BOOK OF ABSTRACTS

BAYS & BAYOUS SYMPOSIUM

FINDING BALANCE

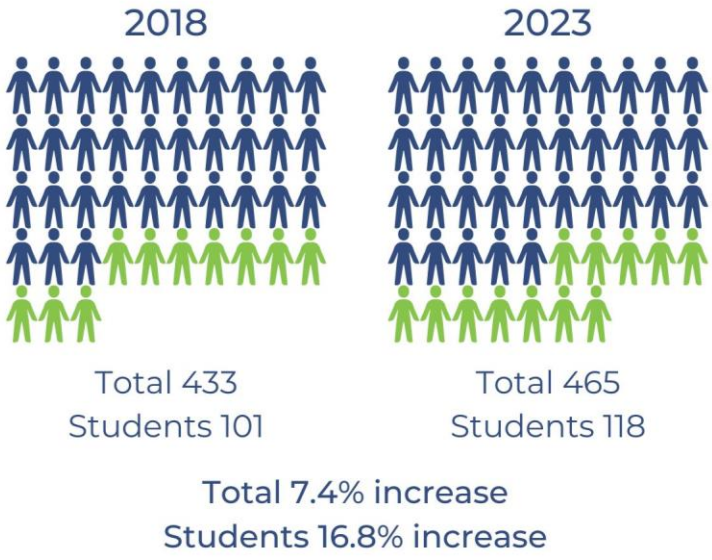
ECOLOGY, ECONOMY, AND COMMUNITY

2023 ALABAMA-MISSISSIPPI BAYS & BAYOUS SYMPOSIUM

Thank you for making Bays and Bayous 2023 an event for the books!

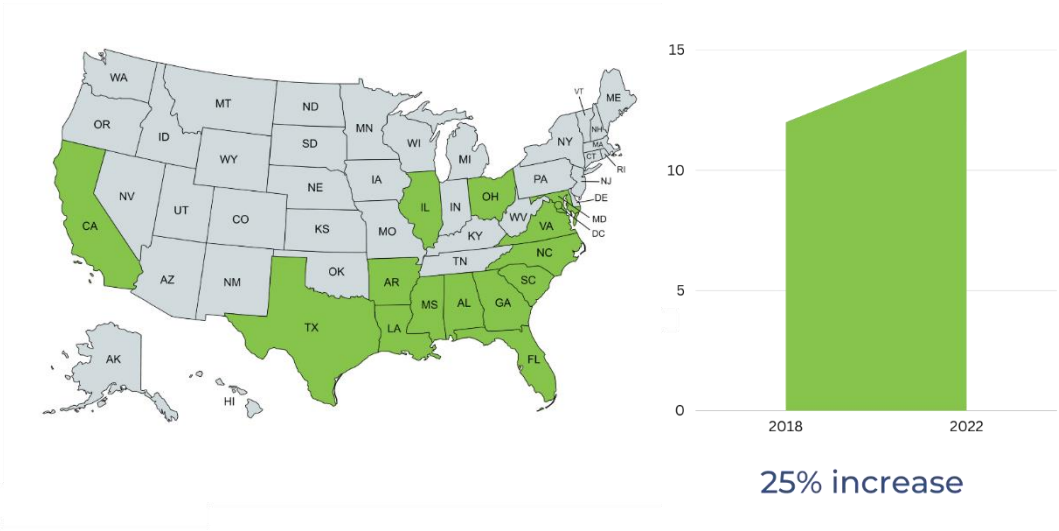
It was a treat to be back in person for Bays and Bayous 2023 with an event that many say is one to remember! The inviting facilities at The Mobile Convention Center provided an open, airy atmosphere filled with conversation, idea-sharing, and networking. With 465 in attendance, the concourse brimmed with chatter as attendees visited vendors, caught up with peers, and enjoyed the environmental art installations.

Attendance

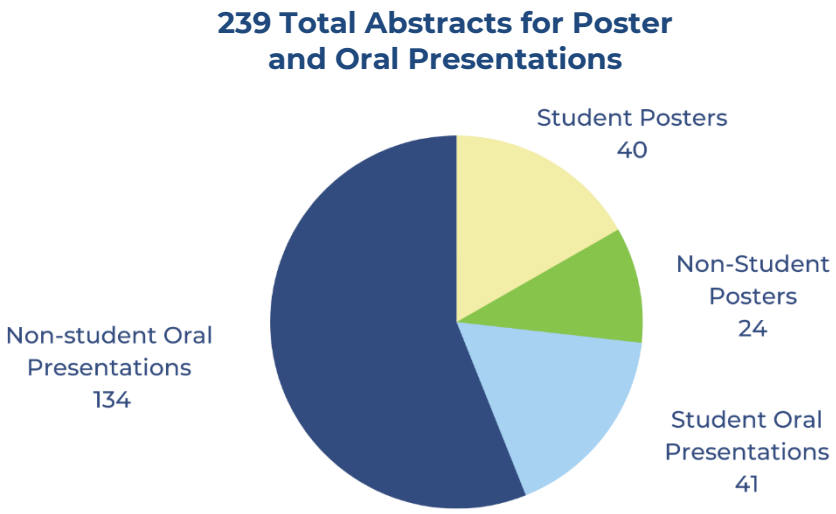


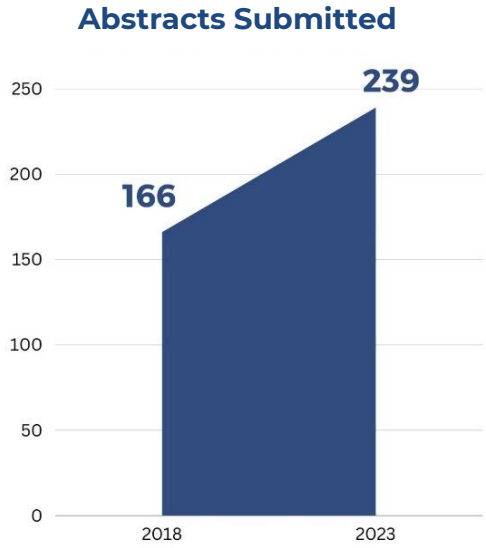
There were 170 oral presentations and 65 posters in the symposium program organized by tracks: Understanding Coastal Ecosystems, Improving Coastal Management, Strengthening Coastal Landscapes, Sharing Coastal Knowledge, and Emerging Coastal Issues. Two keynote speakers Tyrone Hayes, Ph.D., University of California, Berkeley, and Aimée Christensen, CEO of Christensen Global engaged audiences with their presentations. As one attendee put it, "I've never been more interested in frogs as I was during Dr. Hayes' presentation."

On Day 1, a five-person lunch panel offered information and advice for students and young professionals on "A Road Less Traveled". An informal Mentimeter survey gathered perceptions on environmental stressors during lunch on Day 2 when a group of Mardi Gras mystics



States Represented





paraded through the ballroom surprising the audience mid-survey. For the uninitiated, Mobile vigorously touts itself as the birthplace of Mardi Gras—imbuing the local culture, even at science symposiums.

Bays and Bayous is an ambitious regional event and expanding...this year 15 states were represented (a 25% increase over 2018), with a 7.4% overall attendance increase, a 16.8% student attendance increase, and a record number of abstract submissions. Additionally, sponsorships were up 18% over 2018. None of this would have been possible without the dedication of the Bays and Bayous committees, volunteers, and our generous sponsors. Thank you to the Steering Committee, the Program Committee, and the numerous volunteers who worked tirelessly, and sometimes deliriously, to host this notable event.

We are already looking forward to the 2024 event in Mississippi, hosted by the Mississippi-Alabama Sea Grant Consortium.

The Book of Abstracts containing a summary of each presentation is included for your perusal. Be sure to scan the QR code for a 50 second highlight video.

Thank you to the 2023 Bays and Bayous sponsors!

DAY 1 – SESSION 1 JANUARY 24, 2023

UNDERSTANDING COASTAL ECOSYSTEMS

- **Sensitivity Analysis of Wave Modeling During Hurricane Ida in the Gulf of Mexico** - Hafeez Oladejo (S), University of Southern Mississippi
- **Influence of Biogenic Processes on Seabed Properties in the York River Estuary, Chesapeake Bay** - Chesna Cox (S), Dauphin Island Sea Lab/University of South Alabama
- **Influence of Marine Phytoplankton in Surface Water Cr Cycling** - Debbrota Mallick (S), Dauphin Island Sea Lab/University of South Alabama
- **Measuring the Refractive Index of Marine Microbes using a 3D Holo-Tomographic Microscope** - Michael Kamowski (S), University of Southern Mississippi

IMPROVING COASTAL MANAGEMENT

- **Benefit-Cost Analysis of Oyster Reef Restoration in Alabama and Mississippi** - Barbara Okai (S), Mississippi State University
- **Valuation of Oyster Reef Restoration Along the Gulf Coast** - Freedom Enyetornye (S), Mississippi State University
- **Induced Defenses as a Management Tool: Shaping Individuals to Their Environment** - Lee Smee, Dauphin Island Sea Lab/University of South Alabama

STRENGTHENING COASTAL LANDSCAPES

- **Comparing Finfish and Crustacean Assemblages Among Established Marsh Terraces, New Marsh Terraces, and Open Water in a Restored Brackish Marsh** - Shasta Kamara (S), Nicholls State University
- **Integration of Aquaculture Techniques in Oyster Reef Restoration: The Little Dauphin Bay Oyster Restoration Project** - Christina LoBuglio and Caroline Golightly, Auburn University Shellfish Lab
- **Pedigree Reconstruction and Estimates of Genetic Parameters for Growth Traits in Gulf of Mexico Eastern Oyster Families Reared Communally** - Heather King (S), Auburn University Shellfish Lab

(S) designates student presenter

DAY 1 – SESSION 1 JANUARY 24, 2023

SHARING COASTAL KNOWLEDGE

- **Engaging Underserved Communities in Coastal Resilience: A Case Study in East Biloxi** - Qiyamah Williams, Mississippi State University/Mississippi-Alabama Sea Grant Consortium
- **Africatown Connections Blueway - Reconnecting to Water with Stories and Traditions** - Liz Smith-Incer, National Park Service, Rivers, Trails, and Conservation Assistance Program
- **Recruit and Support Sustainably: Early Successes Through the Ocean Exploration Club at Tuskegee University** - Rae Quadara, University of Southern Mississippi
- **Mitigating Flood Risks on the Mississippi Gulf Coast Using Equity-based and Stakeholder-informed Multi-scale Nature-based Solutions** - Wei Wu, University of Southern Mississippi

EMERGING COASTAL ISSUES

- **Marsh Vertical Profiling on Belowground Biomass, Salinity, and Elevation: Enhancing Predictive Modeling on Sea Level Rise and Vertical Accretion Rates** - Makenzie Holifield (S), University of Southern Mississippi
- **The Impact of Inundation and Nitrogen on Common Saltmarsh Species Using Marsh Organ Experiments** - Kelly San Antonio (S), University of Southern Mississippi
- **Tidal Creek Ecosystem Structure and Function Changes Associated with Coastal Watershed Development** - Samuel Bickley, Auburn University
- **PFAS Bioaccumulation, Depuration, and Energetic Cost in the Eastern Oyster, *Crassostrea virginica*** - Kayla Boyd (S), Auburn University Shellfish Lab

DEDICATED SESSION

- **Restoring Three Mile Creek One Neighborhood at a Time** - Christian Miller, Mobile Bay National Estuary Program
- **Twelve Mile Creek Headwater Stream Restoration** - Ryan Stokes, Stantec
- **Three Mile Creek: Restoring a Community Amenity for the City of Mobile** - Lance Slater, City of Mobile
- **Restoration Monitoring in the Three Mile Creek Watershed** - Alex Beebe, University of South Alabama
- **Control of Invasive Island Apple Snails (*P. maculata*) in the Three Mile Creek Watershed** - Cassie Elderage, Osprey Initiative

(S) designates student presenter

DAY 1 – SESSION 2 JANUARY 24, 2023

UNDERSTANDING COASTAL ECOSYSTEMS

- **Source Contributions to Nekton in an Oligohaline Ecosystem** - Keith Chenier (S), Mississippi State University, Coastal Research and Extension Center
- **Drivers of Long-Term Spatiotemporal Shifts in Nekton Communities in Coastal Alabama: 1981 - 2018** - Hannah Ehrmann (S), Dauphin Island Sea Lab/University of South Alabama
- **Shallow Seagrass Versus Fringing Marsh Habitat Use by Juvenile Recruits of Fish and Macroinvertebrates in the Northern Gulf of Mexico** - Just Cebrian, Northern Gulf Institute
- **Nekton and Submerged Aquatic Vegetation Abundance and Distribution Across the Vegetation Growing Season in the Atchafalaya Basin** - Shannan McAskill, University of Southern Mississippi

IMPROVING COASTAL MANAGEMENT

- **Recovery of Nitrogen Removal Capacity in Restored Tidal Marshes of the Mississippi-Alabama Gulf Coast** - Taylor Ledford (S), University of Alabama
- **Baseline Flow, Gage Analysis, and Online Tool Development Supporting Bay and Estuary Restoration in Gulf States** - Kirk Rodgers, U.S. Geological Survey
- **Regional Economic Impacts of Harmful Algal Blooms and Enterococcus in Florida and Mississippi** - Jessica Browne (S), Mississippi State University
- **The Distribution and Direct Economic Impacts of Marine Debris on the Commercial Shrimping Industry** - Alyssa Rodolfich (S), Mississippi State University, Coastal Research and Extension Center

STRENGTHENING COASTAL LANDSCAPES

- **Influences of Future Changes in Watershed on Estuarine Hydrography: A Case Study of Wolf-Perdido Bay** - Zhilong Liu, Dauphin Island Sea Lab/University of South Alabama
- **Seasonal Salinity Trends in the Central and Southern Biscayne Bay, Florida** - Meena Raju, Auburn University
- **Modeling Oyster Larval Development and Success to Metamorphosis in the Mississippi Sound** - James Klein (S), University of Southern Mississippi, Gulf Coast Research Lab
- **Optical Characterization of Water Column Constituents in Support of Oyster Larval Development Investigations** - Tom Wissing (S), University of Southern Mississippi/U.S. Naval Oceanographic Office

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DAY 1 – SESSION 2 JANUARY 24, 2023

SHARING COASTAL KNOWLEDGE

- **Artistic Pathways to Scientific Understanding** - Ayesha Gray, Grand Bay National Estuarine Research Reserve
- **Engaging Audiences - Interactive Websites for a Common Project Narrative** - Justin Quinley, Anchor QEA, LLC
- **GenSea: Bringing Gen Z to the Sea- Blue Economy Career Pathways in Coastal Mississippi** - Patrick Kirby (S), University of Southern Mississippi
- **Supporting Local Businesses Through an Enhanced Gulf Coast Outpost Program** - Alena Anderson (S), Mississippi State University

EMERGING COASTAL ISSUES

- **Disturbance in the Delta: Examining Plant Community Response to Physical Disturbance in the Mobile-Tensaw Delta** - Thelma Hammer (S), University of South Alabama
- **Implementing a Mobile-Tensaw Delta Network of Eddy Covariance Flux Towers** - Gabriel de Oliveira, University of South Alabama
- **Assessing Recovery of Ecosystem Structure and Function in Restored Tidal Marshes of the MS-AL Gulf Coast: A Closer Look at Carbon Storage** - Julia Cherry, University of Alabama
- **Quantitative Assessment of Natural Capital for Restoration Projects** - Don Blancher, Moffatt & Nichol

DEDICATED SESSION

- **Help Us Help You: Working with Communication Professionals to Share Your Science** - Christina Mohrman, Amanda Nalley, Gulf of Mexico Alliance
- **Science for the Community One Step at a Time** - Jessie Kastler, University of Southern Mississippi Marine Education Center
- **Connecting with Media as Research Progresses** - Angela Levins, Dauphin Island Sea Lab

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DAY 1 – SESSION 3 JANUARY 24, 2023

UNDERSTANDING COASTAL ECOSYSTEMS

- **The Greater Amberjack Count: An Overview** - Mark Albins, Dauphin Island Sea Lab/University of South Alabama
- **Estimation of Mortality Rates for the Gulf Menhaden Stock** - Catherine Wilhelm (S), University of Southern Mississippi, Gulf Coast Research Lab
- **Depredation on Descender Devices: A Gulf-Wide Investigation** - Danielle McAree (S), Mississippi State University
- **Investigating Salinity and Temperature Tolerances of Grass Shrimp** - Adam Murray (S), University of Southern Mississippi, Gulf Coast Research Lab
- **The Influence of Changing Environmental and Management Conditions on Past and Present Mississippi Oyster Reefs** - Jessica Pruett, University of Mississippi

IMPROVING COASTAL MANAGEMENT

- **Eastern Shore Watershed Management Plan** - Suzanne Sweetser, Thompson Engineering
- **D'Olive Bay Watershed Monitoring Study and Development of a Watershed Condition Framework** - Tim Thibaut, Barry A. Vittor & Associates, Inc.
- **Watershed Management Plan Implementation in the Fowl River Watershed in Mobile County, Alabama** - Jason Kudulis, Mobile Bay National Estuary Program
- **Foley's Forward Planning and Actions for Resilience** - Leslie Gahagan, City of Foley
- **Resilience Readiness: A Community-Based Participatory Assessment in the City of Pensacola, Florida** - Molly McDaniel, Pensacola and Perdido Bays Estuary Program

STRENGTHENING COASTAL LANDSCAPES

- **Breakwaters and Benthos: Impacts of Shoreline Restoration on Infaunal Communities** - Aaron Bland (S), Dauphin Island Sea Lab/University of South Alabama
- **Developing and Testing a Metric-Based Indicator of Functional Recovery for Tidal Marshes** - Jacob Dybiec (S), University of Alabama
- **Evaluating the Effectiveness of Restoration Approaches for Nearshore Habitat** - Matthew Virden (S), Mississippi State University, Coastal Research and Extension Center
- **Using Fish Community Metrics as Indicators of Habitat Enhancement in Restoration Projects: A Case Study in Coastal Alabama** - Matheus De Barros (S), Dauphin Island Sea Lab/University of South Alabama
- **Supporting Scientific Discovery and Science-Based Guidance for Restoration and Management through the Mississippi Based RESTORE Act Center of Excellence (MBRACE)** - Erin Oliver, Mississippi RESTORE Act Center of Excellence

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DAY 1 – SESSION 3 JANUARY 24, 2023

SHARING COASTAL KNOWLEDGE – DEDICATED SESSION

Community's Rise: A multi-pronged approach to fostering community participation in sea-level rise resilience

- **Comprehensive Sea-Level Rise Outreach and Program Evaluation** - Renee Collini, PLACE:SLR
- **Helping Educators and Students Foster Sea-Level Rise Resilience** - Alison Rellinger, PLACE:SLR
- **Connecting Engaged Residents and Municipal Officials in Productive and Educational Dialogue** - Andrew Medhurst, PLACE:SLR
- **Bringing sea-level resilience education to the community in unexpected places** - Alison Rellinger, PLACE:SLR

EMERGING COASTAL ISSUES – DEDICATED SESSION

Educating and Engaging Communities on Water Quality and Flood Resilience with the Watershed Game - Karen Bareford, Tina Miller-Way, Brenna Sweetman

This session will include an introduction to the Watershed Game, information on how the Game can be used to foster connections within local communities and educate students about water quality, land use, and resilience issues, and the opportunity to play the Coast Model with fellow attendees.

