can be found as single or mixed species meadows, with temperate *Z. marina* most abundant during cooler periods (November – June) and tropical *H. wrightii* most abundant during warmer periods (July-October). This study aims to provide insight on the frequency and magnitude of intra-annual changes in meadow area during the transition periods between the two species, and if change can be related to environmental or biological driver(s) (e.g., temperature, turbidity, species co-occurrence). To assess shifts in seagrass species abundance, UAV imagery was collected monthly and paired with *in situ* measurements to quantify variability in areal extent, seagrass percent cover, and percent cover by species at three seagrass meadows. All sites displayed expected seasonal shifts; two meadows showed a shift in species abundance (*Z. marina* to *H. wrightii*) and were able to maintain seagrass cover and extent. At the third site there was spatial segregation between the two species leading to larger seasonal changes in extent. Mixed meadows show stability during the seasonal shift in species abundance, indicating species diversity could be contributing to maintaining meadow extent.

Titusville Causeway Multi-Trophic Restoration and Living Shoreline Resiliency Action Project

Presenter: **Ryan Mitchell**, DRMP, RMitchell@drmp.com

The Titusville Causeway Shoreline, along the Central Indian River Lagoon in Brevard, County FL, is known for recreation for residents and tourists and also has a place in history as a shuttle launch viewing site dating back to the American Space Race in the 1960s. The Causeway's legacy has been tarnished by major storm events, including Hurricane Irma in 2017 and sustained wind-driven wave energy that has degraded the shoreline, limited recreational activities and reduced the ecological functional capacity. Furthermore, the exposed shoreline has contributed to localized sediment transport to the Indian River Lagoon. DRMP, along with its subconsultant partners Sea & Shoreline, Inc. and Living Shoreline Solutions, Inc. have designed a project that integrates innovative Wave Attenuation Devices (WADs) to re-establish the natural living shoreline, reduce shoreline erosion and benefit the life cycle of various estuarine wildlife species that depend on the Lagoon to survive.

Preference Heterogeneity of Coastal Gray, Green and Hybrid Infrastructure Against Sea-Level rise: A Choice Experiment Application in Japan

*Presenter: **Yui Omori**, Kyoto University, yomori@ncsu.edu

Coastal zones are bearing the brunt of increase in the likelihood of extreme events, coupled with sea-level rise (SLR). Conventionally, gray infrastructure, such as seawalls, have been constructed to reduce risks in limited coastal zone spaces. Nature-based approaches, known as green infra-structure, have been used in coastal defense, and their ecosystem-based disaster risk reduction functions (Eco-DRR) have received growing attention. However, both gray and green infrastructure alone have limitations in responding to an ongoing increase in the intensity and frequency of natural hazards. To overcome these issues, hybrid infrastructure, which combines gray and green components, is needed and they have been receiving growing attention. Meanwhile, a large-scale coastal development requires stakeholder agreement; thus, it is imperative to understand people's demands and build a consensus between municipalities and coastal citizens in coastal development for long-term resilience. The author administered the online survey across Japan, applying to the choice experiment, and obtained 840 valid responses. Therefore, this paper clarified the heterogeneities in coastal people's preferences for coastal ecosystem services provided by gray, green, and hybrid structures in intertidal zones in Japan, recognizing seawalls as gray and coastal pine forests as green infrastructure. Consequently, while coastal citizens acknowledged gray's coastal defense function, the diverse perceptions toward seawalls for SLR preparation were notable as its scenarios became severe. Then, ecosystem-based disaster risk reduction functions provided by coastal forests had 695 JPY per 100m in willingness-to-pay, even though there are uncertainties in their performances.