DEDICATED SESSION

Alabama Center of Excellence

- **Science-driven Solutions for a Changing Climate** - John Valentine, Dauphin Island Sea Lab
- **Sustainability of Current and Future Shoreline Solutions Under Rising Sea Level Scenarios** - Eric Sparks, Mississippi State University
- **Assessing the Function and Vulnerability of Forested Wetlands in the Mobile-Tensaw-Apalachee River Delta** - Christopher Anderson, Auburn University
- **Abundance and Habitat Selection of the West Indian Manatee at the Northern Periphery of Their Expanding Range** - Carl Cloyed, Dauphin Island Sea Lab
- **Understanding the Interactive Effects of Predation and Ocean Acidification on Economically Important Oyster Variants in the Northern Gulf of Mexico** - Randi Cannon (S), Dauphin Island Sea Lab/University of South Alabama

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DAY 1 – SESSION 4 JANUARY 24, 2023

UNDERSTANDING COASTAL ECOSYSTEMS

- **Seasonal Patterns of Fish Habitat Use in the Grand Bay National Estuarine Research Reserve from 2005 - 2014** - Jonathan Pitchford, Grand Bay National Estuarine Research Reserve
- **The Response of Bats and Their Insect Prey to Different Coastal Upland Habitat Management Techniques** - Mandy Sartain (S), Mississippi State University/Mississippi-Alabama Sea Grant Consortium
- **Fine-scale Tracking of Sportfish Habitat Selection and Behavior Along Restored Shorelines** - Sarah Ramsden (S), Dauphin Island Sea Lab/University of South Alabama
- **Evaluating Habitat Use by Nekton in Widgeon Grass, Shoal Grass, and Unvegetated Bottom Habitats in the Grand Bay National Estuarine Research Reserve** - Jessica Woodall (S), University of Southern Mississippi, Gulf Coast Research Lab
- **Characterizing the Distribution of Phragmites australis using Precise Measurements of Elevation, Topography, and Surface Water Salinity** - Margaret Waldron (S), University of Southern Mississippi, Gulf Coast Geospatial Center
- **Tidal Marsh Bird Population Monitoring and Conservation Applications for the Gulf of Mexico** - Rachel Anderson (S), Mississippi State University

IMPROVING COASTAL MANAGEMENT

- **2019 Bonnet Carré Spillway Openings: Impacts of the Fisheries Disaster Declaration** - Dave Storment (S), Louisiana Sea Grant
- **Development of a Daily Operational Model for the Mississippi Sound and Bight** - Brandy Armstrong (S), University of Southern Mississippi
- **Utilizing Water Isotopes to Differentiate Mississippi River, Local Rivers, and Groundwater Sources to the Mississippi Sound and Lake Pontchartrain Area** - Melissa Gilbert, University of Southern Mississippi
- **Simulating How the Bonnet Carré Spillway Impacts Salinity in the Mississippi Sound** - Anna Linhoss, Auburn University
- **Validation of a Modeling System for Freshwater Diversion Events: A Case Study for 2019 Bonnet Carré Spillway Opening** - Kemal Cambazoglu, University of Southern Mississippi
- **Mississippi River Reintroduction into Maurepas Swamp** - Ranjit Jadhav, FTN Associates, Ltd.

STRENGTHENING COASTAL LANDSCAPES – DEDICATED SESSION

- **Western Shore of Mobile Bay: Restoration, Conservation, and Park Initiatives** - Meg Goecker, Moffatt & Nichol
- **Relax, Reconnect, Restore: City of Mobile Park Improvements and Access Enhancements along Mobile Bay** - Jennifer Greene, City of Mobile
- **Deer River Coastal Marsh Restoration** - Mark Saunders, Thompson Engineering
- **Characterizing Wave Climate to Inform Shoreline Protection Design** - Peyton Posey, Moffatt & Nichol
- **Engineering with Nature to Restore Marsh Habitat on Fowl River** - Eric Schneider, Environmental Science Associates
- **Restoring and Enhancing Habitat and Access along the Dauphin Island Causeway** - Matthew Jones, Mobile County Environmental Services

DAY 1 – SESSION 4 JANUARY 24, 2023

SHARING COASTAL KNOWLEDGE – DEDICATED SESSION

Enhancing Community Resilience to Coastal Inundation Events - Marian Hanisko, Brenna Sweetman, Becky Allee, Renee Collini, Karen Bareford, Chris Ellis, Andrew Medhurst

Participants in this panel-driven session will get to hear about key messages included in the Interagency 2022 Sea Level Rise Report, explore new products and visualization tools for communicating impacts of inundation, and get a sneak peek at plans for a new Community of Practice, all while sharing local needs for information, products, tools, and services to address your needs.

EMERGING COASTAL ISSUES

- **Lateral Dynamics in an Estuary with a Narrow, Deep Ship Channel and Wide, Shallow Shoals: Mobile Bay, Alabama** - Harikrishnan Sreeshylam (S), Dauphin Island Sea Lab/University of South Alabama
- **Developing Modeling Capacity to Reveal How Expanding Freshwater Inputs to Mississippi Sound Impact Environmental Conditions** - Jerry Wiggert, University of Southern Mississippi
- **Interactions Between Sediment Stability and Infaunal Community Structure Following a Hurricane Disturbance** - William Clemo (S), Dauphin Island Sea Lab/University of South Alabama
- **Do Tropical Cyclones Short-Circuit Sedimentary Elemental Sequestration in the Northern Gulf of Mexico?** - Jeffrey Krause, Dauphin Island Sea Lab/University of South Alabama
- **Modeling the Impacts of Coastal Flooding on Gulf Coast Tourism Resilience** - Christopher Gerber (S), Auburn University
- **Building a Comprehensive Archive and Open Access Data Portal for Monitoring Marine Microplastics - the NOAA NCEI Global Marine Microplastics Database and Web Map** - Jennifer Webster, NOAA/NESDIS/NCEI

DEDICATED SESSION

Alabama Center of Excellence (continued)

- **Using Optical and Metabolomic Approaches to Predict the Nutritional Quality of Plankton Communities for Shellfish Consumption Under Multi-Stressor Climate Conditions** - Alison Siersma (S), Dauphin Island Sea Lab/University of South Alabama
- **Meiofaunal Diversity as a Tool for Understanding and Monitoring Northern Gulf of Mexico Environments** - William Ballentine (S), Dauphin Island Sea Lab/University of South Alabama
- **Characterizing Hypoxia on the Alabama Shelf During Unprecedented 2019 Opening of the Bonnet Carré Spillway** - Brian Dzwonkowski, Dauphin Island Sea Lab/University of South Alabama
- **The Spatiotemporal Patterns of Community Vulnerability in Mobile Bay from 2000-2020** - Hemal Dey, University of Alabama
- **Is Your Water Well? Stressors on Groundwater Quality for Private Well Users in the Alabama Gulf Coast** - Ann Ojeda, Auburn University
- **Sustainability and Vulnerability of Southern Alabama Groundwater Under a Changing Climate** - Yong Zhang, University of Alabama

DAY 2 – SESSION 1 JANUARY 25, 2023

UNDERSTANDING COASTAL ECOSYSTEMS

- **Coastal Attribute Data Analysis Based on Living Shoreline Suitability Models for Selected Water Bodies and Coastal Metropolitan Areas in the Gulf of Mexico** - Chris Boyd, Troy University
- **Assessing the Effectiveness of Living Shorelines at Preventing Coastal Erosion and Maintaining Healthy Habitats** - Patrick Biber, University of Southern Mississippi
- **NOAA Firebird: Fire Effects in Gulf of Mexico Marshes on Mottled Ducks, Black and Yellow Rails** - Mark Woodrey, Mississippi State University
- **Reproductive Success of Shorebirds in Alabama** - Olivia Morpeth, Alabama Audubon

IMPROVING COASTAL MANAGEMENT

- **Examining Movement Dynamics of the Gulf Menhaden Fishery to Evaluate the Impacts of Spatial Closures** - Robert Leaf, University of Southern Mississippi
- **Changes in the Fish Community Following Artificial Reef Installation in a Northern Gulf of Mexico Estuary** - Michael Archer, Grand Bay National Estuarine Research Reserve
- **Co-Producing a Shared Characterization of Depredation in the Gulf of Mexico Reef Fish Fishery** - Ana Osowski, Mississippi State University/Mississippi-Alabama Sea Grant Consortium
- **Using Computer Vision Toward Automation of Fish Ageing** - Ralf Riedel, University of Southern Mississippi

STRENGTHENING COASTAL LANDSCAPES

- **Marlow Spring Branch Restoration** - Nicholas Combs, Thompson Engineering
- **Forest Restoration and Management Can Maintain or Enhance Water Resources in the Gulf of Mexico** - Peter Caldwell, USDA Forest Service Southern Research Station
- **Exploring Innovative Nature-Based Approaches to Regional Stormwater Management in Ocean Springs, MS** - Nina Woodard, PLACE:SLR

(S) designates student presenter

DAY 2 – SESSION 1 JANUARY 25, 2023

SHARING COASTAL KNOWLEDGE

- **Oyster Gardening: An Implement for Extension Programming** - Emily McCay, Auburn University Marine Extension and Research Center/Mississippi-Alabama Sea Grant Consortium
- **Empowering Oyster Growers While Growing Capacity: Research, Testing and Training to Address Microbiological Impediments on Shellfish Aquaculture** - Ronald Bond, University of California, Davis
- **Oyster Farming Resilience Index** - Rusty Grice, Mississippi-Alabama Sea Grant Consortium
- **Extending Our Reach: A Multi-State Collaborative Approach to Reef Fisheries Extension** - Marcus Drymon, Mississippi-Alabama Sea Grant Consortium

EMERGING COASTAL ISSUES

- **Loss of Mississippi Diamondback Terrapin (*Malaclemys terrapin pileata*) Nesting Habitat and Implications for Restoration** - Andrew Heaton, Grand Bay National Estuarine Research Reserve
- **Florida Panhandle Terrapin Project** - Rick O'Connor, Florida Sea Grant/UF IFAS Extension
- **Heatwave Duration Correlates with the Poor Recruitment of Oysters in Alabama Coastal Waters** - Jeffrey Plumlee, Dauphin Island Sea Lab/University of South Alabama
- **Impacts of Disaster Events on the Gulf of Mexico Region and States Commercial Landings and Dockside Values** - Benedict Posadas, Mississippi State University, Coastal Research and Extension Center

DEDICATED SESSION

Dauphin Island: Managing Rising Tides and Shifting Sands to Maintain Balance Between Nature, Culture, and Economy

- **Dauphin Island Watershed Management Plan: Building on the Past to Plan for a Sustainable and Resilient Future** - Chris Warn, ESA
- **Leveraging Adaptation Pathways to Identify Vulnerabilities and Opportunities for Resilience in Dauphin Island, AL** - Stephanie Patch, University of South Alabama
- **Strategic Habitat Acquisition on Dauphin Island** - Meg Goecker, Moffatt & Nichol
- **Restoring Little Dauphin Island through Collaborative Partnerships** - Justin McDonald, U.S. Army Corps of Engineers
- **Creating Place in Paradise** - Brandon Bias, Goodwyn Mills & Cawood, Inc.

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DAY 2 – SESSION 2 JANUARY 25, 2023

UNDERSTANDING COASTAL ECOSYSTEMS

- **Monitoring Wetland Vegetation in Response to Climate Changes with NDVI** - Sadia Alam Shammi, Mississippi State University
- **Where Are You From? Sorting Out Sediment Provenance Deposited on a Transgressive Marsh** - Christopher Smith, U.S. Geological Survey
- **Using Unoccupied Aircraft Systems to Monitor Restored Wetland Vegetation Communities** - Alexandra Rodriguez, Dauphin Island Sea Lab
- **Not All Marsh Edge is Equally Valuable Fish Habitat: Variation in Fish Community Structure Across Mississippi Sound, Alabama** - Ronald Baker, Dauphin Island Sea Lab/University of South Alabama

IMPROVING COASTAL MANAGEMENT

- **The Impact of Soil Porewater Salinity and Fire Management on the Salt Marsh, Ecotone, and Forest Habitats** - Wei Wu, University of Southern Mississippi
- **Impacts of Wildfires and Prescribed Fires on the Presence of Invasive Plants in Coastal Mississippi** - Robert Grala, Mississippi State University
- **Graham Creek Nature Preserve: Balancing Conservation, Education and Recreation** - Leslie Gahagan, City of Foley

STRENGTHENING COASTAL LANDSCAPES

- **Bucktown Living Shoreline: Benefits of Public-facing Habitat Restoration** - Mindy Joiner, Moffatt & Nichol
- **Design, Construction, and Monitoring of a Living Shoreline Project** - Wendell Mears, Anchor QEA, LLC
- **Living Shorelines: Management Hurdles in Regulatory Requirements** - Tom Hutchings & Lee Yokel, EcoSolutions, Inc.
- **Living Shorelines: Large-Scale Impacts from Small-Scale Decisions** - Sara Martin, Mississippi State University

(S) designates student presenter

DAY 2 – SESSION 2 JANUARY 25, 2023

SHARING COASTAL KNOWLEDGE

- **An Overview of the Dauphin Island Sea Lab's K-12 Marine Science Education Program** - Virginia Driskell, Dauphin Island Sea Lab
- **Plastic Pollution Awareness in Educators** - Tracy Jay, Environmental Studies Center
- **CHANGES: A High School Education Program for Coastal Restoration, Management, and Monitoring** - Sandra Bilbo, Grand Bay National Estuarine Research Reserve
- **Impacts of Decade-old MASGC-supported Internship Program in Environmental Education for Underrepresented Students** - JoAnn Moody, Dauphin Island Sea Lab

EMERGING COASTAL ISSUES

- **Water Quality is Changing in Mobile Bay and Mississippi Sound - What Are the Mechanisms and What Are Our Options?** - John Lehrter, Dauphin Island Sea Lab/University of South Alabama
- **Delineation of Groundwater Recharge Areas in Baldwin County, Alabama for Water Management and Water Policy Development** - Greg Guthrie, Geological Survey of Alabama
- **We Can All Do More to Help with Sustainability! So What is Manufacturing Doing to Help the Local Environment?** - Steven Stewart, SCS Engineers

DEDICATED SESSION

- **Maximizing Back-Barrier Island Marsh Habitat Through Innovative Solutions** - Peyton Posey, Moffatt & Nichol
- **Little Billy Goat Hole and East End Improvements** - Amanda Tinsley, Moffatt & Nichol
- **Dauphin Island East End Beach & Dune Restoration** - Thomas Buhring, South Coast Engineers
- **Dauphin Island, AL Living Shoreline Designs in Aloe Bay** - Kate Dawson, Moffatt & Nichol
- **Shorebird Conservation and Habitat Management on Dauphin Island's West End** - Lianne Koczur, Alabama Audubon & Nicole Love, Thompson Engineering

(S) designates student presenter

DAY 2 – SESSION 3 JANUARY 25, 2023

UNDERSTANDING COASTAL ECOSYSTEMS

- **Distribution, Abundance, and Reproductive Output of Spawning Female Blue Crabs in the Vicinity of the Mississippi Barrier Islands** - Zachary Darnell, University of Southern Mississippi
- **Marine Connectivity in the Mississippi Bight: Whose Larval Fish and Crabs Are They?** - Donald Johnson, University of Southern Mississippi
- **Responses of Juvenile Spotted Seatrout *Cynoscion nebulosus* to Experimental Acute and Chronic Low Salinity Exposure** - Ronald Baker, Dauphin Island Sea Lab/University of South Alabama
- **Dietary Evidence of Facultative Cleaning by Juvenile Leatherjackets from Coastal Alabama** - Kelsey Hofheinz, Dauphin Island Sea Lab

IMPROVING COASTAL MANAGEMENT

- **The Development and Application of a Geospatial Coastal Vulnerability Grid** - Claire Babineaux, Mississippi State University Extension, Northern Gulf Institute
- **Geospatial Technologies for Climate-Related Infrastructure Assessments and Adaptive Management** - Katarzyna Grala, Mississippi State University Extension, Northern Gulf Institute
- **Hindsight is 20/20: Re-envisioning an Environmental Monitoring Network** - Josh Goff, Dauphin Island Sea Lab
- **Taking Coastal Monitoring to New Heights: UAS Use for Streamlined Restoration Monitoring** - Megan Laufer, Dauphin Island Sea Lab

STRENGTHENING COASTAL LANDSCAPES

- **The Aristotelian Philosophy of Oyster Management: Good Habit[at]s Formed at Youth Make All the Difference** - Scott Milroy, University of Southern Mississippi
- **Validation of Field-Applicable Detection Kits for Total and Pathogenic *Vibrio parahaemolyticus* in Oysters** - Andy DePaola, Angelo DePaola Consulting, LLC
- **Distribution and Condition of Seagrasses in the North Central Gulf of Mexico** - Kelly Darnell, University of Southern Mississippi
- **Incorporating a Tiered Monitoring Design into the State of Alabama's SAV Mapping Program** - Dottie Byron, Dauphin Island Sea Lab

(S) designates student presenter

DAY 2 – SESSION 3 JANUARY 25, 2023

SHARING COASTAL KNOWLEDGE

- **A Classroom Course in Community Resilience: A Climate Change Curriculum that Prepares for the Future** - Samantha Capers, University of Southern Mississippi Marine Education Center
- **Fostering a Culture of Intentional Resilience Through Building Codes and Sustainable Construction Standards** - Stephen Deal, Mississippi-Alabama Sea Grant Consortium
- **Neighbors Helping Neighbors: Community Centered Severe Weather Preparedness and Resilience** - Tracie Sempier, Mississippi-Alabama Sea Grant Consortium
- **An Introduction to the Alabama Forestry Commission's Coastal Program** - Ryan Peek, Alabama Forestry Commission

DEDICATED SESSION

Gulf of Mexico Alliance Café: Building Partnerships for a Healthier Gulf - Laura Bowie, Becky Ginn, Christina Mohrman, Amanda Nalley, Dave Reed, and Ali Robertson

In this session, GOMA staff will facilitate conversations in an open "café" where symposium participants can learn more about Alliance resources based on their individual interest.

(S) designates student presenter

ABSTRACTS (ORAL PRESENTATIONS)
(Alphabetical by Title)

2019 Bonnet Carré Spillway Openings: Impacts of the Fisheries Disaster Declaration

Dave Storment
Louisiana Sea Grant

Historic levels of rain in 2019 put the Mississippi River at risk of flooding New Orleans. For the first time since construction, the US Army Corps of Engineers opened the Bonnet Carré Spillway twice in a calendar year, and for a longer duration than any previous opening. The spillway diverted trillions of gallons of freshwater from the river through lake Pontchartrain and into the Gulf of Mexico, causing lowered salinity levels that decimated over 90% of oysters and killed or forced movable species like finfish and crabs to retreat from the area of impact in the Gulf. This event caused enough economic harm in the fishing industries of Louisiana, Mississippi, and Alabama that the Secretary of Commerce, under authority of the Magnuson-Stevens Act and Interjurisdictional Fisheries Act, declared it a "commercial fishery disaster" and "catastrophic regional fishery disaster." Pursuant to these declarations, Congress allocated $88 million dollars in federal relief among the three states. This presentation will provide an overview of the spillway opening process, as well as discuss the environmental and economic consequences involved. It will then analyze the Secretary's method of evaluation of potential fishery disasters and identify potential areas for improvement in the relief funds process.

A Classroom Course in Community Resilience: A Climate Change Curriculum that Prepares for the Future

Jessica Kastler [1], Tracie Sempier [2], Laura Blackmon [1], Samantha Capers [1]
[1] University of Southern Mississippi; [2] Mississippi-Alabama Sea Grant Consortium

In this NOAA B-WET meaningful watershed educational experience (MWEE), students learn that climate change, a real-world process with anthropogenic influence, is causing sea-level rise and other events. Participating teachers receive Continuing Education Units and stipend support, as well as climate change instruction introducing the Community Resilience Index (CRI); a tool used by community leaders to prioritize projects pertaining to climate-related problems. Students are assigned a scenario developed by project partners, describing an infrastructure, transportation, social or economic deficiency identified by communities along the northern Gulf Coast after Hurricane Katrina. Student teams researches their assigned scenario and develop mitigation strategies using the CRI. Top teams compete in the Stewardship Summit and present their solutions to local professionals working on community resilience concerns. These professionals gain fresh ideas from student proposals, and students are empowered to act in ways that make their communities safer. To date 8 teachers from the northern Gulf Coast have participated in the project and 206 students have participated in the stewardship summit.

Abundance and Habitat Selection of the West Indian Manatee at the Northern Periphery of Their Expanding Range

Carl Cloyed [2], Elizabeth Hieb [1], Kayla DaCosta [2], Monica Ross [3], Ruth Carmichael [1]
[1] Dauphin Island Sea Lab; [2] Dauphin Island Sea Lab/University of South Alabama;
[3] Clearwater Marine Aquarium

Habitat selection during range expansion may facilitate movement into new geographic areas, shaping climate driven changes in distribution. West Indian manatees are ideal for understanding how habitat selection influences range expansion because their presence has rapidly increased at their range margins in the northern Gulf of Mexico during the past two decades. We estimated manatee abundance in coastal Alabama waters using aerial surveys from 2010 and 2019 and used resource selection functions on tagged and opportunistically sighted manatees to quantify habitat use. We estimated ~25 and 34 manatees occupied coastal Alabama waters at any given time during the warm season (Apr-Nov) in 2010 and 2019, respectively. Manatees primarily used the Mobile-Tensaw River Delta and Dog River areas, selecting for nearshore, shallow water habitats proximate to submerged aquatic vegetation. Distance to boat ramp and human population density had a stronger effect in the sighted dataset but remained important in the tagged dataset, indicating that manatees used areas that overlapped with human activities. Temperature strongly predicted when manatees were sighted, with the highest probability of sighting occurring May-Nov when temperatures were >20°C. These are the first estimates of manatee abundance and habitat use in the U.S., outside of Florida. Range expansion in manatees will likely be dependent on the availability of nearshore habitat with submerged vegetation, increased sea temperatures, and on manatee's ability to migrate to those habitats when seasonally available. Environmental changes that decrease or increase these habitats and conditions can threaten or aid, respectively, manatee range expansion.

Africatown Connections Blueway - Reconnecting to Water with Stories & Traditions

Liz Smith-Incer
National Park Service, Rivers, Trails, and Conservation Assistance Program

Africatown, located just north of downtown Mobile, Alabama, was formed by West Africans, who in 1860 were included in the last known illegal shipment of slaves to the United States. In this session, Liz Smith-Incer of the National Park Service, will present on the Africatown Connections Blueway and how descendants of the original founders of Africatown are seeking to re-connect their community to the waterways and African culture through the project. Project partners are not only reconnecting to one another through new traditions, they are fostering a greater understanding of their connections to the land and water that nourishes the Mobile metro area. Tennessee State University & Oberlin College have teamed up with the National Park Service to create an online story map of the Africatown Connections Blueway. A summary of this process will be given during the session. Project partners have also re-established community rituals and traditions that are now practiced fortifying the connections between elders and youth of the community. Session participants will learn the steps of two community engagement traditions and actively participate in practicing these traditions. Of primary importance is to recognize and preserve the international historical significance of Africatown in hopes of contributing to racial healing and reckoning as well as celebrating the contribution of this community.

Alabama Center of Excellence: Science-driven Solutions for a Changing Climate

John Valentine, Dorothy Byron, Amy Hunter, Ken Heck
Dauphin Island Sea Lab

On October 1, 2019, the United States Department of Treasury, in cooperation with the Alabama Gulf Coast Recovery Council (AGCRC) and the Alabama Department of Conservation and Natural Resources (ADCNR) awarded the Dauphin Island Sea Lab funding to establish and operate the Alabama Center of Excellence (ALCoE). Building on the network of experts from 22 of Alabama's College and Universities, ALCoE's mission is to provide results from innovative, forward looking, research conducted on areas of coastal concern to interested members of government, academic community, and the public. Focusing on the effects of multiple stressors that are anticipated to occur as our climate changes, ALCoE will provide freely accessible results that will be useful for the wise stewardship of Alabama's marine resources. This dedicated session will showcase the multi- stressor studies supported by ALCoE's first round of funding.

An Introduction to the Alabama Forestry Commission's Coastal Program

Ryan Peek
Alabama Forestry Commission

The Alabama Forestry Commission (AFC) established the AFC Coastal Program as a new and innovative initiative to provide extra focus on enhancing water quality in forested watersheds connected to coastal Alabama. This program has allowed the AFC to allocate additional resources to benefit forests in Alabama's coastal county watersheds. The Program also provides financial and technical assistance to forest landowners to assist in implementation of forest management activities on their lands. Forested watersheds provide a multitude of ecological services including erosion control, water quality improvement, wildlife and aquatic habitat, and water storage. In addition to the ecological benefits, a properly managed forest can yield significant economic returns for the landowners which are then utilized to implement additional activities that are ecologically beneficial. The AFC's Coastal Watershed Enhancement Program (CWEP) provides services and financial assistance to landowners to implement invasive species control primarily through mechanical stand treatments, forest management planning and certification activities, and education and outreach programs regarding the importance of forests in maintaining water quality. Stand reestablishment, prescribed fire, and urban forestry are also components of the program. The AFC anticipates growing this program with partners, including adjacent gulf coast states, in order to maximize the water quality enhancement benefits across the Gulf of Mexico.

An Overview of the Dauphin Island Sea Lab’s P-12 Marine Science Education Program

Virginia Driskell, Angie Dixon, Greg Graeber, Kyle Halstead, Rachel McDonald, Tina Miller-Way, JoAnn Moody
Dauphin Island Sea Lab, Discovery Hall Programs

The Dauphin Island Sea Lab's Discovery Hall Programs (DHP) has welcomed secondary teachers and students for marine science education since 1975. Over the years, our program has grown and adapted to reach a variety of audiences using a variety of strategies. While programs have evolved to meet current needs, our mission of increasing environmental literacy and our strategy of directly involving participants in place-based education with dynamic, hands-on activities has been consistently woven into the educational experience that we provide. During the school year, our 9 full-time staff focus on onsite field classes, short professional learning opportunities for educators and our in-school classroom program, the BayMobile. We offer a variety of field classes - those focused on ecology and natural history of coastal habitats, a number of ocean STEM classes, and classes focused on specific environmental issues. During the summer DHP focuses on our residential marine science class for high school students, overnight and day camps, and multi-day professional development workshops for educators. Over time, we have continued to adapt our programs to focus on topics and teaching tools of the time. For example, during the COVID pandemic, DHP pivoted to predominantly virtual programming. As STEM focused learning became a centerpiece in education, we developed a robust STEM education program with field classes, workshops, and extracurricular competitions. While it is often difficult to formally document the outcomes of experiential education programs like ours, our many alumni attest to the impact of their experiences with Discovery Hall's programs.

Artistic Pathways to Scientific Understanding

Ayesha Gray, Sandra Bilbo
Grand Bay National Estuarine Research Reserve

Science and art are endeavors of discovery and creativity. Scientists have used art to communicate findings and illustrate concepts; artists have looked to science and nature for inspiration. The disciplines are linked. Creating Art with Inspiration from the Natural World: Broadening the Conservation Audience will show how the Grand Bay National Estuarine Research Reserve (GNDNERR) is using art workshops to encourage artistic expression about reserve subject matter to engage artists (and others) in coastal science, as we link art and science to inspire and teach about the natural world. Our specific goal is broadening our conservation audience through simple four part workshops: 1) explore the reserve, 2) find inspiration, 3) learn a technique, and 4) create art. Our intention with this presentation is to provide information showing how we are using art and nature to increase our science and conservation audience. We engage our community one member at a time, artistically; we have them experience our reserve whether they have previously visited or not, and make something whether they have previously done art or not, and they create something that shows us what they see in addition to having a high-quality experience at the reserve. The participants then donate art pieces to the reserve which are used in further outreach. Each workshop has a theme focused on our animals, plant species, ecological processes, and habitats, and intends to use art education to highlight our restoration and conservation work ultimately broadening our audience for that message.

Assessing Recovery of Ecosystem Structure and Function in Restored Tidal Marshes of the MS-AL Gulf Coast: A Closer Look at Carbon Storage

Julia Cherry, Jacob Dybiec, Shelby Rinehart, Taylor Ledford, Emily Fromenthal, Corianne Tatariw, Behzad Mortazavi
University of Alabama

Tidal marshes provide numerous ecosystem services, including blue carbon (C) storage, but they are also highly vulnerable to degradation and loss from sea-level rise, development, and other anthropogenic impacts. Restoration and creation projects are increasingly used to recover tidal wetland habitat, but it is unclear how effective these projects are at restoring ecosystem functions. To assess the efficacy of restoration projects along the Mississippi-Alabama Gulf Coast, we quantified soil organic matter (SOM) and carbon (C) content in 12 restored marshes of different ages (7-34 yr) and compared them to vegetated and unvegetated areas in nearby reference marshes. We found that vegetated reference marshes consistently stored more SOM and C than restored sites, regardless of marsh age or soil depth. Across restored marshes, we found that SOM and C in the upper 5 cm increased with time since restoration, while SOM and C in deeper soil increments (5-10, 10-15, 15-20 cm) were similar, regardless of age. A comparison among different types of restored marshes (e.g., living shorelines, large-scale beneficial use, mitigation via habitat conversion) revealed that mitigation sites, which were also the oldest, stored more SOM and C than other restored sites. Despite observed lags in C storage recovery, these restored sites are on a trajectory of recovery and are likely outperforming unvegetated areas at nearby reference sites. Consequently, tidal marsh restoration appears to be an effective strategy to recover ecosystem services, including those that help marshes mitigate the effects of climate change.

Assessing the Effectiveness of Living Shorelines at Preventing Coastal Erosion and Maintaining Healthy Habitats

Gabrielle Spellmann, Patrick Biber
University of Southern Mississippi

Hardened shorelines have been the leading method against shoreline erosion. Living shorelines, however, have longer sustainability and provide an ecosystem similar to a natural marsh. The living shoreline method often combines native vegetation and a wave dampener just offshore. We compared hardened, natural, and living shorelines and their success at mitigating erosion under different wave energy and fetch exposure. Comparisons of these three shoreline types was conducted at six field sites in Mississippi and Alabama. The field data was collected in winter and summer of 2020 using wave gages, water quality sondes, sediment cores, and vegetation quadrats. Google Earth satellite imagery was used to calculate shoreline erosion rates and fetch. The coastline and its shape were influenced by the energy exerted, with the high energy coastlines eroding quicker. Hardened shorelines were found to have little to no erosion, while natural shorelines had the greatest amount of erosion. Living shorelines lessened the rate of erosion. However, natural and living shorelines were similar in slope and sediment parameters, while hardened shorelines had steep slopes and higher sand content. Living and natural shorelines had similar vegetation diversity, while hardened shorelines differed with often very little vegetation. Living shorelines with a combination of vegetation and a wave dampener decreased the impact of erosion to create a more natural ecosystem, especially at low energy sites. This data on different exposure and wave energies will help managers and landowners to decide the best method to protect their property from erosion while maintaining a healthy ecosystem.

Assessing the Function and Vulnerability of Forested Wetlands in the Mobile- Tensaw-Apalachee River Delta

Christopher Anderson [1], Ruth Carmichael [2], Latif Kalin [1]
[1] Auburn University; [2] Dauphin Island Sea Lab

River deltas are naturally dynamic ecosystems that occupy the interface between watersheds and estuaries. In larger delta systems, an extensive tidal forested freshwater wetland (TFFW) zone commonly occurs, however there is little information about these areas and their functional role in relation to the larger estuary. To address these knowledge gaps, we present newly started research to determine the current condition and function of the Mobile-Tensaw-Apalachee (MTA) River Delta and predict potential changes to the delta due to sea level rise (SLR) and future river flows due. As part of this project, nine water-gaging stations were established roughly equidistant along a forested tidal gradient within the delta. River salinity and tidal connectivity models will be developed for each station using artificial neural networks (ANNs), a data-driven approach that can help learn and map complex relationships between inputs and outputs. Forest survey plots (n≈50) will be stratified across forested wetland types and river reaches to determine canopy tree composition in relation to tidal influence. Finally, there remains significant uncertainty about the role that TFFWs have in terms of export of organic matter (OM) and nutrients to the larger estuary. We will utilize an isotopic and fatty acid/alkane approach to assess spatial and temporal trends of OM input to Mobile Bay. We present initial data collected from the study and highlight future analyses which will contribute key understandings of the MTA River Delta while determining its vulnerability to future changes in river flow and sea levels.

Avian Use of Marsh Terraces in Coastal Louisiana

Madelyn McFarland [1], J. Brian Davis [1], Michael Brasher [2], Mark Woodrey [1], Larry Reynolds [3], Fernando Vizcarra [1]
[1] Mississippi State University; [2] Ducks Unlimited Inc.; [3] Louisiana Department of Wildlife and Fisheries

Louisiana's coastal wetlands support millions of resident and migratory birds annually. Louisiana accounts for approximately half of the coastal wetlands in the continental United States but has experienced a disproportionate amount of coastal land loss compared to other Gulf Coast states. Projections of future land loss indicate that Louisiana's coast may be incapable of supporting historically vast populations of migratory and resident birds. Marsh terracing is a common restoration technique used to combat coastal wetland loss. This technique uses in situ sediment to construct segmented ridges in open water areas to enhance marsh conditions, subsequently establishing vegetation that benefits wetland-dependent fauna. Despite widespread use, past research and monitoring provided limited results on their value as avian habitat. Using ground and aerial surveys, our study evaluated avian use of marsh terraces across 24 paired sites (terraced and adjacent non-terraced sites) in coastal Louisiana. Avian surveys focused on breeding secretive marsh birds (SMB) and wintering waterfowl. Results indicate that presence/absence of marsh terraces influenced numbers of ducks detected, though relative abundance varied spatially and temporally. Preliminary results of the SMB analysis reveal that non-terraced sites were used by a greater abundance and diversity of SMBs than terraced sites, though analysis is ongoing. I suspect that site-specific characteristics and the occurrence of two catastrophic hurricanes influenced observed patterns of avian use of paired sites. Our study will better inform decisions on restoration techniques used to minimize marsh loss and improve avian habitat availability at local and regional scales.

Baseline Flow, Gage Analysis, and On-Line Tool Development Supporting Bay and Estuary Restoration in Gulf States

Kirk Rodgers
U.S. Geological Survey

The U.S. Geological Survey in cooperation with the Gulf Coast Ecosystem Restoration Council and the U.S. EPA are collaborating to assess the climatic, physiographic, and anthropogenic factors driving spatial variability and temporal trends in the freshwater delivery to the Gulf of Mexico. The timing and magnitude of freshwater delivery influences terrestrial and aquatic communities, changing community composition and altering habitats necessary to support indigenous life. The 9- year, 8.9 million dollar projects examine multiple aspects of streamflow including streamflow trends, alteration of flow, lowflow statistics, and flow-ecology relationships in the southeast United States. Data produced as part of the Baseline Flow study is served on the RESTORE Data Visualization tool which utilizes modern web technologies and numerous free and open-source software (FOSS) libraries to provide user with an engaging experience through a high degree of interactivity and responsiveness. The web application provides a map-based interface for viewing spatial patterns of basin characteristics, streamflow statistics, and various metrics of flow alteration across the Gulf Coast region.

Benefit-Cost Analysis of Oyster Reef Restoration in Alabama and Mississippi

Barbara Okai [1], Daniel Petrolia [1], Matthew Interis [1], Seong Do Yun [1], Zhenshan Chen [1], Judy Haner [2], Thomas Mohrman [2]
[1] Mississippi State University; [2] The Nature Conservancy

Oyster reefs provide economic benefits such as food, habitat for other fish, improved water quality, stabilized shorelines, and increased biodiversity. Oyster reefs have seen an 85% decline globally over the past century, which has led to recent restoration efforts. This study aims to conduct a Benefit-Cost Analysis (BCA) for the various ecosystem services provided by restored oyster reefs. The data in this study are obtained from two sources. The first source is economic benefits estimates from the economic valuation literature, which will be applied using the benefit transfer method. The benefit transfer method takes benefit estimates from existing studies and adjusts them to present needs. The second source is project construction and monitoring reports for 13 completed or proposed oyster restoration projects in Alabama and Mississippi. These projects represent the set of larger-scale projects in the study area, with planning and construction costs ranging from $3.2 million to $50 million per project. One contribution of this study is to determine the extent to which the choice of benefit transfer method (value transfer, function transfer, or meta-analysis regression) impacts benefits estimates for the ecosystem services of restored oyster reefs. The findings of this study can serve as a template for evaluating future restoration efforts.

Breakwaters and Benthos: Impacts of Shoreline Restoration on Infaunal Communities

Aaron Bland [1], Alexandra Rodriguez [2], Ronald Baker [1]
[1] Dauphin Island Sea Lab/University of South Alabama; [2] Dauphin Island Sea Lab

Shoreline restoration aims to develop coastlines that are resilient to erosion and storm surge while promoting ecosystem services. Many restoration projects, including 'living shorelines', incorporate breakwaters to reduce wave activity; these structures may modify the local sediment depositional environment and provide a greater diversity of nearshore habitat types. Changing sediment properties and introducing new habitat features can significantly alter and potentially enhance the composition and abundance of resident infaunal communities, an important component of the nearshore ecosystem that transfers production to higher trophic levels. To determine whether restoration activities have structured infaunal communities, we collected benthic cores at Alabama living shoreline sites and adjacent unimpacted reference locations. Cores were collected on transects from outside the breakwater to inside the marsh edge. Therefore, the impacts of living shoreline restoration on infauna were contextualized against typical cross-shore variability. This study addresses whether shoreline restoration modifies infaunal communities and potentially affects ecosystem functioning. By examining the connections between breakwater installation, sediment modification, the provision of habitat features, and infaunal community structure, we help inform the future design and siting of responsible coastal management activities.

Bucktown Living Shoreline: Benefits of Public-facing Habitat Restoration

Mindy Joiner [1], Lauren Averill [2], Michelle Gonzales [2], Kevin Hanegan [1], Gerald Songy [1]
[1] Moffatt & Nichol; [2] Jefferson Parish

The Bucktown Living Shoreline project in Metairie, LA will provide many benefits, including habitat, resilience, recreation, and education benefits, to the Bucktown community. Using off-shore breakwaters combined with natural and nature-based features, including planted marsh and uplands, protected estuarine nursery, and tidal creeks, this project will introduce heterogeneous habitat for marsh species. Approximately 20 acres of marsh and 0.75 miles of shoreline will be constructed and will benefit the ecosystem by providing habitat for marsh species, fisheries enhancement, and increased water quality in the project area. The living shoreline will be constructed shoreward of the Hurricane Storm Damage Risk Reduction System (HSDRRS) and will contribute to the Multiple Lines of Defense Strategy, an innovative approach to increasing resilience of the levee and the community. Additionally, a unique project aspect is the inclusion of a blueway between the breakwaters and marsh. This blueway will provide a continuous path for paddling activities and will allow the community access to water recreation in the lake. This project will help facilitate a stronger relationship between Jefferson Parish residents and surrounding native habitats. Another unique aspect of this project is an educational benefit to the community. The project footprint is next to the Bucktown Peninsula, a public recreational area. Educational signage will be established onsite extolling the benefits of wetlands and the protection offered by the project. This project is a rare opportunity to construct a living shoreline in a highly visible area where the public is encouraged to enjoy the benefits.

Building a Comprehensive Archive and Open Access Data Portal for Monitoring Marine Microplastics - the NOAA NCEI Global Marine Microplastics Database and Web Map

Jennifer Webster [1], Ebenezer Nyadjro [2], Gunnar Kaltenberger [3], Lenny Collazo [1], Tiffany Toft [1], Zhankun Wang [2], Yee Lau [2], Just Cebrian [2], Tim Boyer [1], Kirsten Larsen [1]

[1] National Oceanic and Atmospheric Administration; [2] Mississippi State University; [3] General Dynamics Information Technology

Microplastics (< 5 mm) pollution is a growing problem affecting coastal communities, marine ecosystems, aquatic life, and human health. Aquatic biota such as plankton, fishes, and shrimp ingest microplastics that interfere with organ functions, reduce growth, and eventually kill these organisms. Microplastics can also bioaccumulate in humans through the consumption of seafood, possibly leading to oxidative stress and cell damage. Despite the extensive negative impacts, studies on microplastic consequences have been limited due to the lack of large-scale, long-term monitoring and collection of data. The National Oceanic and Atmospheric Administration (NOAA) National Centers for Environmental Information (NCEI) now offers global open access to marine microplastics data on an easily discoverable, public GIS web map and data portal https://www.ncei.noaa.gov/products/microplastics. The objective of this data portal is to provide a repository where microplastics data are aggregated, archived, and served in a user friendly, consistent, and reliable manner. This work contributes to NCEI's efforts towards data integration, harmonization, and interoperability among national and international collaborators for monitoring global marine microplastics. In concert with national and international efforts, NCEI aims to adapt to user needs as contributors to this rapidly evolving science come to a consensus on reporting metrics and sampling methods. Through this data visualization and access portal, researchers and interested groups will be able to access and analyze data that will enable a better understanding of the potential impacts that microplastics may have on human health, marine wildlife, and the blue economy.