Integrating Ecosystem Services Into Flood Resilience Planning in New Bern, North Carolina

*Presenter: **Jackie Ruiz**, UNC, jackie26@email.unc.edu
Co-authors: Anne Smiley, Helena Garcia, Lauren Grimley, Antonia Sebastian, Phil Berke, Miyuki Hino

Coastal communities are experiencing increased flood hazards and their associated risks. As sea levels rise, both nuisance flooding and extreme storm-induced flooding are occurring more frequently. Natural habitats mitigate some of the risks of flooding (e.g., water quality degradation) but are subject to fragmentation and/or loss as coastlines continue to urbanize and sea levels rise. The overall objectives of this project are to quantify how changes in land cover and flood hazard influence the supply of flood mitigating ecosystem services (FMES), and to assess where and for whom local plans conflict or support the protection of FMES services in the New Bern area. This convergent research is novel because it integrates community planning priorities, distributions of social vulnerabilities, flood hazard modeling, and detailed habitat mapping to improve resilience planning at the local scale. Our preliminary results show (1) that the distribution of greenspaces is heterogenous across the New Bern subbasins, (2) there has been a net loss in greenspace across the study area between 1996 and 2016, (3) measures of high social vulnerability are clustered in the New Bern area, (4) the prioritization of FMES is not consistent across multiple plans in New Bern, and (5) economic development and equity priorities conflict with FMES and hazard mitigation priorities. Next steps include assessing spatial relationships between losses in greenspaces and clusters of high social vulnerability. Our results will provide quantitative information on ecosystem benefits to a coastal community and advance resilience planning to minimize environmental degradation and maximize community benefit.

Poster Abstracts *(continued)...*

Issues and Initiatives in Public Health for North Carolina's Coastal Communities

*Presenter: **Cotie San**, NC Sea Grant, cotiesan@unc.edu

As climate change worsens and natural disasters become more brutal and frequent, North Carolina's coastal communities will continue to be at risk for exacerbated environmental and public health issues. With established programming and connections, North Carolina Sea Grant is well-positioned to utilize existing resources to support coastal communities through a more public health-focused lens. Through a systematic review of Community Health Needs Assessments, annual reports from nonprofit organizations, and interviews with public and environmental health professionals, the top public and environmental priority areas were identified. Additionally, existing research, programming, and policies were analyzed to understand each county's - and the state's - strategies for addressing the issues. This poster will highlight the most prevalent issues in CAMA counties, existing initiatives, and remaining needs that Sea Grant may be able to address. Through strategic partnerships and resource distribution, Sea Grant can further support coastal communities through stronger infrastructure, community awareness, and information sharing.

Unraveling the Genomic Features of Estuarine Picocyanobacteria from the Neuse River and Pamlico Sound

*Presenter: **Joel J. Sanchez**, NC State University Department of Marine, Earth and Atmospheric Sciences, jjsanche@ncsu.edu
Co-authors: Ryan W. Paerl

The Neuse River Estuary and Pamlico Sound (NRE-PS) are part of the second largest temperate estuary system in the US, also known as the Pamlico-Albemarle Sound System (PASS). Hydrological, biological, and chemical characteristics of the NRE-PS have been studied extensively, however select phytoplankton members have been poorly studied – namely picocyanobacteria (PicoP), which are tiny (<3 μm diameter) but critical contributors to phytoplankton biomass and primary productivity. PicoP from other aquatic systems have been found to make, or possess synthesis genes for, cyanotoxins (Microcystin) or allelopathic compounds. Metabolic potential nor toxin production has been examined in NRE-PS PicoP. To address this, we obtained and searched the genomes of 13 picocyanobacterial isolates for known primary and secondary metabolic pathways. We obtained high-quality isolate genomes from six different PicoP genera: Synechococcus (n=2), Cyanobium (n=1), Vulcanococcus (n=1), Cyanobium UBA5018 (n=2), and Cyanobiaceae (n =7). The recovered genomes possess several genes involved in carbon, nitrogen, and phosphorous acquisition and metabolism which helps explain the success of PicoP in lower nutrient and dynamic conditions of the NRE-PS. In addition, 55 genes related to secondary metabolism were identified, none of which were associated with known cyanotoxins; however, 31 genes are poorly described and may have a role in allelopathy or other functions. Overall, PicoP possess few secondary metabolite genes and are unlikely sources of well-studied cyanotoxins in the NRE-PS.

Quantifying Carbon Burial Dynamics in North Carolina Seagrass Beds

*Presenter: **Yasamin Sharifi**, UNC Institute of Marine Science, ysharifi@unc.edu
Co-authors: Tony Rodriguez, Professor, Brent McKee

Seagrass meadows extract carbon from the atmosphere and store it in sediment below ground, making this ecosystem important for mitigating atmospheric green-house gas levels. Extensive seagrass beds along the North Carolina coast suggest a great potential for CO_2 removal and long-term burial; however, little is known about the rates of carbon burial and the total size of the carbon stock that has formed locally over the past millennia. Our work quantitatively examines seagrass carbon burial dynamics by collecting surface sediment samples at approximately 200 sites throughout Core Sound, North Carolina. Analysis of these samples reveals how local carbon burial varies in response to environmental conditions, meadow characteristics, and proximity to inlets and shorelines. Quantifying carbon stocks is a critical first step for assessing the capacity of North Carolina seagrass beds to offset anthropogenic emissions and evaluating their viability as efficient blue carbon sinks over decadal to centennial time scales. Our findings provide the first comprehensive empirical reports of carbon stocks in natural seagrass beds in a North Carolina estuary. To our knowledge, this work will be the first of its kind done on the eastern seaboard of the United States. Results will advance the field of blue carbon science by improving measuring methodology and expanding the available dataset for estimating carbon inventories of North American seagrass.

Internships Are Vital to Undergraduates

*Presenter: **Cassi Shires**, NC State University, cpshires@ncsu.edu

A ten-week fishery research internship with the North Carolina Department of Environmental Quality allowed me to experience work in the lab, field, and office in the summer of 2022. The internship took place at the Division of Marine Fisheries (DMF) in Morehead City, NC. During this internship, I was able to participate in gillnet surveys, recreational water quality sampling, and submerged aquatic vegetation sampling in the field and laboratory. Office work consisted of filing fisheries management plans and other documents into the DMF digital SharePoint library. In the beginning of the experience, I was responsible for evaluating fish aging and taking juvenile fish surveys to understand the abundance and habitat of many fish species, as well as crustaceans. Samples from the beaches in the Back Sound and Cape Lookout were collected and tested for water quality purposes. This work was done with a team. The experience also allowed me to gain practical involvement in office work. Overall, the internship at the division has allowed me to gain technical skills and intensive knowledge of what I have been exposed to in my classes. This opportunity widened my networking because I met acquaintances that have similar interests and mentors that will be beneficial to me as I grow in my career. And most importantly, I learned a lot about myself. This internship took me out of my comfort zone and pushed me to explore more into my major.

Poster Abstracts *(continued)...*

Characterizing Behavior: The Effect of Individual Personality on the Response to Environmental Stimuli of the Blue Crab, *Callinectes sapidus*

*Presenter: **Savannah Kilgore Simpson**, UNCW Center for Marine Science, skk3732@uncw.edu
Co-authors: Stephanie J. Kamel, Christina M. Salerno

Behavior in animals is highly complex and plays a key role in the fitness of organisms in their environments. When behavior is consistent within an individual over time, yet conspecifics differ from one another, it is termed animal personality. Personality is known to affect fitness and shape interspecies interactions, many of which can have a considerable impact on community dynamics. Though individuals can be highly consistent, they may still exhibit significant behavioral differences in how they respond to changing environmental conditions, known as behavioral plasticity. Blue crabs, *Callinectes sapidus*, are ecologically important benthic crustaceans that inhabit salt marshes, a highly variable environment. Factors such as tidal range, food availability, and competition can influence how individual blue crabs respond across environmental contexts, resulting in potential impacts on survival. Blue crabs are noted for their propensity towards aggression, however variation in aggression levels among individuals has not been extensively studied. Here we assess a) if blue crabs exhibit individual differences in levels of aggression (i.e. personality) and b) if personality type influences behavioral plasticity in the presence of varying environmental stimuli (olfactory cues from conspecifics and prey). We hypothesize that individual blue crabs will consistently vary in their levels of aggression, with differences being maintained over time. We also expect to find variation in behavioral plasticity, with aggressive crabs being more responsive to cues from both conspecifics and prey. This work will provide insights into the behavioral interactions occurring between predators and prey that are foundational members of salt marsh ecosystems.