Changes in the Fish Community Following Artificial Reef Installation in a Northern Gulf of Mexico Estuary

Michael Archer, Jonathan Pitchford, Michael Brochard, Cher Griffin
Grand Bay National Estuarine Research Reserve

The Grand Bay estuary is a retrograding deltaic system along the northern Gulf of Mexico experiencing shoreline erosion rates of 0.50 – 6.50 m/yr. Total marsh extent at the Grand Bay National Estuarine Research Reserve is decreasing as exposed erosional marsh edge loss is exceeding upland-marsh migration. Sub- and intertidal artificial reefs were installed within the Reserve in late 2020 and early 2021 with the goals of decreasing shoreline retreat by reducing wave energy and creating functional habitat. Using a Before-After-Control-Impact (BACI) experimental design, resident and transient fish assemblages were monitored pre- and post-reef installation every other month for two years using a gill net at the three sub- and intertidal reef sites and three control sites. Preliminary results are showing an increase in hardhead (*Ariopsis felis*) and gafftopsail (*Bagre marinus*) catfish, croaker (*Micropogonias undulatus*), and speckled trout (*Cynoscion nebulosus*) at reef sites compared to control sites. The total number of fish caught in the gill net has decreased at all sites post-reef construction, however, sites where the reef was installed saw a much smaller decrease compared to control sites. All reef sites had an increase in total fish caught post-reef installation if the decrease in menhaden (*Brevoortia patronus*) was excluded. Artificial reefs can hopefully be a valuable tool in conserving marsh extent as well as creating functional habitat and this project will be used to inform project managers about their impact to the local fish community in an estuary environment.

CHANGES: A High School Education Program for Coastal Restoration, Management, and Monitoring

Sandra Bilbo, Dennis McGrury
Grand Bay National Estuarine Research Reserve

The Grand Bay NERR is home to estuarine marsh connecting to more upland wet pine savanna habitat. These ecosystems undergo constant change due to selective pressures, requiring continuous application of management, monitoring, and restoration. This presents a perfect opportunity to use these unique habitats and current management applications as a platform to educate students about ecological processes and applicable restoration practices. Grand Bay NERR was awarded a National Academy of Sciences Capacity Building grant for science education. Our program, CHANGES, aims to support the development of environmental literacy and stewardship in future generations and supply direct exposure to the real-world work of natural resource managers using student-centered, field-based education. Grand Bay NERR scientists and educators collaborated with local teachers to develop scientifically accurate, high quality lesson plans, and programming aligned with state and national science education standards. This hands-on education program took place in local classrooms and included two field days at Grand Bay NERR. In this presentation, the Bays & Bayous audience will learn about the program, the creative development process that includes input from teachers and science professionals, and its progress within the award period. A major takeaway was support from scientists and educators alike, so all scientists, resource managers, program directors, and educators are welcome to attend.

Characterizing Hypoxia on the Alabama Shelf During Unprecedented 2019 Opening of the Bonnet Carré Spillway

Brian Dzwonkowski, John Lehrter, Jeff Coogan, Zhilong Liu, Grant Lockridge, Devanarayana R. M. Rao
Dauphin Island Sea Lab/University of South Alabama

In spring and summer of 2019, the two openings of the Bonnet Carré Spillway represented an unprecedented influence on natural modes of variability in a coastal system. The abundance of river discharge diverted by this event has an unknown potential for impacts on water quality and coastal dynamics in this region. Using a combination of data from shelf hydrographic surveys and a mooring site during the event, the dissolved oxygen dynamics on the shelf are investigated. Extensive of areas of hypoxia on the shelf were observed throughout the summer study period with high variability in both space and time. Patterns in the along and across-shelf bottom dissolved oxygen spatial structure were apparent in the data. In the along-shelf direction, dissolved oxygen tended to decrease from east to west. The across-shelf pattern was more complex with mid-shelf minimum between ~12-25 m. Furthermore, time series data of bottom dissolved oxygen from June through September were correlated with changes in bottom temperature, revealing a significant connection to upwelling/downwelling events and the presence or absence of hypoxia on the inner to mid-shelf. The results of this study are expected to facilitate the development of more effective mitigation and adaptation strategies in response to current and predicted changes in coastal oceans.

Characterizing the Distribution of Phragmites australis using Precise Measurements of Elevation, Topography, and Surface Water Salinity

Margaret Waldron, Patrick Biber, Carlton Anderson, Gregory Carter
University of Southern Mississippi

The increase in extent of the competitive *Phragmites australis* in several of Mississippi's coastal marsh areas raises questions about how these marshes may develop, in terms of both spatial extent and ecosystem function. To better characterize tolerance limits of P. australis and estimate future spread potential, we are investigating the elevation range, topography, and surface-water salinity in *P. australis*-dominated areas. Vegetation and salinity measurements were collected during the 2022 growing season in the Pascagoula River, Jourdan River, and Hancock County Coastal Preserves. Two *P. australis*-dominated and two adjacent non-*P. australis* dominated transects were surveyed (RTK GNSS, Trimble R12i) at each site to record elevation and species presence at 0.5m intervals. Transects began in the water 1.5m before the shoreline and continued landward perpendicular to the shoreline, traversing the entire width of the *P. australis* patch at each site. Surface salinity was recorded at 15min intervals (Star-Oddi CT/CTD) beginning in August 2022. While maximum elevations of occurrence were similar among *P. australis*, *Juncus roemerianus,* and *Spartina cynosuroides*, minimum elevations for *P. australis* were the lowest among all species sampled at all sites. Additionally, the lowest-salinity site (Pascagoula) exhibited lower elevations for *P. australis*, *J. roemerianus*, *S. cynosuroides*, and *Sagittaria lancifolia* than the two higher-salinity sites. Data from these and additional sites will be synthesized with aerial image data documenting historical trends in *P. australis* distribution to assess the impacts of several physical environmental variables on inundation tolerance and rate of spread.

Characterizing Wave Climate to Inform Shoreline Protection Design

Peyton Posey [1], Kevin Hanegan [1], Nick Cox [1], Matthew Jones [2], Tina Sanchez [2], Meg Goecker [1]
[1] Moffatt & Nichol; [2] Mobile County Environmental Services

Just north of the mouth of East Fowl River, the Salt Aire marsh has experienced about 415 feet of shoreline erosion since the 1930s. The Salt Aire Shoreline Restoration Project aims to restore and stabilize approximately 30 acres of intertidal marsh habitat. The wave climate impacting the project site is the governing input in the shoreline protection design. In order to characterize the wave climate, Moffatt & Nichol performed a regional modeling effort using the Mike21 FM Spectral Wave model. The regional model was forced using wind and water level data hindcast over 34 years under low-intermediate sea level rise projections. The model was calibrated using two measured data sources: one offshore in deeper water and one nearshore in shallower water. The results of the modeling effort were statistically evaluated to determine water level, significant wave height, and peak wave period corresponding to different environmental conditions (percent exceedance and return period events). These results were used to calculate wave transmission through shoreline protection features for varying geometries, resulting in a risk-cost matrix for the project owner to use as a decision-making tool. This presentation will discuss means and methods utilized in the numerical modeling effort, summarize the wave climate at the project site, and describe the risk-cost matrix that resulted from the wave characterization.

Co-Producing a Shared Characterization of Depredation in the Gulf of Mexico Reef Fish Fishery

Ana Osowski [1], Amanda Jefferson [1], Alena Anderson [2], Danielle McAree [2], Steven Scyphers [3], Savannah Swinea [4], Evan Prasky [4], Sarah Gibbs [3], Mandy Karnauskas [5], J. Marcus Drymon [1]

[1] Mississippi State University/Mississippi-Alabama Sea Grant Consortium; [2] Mississippi State University; [3] Dauphin Island Sea Lab/University of South Alabama; [4] Northeastern University; [5] National Oceanic and Atmospheric Administration

Depredation, defined as the partial/complete removal of a hooked fish by a non-target species, is a cryptic form of mortality that can have significant implications on the accuracy of stock assessments and species management efforts. Given escalating occurrences of depredation in the Gulf of Mexico (GoM) reef fish fishery and increased frustration from stakeholders concerning this issue, we worked to produce a shared characterization of the impacts of GoM reef fish depredation. First, we gathered and analyzed an existing GoM depredation-related dataset. Then, we designed and implemented a depredation-focused electronic survey of GoM fishermen. Data synthesis from these two phases laid the groundwork for a collaborative workshop, which: 1) allowed stakeholders to develop and assess regional GoM reef fish depredation community models; 2) facilitated in-person discussion and reciprocal learning among researchers, resource managers, and stakeholders about GoM reef fish depredation; and 3) identified knowledge gaps concerning GoM reef fish depredation. Stakeholders identified contributing factors to increased depredation rates, including changes in fisheries management and socio-economic dynamics, and environmental/ecological alterations. Regions with the highest depredation rates were identified through participatory mapping exercises and included areas off Pensacola, FL, and Galveston, TX. Community models developed from group discussion illuminated differences in perceptions and attitudes towards depredation at the state level. Solutions to increased depredation included the implementation of a directed/expanded shark fishery and support for shark deterrents. Our efforts represent a first step to quantify the nature and extent of depredation in the GoM reef fish fishery.

Coastal Attribute Data Analysis Based on Living Shoreline Suitability Models for Selected Water Bodies and Coastal Metropolitan Areas in the Gulf of Mexico

Chris Boyd, Xutong Niu
Troy University

Living Shorelines Suitability Model (SSM V3.0 and V5.1, developed by the Virginia Institute of Marine Sciences) was successfully run for Mobile Bay, Alabama (SSM V3.0), the Perdido Bay, Ono Island Complex, Alabama, Lake Pontchartrain, Louisiana, Galveston Bay, Texas, and Pensacola Bay, Florida (SSM V5.1). The SSM model results have provided resource managers with suitable shoreline management recommendations and help them to make improved restoration decisions for coastal erosion protection. Shoreline attributes that were collected and used in running these SSM models also provide abundant information about different geomorphic features, extent of tidal shorelines, percent coverage of coastal structures, and nearshore habitats that can be further analyzed and compared to broaden our knowledge and understanding of shorelines within these bay areas in the Gulf of Mexico. This presentation will present statistical analysis results associated with these attribute data that include beach, fetch, bathymetry, riparian land use, shoreline protection structures both onshore and offshore, subaquatic vegetation, and tidal marsh. It is found that the percent gray infrastructure ranged from 16% in the Pensacola Bay Watershed, Florida to 42% in Lake Pontchartrain, Louisiana, with the percent green infrastructure ranging from 0.4% in the Perdido Bay, Ono Island Complex to 11.4% in Galveston Bay, Texas. The percent high fetch was greatest in Lake Pontchartrain, Louisiana (84.5%), with Perdido Bay and Ono Island Complex, Alabama and Galveston Bay containing the greatest percentage of low fetch. Correlation analysis between coastal population distribution patterns and shoreline land use changes will be presented as a part of this research.

Community's RISE: Bringing Sea-Level Resilience Education to the Community in Unexpected Places

Alison Rellinger [1], Renee Collini [1], Andrew Medhurst [1], Tina Miller-Way [2], Stephanie Patch [3], Tracie Sempier [4], Eric Sparks [5], Natalie Ortell [6], Donna Peterson [5]

[1] PLACE:SLR; [2] Dauphin Island Sea Lab; [3] University of South Alabama; [4] Mississippi-Alabama Sea Grant Consortium; [5] Mississippi State University; [6] Alabama School of Math and Science

The Community's RISE project works to bring community members at all levels of understanding and engagement into the conversation about future flood resilience and direct them towards the next steps in their pathway to fostering a resilient community. As part of this project, we're connecting with residents throughout the northern Gulf Coast via Pop-In events. The Pop-Ins are immersive sea-level rise experiences at "every day" locations (e.g., baseball games, art walks) to reach those in our community without the means or motivation to otherwise engage in future flood resilience. Pop-Ins are designed to be conducted by our community partners in each of 12 locations (4 Florida panhandle, 4 Alabama, 4 Mississippi). Our Pop-in activities are designed using lessons learned from past experiences, social science research on sea-level rise and flood risk perceptions, and input from an advisory board of citizens ranging from novice to experienced in outreach in science and climate. Games and hands-on activities are curated for hyper local engagement using imagery and examples from the coastal towns and cities where each Pop-In is held. This session will discuss the process of creating and evaluating content for this type of event as well as explore some of the content used at these events. These Pop-Ins represent one part of our three-part strategy to foster a scientifically and civically literate community that can actively support cultures, economies and economies that are resilient to sea-level rise.

Community's RISE: Comprehensive Sea-Level Rise Outreach and Program Evaluation

Renee Collini [1], Donna Peterson [2], Alison Rellinger [1], Andrew Medhurst [1], Tina Miller-Way [3], Natalie Ortell [4], Stephanie Patch [5], Eric Sparks [2], Tracie Sempier [6]
[1] PLACE:SLR; [2] Mississippi State University; [3] Dauphin Island Sea Lab; [4] Alabama School of Math and Science; [5] University of South Alabama; [6] Mississippi-Alabama Sea Grant Consortium

Community's RISE is an inclusive SLR education and outreach program that spans ages, locations, and demographics to generate better prepared coastal constituencies. The program activities target different community sectors: 1) educator workshops encouraging application of an updated SLR curriculum for high school students; 2) Community Connection Dialogues that connect community leaders working on SLR with engaged constituents to inform and empower future action; and, 3) pop-in immersive SLR experiences at "every day" locations (e.g., baseball games, art walks) to reach those without the means/motivation to engage in SLR resilience. In this presentation we will describe the overarching project and the methods for developing and implementing this framework. Additionally, though some literature is available regarding residents' perspectives around SLR and willingness to pursue resilience actions, there have been few efforts to evaluate and share the results of extension, outreach, and education work affecting perceptions and willingness to take action for SLR resilience. Therefore, an important component of this project is evaluating the effectiveness of these efforts to educate and inspire action among participants. A RE-AIM evaluation framework is being used to determine the reach, effectiveness, maintenance at the participant level and adoption, implementation, and maintenance at the programmatic level. In this talk we will review the evaluation framework and how it can be applied to education and outreach programs broadly to assess their effectiveness. We will also discuss what we have learned so far regarding our program and make recommendations for future SLR-focused education and outreach programming.

Community's RISE: Connecting Engaged Residents and Municipal Officials in Productive and Educational Dialogue

Andrew Medhurst [1], Renee Collini [1], Alison Rellinger [1], Tina Miller-Way [2], Natalie Ortell [3], Donna Peterson [4], Tracie Sempier [5], Eric Sparks [4]
[1] PLACE:SLR; [2] Dauphin Island Sea Lab; [3] Alabama School of Math and Science; [4] Mississippi State University; [5] Mississippi-Alabama Sea Grant Consortium

The Community's RISE project works to bring community members at all levels of understanding and engagement into the conversation about future flood resilience and direct them towards the next steps in their pathway to fostering a resilient community. One component of the Community's RISE project is Community Connection Dialogues which focus on connecting residents with sea-level rise information and resources. Community Connection Dialogues are designed to connect informed and engaged constituents with municipal officials who are actively supporting sea-level rise and flood resilience activities in their communities. These events introduce residents to the basics of sea-level rise, the science behind changing flood risks, the associated impacts of sea-level rise, and how to plan and prepare in their community. Each event is co-hosted by a local community organization and a municipal partner who are able to highlight ongoing resilience actions in the area and provide expertise and resources for continuing discussions on building resilience to sea-level rise in the future. This presentation will introduce the process for conducting the Community Connection Dialogues and review data collected to evaluate their effectiveness at increasing knowledge and changing behavior for both community residents and municipal officials.

Community's RISE: Helping Educators and Students Foster Sea-Level Rise Resilience

Alison Rellinger [1], Renee Collini [1], Andrew Medhurst [1], Tina Miller-Way [2], Stephanie Patch [3], Tracie Sempier [4], Eric Sparks [5], Natalie Ortell [6], Donna Peterson [5]

[1] PLACE:SLR; [2] Dauphin Island Sea Lab; [3] University of South Alabama; [4] Mississippi-Alabama Sea Grant Consortium; [5] Mississippi State University; [6] Alabama School of Math and Science

The Community's RISE project works to bring community members at all levels of understanding and engagement into the conversation about future flood resilience and direct them towards the next steps in their pathway to fostering a resilient community. As part of our Community's RISE project, we're connecting with teachers and educators through our Sea Level Rise in the Classroom curriculum. This curriculum features lessons on sea-level and flooding basics, natural solutions such as living shorelines, ordinance and policy solutions, and community planning. The curriculum was developed in collaboration with educators in the Gulf and after completion we conducted hands-on trainings so educators can confidently instruct their students fostering community members that support personal and community solutions to rising seas. The curriculum connects students with the tools to explore the local impacts of sea-level rise as well as learn how to identify stakeholders, assess risk, and other essential skills on their pathway to understanding how to create a community resilience plan. Educators were surveyed before and after workshops and will continue to be interviewed to determine their use of the curriculum materials and sea-level rise resilience education in their classrooms. These evaluations allow us to track impacts of this type of education, success of uptake, and effectiveness at meeting learning and behavior change objectives. This portion of the session will explore the curriculum activities, how the high school classroom can be part of community wide resilience efforts, and evaluation results.

Comparing Finfish and Crustacean Assemblages Among Established Marsh Terraces, New Marsh Terraces and Open Water in a Restored Brackish Marsh

Shasta Kamara, Allyse Ferrara, Quenton Fontenot, Gary LaFleur, Jonathan Willis
Nicholls State University

Louisiana has lost approximately a quarter of coastal lands that were present in 1932 from a variety of natural and anthropogenic factors, thus necessitating restoration activities. One technique is creating marsh terraces in areas where marsh has been degraded to open water. Terraces provide edge habitat and slow land loss by reducing wave energy in surrounding marsh. This study evaluated the influence of marsh terraces on finfish and crustacean assemblages in a brackish marsh east of Golden Meadow, Louisiana. The habitats evaluated were new terraces built in 2022, established terraces built in 2017, and an open water area. Gee's minnow traps, gill nets and a shrimp trawl were used to sample along terrace edges, terraces channels and in open water. Sampling occurred twice a month May through October 2022. Finfish and crustaceans were identified to species, counted and measured (mm). Catch per unit effort (CPUE) was calculated as number of individuals collected per unit of effort for each gear type. *Fundulus grandis* (Gulf Killifish) collected in minnow traps had a higher mean CPUE (± SE) in established terraces (0.26 ± 0.08) than new terraces (0.01 ± 0.01; $F_{1,22} = 13.43$, $P = 0.001$), but no differences were detected for other species. Differences between established and new terraces may indicate changes in edge habitat quality for some species while trawl data indicate finfish assemblages are not different among habitats. Examining finfish and crustacean assemblages provided insight into possible ecological effects of terraces and how those effects may change over time.

Connecting with Media as Research Progresses

Angela Levins
Dauphin Island Sea Lab

Scientists are increasingly expected to share their work with both professional peers and non-technical, lay audiences. Professional sharing is important for the exchange of scientific knowledge and to improve resource management while communication with non-scientific audiences is essential to inform community members and decision-makers, build trust and increase transparency. Research takes time and some research projects have more than one message from receiving grant monies to publication. Some research projects expand over time, building on previous findings to add another level of understanding. Each milestone can be another opportunity to share how the research is impacting policy, enhancing management, and expanding our understanding. Each level of research is a chance to engage your community. Discover how to bring the reporter back to the project even if they've reported on the story before with an example built from crab pee and strengthening oysters.