An Examination of Cold Tolerance in *Halodule wrightii*: Is There a Latitudinal Gradient from Florida to North Carolina, USA?

*Presenter: **Lindsey Stevenson**, UNCW, lvs7489@uncw.edu
Co-authors: Bradley Furman, Kelly Darnell, Jessie Jarvis

North Carolina is located in a unique biogeographic transition zone where climate change is altering the relative abundance of temperate (*Zostera marina*) and tropical (*Halodule wrightii*) seagrass species. North Carolina seagrass meadows change seasonally, where *Z. marina* dominates during the colder winter to early summer and *H. wrightii* dominates during the warmer late summer to early fall. Currently, warmer water temperatures are driving the loss in *Z. marina* biomass, which may competitively advantage the heat-tolerant *H. wrightii* for longer periods throughout the year. However, *H. wrightii* becomes thermally stressed during colder periods where *Z. marina* dominates, and little is known about *H. wrightii* cold tolerance. Previous studies suggest that *H. wrightii* cold tolerance may vary across regions. Based on these findings, this study aimed to investigate *H. wrightii* cold tolerance across a latitudinal gradient from Florida to North Carolina. The effects of cold stress on *H. wrightii* were quantified during a 3-week laboratory experiment. Shoots were collected and planted from North Carolina, Florida Bay, and the Northern Gulf of Mexico. *H. wrightii* shoots from each location were exposed to optimal (20-23°C), stressful (10°C), and extreme (5°C) temperatures. The resilience of *H. wrightii* to cold temperatures was quantified structurally (above- and belowground biomass) and physiologically (pulse-amplitude modulation-fluorometry, C:N ratios). This study helps to fill the knowledge gaps on *H. wrightii* cold tolerance and provide a better understanding of how *H. wrightii* may persist at the leading edge of its geographic distribution.

Using Models to Assess Movement of Sediments in Connected Beach-Dune Environments

*Presenter: **Matthew B. Vincent**, UNCW, mbv4297@uncw.edu
Co-authors: Joseph W. Long, Andrea D. Hawkes

The need for process-based aeolian and hydrodynamic sediment transport models continues to increase as plans and mitigation strategies are needed to enhance barrier island resilience. Many applications of these models to-date generalize the coastal landscape by using idealized representations of protective sand dunes with a constant sloping beach and neglect detailed features like dynamic berms that separates foreshore and backshore environments. Models that include these detailed features of the coastal landscape often lack ground-truth data at frequent time intervals to test and improve model formulations. In this study, we collect repeat field observations at the Masonboro Island National Estuarine Research Reserve to expand, calibrate, and test a numerical model of nearshore hydrodynamic and aeolian sediment transport. Observations consist of four years of seasonally collected aerial drone imagery, vegetation surveys, aeolian transport volumes, and real-time-kinematic GPS surveys. We characterize the wave and wind climate by using real-time climate data from offshore wave and wind buoys, and local weather stations. Model simulations over a three-year period are used to quantify the role that storms, moderate wave conditions, and aeolian transport have in dictating the island dynamics. We analyze the model results to evaluate the evolution of the foredune and berm to better understand the feedbacks between the shoreface, berm, and dune on different time scales. We also evaluate thresholds (e.g., berm elevations that protect dunes) that are important in describing barrier island evolution. Model results will provide insight into dominant physical processes on sandy beaches and can inform coastal resiliency plans.

A Method to Assess and Value Floodplain Attenuation Services in the Schuylkill Watershed

Presenter: **Jacqueline Welles**, U.S. Geological Survey, jwelles@contractor.usgs.gov
Co-authors: Kristina Hopkins, Emily Pindilli

Floodplains provide flood mitigation services by retaining floodwater and thereby reducing the impact of flood damages to property in adjacent areas during storm events. This study used geospatial tools to assess the extent and depth of flooding during representative storm events in the upper and lower Schuylkill River Watershed, as it currently exists (baseline) and under a counterfactual scenario with minimal to no floodplain storage. This analysis used flood frequency estimates of stage for the annual exceedance probabilities of 50-, 20-, 10-, 4-, 2-, 1-percent, which correspond to the 2-, 5-, 10-, 25-, 50-, and 100-year return recurrence intervals respectively, floodplain profiles derived from Height Above Nearest Drainage (HAND) grids, and

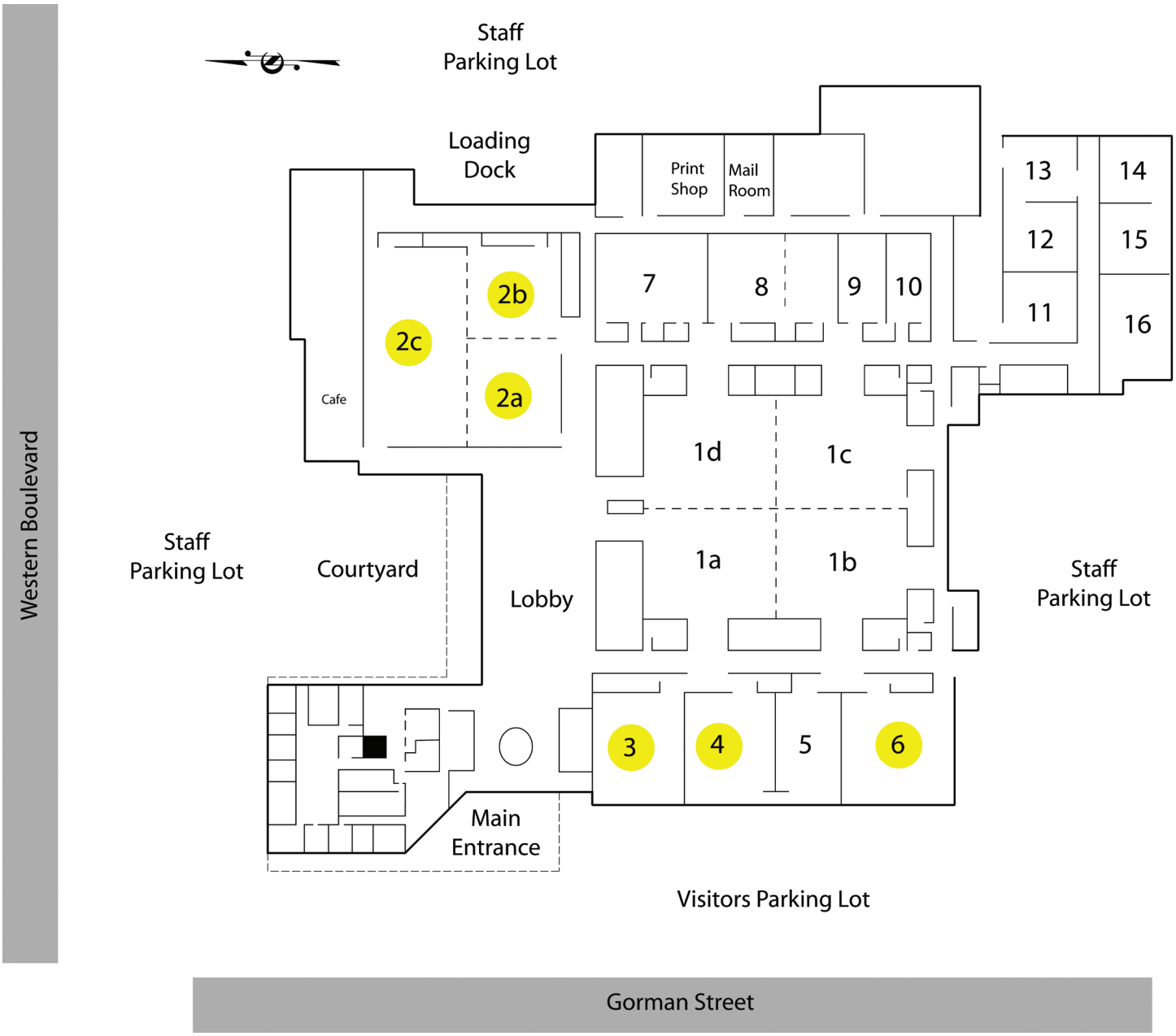
floodplain geomorphic measurements from the United States Geological Survey (USGS) Floodplain and Channel Evaluation Tool (FACET) to develop an estimated depth grid for the baseline and counterfactual scenarios for each flood recurrence interval. Then Federal Emergency Management Agency (FEMA) Hazus model damage-depth curves and property values were used to estimate the severity of property damage and estimate associated monetary losses that would occur in the area of interest under minimal to no floodplain storage for each flood recurrence interval compared to those incurred under current floodplain storage capacity. This represents the ecosystem services value of the floodplain flood attenuation through a damages avoided method. Results indicate elimination of the floodplain contributes to higher building damages and monetary losses, underscoring the importance of floodplains in mitigating damages from floods.