Control of Invasive Island Apple Snails (*P. maculata*) in the Three Mile Creek Watershed

Cassie Elderage [1], Don Bates [1], Shawn McNulty [2]
[1] Osprey Initiative; [2] American Sport Fish

Apple snails (*P. maculata*) exhibit high reproductive potential, growth rate, dietary flexibility, and resistance to several environmental conditions including hypoxia, high temperature, and desiccation. These attributes make them an efficient invasive species and a threat to native gastropods' ability to find necessary resources. American Sportfish and Osprey Initiative (Osprey) were contracted by the Mobile Bay National Estuary Program (MBNEP) to remove the invasive snails from the infested watershed using environmentally low-impact methods, including the manual removal of the snails over a three-year interval. The manual removal of the snails was supplemented by molluscicide application in years two and three to minimize the population and prevent spread into the Mobile-Tensaw Delta or neighboring watersheds. The combination of manual removal and chemical treatments was shown to effectively decrease the apple snail population within Langan (Municipal) Park. Over the project's life, the weekly average of both snails and eggs decreased significantly. For eggs, the 2020 average was 2782, the 2021 average was 570, and the 2022 average was 357. For snails, these numbers were 559, 113, and 33 respectively. This targeted approach is efficient with little impact on native species. Osprey recommends utilizing this approach to remove and mitigate apple snails as part of a comprehensive invasive species management plan.

Creating Place in Paradise

Brandon Bias
Goodwyn Mills & Cawood, Inc.

Over the years, Dauphin Island, Alabama has been impacted by many events or disasters and each of these places a surprising strain on the Town. When these events or disasters occur, the tourism industry - the life blood of the community - practically disappears. As a recent example, the Town spent nearly $2 million in 2019/2020 in excess of disaster assistance funds on infrastructure, clean-up, and recovery from multiple storms. Considering the Town's annual budget is typically only $4 million, that 50%+ expenditure for recovery represents a significant impact to the Town. Town Leadership began to recognize these vulnerabilities and the need for both physical and fiscal resiliency many years ago. Following Hurricane Katrina in 2007 the Town adopted an ambitious Strategic Plan in which a town center was envisioned along a central and protected area called Aloe Bay. The plan included revitalizing a true working waterfront which builds upon the past, and creates a small mixed-use area with commercial fishing, eco-tourism activities, housing and retail space. This represented a significant consideration by the community to recognize Aloe Bay as a point of economic sustainability for the Town into the future. Following the Deepwater Horizon oil spill in 2010, the Town chose to leverage these ideas as part of a funding request to the Alabama Gulf Coast Recovery Council, resulting in the Town being awarded over $16.5 million for physical improvements to make this vision a reality through the Aloe Bay Town Center Master Plan.

Dauphin Island East End Beach & Dune Restoration

Thomas Buhring [1], Scott Douglass [1], Jeff Collier [2]
[1] South Coast Engineers; [2] Town of Dauphin Island

The 2015-2016 Dauphin Island East End Beach and Barrier Island Restoration Project, one of ASBPA's Best Restored Beaches of 2017, was the first major beach nourishment constructed in the island's 300+ year history. Over the last seven years, it has weathered multiple significant tropical weather events and successfully halted the ongoing erosion within the project area, which had lost as much as 700 feet in width in recent decades. Now the Town of Dauphin Island is designing a major extension of the project with funding from the National Fish and Wildlife Foundation's (NFWF) Gulf Environmental Benefit Fund (GEBF). This presentation will summarize the status of the upcoming Dauphin Island East End Beach & Dune Restoration Project, currently in the design phase and planned for construction in Summer 2023. The upcoming beach and dune restoration will renourish and expand the existing project with approximately 1.14 million cubic yards of beach quality sand, widening the beaches of the East End by about 350 feet in order to restore Gulf-front beach and vegetated dune habitat, including nesting and foraging habitat for seabirds, shorebirds, and sea turtles. The beach nourishment will also reduce the risk of saltwater intrusion and breaching into a nearby Audubon Bird Sanctuary freshwater lake, introduce beach sands into the littoral drift of the barrier island, and increase the resilience of the East End to sea level rise and extreme events.

Dauphin Island Watershed Management Plan: Building on the Past to Plan for a Sustainable and Resilient Future

Chris Warn, Eric Schneider
Environmental Science Associates

Dauphin Island is a barrier island with a rich cultural and ecological heritage which draws tens of thousands of visitors every year from across the United States. Historical and recent hurricanes and made-made disasters such as Hurricanes Ivan (2004), Katrina (2005), and the Deepwater Horizon (DWH) oil spill (2010) have resulted in substantial ecological changes on the Island. These events, coupled with significant increase in housing development, have resulted in the loss and degradation of natural habitats, including wetlands, seagrasses, beach and dune habitats, and maritime forest. Impacts from a changing climate, including sea level rise and coastal storms, continue to damage these habitats, threatening the ecological resources and local economy. To address these issues, a watershed management plan was developed in collaboration with the MBNEP, Town of Dauphin Island, Mobile County, and ADCNR to engage the community and its stakeholders to protect, restore, and enhance the Island's ecological assets while simultaneously implementing innovative solutions to promote and sustain the Island's human community and economy. This presentation will discuss some of the challenges and opportunities that were encountered in developing this plan as the community sought balance between economic resiliency and coastal resiliency, while struggling to maintain its cultural heritage and natural beauty.

Dauphin Island, AL Living Shoreline Designs in Aloe Bay

Kate Dawson [1], Meg Goecker [1], Gerald Songy [1], Jeff Collier [2]
[1] Moffatt & Nichol; [2] Town of Dauphin Island

The Aloe Bay shoreline of Dauphin Island, AL has long been subject to storm surge, erosion, and habitat loss and degradation. The engineering and design of two living shorelines within the bay is currently underway to help address these issues. The shorelines are located on the northeast side of the bay off El Dorado Avenue and on the south side of the bay off De Soto Avenue. These respective shorelines have eroded approximately 140 feet and 100 feet over the last 30 years. The proposed designs will include shoreline protection features, placement of fill to create beach and marsh habitat, incorporation of oyster reef habitat, and improved recreational access. Implementation of these projects will help restore marsh and oyster habitat along the north side of the island in a culturally and ecologically significant region. They will not only improve the island's overall estuarine productivity and provide much needed shoreline habitat restoration but will also improve community resilience by protecting critical infrastructure assets and enhancing the vitality of Aloe Bay, the island's town center and economic hub. These projects are proposed for discussion as part of the Dauphin Island Dedicated Session Managing Rising Tides and Shifting Sands to Maintain Balance Between Nature, Culture, and Economy.

Deer River Coastal Marsh Restoration

Mark Saunders
Thompson Engineering

Located within the Deer River Watershed, the Deer River marsh system, one of the largest intact marsh complexes on the western shore of Mobile Bay, has long suffered from the impacts of winds, tides, wakes, and storm surge. Protecting this approximately 275-acre tract of salt marsh is a priority recommendation of the Western Shore Watershed Management Plan. With funding from the National Fish and Wildlife Foundation Gulf Environmental Benefit Fund and National Coastal Resilience Fund restoration activities are underway. Objectives of the project include: Stabilize and enhance up to 5,600 linear feet of shoreline; Reestablish the network of tidal channels, including the South and Middle Forks of Deer River, which are extremely shallow and impaired by siltation, limiting tidal exchange and circulation necessary to sustain the currently healthy marsh; Create up to 30 acres of additional marsh. Not without challenges, the project is currently in final design and permitting. The marsh-protection concept consists of an offshore constructed marsh island (3,000' long by 300' wide) with a segmented breakwater on its outer face. The marsh island will make beneficial use of 200,000 cubic yards of dredge material from the Mobile Harbor Channel deepening and widening project. As part of the Deer River hydrology enhancement approximately 50,000 cubic yards of soft organic material will be dredged from the channel, improving tidal flow and aquatic habitat. Thin-layer placement of this material will increase marsh elevations for approximately 50 acres, improving resiliency to storms and sea-level rise.

Delineation of Groundwater Recharge Areas in Baldwin County, Alabama for Water Management and Water Policy Development

Gregory Guthrie, Mary Hastings Puckett, Bennett Bearden, Gary Hastert
Geological Survey of Alabama

Implementation of Managed Aquifer Recharge (MAR) policies may provide useful tools for protecting shallow groundwater sources from natural and anthropogenic stressors that affect the amount and quality of available water. A shallow aquifer recharge model (SARM) developed for Alabama allows for the identification of potential shallow aquifer recharge areas. The model utilizes Multicriteria Decision Analysis in conjunction with the Analytical Hierarchy Process in a Geographic Information System environment to produce maps that can be modified for different climatic and land use scenarios to identify potential recharge areas. Baldwin County, one of Alabama's two coastal counties, is experiencing high growth and attendant land use conversion. Shallow aquifers are used extensively in this area to provide groundwater for domestic and irrigation purposes. Depth to the water table in Baldwin County fluctuates widely in response to changing climatic conditions, affecting water availability. The shallow aquifer contains sandy strata with high permeabilities which have the potential to promote rapid infiltration of contamination from septic tanks, agricultural runoff, and coastal flooding and storm surge during tropical storms. SARM maps indicate that extensive recharge areas have been lost over the last few decades resulting from conversion of open agricultural lands to urban landscapes, promoting surface runoff and diminishing potential aquifer recharge. Shallow aquifer contamination potential has also increased due to these changes. Implementation of MAR policies at the state and local levels can help address the loss of recharge areas by guiding management decisions that promote sustainable water resources for future growth and environmental health.

Depredation on Descender Devices: A Gulf-Wide Investigation

Danielle McAree [1], Alena Anderson [1], Amanda Jefferson [2], Angela Collins [3], Matthew Streich [4], J. Marcus Drymon [2]

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The post-release survival of discarded reef fishes is often hindered by pressure-related injuries known as barotrauma. Descender devices are effective tools designed to return a fish to the depth of capture, thereby minimizing the effects of barotrauma. While regulations require Gulf of Mexico anglers targeting species in the snapper-grouper fishery management unit to be equipped with descender devices, there is no way to enforce the use of such devices. The widespread acceptance of descender devices by Gulf of Mexico anglers is limited by concerns that these tools merely generate more opportunities for depredation, defined as the partial or complete removal of a captured species by a non-target species. Therefore, we initiated a study to measure the rate of depredation on reef fishes released using descender devices across the U.S. Gulf of Mexico and identify the species responsible for depredation. We incentivized 30 reef fish charter-for-hire captains across the region to collect data during their routine fishing trips. The captains are using downward-facing GoFish® cameras to record reef fish descents on SeaQualizer™ descender devices. Thus far, we have received video footage and accompanying data for 314 descender releases. These videos and data will be analyzed to calculate species-, region-, and depth-specific depredation rates. Ultimately, the results of this project will provide insight into the relationship between the use of descender devices and the occurrence of depredation on these devices in the reef fish fishery across the U.S. Gulf of Mexico.

Design, Construction and Monitoring of a Living Shoreline Project

Wendell Mears, Sarah Ballard, Renee Robertson, Rick Coupe
Anchor QEA, LLC

The Hancock County Marsh Living Shoreline Project (project) was developed as an Early Restoration (RESTORE) project; Early Restoration projects are intended to accelerate meaningful restoration of injured natural resources, and their services, resulting from the Deepwater Horizon oil spill. The Mississippi Department of Environmental Quality and National Oceanic and Atmospheric Administration (the federal and co-implementing trustee) worked cooperatively to develop a project along the Hancock County, Mississippi, shoreline. This project would partially offset injuries by preserving and protecting existing marsh and providing for increased secondary productivity. It is the first Mississippi RESTORE project to be designed and constructed. The project consists of three restoration components: 5.9 miles of living shoreline was constructed at two locations, from Pearl River to Heron Bay and from St. Joseph's Point to Bolan Bayou. By dampening the wave energy, the breakwater will help reduce shoreline erosion, protect the coastal preserve, and re-establish habitat that was once present in the region; Forty-six acres of marsh will be constructed with beneficial use (BU) dredged material to protect and restore marsh areas that have experienced historical erosion; and Forty-six acres of subtidal reef was constructed in Heron Bay to enhance habitat conditions and increase secondary productivity in the area. The project's purpose is to preserve and protect existing habitat while providing areas of secondary shellfish productivity. The selected alternative was a result of detailed geotechnical, wind-wave, and current analyses to locate and design the segmented breakwater, subtidal reef, and marsh components of the project.

Developing and Testing a Metric- Based Indicator of Functional Recovery for Tidal Marshes

Jacob Dybiec, Taylor Ledford, Shelby Rinehart, Behzad Mortazavi, Julia Cherry
University of Alabama

Despite their known importance, an estimated 25-50% of tidal marshes have been lost worldwide over the past 50 years, and those that remain are at increased risk of loss due to climate change. While tidal marsh restoration and creation efforts are used to offset these losses, the recovery of important functions like carbon storage and nitrogen removal capacity is often not assessed, due to time and budget constraints. As such, an accessible method for estimating the recovery of function in restored and created tidal marshes would be of great benefit to coastal sustainability efforts. Metric-based indicators have previously been used to assess ecosystem functions through simple and inexpensive biotic/abiotic measures and may therefore provide such a method. Using data collected from 12 restored/created and 4 natural tidal marshes across the Northern Gulf of Mexico during Summer 2021, we created a series of metrics capable of "scoring" functional recovery in tidal marshes using easy-to-measure factors such as site age, bulk density, and plant cover. By resampling these same 16 sites in Summer 2022, we were able to determine the accuracy of these metrics. This metric-based indicator of functional recovery will provide a critical tool to coastal restoration practitioners in properly assessing the outcomes of restoration and creation projects.

Developing Modeling Capacity to Reveal How Expanding Freshwater Inputs to Mississippi Sound Impact Environmental Conditions

Jerry Wiggert, Brandy Armstrong, Sandeep Kuttan, M. Kemal Cambazoglu, Kim de Mutsert
University of Southern Mississippi

The past ten years has seen a significant increase in freshwater inputs to the Mississippi Sound (MSS), associated with amplified riverine inflows and human managed freshwater diversions. In addition, with the intent of reversing wetland losses, the State of Louisiana has developed plans to invest in new man-made sediment diversion infrastructures that would further amplify these freshwater inputs to the region. As a first step toward assessing how evolving diversion implementations will affect living marine resources of the Mississippi Gulf Coast, the University of Southern Mississippi modeling group has developed a 400 m resolution, 24-layer circulation model of the Mississippi Sound and Bight (msbCOAWST), which utilizes the COAWST modeling system. This model is designed to support the coastal management community, providing the tools and resources needed to better evaluate complex scientific issues and inform resource management decisions. We are currently testing our model domain framework, which has been designed to explicitly include freshwater diversion constructs that affect the estuarine waters of the MS Sound/Bight. Here, we present initial results that demonstrate the utility of our modeling framework, focusing on the unprecedented 2019 freshwater incursions that led to catastrophic impacts on the oyster reefs situated within MS Sound.

Development of a Daily Operational Model for the Mississippi Sound and Bight

Brandy Armstrong, M. Kemal Cambazoglu, Jerry Wiggert
University of Southern Mississippi

The University of Southern Mississippi (USM) modeling group has developed a daily instance of the 400m resolution, 24-layer circulation model of the Mississippi Sound and Bight region based on a regional application established during the GoMRI- funded CONCORDE consortium. Called msbCOAWST, this model uses NOAA National Water Model (NWM) as river forcing, NOAA High Resolution Rapid Refresh (HRRR) as atmospheric forcing and is downscaled from a regional application of Navy Coastal Ocean Model (NCOM) for American Seas (AMSEAS), used as open boundary conditions. The model forcing assimilates observed stream gage values (NWM) and radar data (HRRR). NCOM AMSEAS assimilates all quality-controlled observations in the region (satellite sea surface temperature, altimetry, surface and profile temperature and salinity). Daily msbCOAWST output is available through Coastal CUBEnet and the USM THREDDS server. The modeling system has been designed to incorporate openings of the Bonnet Carré Spillway and is being used to provide guidance on the impact that local rivers and freshwater diversions have on conditions in the Mississippi Sound. Currently a daily hindcast is being run, and future efforts plan to include a now-cast and a one-day forecast. The msbCOAWST model will support the coastal management community and stakeholders, providing the tools and resources needed to better evaluate complex scientific issues and inform natural resource management decisions in the study area. The model can also play a role in connecting sparse in situ observations, assimilating and synthesizing them, and assist in the design of more robust observation networks.

Dietary Evidence of Facultative Cleaning by Juvenile Leatherjackets from Coastal Alabama

Kelsey Hofheinz [1], Alexandra Rodriguez [2], Ronald Baker [1]
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Carangidae is a family of carnivorous fish that, at maturity, primarily feeds on fish and mobile invertebrates. Juvenile Leatherjackets (Carangidae, *Oligoplites saurus*), feed on a variety of prey items, such as mysids, shrimp, and fish, and also consume fish skin, scales, and ectoparasites. There is conflicting evidence in the literature as to if these juveniles are incidentally consuming ectoparasites, or if they are in fact engaging in facultative cleaning behavior, specifically targeting these parasites. To determine if *O. saurus* are targeting scales or ectoparasites as a food source, the gut content of 130 juvenile leatherjackets, 21 - 100 mm TL, opportunistically collected throughout coastal Alabama were analyzed. 109 individuals had some food in the stomachs, and of these, scales were the most abundant food type, occurring in the stomachs of 66 individuals (61 %). Ectoparasites, the second most abundant prey item, were found in 52 stomachs (48 %). The high occurrence of ectoparasites relative to scales suggests that this species is actively targeting these parasites. Although cleaning behaviors are well studied on coral reefs, little is known about their potential importance in fish communities in turbid coastal environments. Monitoring the diets of these common fish could potentially provide an indicator of the parasite load and general health of coastal fish communities.

Disturbance in the Delta: Examining Plant Community Response to Physical Disturbance in the Mobile-Tensaw Delta

Thelma Hammer, Kelly Major, Emily Newman, Jeremiah Henning
University of South Alabama

In species rich ecosystems, disturbance promotes biodiversity by facilitating the establishment of rare taxa. However, intensive disturbance events may alter community composition and ecosystem function if communities are re-established by non- native species. The Mobile-Tensaw Delta (MTD) is a unique mosaic of diverse habitats that are subject to frequent disturbance events, including hurricanes, flooding, land transformations, and increasing invasive species establishment. To understand the role of disturbance in promoting biodiversity in the MTD and recovery following a disturbance event, we established a disturbance experiment across two habitat types at Jacinto Port Forever Wild Tract (Saraland, AL). We established a series of 1 x 1 m2 paired plots at 2 sites (a mesic mixed-hardwood-pine forest and a hydric bottomland forest) and rototilled one of the pairs by random selection. Prior to rototilling, we performed floristic surveys and collected soil samples to implement a full Before-After-Control-Impact experimental design. Plant and soil community recovery was monitored at 3 and 6 months post disturbance and will continue every 3 months for the next year. Our preliminary results suggest that disturbance may facilitate the establishment of non-native plants like *Phyllanthus urinaria*, which was more prevalent in our physically-disturbed plots after 3 months. By investigating the potential shifts in plant community structure and resilience, we aim to contribute to the understanding of both long and short-term physical disturbance in deltaic systems, and the efficacy of current conservation practices.

Do Tropical Cyclones Short-Circuit Sedimentary Elemental Sequestration in the Northern Gulf of Mexico?

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In coastal systems, primary productivity is dominated by diatoms, a group of phytoplankton which produce a shell of amorphous biogenic silica (bSi); after death, diatom bSi sinks and is sequestered in sediments. Tropical and subtropical coastal systems sequester ~25-40% of the global silica burial. In sediment, bSi can be buried in its original unaltered form or undergo diagenetic alteration via reverse weathering, which been proposed as the missing sink for a suite of major elements (Mg, K), alkalinity, and trace elements. Hurricane Ida moved through the Louisiana shelf at the end of August 2021. Sediment samples collected days before landfall were taken, along with four additional periods between December 2021 and August 2022. The storm response was variable among sites but appeared to be related to grain size. At a clay dominated site, there was a decline in sediment bSi and apparent reworking of sediments (increase in grain size proportion) post storm. In a silt dominated site, there was an decrease in the fraction of clay and fine silt in surface sediments and also a corresponding decline in bSi. Early results suggest that the storm-driven injection of oxygen into the surface sediments stimulated bSi dissolution and potentially enhanced liberation of particle-bound Si from diagenetic products. Thus, tropical cyclones may weaken the regional sediment silica sink and facilitate water-column diatom production via benthic flux. These results help us understand how element sequestration may be altered regionally in a future with more intense cyclone events.