Seasonal Dynamics of Seagrass Assemblages in Northeast Pamlico Sound

Presenter: **Dylan Whitt**, ECU, whittd18@students.ecu.edu
Co-authors: James Walter Morley

As every year passes and global warming's grasp on the biosphere grows tighter, it becomes critical to understand how both, commercially-relevant and other species' distributions are impacted by the changing climate. This study is an analysis of a novel dataset collected in the northeast region of Pamlico Sound known as Oregon Inlet and the surrounding area. The dataset is from beach seine sampling of fish and invertebrate assemblages within seagrass habitats, and juxtaposed with adjacent non-vegetated habitat. In paired beach seine hauls, abundance of fish and invertebrates was an order of magnitude higher over seagrass compared to unvegetated bottom. YSI data collected from each sampling location, such as temperature, salinity, and dissolved oxygen, is used to justify the species compositions within targeted sites. Diversity indexes such as the Shannon-Weiner Species Diversity Index are used to understand how biodiversity in fish and invertebrate seagrass assemblages changes seasonally. Sampling was conducted across multiple dates between summer and fall to encompass greater variations in habitat compositions in the Pamlico Sound. In the months between summer and fall there was a general decline in fish abundances with more significant declines in invertebrate populations. Species composition changed seasonally, and consisted of five dominant species, pinfish, pigfish, silver perch, bay anchovy and Atlantic silversides.

Venue Map


Western Boulevard
Staff
Parking Lot
Loading
Dock
Print
Shop
Mail
Room
13
14
12
15
11
16
7
8
9
10
2b
2c
2a
Cafe
1d
1c
Staff
Parking Lot
Courtyard
Lobby
1a
1b
Staff
Parking Lot
3
4
5
6
Main
Entrance
Visitors Parking Lot
Gorman Street

The StriperHub team would greatly appreciate your input!

The striped bass served at the North Carolina Coastal Conference is compliments of StriperHub and was cultivated at the N.C. State University's Pamlico Aquaculture Field Laboratory in Aurora, N.C. We would greatly appreciate your feedback about the quality of the fish. Please take a short online and anonymous survey by scanning the QR code below with your smartphone. Thank you in advance for your participation!

Learn more about sustainable striped bass aquaculture from N.C. State professor and StriperHub coordinator Ben Reading, who is Tuesday's featured speaker during lunch.

We express our appreciation to Locals Seafood of Raleigh for filleting the striped bass for the meal.

LOCALS SEAFOOD

North Carolina Sea Grant's Locations

North Carolina Sea Grant
NC State Centennial Campus
850 Main Campus Drive
Toxicology Building, Suite 105
Raleigh, NC 27606

North Carolina Sea Grant
NC State Center for Marine Sciences and Technology
303 College Circle
Morehead City, NC 28557

NC Sea Grant Extension Program
Coastal Studies Institute
850 NC Highway 345
Wanchese, NC 27981

North Carolina Sea Grant
UNC-W Center for Marine Science
5600 Marvin K. Moss Lane
Wilmington, NC 28409

ncseagrant.org

Sea Grant
North Carolina

919.515.2454