Drivers of Long Term Spatiotemporal Shifts in Nekton Communities in Coastal Alabama: 1981 - 2018

Hannah Ehrmann, Ronald Baker
Dauphin Island Sea Lab/University of South Alabama

Coastal ecosystems are undergoing significant changes driven by a range of stressors, many resulting from localized impacts of climate change. Long term environmental changes affect community structure, primarily by shifts in dominant or key species. This study quantified nekton community and species level responses to environmental variation over recent decades. These analyses aim to improve predictions of coastal living resources' response to environmental changes. Trawl sample data from the Alabama Department of Marine Resources Fisheries Assessment and Monitoring Program were used to describe multidecadal patterns in nekton communities across 16 stations in coastal Alabama between 1981 - 2018. Shifts in community structure were assessed through nonmetric multidimensional scaling analysis and post hoc testing. Nekton communities were significantly grouped by station, however there was overlap between stations and a gradient from fresh to saline communities was present. In preliminary analyses, temporal patterns in the multivariate community analysis were convoluted by interacting factors and no significant patterns were identified. Further analyses will assess long-term trends in community structure, and identify relationships between community structure, key species, and key drivers such as freshwater inflow and temperature. This work emphasizes the importance of understanding the relationship between long term environmental changes and biota at a regional scale, and results will be shared with local environmental managers.

D’Olive Bay Watershed Monitoring Study and Development of a Watershed Condition Framework

Tim Thibaut, Jonathan O’Neal, Howard Horne, Barry Vittor
Barry A. Vittor & Associates, Inc.

A Watershed Condition Framework (WCF) was used to evaluate trends in environmental condition through an analysis of wetland, stream, and riparian buffer quality in the D'Olive Bay Watershed (AL), where development was causing severe degradation and a restoration program was implemented in four sub-watersheds. The Science Advisory Committee of the MBNEP previously developed a conceptual framework for a Biological Condition Gradient (BCG) based on the relative proportion of good, fair, and poor conditions within an assessment area, which was used as the basis of a three-tiered classification for the WCF. A Rapid Stream Assessment (RSA) method was developed to measure stream condition and the Wetland Rapid Assessment Procedure (WRAP) was used to assess wetland functional values at the restored sites and adjacent areas. In general, stream reaches above the restoration sites scored higher than the restoration sites themselves or their immediate downstream reaches. Restored reaches overall had relatively poor scores for riparian buffer zone width and canopy cover, and in some for instances for channel alteration and bank vegetative protection. Results for downstream reaches were variable, but their overall RSA scores were similar to or higher than the restoration areas, generally due to greater riparian buffer zone width and better canopy cover. Scores for sediment deposition were generally poor at downstream sites, but most received moderate scores for habitat smothering. The Joe's Branch sub-watershed overall had improved stream conditions, from a baseline WCF Class 3 (Impaired Function) to Class 2 (Functioning at Risk) post-restoration.

Eastern Shore Watershed Management Plan

Suzanne Sweetser, Nicole Love
Thompson Engineering

Thompson Engineering was selected by the Mobile Bay National Estuary Program to develop a comprehensive watershed management plan (WMP) for the Eastern Shore Watershed. The Eastern Shore Watershed planning area contains seven subwatersheds: Jordan Brook/Yancy Branch (3.8 mi^2), Rock Creek / UT1-UT3 (6.5 mi^2), Fly Creek / UT-4 (8.5 mi^2), UT5 – UT6/City of Fairhope core (2.9 mi^2), Point Clear (5.3 mi^2), Bailey Creek / UT7-UT11 (4.5 mi^2), and UT12 (3.6 mi^2). The Eastern Shore Watershed includes a total of 3,138 acres of wetlands, 23 miles of coastline, 48 miles of streams, and 1 mile of ditches/canals. The planning process includes outreach and education, soliciting watershed knowledge, collecting data, obtaining community buy-in and plan implementation. A WMP has the following broad objectives: Coordinate and collect information from stakeholders and community members; Assess the quality of the watershed with its current inputs; Improve and sustain water quality; and Provide guidance to resource managers and policy managers. During the planning process, critical issues identified specific to this watershed included development, water quality, erosion/sedimentation, litter, human health/wellbeing, and habitat loss. The identification of these issues with help of municipalities and communities paved the way for developing management measures and implementation strategies that included corresponding sample projects, cost estimates, and regulatory strategies.

Educating and Engaging Communities on Water Quality and Flood Resilience with the Watershed Game

Karen Bareford [1], Tina Miller-Way [2], Brenna Sweetman [3], John Bilotta [4], Cynthia Hagley [5], Maggie Karschnia [6], Madison Rodman [7]

[1] Mississippi-Alabama Sea Grant Consortium; [2] Dauphin Island Sea Lab, Discovery Hall Programs; [3] National Oceanic and Atmospheric Administration; [4] University of Minnesota Water Resources Center; [5] University of Minnesota Duluth; [6] Minnesota Sea Grant/ University of Minnesota Water Resources Center; [7] Minnesota Sea Grant

The Watershed Game has been used for 15 years in more than 20 states as a tool to facilitate conversations with communities on how they can adapt practices, policies, and plans to improve water quality. Originally developed by Minnesota Sea Grant, the Game is designed to shift the conversation on watershed management and planning by using a relaxed environment to break down barriers, encourage dialogue and mutual respect, and foster cooperation through hands on activity. The Game includes a Local Leader version, designed for use with community leaders available in four models (stream, lake, river, coast) and a Classroom Version, designed for middle and high school-aged youth for use by formal and nonformal educators. Mississippi-Alabama Sea Grant Consortium, The University of Alabama, and NOAA recently teamed up with Minnesota Sea Grant and Minnesota Extension to develop the new Coast Model of the Game which focuses on land use impacts to water quality, natural resources, and community resilience to flooding in coastal regions. An evaluation of the Game revealed communities that have used the Local Leader Version of the Game as a water education and engagement tool had positive results in facilitating conversations around sustainable water and land use planning. This session will include an introduction to the Watershed Game, information on how the Game can be used to foster connections within local communities and educate students about water quality, land use, and resilience issues, and the opportunity to play the Coast Model.

Empowering Oyster Growers While Growing Capacity: Research, Testing and Training to Address Microbiological Impediments on Shellfish Aquaculture

Ronald Bond [1], Rusty Grice [2], Edward Atwill [1], Andy DePaola [3], Melissa Partyka [4]
[1] University of California, Davis; [2] Auburn University Shellfish Laboratory; [3] Angelo DePaola Consulting; [4] Auburn University Marine Extension and Research Center

Off-bottom shellfish aquaculture in Alabama is a new and thriving industry. Shellfish growers that have successfully sited their operations often face regulatory closures following adverse environmental events, potentially leading to significant financial hardship. As of 2021, there are only two certified microbiological testing labs in the states of MS and AL, neither of which can perform analyses following sanitary sewer overflows that would allow growers to "test to open". There is a clear, apparent, and well documented need for 1) increased data on the distribution and abundance of microbial indicators in and around shellfish growing areas, 2) improved capacity for affordable microbiological testing using National Shellfish Sanitation Program's certified methodologies, and 3) training to educate growers on current microbiological regulations and how to navigate them. Addressing these needs will work to strengthen and improve Alabama coastal management through adaptive approaches while sharing coastal knowledge. In this presentation we will discuss methods we're employing to increase stakeholder communication with regulatory authorities, improve risk communication related to regulations and seafood safety, and expand available environmental data related to a growing but heavily regulated industry.

Engaging Audiences - Interactive Websites for a Common Project Narrative

Justin Quinley, Jill Oliver
Anchor QEA, LLC

Environmental projects are often high-profile and receive attention from a variety of audiences. Stakeholders, regulators, and the public are all key to maintaining a successful program, yet all need to understand project complexities from a different perspective. Traditionally, information has been delivered through lengthy technical documents or presentations. These methods can lead to a scattered message and tend to be overwhelming in volume and detail-especially for today's online audiences. Keeping audience attention is a concern, as audiences expect information to be at their fingertips, relevant, timely, personalized, and engaging. This presentation highlights three interactive solutions-a dashboard, story map, and living document-each designed to improve communication by centralizing information with a cohesive and comprehensive narrative. A dashboard links information and resources from multiple locations, provides key data summaries, and transforms static information into a dynamic format. A story map is an immersive narrative that guides the audience through the history and ongoing activities at a contaminated sediment site. A living document, encompassing planning and restoration of a watershed, replaces traditional documentation and centralizes project information in an interactive website alongside public comment forms and interactive maps. All websites are public, easily modified, and keep information current and relevant. Easily accessible web technology allows project teams to design and focus a common narrative that is relevant, personalized, and engaging-with more graphics, fewer words, and more understanding.

Engaging Underserved Communities in Coastal Resilience: A Case Study in East Biloxi

Qiyamah Williams, Renee Collini
PLACE:SLR

Underserved and historically disenfranchised groups are often at the frontlines of climate change and sea-level rise impacts; however, they often have not had a voice in processes around funding, planning, and implementing actions to mitigate these impacts. To productively move forward with equitable climate resilience, it is essential that all members of communities can actively participate; yet our current approaches for engagement frequently are not effective at reaching our frontline, under resourced residents. We worked collaboratively with colleagues across the United States to begin exploring how to effectively engage in underserved communities. Leveraging Enhanced Engagement and Risk Communication for Underserved Communities: Research Findings and Emerging Best Practices our team set out to model identified best practices and test their effectiveness. Examples of best practices included a focus on community-driven, inclusive engagement frameworks, community trust building, accessibility and equity of outreach, and non-extractive engagement. In this presentation, we will share when this approach was modeled in East Biloxi, MS, a predominantly underserved minority community within the City of Biloxi still working to rebuild after major wind and flood damage from Hurricane Katrina almost 20 years ago. PLACE:SLR, the Steps Coalition, East Biloxi Community Collaborative, The Gulf Coast Community Design Studio, and the Biloxi NAACP created and implemented Resilient East Biloxi, a series of community leader trainings and resident engagement events. We will share the process we pursued for engagement, the resulting program, the evaluation results of the program, and lessons learned for future efforts to engage in underserved communities.

Engineering with Nature to Restore Marsh Habitat on Fowl River

Bryan Flynn, Eric Schneider, Chris Warn, Elizabeth Dost
Environmental Science Associates

A team of scientists and coastal engineers is developing a solution to stabilize and protect priority in-river wetland spits and restore marshland throughout the intertidal portions of lower Fowl River. This NFWF funded project is being implemented through a collaborative effort between the MBNEP, ADCNR, and Mobile County to restore these important coastal spits and wetlands that were identified as a significant priority action in the Fowl River Watershed Management Plan. This presentation will discuss how the project team built upon the Fowl River Marsh study to identify shoreline restoration locations and develop engineering and construction design plans to stabilize and enhance priority coastal spits and shorelines of Fowl River from negative impacts associated with sea level rise, increased salinity, and boat wakes. The team will discuss the challenges associated with site conditions and permitting this complex coastal restoration project and the innovative engineering-with- nature approach to stabilizing shorelines and restoring marsh habitat. Through a phased and adaptive approach, the design solution will incorporate thin-layer placement of sediment on the spits and limit the extent of structural wave attenuation.
Installation of rip rap sills and timber wave screen structures will be limited to the areas of greatest concern for overtopping and closest proximity to the river channel. An adaptive management plan will be incorporated in the final design to determine the timing for additional thin-layer placement of sediment and additional timber wave screen structures in the areas where they are most warranted.

Enhancing Community Resilience to Coastal Inundation Events

Marian Hanisko [1], Brenna Sweetman [1], Becky Allee [1], Renee Collini [2], Karen Bareford [3], Chris Ellis [1], Andrew Medhurst [2]

[1] National Oceanic and Atmospheric Administration; [2] PLACE:SLR; [3] Mississippi-Alabama Sea Grant Consortium

Gulf Coast communities are increasingly at risk from inundation events caused by rising seas, heavy precipitation, and surge resulting from more frequent and intense storms. Staying informed about the latest science, and understanding how to use the science and related tools to inform local decisions are big challenges. If we can work together to overcome these challenges, we can help create resilient communities that are better able to manage risk long term. This session includes several objectives. Participants will: Understand key messages included in the interagency 2022 Sea Level Rise Technical Report (Sweet et. al., 2022); Explore new products and enhancements to existing products (e.g., Sea Level Rise Application Guide, Gulf TREE, NOAA Sea Level Rise Viewer, and the National Water Model) to help visualize and communicate impacts from inundation; and Share local needs for inundation information, products, and services that will help drive efforts to meet these needs. Participants will also get a sneak peek at plans for a new national Coastal Resilience to Inundation Community of Practice designed to help members to stay up-to-date on the latest information and best practices for addressing inundation challenges!

Estimation of Mortality Rates for the Gulf Menhaden Stock

Catherine Wilhelm [1], Amy Schueller [2], Emily Liljestrand [3], Kim de Mutsert [1], Robert Leaf [1]
[1] University of Southern Mississippi; [2] National Oceanic and Atmospheric Administration; [3] Michigan State University

Gulf Menhaden, *Brevoortia patronus*, is the target species of the second largest fishery in the United States. Gulf Menhaden fishery and stock is described using an age-structured stock assessment that has been ongoing since the 1960s. The model is parametrized, in part, using age-specific mortality rates. New advancements in technology have made it possible for modernizing the calculations of many of these parameters in the assessment. In an effort to improve estimates of Gulf Menhaden mortality rates we conducted a study to develop mark-recovery models in AD Model Builder to evaluate recently digitized records of a large-scale tag and recapture study. Recovery data were comprised of adult (n = 90,210) and juvenile (n = 142,013) individuals that were captured, tagged with unique ferro-magnetic tags, and then recovered from the fishery from 1970 to 1988. The models account for the difference in juvenile and adult tagging mortality as well as tag recovery probability. Juvenile dynamics were modeled such that 'transition' into the adult tagged population took place after tagging, with the assumption that all recovered fish were adults. Fishing effort was derived from fishery landings per month throughout the tagging study. Estimating mortality rates based on mark recovery data using contemporary methods will provide validation of current parameters, indicate the annual variation in mortality, and allow an understanding of the range of observed mortality.

Evaluating Habitat use by Nekton in Widgeon Grass, Shoal Grass, and Unvegetated Bottom habitats in the Grand Bay National Estuarine Research Reserve

Jessica Woodall [1], Kelly Darnell [1], Kimberly Cressman [2], M. Zachary Darnell [1], Patrick Biber [1]
[1] University of Southern Mississippi; [2] Catbird Stats, LLC

Seagrass beds support high biodiversity and animal abundance, serve as feeding grounds for a variety of nearshore animals, offer shelter from predation, and act as a nursery habitat for juveniles. The species composition of seagrass beds can impact habitat use by animals. Two common species of seagrass in the Gulf of Mexico are *Ruppia maritima* (widgeon grass) and *Halodule wrightii* (shoal grass). The shallow coastal waters of the Grand Bay National Estuarine Research Reserve (GNDNERR) support both of these species, but the habitat use of each by nekton is poorly understood, which limits management. Nekton communities were sampled in May, July, and September 2022 in GNDNERR within *R. maritima* and *H. wrightii*-dominated seagrass beds and unvegetated habitat. All nekton were collected, identified to species, weighed, and measured to quantify density, species richness, and species diversity within each habitat. Seagrass cores were also collected to quantify above and below-ground biomass, leaf area index, and epiphyte load. Juveniles of several commercially fished nekton species including blue crabs (*Callinectes sapidus*), white shrimp (*Litopenaeus setiferus*), and brown shrimp (*Farfantepenaeus aztecus*) were collected, with higher density and greater species diversity in seagrass compared to unvegetated bottom. These results reinforce the importance of seagrass within GNDNERR as essential nursery habitat and can be used to inform management and long-term planning.

Evaluating the Effectiveness of Restoration Approaches for Nearshore Habitat

Matthew Virden [1], Jonathan Pitchford [2], Eric Sparks [1]
[1] Mississippi State University; [2] Grand Bay National Estuarine Research Reserve

In the northern Gulf of Mexico, oysters and marshes have been critical components estuarine ecosystems, and provide multiple ecological and economic benefits. At the Grand Bay National Estuarine Research Reserve, there is a large-scale subtidal and intertidal living shoreline project that finished construction in July 2021. The timing of this project allowed for collection of pre- and post-construction data to determine the effectiveness of the restoration approaches. A suite of ecosystem functions and services were evaluated at the intertidal and subtidal sites, along with nearby control sites. Wave gauges were deployed on a rotational basis and replicated in front and behind reefs and at similar locations in control sites to evaluate the influence of reef placement on wave energy. To provide large-scale estimations of shoreline position and vegetation cover, quarterly unmanned aircraft system (UAS) flights were conducted. Continuous georeferenced maps were produced of the entire study area from the UAS flights. Fine-scale field measurements were used to validate UAS maps. Oyster settlement was monitored using tile-based spat collectors deployed on both intertidal and subtidal reef areas as well as nearby controls. Spat collectors were deployed and retrieved monthly from April-October 2022. Evaluating the impact of restoration efforts was accomplished using a variety of univariate and multivariate approaches across the range of metrics measures. Understanding this impact of oyster reef restoration on a wide range of ecosystem functions will better inform the planning and implementation of future restoration projects.

Examining Movement Dynamics of the Gulf Menhaden Fishery to Evaluate the Impacts of Spatial Closures

Robert Leaf, Wei Wu
University of Southern Mississippi

We examined the movement and harvest dynamics of the Gulf Menhaden *Brevoortia patronus* fishery using logbook data (2006 to 2009 and 2011). We used bootstrap resampling of trip-level data (n = 1,000) to describe the mean set-specific catch per unit effort (CPUE, metric tons, mt set-1) , the mean number of sets deployed on each trip, mean trip-specific CPUE (mt minute-1), and the distance traveled to the first and subsequent sets (set number ≥ 2) . We explored the impacts of spatial restrictions (1.6, 3.2 km, and 4.8 km areas) adjacent to land in the region on the statistics and calculated the month-specific overlap of each summary statistic, for each restriction regime scenario. We used this analysis to evaluate spatial and temporal differences in fishing effort in each restriction regime. We found that spatial restrictions served to increase the travel distance to the first set and set-specific and trip-specific CPUE are reduced. The restriction regimes resulted in a reduction in the total harvest: Total harvest for the 1.6 km restriction regime was 4.3 to 7.2%, 9.1 to 12.0% in the 3.2 km restriction regime, and 12.7 to 15.4% in the 4.8 km restriction regime. A coherent and comprehensive management strategy that considers fisher behavior will serve to minimize tradeoffs and maximize outcomes for the fishing community and the sustainability of the resource.

Exploring Innovative Nature-Based Approaches to Regional Stormwater Management in Ocean Springs, MS

Nina Woodard [1], Renee Collini [1], Carolyn Martin [2], Eric Sparks [3]
[1] PLACE:SLR; [2] City of Ocean Springs, MS; [3] Mississippi State University

Like many other cities, Ocean Springs, MS needs more accessible and affordable housing. As housing pressure increases, developers are developing tracts of land that are problematic primarily due to little elevation change. While adopted code allows the city to ensure the highest quality of design, this growth creates increasing pressure on existing stormwater conveyances – green and gray. We, a team of local government officials, researchers, and engagement specialists, are assessing the feasibility of integrating nature-based solutions (NBS) in a regional stormwater management system in Ocean Springs to meet the challenges of future climate and development conditions, while increasing access to green space for residents. Community and municipal stakeholder needs, as well as biological and physical measurements, will inform the assessment. Working with residents, we gained knowledge on flood patterns and distribution to help us ascertain the scope of flooding issues in the region. Additionally, residents provided input on desired recreational activities and natural access to gain an understanding of community needs and further inform the NBS considered for addressing stormwater management. The City of Ocean Springs and Jackson County refined the study area, stakeholders to include, and range of NBS alternatives to explore. These combined community and municipal perspectives, along with physical assessments, will provide the necessary information to conduct an optimization exercise to assess different infrastructure options under a variety of future development and climate conditions. If any potential outputs meet the needs of municipal partners and stakeholders, funding will be pursued to conduct engineering, design, and implementation.

Extending Our Reach: A Multi-State Collaborative Approach to Reef Fisheries Extension

J. Marcus Drymon
Mississippi-Alabama Sea Grant Consortium

Southeastern United States reef fisheries are some of the most commercially valuable and recreationally popular in the country. Across these fisheries, a speciose assemblage is targeted by a diverse and geographically variable group of stakeholders who collectively possess a wealth of local ecological knowledge gained from years on the water. Broadly speaking, the goal of the proposed regional collaborative is to build upon the conventional unidirectional flow of information (i.e., from research to management to stakeholder) by working directly with stakeholders on a consistent basis to identify pressing research needs and communicate those needs to the scientific and management community (i.e., from stakeholder to research and management). To accomplish this, we have assembled a team comprised of Sea Grant fisheries Extension professionals from across the Southeastern US (Texas, Louisiana, Mississippi, Alabama, Florida, Georgia, South Carolina and North Carolina). We have complemented these Sea Grant professionals with a social-ecological fisheries scientist, management representatives from the Gulf of Mexico and South Atlantic Fishery Management Councils and an Advisory Panel of commercial and recreational sector stakeholders and state fisheries management representatives. Collectively, this collaborative will work to gather (Objective 1), refine (Objective 2) and communicate (Objective 3) Southeastern US reef fish knowledge to appropriate stakeholders.

Fine-scale Tracking of Sportfish Habitat Selection and Behavior Along Restored Shorelines

Sarah Ramsden [1], Mark Albins [1], Michael Dance [2], Sean Powers [1], Ronald Baker [1]
[1] Dauphin Island Sea Lab/ University of South Alabama; [2] Louisiana State University

To effectively restore habitats in ways that benefit fisheries, managers must understand how fisheries species use those habitats. We used fine-scale acoustic telemetry to track the movements of sportfish and make inferences about their use of various microhabitats associated with restored shorelines. Arrays of closely spaced acoustic receivers were deployed along two shorelines in Mississippi Sound, Alabama: Lightning Point/Little Bay Peninsula, a reconstructed marsh and lagoon protected by riprap and concrete pyramid breakwaters; and Point aux Pins Peninsula, a complex seascape of mudflats, seagrass, marsh edge, and oyster beds also protected by breakwater pyramids. We used the receiver arrays to triangulate the positions of acoustically tagged fish with an accuracy on the order of 1-2 m. The distance and turning angle between consecutive positions was then calculated and used as a quantitative proxy of behavior. We interpreted meandering tracks made up of medium length steps as indicative of foraging, single direction tracks of long steps as indicative of travel, and relatively stationary tracks of very short steps as indicative of sheltering. We have tagged and tracked three sportfish species, Red Drum, Speckled Seatrout, and Sheepshead, in both arrays. Preliminary results show Sheepshead sheltering near breakwater pyramids at night and foraging widely during the day. Red Drum and Speckled Seatrout appear to shelter along the marsh edge at night and forage over oyster reefs during the day. Understanding how habitats within existing restored shorelines are used by fisheries species can help inform the design of future restoration projects.

Florida Panhandle Terrapin Project

Rick O'Connor [1], Daniel Catizone [2], Margaret Lamont [2]
[1] Florida Sea Grant/University of Florida IFAS Extension; [2] U.S. Geological Survey

Diamondback terrapins (*Malaclemys terrapin*) are the only resident estuarine turtle in the United States. They range from Massachusetts to Texas inhabiting salt marshes, and in some cases mangroves, within each of those states. Little is known about the animal within portions of its range but there are numerous data gaps in the Florida panhandle. Beginning in 2007 a citizen science effort was developed by a marine science program in Pensacola to first determine whether the terrapin existed in the panhandle and, if so, what their population status was. This project moved under Florida Sea Grant in 2012 and is now a partnership between Florida Sea Grant and the U.S. Geological Survey (USGS) surveying nesting beaches between Escambia and Franklin counties. Trained volunteers survey known nesting beaches to determine frequency of nesting and nest predation. They also conduct 30-minute head counts in lagoons that have terrapins and assist Sea Grant and USGS with capture efforts to tag individuals. These tagged individuals can help better understand how they are using the habitat as well as obtain tissue samples for genetic studies. Volunteers are involved in seeking new potential nesting beaches in this region at the end of each nesting season. This presentation will give a 2022 update and what this team has learned to this point and where data gaps still exist.

Foley's Forward Planning and Actions for Resilience

Leslie Gahagan
City of Foley

With explosive growth and severe weather events, the City of Foley is planning and acting towards a more resilient community. Foley began through watershed management planning, and has continued with a flood response plan. Drainage plans are being developed in each watershed to combine with other planning efforts for an overall goal of better preparations for extreme weather events. Foley has also developed new regulatory standards for developments which will be discussed. There are restoration projects of wetlands and waterways under construction and development to mitigate for increased storm water effects. The City is developing a maintenance schedule for storm water facilities and waterways to handle debris and sediment that have caused a lack of hydraulic capacity in the drainageways. Finally, there will be discussion regarding the conservation of environmentally sensitive lands while educating the public about the efforts.

Forest Restoration and Management can Maintain or Enhance Water Resources in the Gulf of Mexico

Peter Caldwell [1], Will Brantley [2], Ryan Peek [2]
[1] USDA Forest Service Southern Research Station; [2] Alabama Forestry Commission

Decades of research show that forests provide the cleanest and most stable surface water flows compared to other land uses. Due to a combination of social and economic factors, forest losses in the 21st century are predicted to be especially high along the Gulf of Mexico and these losses will have direct impacts on water quantity and quality delivered to the Gulf. Projections suggest that developed land use in the southern Gulf Region could increase by 2.8 million acres (+166%) by 2060, resulting in a loss of forest land of 2.2 million acres (-10.2%) over the region and more than 25% in some coastal counties. Through a collaborative effort among multiple federal and state agencies and NGOs, a new program has been established that will enhance and maintain water quality and quantity by protecting, managing, and restoring forested ecosystems in the Gulf Coast regions of Alabama, Florida, and Mississippi. In this presentation, we will review literature and describe new analyses that link forest land cover to water quality in the region, and will provide an overview of science-based approaches that will be used to guide restoration decision-making and to quantify the benefits of forest restoration for the Gulf. Providing private forest landowners with technical and financial forest management assistance will help them make a viable living on their forest land and will reduce the risk that their land will be converted to other land uses with associated water quantity and quality impacts.

Fostering a Culture of Intentional Resilience Through Building Codes and Sustainable Construction Standards

Stephen Deal [1], Sonja Sheffield [2], Graham Green [2]
[1] Mississippi-Alabama Sea Grant Consortium; [2] Smart Home America

This session will enhance knowledge about the value of building codes and how higher standards can improve the disaster response and recovery process in local government jurisdictions. Stephen Deal, with MS-AL Sea Grant, and Sonja Sheffield, with Smart Home America, will provide a brief overview of building codes and their value to pre-disaster mitigation. Following this overview, information will be provided about Smart Home's Code Supplement, which provides beyond-code protection against natural disasters such as hurricanes and high wind and hail. Attendees will also discover how the Code Supplement's standards have been successfully integrated into Alabama communities' planning practices and what outreach is being done to promote the use of the supplement in other cities and states. Session attendees will learn about different components of the FORTIFIED construction programs, such as FORTIFIED Roof, FORTIFIED Commercial, and the newly conceived FORTIFIED Multifamily. Attendees will also learn about the building science and research conducted by the Insurance Institute for Business and Home Safety (IBHS) and how that work serves as the foundation for the FORTIFIED program. The material covered in this session will focus on crucial coastal issues such as disaster planning and recovery and how communities can benefit from increased information exchange and training on cutting-edge building practices and construction techniques.

GenSea: Bringing Gen Z to the Sea- Blue Economy Career Pathways in Coastal Mississippi

Patrick Kirby, Hannah McDuffie, Julie Cwikla, Tara Skelton
University of Southern Mississippi, Center for STEM Education

Due to outmigration of young, educated college graduates, Mississippi is experiencing a net loss of "homegrown" talent commonly referred to as brain drain. Mississippi has experienced the sharpest decrease in college educated Millennials in the United States over the past decade. GenSea is a collaborative effort to introduce Mississippi's high school students and educators to the vast STEM career opportunities along the coastal Mississippi corridor, led by the University of Southern Mississippi's Center for STEM Education and School of Ocean Science and Engineering. In June 2022 , a select group of 20 STEM educators from around Mississippi attended a 3-day professional development event hosted by GenSea; they toured technical training sites and interacted with STEM professionals in authentic environments to learn about job opportunities in marine science, ocean engineering, and hydrography. This inquiry is a work-in-progress aiming to examine the impacts of professional development on teachers' awareness and knowledge of career pathways, as well as their plans to incorporate STEM blue economy career opportunities into their lessons. Following a mixed method approach and guided by Desimone's (2009) conceptual framework, pre-post surveys were taken before and after each day of training in addition to a general pre- post survey pertaining to the event as a whole. Preliminary results of paired student's t-tests and measures of effect size from year 1 of a 2-year study indicate exposure to blue economy careers significantly increased teachers' awareness($n=19$, $p< .001$, $SD=.602$) and knowledge of career pathways ($n=19$, $p< .001$, $SD=.905$) into STEM.

Geospatial Technologies for Climate-Related Infrastructure Assessments and Adaptive Management

Kate Grala, John Cartwright
Mississippi State University

The impacts of the sea level rise (SLR), high tide flooding, storm surge, extreme weather events, and other shifting climatic conditions pose an increasing risk to the natural and built environments in coastal areas. Decision-makers often lack easy-to- use tools that would facilitate a rapid data-driven assessment of the vulnerability associated with these impacts on infrastructure systems of the built environment such as transportation, power, wastewater, communications, and other systems. This project used a Geographic Information System framework to improve data analysis of the geographic variability in the vulnerability and risk to these systems. This provides for improved adaptive decision-making capabilities to identify system vulnerabilities and increase the resiliency and sustainability of coastal communities. This presentation highlights the work of two geospatial efforts for the assessment of infrastructure systems at both the regional and local scales. The efforts include a multistate assessment of the SLR impacts on transportation infrastructure and a local-level vulnerability assessment of on-site wastewater disposal systems. These analyses are based on geospatial science and consider spatial relationships between different segments of infrastructure systems. The results are disseminated via interactive web-based applications (maps and dashboards) to help identify the most vulnerable communities. These efforts produced geospatial tools to automate data identification and extraction across multiple layers. Decision-makers can use the developed tools to augment their decision-making processes and find better adaptive management solutions to ensure that the coastal communities are more robust and prepared to withhold potential SLR impacts.

Graham Creek Nature Preserve: Balancing Conservation, Education and Recreation

Leslie Gahagan
City of Foley

As populations flock to the Gulf Coast, conservation of habitats and headwaters are a primary goal of communities. Coastal Alabama draws drinking water from aquifers and with growing development wellhead protection is critical. Foley, one of the fastest growing cities in state, has developed a 600 acre nature preserve offering passive recreation and educational programs while preserving habitats and protecting groundwater and headwater resources. This presentation will highlight the overall goal of conservation while gathering public support through partnerships, educational opportunities, and recreation. Multiple universities have performed research in the preserve as it is an untouched headwater system that flows to a major coastal bay. The Preserve has been awarded multiple grants and donations to purchase adjacent lands and amenities including a modular large scale hydroponics operation and demonstration longleaf forest; however municipal funds cover all operational costs. Graham Creek Nature Preserve has been in operation for fifteen years demonstrating the collaboration of conservation and passive land use.

Gulf of Mexico Alliance Café: Alliance Capacity to Increase Regional Collaboration

Laura Bowie, Becky Ginn, Christina Mohrman, Amanda Nalley, Dave Reed, Alison Robertson
Gulf of Mexico Alliance

The Gulf of Mexico Alliance (GOMA) is a partnership network dedicated to enhancing the environmental and economic health of the Gulf of Mexico through increased collaboration. Led by the five Gulf states (Alabama, Florida, Louisiana, Mississippi, and Texas), GOMA's network includes over 165 participating organizations from state and federal agencies, tribal governments, communities, academia, businesses, and non-governmental organizations in the region. GOMA provides leadership to address ongoing and emerging issues common to all five Gulf States in a voluntary and cooperative way. Building on nearly two decades of experience working in the Gulf region, GOMA has developed expertise that encourages participation from a variety of partners across geographic and organizational boundaries. This includes providing forums for collaboration, facilitation, grant management, and other regional capacity. Initiatives such as the Alliance's Gulf Star Program are known for projects that provide foundational support for ecosystem health and resilience without extra burden on the grant recipient. This model increases the diversity of engaged partners as the application process and match requirements are often barriers for communities and small organizations. During an open "café" session, GOMA staff will facilitate conversations about best practices, success stories, and techniques that enable successful strategic partnerships.

Gulf of Mexico Alliance Café: Alliance Priority Issues

Laura Bowie, Becky Ginn, Christina Mohrman, Amanda Nalley, Dave Reed, Alison Robertson
Gulf of Mexico Alliance

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Gulf of Mexico Alliance Café: Building Partnerships for a Healthier Gulf

Laura Bowie, Becky Ginn, Christina Mohrman, Amanda Nalley, Dave Reed, Alison Robertson
Gulf of Mexico Alliance

The Gulf of Mexico Alliance (GOMA) is a partnership network dedicated to enhancing the environmental and economic health of the Gulf of Mexico through increased collaboration. Led by the five Gulf states (Alabama, Florida, Louisiana, Mississippi, and Texas), GOMA's network includes over 165 participating organizations from state and federal agencies, tribal governments, communities, academia, businesses, and non-governmental organizations in the region. GOMA has built a reputation for fostering cooperation among this large network of partners to create positive change. It is a trusted source of scientific information and best management practices for coastal communities and ecosystems across the region. The Alliance's actions support commitments to strengthening community resilience, increasing regional data sharing, serving underrepresented communities, and improving management of coastal habitats and wildlife species. Participation in GOMA is open to anyone interested in engaging with others to achieve positive outcomes for a healthier Gulf. Want to know more? In this session, GOMA staff will facilitate conversations in an open "café" where symposium participants can learn more about Alliance resources based on their individual interest. Café topics will include: Alliance priority issues including community resilience; regional data sharing; education and engagement; management of natural resources including habitat, water, and wildlife; marine debris; and ecosystem services; the Gulf of Mexico Open Data Platform and GOMA's other tools for regional data sharing; opportunities for business and industry engagement; science communication networking; and grant management best practices, facilitation, and other regional capacity provided by the Alliance.

Gulf of Mexico Alliance Café: Business and Industry Engagement

Laura Bowie, Becky Ginn
Gulf of Mexico Alliance

The Gulf of Mexico Alliance (GOMA) is a partnership network dedicated to enhancing the environmental and economic health of the Gulf of Mexico through increased collaboration. Led by the five Gulf states (Alabama, Florida, Louisiana, Mississippi, and Texas), GOMA's network includes over 165 participating organizations from state and federal agencies, tribal governments, communities, academia, businesses, and non-governmental organizations in the region. Participation in GOMA is open and voluntary. To foster and strengthen business engagement, the Alliance has created two unique opportunities for industry partners in the region. The GOMA Business Advisory Council is committed to promoting a shared sense of stewardship for the Gulf and providing a forum for shared input. Over 60 representatives from industries operating in and around the Gulf of Mexico region participate annually. The group includes tourism, oil and gas, manufacturing, utilities/energy, transportation, seafood, agriculture, and environmental consultants. The Alliance's Gulf Star Program is a public-private partnership that funds regional projects to support healthy ecosystems and impact Gulf economies. In just a few short years the program has become known for its success, funding over 60 projects in all five Gulf states. Gulf Star partners include government agencies and several of the region's leading corporations working together to leverage resources for a greater impact. To encourage engagement, GOMA staff will facilitate conversations on ways industry can work collaboratively with other coastal management stakeholders through the Alliance during an open "café" session.

Gulf of Mexico Alliance Café: Promoting Science Communication

Amanda Nalley, Christina Mohrman
Gulf of Mexico Alliance

The Gulf of Mexico Alliance (GOMA) is a partnership network dedicated to enhancing the environmental and economic health of the Gulf of Mexico through increased collaboration. Led by the five Gulf states (Alabama, Florida, Louisiana, Mississippi, and Texas), GOMA's network includes over 165 participating organizations from state and federal agencies, tribal governments, communities, academia, businesses, and non-governmental organizations in the region. Participation in GOMA is open and voluntary. To facilitate information sharing among science communicators in the region, the Alliance recently formed a Gulf of Mexico Communication Network. The goals of this group are to promote each other's communication goals, share expertise, and explore best practices. Specific topics discussed by the group include media distribution, social media engagement, and translating science content for non-technical audiences. The group includes representatives from federal, state, and county agencies; non-profits; and academia. During an open "café" session, GOMA staff will connect science communicators across the region and facilitate conversations about needs, audiences, and science communication strategies.

Gulf of Mexico Alliance Café: Tools for Regional Data Sharing

Dave Reed, Christina Mohrman, Alison Robertson
Gulf of Mexico Alliance

The Gulf of Mexico Alliance (GOMA) is a partnership network dedicated to enhancing the environmental and economic health of the Gulf of Mexico through increased collaboration. Led by the five Gulf states (Alabama, Florida, Louisiana, Mississippi, and Texas), GOMA's network includes over 165 participating organizations from state and federal agencies, tribal governments, communities, academia, businesses, and non-governmental organizations in the region. Participation in GOMA is open and voluntary. As part of an overarching strategy for regional data sharing aligned with priority issues identified by the Alliance, GOMA has developed the Gulf of Mexico Open Data Platform (GOMOD) to makes it easier for users to discover, explore, and access data. The GOMOD Platform currently includes comprehensive maps of priority seagrass and oyster habitat datasets for the entire region, curated theme maps for key coastal and ocean management topics of interest to Gulf stakeholders, and a data explorer. GOMA and key partners have also developed a suite of other important tools for Gulfwide coastal management including the Deepwater Horizon Project Tracker, Gulf TREE, and the Northern Gulf Sediment Availability and Allocation Program Tool. These tools support partner and stakeholder natural resource priorities and enhance capacity to share and integrate data across the region. To encourage engagement, GOMA staff will demonstrate use of these tools and facilitate conversations about regional data sharing during an open "café" session where participants can engage based on their specific interest(s).

Heatwave Duration Correlates with the Poor Recruitment of Oysters in Alabama Coastal Waters

Jeffrey Plumlee [1], Sean Powers [1], Jason Herrmann [2], John Mareska [2]
[1] Dauphin Island Sea Lab/University of South Alabama; [2] Alabama Department of Conservation and Natural Resources

Heatwaves are extreme temperature events defined as three or more days above the 90th percentile of daily maximum temperatures. For oysters increased temperatures (resulting in enhanced stratification and low dissolved oxygen) can lead to altered growth, reproduction, and increased mortality. This study examines the relationship between oyster recruitment and heatwaves. Our analysis is designed to examine the predictability of poor recruitment of oysters, defined as the relative abundance of spat below the median density observed over a 46-year time period at a given reef. From 1976 – 2021 the state of Alabama surveyed oysters and spat in 0.9 m2 quadrats on three oyster reefs, Buoy Reef, Cedar Point, and Kings Bayou in Mobile Bay, AL. Daily maximum temperature measurements (°C) were taken at the Mobile County Airport and heatwaves were defined as days where the maximum temperature was ≥ 33.6 °C. We investigated the prediction of poor recruitment using extreme cases (≥ 33% of observations) of four components of heatwaves, maximum yearly temperature, heatwave days, consecutive heatwave days, and number of heatwaves. Only consecutive days ≥ 33.6 °C were correlated with the poor recruitment of oysters. For two of the three oyster reefs, Buoy Reef and Kings Bayou, poor recruitment occurred 100% of the time when there were ≥ 12 consecutive heatwave days, for Cedar Point 75% of the time. Climate change is predicted to increase the periodicity and duration of heatwaves potentially resulting in decreased recruitment of oysters and should be the focus of future study.

Help Us Help You: Working with Communication Professionals to Share Your Science

Christina Mohrman [1], Amanda Nalley [1], Anita Arguelles [2], Brynn Garner [3], Jessica Kastler [2], Angela Levins [4], Megan Radke [5]
[1] Gulf of Mexico Alliance; [2] University of Southern Mississippi; [3] U.S. Fish and Wildlife Service; [4] Dauphin Island Sea Lab; [5] Harte Research Institute

Scientists are increasingly expected to share their work with both professional peers and non-technical, lay audiences. Professional sharing is important for the exchange of scientific knowledge and to improve resource management while communication with non-scientific audiences is essential to inform community members and decision-makers, build trust and increase transparency. Traditional methods of professional communication (e.g., reports, publications and presentations) follow a format similar to the workflow scientists use in their research. These communication types use specialized language and emphasize how the work was conducted, including information such as repeatable methods and statistically significant results. In contrast, the approach to communication and delivery of messages to lay audiences is drastically different. These audiences are much more interested in a storytelling approach that is relatable and emphasizes why the work is important. Translating technical language into more easily understood terms and providing compelling components, such as photographs, video and audio, that support the story are of key importance. Because the approaches are so unalike, it can be challenging for science professionals to communicate successfully with both of these audiences. The good news is, scientists don't have to do it all alone! Bringing expertise in how to craft successful messages across a variety of media types, science communicators bridge the gap between scientists and media, decision-makers, and the community. In this session, presenters will share best practices and case studies that will inspire scientists to build relationships with science communicators and increase knowledge sharing with broader audiences.

Hindsight is 20/20: Re-envisioning an Environmental Monitoring Network

Josh Goff, Patrick David, Cory Harper
Dauphin Island Sea Lab

The Dauphin Island Sea Lab (DISL) has operated the Alabama Real-Time Coastal Observation System (ARCOS) continuously since 2003 to monitor hydrographic and meteorological conditions in and around Mobile Bay. In 2020, Hurricane Sally extensively damaged the hardware and infrastructure of the network rendering many stations inoperable and in some cases beyond repair. We used this event as an opportunity to review the network state pre-Sally and identify points of failure to inform future network architecture resiliency. Support from the Alabama Center of Excellence and additional funding sources enabled the acquisition of a new Data Architect and a dedicated ARCOS technician to provide additional manpower for maintenance and systems integrations. This has provided the necessary resources to restore the network back to operational status. Maintenance schedules were increased to provide better resiliency and network uptime, and legacy protocols were reviewed to improve data integrity and quality assurance. The ARCOS team has also developed new visualizations and interfaces to enhance data interactions for both the general public and stakeholders. Additionally, upgrades to data delivery and storage are being developed. Looking ahead, our future plans include expanding network parameters, incorporating other gulf-wide monitoring networks into our data streams, and increasing stakeholder engagement.

Impacts of Decade-old MASGC-supported Internship Program in Environmental Education for Underrepresented Students

Tina Miller-Way, Angie Dixon, Virginia Driskell, Greg Graeber, Kyle Halstead, Rachel McDonald, JoAnn Moody
Dauphin Island Sea Lab, Discovery Hall Programs

For the past 12 years, Mississippi-Alabama Sea Grant Consortium has supported a summer internship explicitly for underrepresented students through its support of environmental education programs at Discovery Hall of the Dauphin Island Sea Lab. The Summer Environmental Education Internship program provides undergraduate students with direct experience in the many facets of nonformal environmental education including teaching experience with students from K through 12th grade, communication with the public through outreach events, familiarity with the field of formal education through professional development for educators, and through working with DHP staff, the planning and operations associated with outdoor education programs. Interns are paid for their time and room and board is provided ensuring equitable access to students from many backgrounds. Interns are mentored by DHP's education team (the chair and 6 full time educators) who collectively represent a diversity of training and degrees held, teaching styles, life experiences and areas of focus for Gulf of Mexico knowledge. Since 2010, MASGC has supported 14 positions: we have successively recruited 12 individuals from underserved populations as interns. Seven individuals were African American, 3 were Latinx and 1 was a Pacific Islander. Five individuals have been from universities within Alabama, and 7 individuals came from universities in states from Maine to Hawaii. Exit interviews have indicated that interns feel their experience was valuable in increasing their knowledge of the Gulf of Mexico and further refining their interests, skills and career choice.

Impacts of Disaster Events on the Gulf of Mexico Region and States Commercial Landings and Dockside Values

Benedict Posadas
Mississippi State University

This presentation shows the three approaches in measuring the joint and individual impacts of man-made and natural disasters, global pandemic and recessions, US-China trade war, and recent increases in fuel prices on the Gulf of Mexico (GoM) region and states commercial landings and dockside values. Recent disasters included major hurricanes, the opening of the Bonnet Carré spillway, and harmful algal blooms. The COVID-19 pandemic was declared a national emergency in the U.S. on Mar.13, 2020. The U.S. economy was in recession from Feb. to Jun. 2020. The US-China trade war started in July 2018 when the US imposed tariffs on $34 billion of Chinese goods. China reciprocated by imposing equivalent tariffs on US exports. Fuel prices rose to more than $4 per gallon in early 2022. The first two approaches develop and estimate ordinary least square
(OLS) equations for the GoM region and individual states. The OLS models assume that monthly landings are significantly influenced by time, month, disasters, covid19, recession, the U.S. trade war with China, the dollar index, unemployment rate, fuel price, and Gulf dockside and wholesale prices, imported wholesale prices. The first economic model (OLS1) estimates total losses from actual and predicted values. The second economic model (OLS2) estimates total losses from predicted and no-disaster values. The third economic model is the Mean-Difference model, which estimates total losses from current and previous years' benchmark values.

Impacts of Wildfires and Prescribed Fires on the Presence of Invasive Plants in Coastal Mississippi

Robert Grala, Kate Grala, John Cartwright
Mississippi State University

Communities and landscapes associated with the Gulf of Mexico are frequently exposed to extreme weather events. These events facilitate the spread of invasive plant species, leading to the loss of native vegetation, reduced landscape potential to support ecosystem services, and substantial mitigation expenditures. Despite costly ecological and economic consequences, there is a limited understanding of how invasive plants spread in coastal areas and how wildfires, prescribed fires, and factors associated with land development contribute to this process. This lack of information prevents the implementation of adaptive ecosystem management strategies that would effectively mitigate the spread of invasive plants. Geospatial and regression analyses were conducted to determine the association of invasive plant presence in coastal Mississippi with the occurrence of wildfires, implementation of prescribed fires as well as ecological, socioeconomic, urbanization, and extreme weather factors. A greater presence of invasive plants was likely to occur in areas with a longer period since the implementation of a prescribed fire and a greater population density. Older-aged forests and areas with a greater percentage of forest cover, located further away from a wildfire, with a longer period since wildfire occurrence, with a greater average personal income, and located away from county roads were likely to experience a smaller presence of invasive plants. Results will help prioritize the implementation of prescribed fires to limit the spread of invasive plants and achieve other ecological benefits that will facilitate increased resilience of coastal communities and landscapes.

Implementing a Mobile-Tensaw Delta Network of Eddy Covariance Flux Towers

Gabriel de Oliveira [1], Skye Hellenkamp [1], John Lehrter [2]
[1] University of South Alabama; [2] Dauphin Island Sea Lab/University of South Alabama

Eddy covariance is of great use to several regulatory and commercial applications, related to environmental and water management, industrial monitoring, agricultural production, and other areas where directly measured energy, water vapor or gas exchanges, emissions and budgets are of interest. Major flux measurement networks exist to provide global synthesis, which allows interpretation of one particular site in the context of world-wide observations. Automated and semi-automated technical tools are now also available to expand the use of automated flux stations, individually and as a part of cross shared flux networks, into modelling and remote sensing with global coverage and local resolution. In this project, we aim to design a network of eddy covariance towers throughout the Mobile-Tensaw Delta in order to understand the responses of different terrestrial ecosystems on releasing/absorbing water to and from the atmosphere and emitting/absorbing carbon to and from the atmosphere. The idea is to set up towers over hardwood evergreen forests, wetlands, marshes and also agricultural areas in the surroundings. These towers, together with remote sensing (satellite) data and modeling we will be able to investigate, e.g., how different ecosystems in the Delta are behaving, both spatially and temporally, in terms of acting a sink or source of carbon.

Incorporating a Tiered Monitoring Design into the State of Alabama's SAV Mapping Program

Dorothy Byron, Kenneth Heck
Dauphin Island Sea Lab

Mapping of submerged aquatic vegetation using aerial imagery is often costly (> $100,000 per survey) and provides limited information on the health and condition of SAV. While these maps can be used to look at changes in SAV extent, they do not provide resource managers detailed information on the health and status of this vital coastal habitat so that protection and conservation management efforts can occur before negative changes become irreversible. For this reason, other State and Federal SAV monitoring programs conduct annual, in-water visual surveys, which in combination with aerial imagery acquisition and GIS products, provide a better picture to detect resource losses before they become irreversible. Using a tiered monitoring strategy based on National Park Services protocols, we created a grid of tessellated hexagons for selecting sampling locations within the mesohaline and polyhaline portions of coastal Alabama waters. Surveying the species composition and percent coverage of each species, we can begin to uncover the drivers of SAV change within the Mobile- Tensaw Delta and coastal Alabama bays.

Induced Defenses as a Management Tool: Shaping Individuals to Their Environment

Delbert L. Smee [1], Benjamin Belgrad [2]
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Many prey species can adjust morphology to reduce predation risk, but the benefits of changing morphology to thwart predators are poorly understood, particularly when the benefits may be variable in time and space. Using predator cues to enhance prey defenses may improve survival of cultivated species and enhance species restoration efforts, but assessment of such benefits is needed. We examined how raising a foundation species, oysters (*Crassostrea virginica*), under hatchery conditions with cues from two common predator species (blue crabs – *Callinectes sapidus*, and oyster drills – *Stramonita haemastoma*), can improve survival across a variety of predator regimes and environmental conditions. Oysters responded to crabs by growing shells that were 15% larger and 47% stronger than controls, while drills triggered shell changes in which shell size increased only 5% but strength was 55% greater than controls. Predator-induced changes significantly increased oyster survival up to 600%. Survivorship was maximized when cue source was matched with local predator regime, but crab cues consistently improved survival while drill cues sometimes produced maladaptive responses. Overall, our findings demonstrate the utility of using predator cues to enhance the survival of target species across landscapes and provide insight into the role of phenotypic plasticity in structuring population dynamics.

Influence of Biogenic Processes on Seabed Properties in the York River Estuary, Chesapeake Bay

Chesna Cox [1], Kelly Dorgan [1], Nina Stark [2], Grace Massey [3], Carl Friedrichs [3], Eric Hunstein [2], M. Rahman [4]

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Animals living in sediments (infauna) drastically modify the physical characteristics of their sediment habitats through ingestion and egestion, locomotion and tube and burrow formation. Infauna can secrete mucus that compacts sediment leading to an increase in sediment strength. Infauna can also increase localized porosity by excavating sediment, burrowing and disrupting sediment structure, or pumping water into the sediment. The accumulation of these activities can change sediment stability, making it more or less resistant to erosion from hydrodynamic stress or compaction or failure under loads, e.g., from objects or structures on the seafloor. This study aims to analyze how the benthic community influences sediment stability by sampling sediment communities with differing sediment physical properties. The York River Estuary, Chesapeake Bay, has a natural gradient in salinity and physical forcings. Historically, the less saline, high flow regions of the York River Estuary contain mostly burrowing bivalves that pump water to the surface. Saltier areas closer to the Chesapeake Bay with less river flow but more waves have more infauna that create burrows and rework the sediment. We predict that the pumping and burrowing activity of burrowing bivalves will increase porosity and destabilize the sediment. More sediment compaction by burrowers will result in increased cohesion resulting in greater stability. We also expect sites with more infaunal activity to have greater variability in sediment properties. The sediment community will be compared with measures of sediment physical properties and the impacts of fauna will be integrated into a framework for characterizing the stability of sediments.

Influence of Marine Phytoplankton in Surface Water Cr Cycling

Debbrota Mallick, Jeffrey Krause
Dauphin Island Sea Lab/University of South Alabama

The chromium (Cr) stable isotope system has recently been developed as a promising redox proxy to study Earth's oxygenation history. However, the understanding necessary to use Cr as a paleo redox proxy hinges on understanding how it cycles in the water column. In oceanic environments, Cr shows a nutrient type of distribution despite being a non-essential element for biological production. Recent work also has shown that behavior of Cr in estuaries is non-conservative, highlighting the potential for biologic and abiotic processes at the land-sea interface to affect the delivery of Cr to the ocean. The reduction of Cr (VI) to Cr(III) by phytoplankton has been examined previously; however, whether this affects Cr isotopic fractionation is unknown. This study aims to observe the influence of coastal Alabama phytoplankton on the reduction and potential isotopic changes of Cr. To date, experiments using locally isolated diatoms have been conducted with additional phytoplankton species to be selected. The water samples were subsampled for cell density, Cr concentration, and Cr isotopes analysis. The results will address whether broad corresponding trends of Cr with phytoplankton activity in the open ocean (prior studies) are relevant to coastal phytoplankton, which can accumulate 1-2 orders of magnitude more biomass, and lead to a better understanding of Cr cycling at the land-sea interface. Key words: Phytoplankton, productivity, photocatalytic reduction, Cr concentration and isotopes.

Influences of Future Changes in Watershed on Estuarine Hydrography: A Case Study of Wolf- Perdido Bay

Zhilong Liu [1], John Lehrter [1], Brian Dzwonkowski [1], Lisa Lowe [2]
[1] Dauphin Island Sea Lab/University of South Alabama; [2] North Carolina State University

Urbanization along the northern Gulf of Mexico promotes the conversion of forestlands to urban, pasture or agricultural uses. Loss of forests increases discharge and nutrient loading draining out of the watershed to the downstream estuary reducing the estuarine water quality and clarity. Meanwhile, the lack of flushing due to weak tides together would make the ecosystem in estuaries along northern Gulf coast even vulnerable. Yet the impacts of future changes in land use/land cover and climate on estuarine physical and biogeochemical processes are not well characterized. Hence, to understand the forest changes in the watershed on the physical processes in the Wolf-Perdido Bay, we develop a three-dimensional hydrodynamic model using the Semi-implicit Cross-scale Hydroscience Integrated System Model (SCHISM). The model is calibrated and validated with hydrographic observations. By integrating the hydrodynamic model with a regional downscaling climate model and a watershed model, scenario studies are conducted to predict the responses of estuarine processes including vertical stratification, transport and mixing to multiples levels of land use/land cover changes in the watershed. The results from this work will reveal the relevant importance of forest changes in watershed in relation to natural variability of downstream estuaries and improve our understanding and predictions of how the Wolf-Perdido Bay's quality evolve in the future.

Integrating Multi-scale Observations, Machine Learning and Systems Modeling for Coastal Monitoring, Assessment, and Prediction (Coast-MAP) in the Context of Multiple Stresses

Shufen Pan [1], Hanqin Tian [2], Christopher Anderson [1], Wanyun Shao [3]
[1] Auburn University; [2] Boston College; [3] University of Alabama

Coastal Alabama has elevated risks of coastal hazards due to the combination of high social vulnerability, and exposure to hurricanes. To address the combined effects of multiple stresses and to improve predictability, there is a critical need for methodological advancements that integrate multiple layers of geographic information and pursue a science-based approach to monitoring, understanding, predicting, and responding to changes in coupled social-ecological systems along the Gulf. The goal of this project is to develop a holistic platform that integrates multiscale observations, machine learning and systems modeling for coastal monitoring, assessment and prediction (Coast-MAP) of ecosystem health, water resources and social resilience in the past 30 years and next 30 years. The multiple stressors we will consider include climate change, floods and droughts, hurricanes, land use, urbanization, sewage, and nutrient loads. We have been making some progress toward the following objectives: 1) Evaluate the contemporary states of ecosystem health, water resource and social resilience through ground and satellite observations, machine learning and geospatial mapping; 2) Assess and attribute impacts of multiple stresses on ecosystem health and water resource in the past 30 years; 3) Predict potential impacts of climate and land use changes on ecosystem health and water resources in the next 30 years; 4) Improve understanding of the effectiveness of specific resilience-based assessments and decision-making tools with stakeholders. The methods and metrics will be used to measure coastal resilience that are context specific, validated with observed data, and ground-truthed via stakeholder participation.

Integration of Aquaculture Techniques in Oyster Reef Restoration: The Little Dauphin Bay Oyster Restoration Project

Christina LoBuglio, Caroline Golightly, Meghan Capps, Scott Rikard
Auburn University Shellfish Laboratory

Oyster reef restoration projects often focus on planting cultch and occasionally seeding of hatchery-reared spat on shell requiring large logistical efforts. Fresh set spat experience high mortality due to predation and sedimentation. The Auburn University Shellfish Lab (AUSL) is conducting a three-year oyster reef restoration in Little Dauphin Bay (LDB), AL utilizing aquaculture techniques to improve survival and remove logistical concerns by using smaller setting material Six paired plots (750m2) were cultched with oyster shell in LDB followed by seeding of spat clusters on one plot per pair (shell height=25mm). Spat clusters are produced by setting pediveliger larvae on small shell at the AUSL hatchery and then moved to an AUSL oyster farm. At the farm, aquaculture gear is used to accelerate growth and protect spat from predation prior to planting seed on plots. Three sets of paired plots are trapped for oyster drills to analyze predator mitigation. Plots are assessed semi- annually for differences in oyster populations between seeded and non-seeded plots and predator mitigation effects. At the project midpoint (October 2022), 628,000 oysters were planted with further deployments slated through Fall 2023. Sampling indicates a bi-modal distribution of oysters suggesting two recruitment classes, but no significant population difference is currently observed between seeded and non-seeded plots. Oyster drills appeared on reefs in March 2022 with trapping efforts showing little effect on oyster populations. Sampling of plots through Spring 2024 will determine overall interaction of seeding and trapping in enhancement of restored oyster populations.

Interactions Between Sediment Stability and Infaunal Community Structure Following a Hurricane Disturbance

William Clemo, Kelly Dorgan, Brian Dzwonkowski
Dauphin Island Sea Lab/University of South Alabama

Shallow coastal sediments are important for global carbon storage and nutrient cycling, marine infrastructure and navigation, and provide a habitat for diverse communities of burrowing invertebrates (infauna). Extreme storms such as tropical cyclones can dramatically restructure shallow sediment and kill infauna through resuspension and sand deposition from barrier island erosion. Additionally, infaunal activities, including burrowing, tube construction, and feeding on sediment, can impact sediment structure and stability. However, little is known about how infaunal communities recover after hurricanes and how recovering infauna impact sediment stability. We investigated temporal changes to surface sediment physical properties (erodibility, grain size, porosity), bed shear stress, and infaunal community structure at 5m, 12m and 20m depths in the northern Gulf of Mexico following Hurricane Sally (2020). We expected that changes to erodibility immediately after Hurricane Sally would relate mainly to storm-generated changes to grain size and porosity whereas months after Sally, temporal changes to infauna community structure would drive temporal erodibility differences at a given site. We also expected that infaunal impacts to erodibility would be greater in cohesive muds compared to clean sands. Here we present data on temporal changes to sediment and infaunal community structure from sediment cores collected offshore of Alabama 6d before and 10, 40, 85, 162 and 251d after Hurricane Sally. These results will provide insight on how tropical cyclones impact sediment and infaunal community structure on small spatial scales as well as the short and long-term impacts of infaunal community recovery on sediment stability and transport.

Investigating Salinity and Temperature Tolerances of Grass Shrimp

Adam Murray, Jeremy Johnson, Kim de Mutsert
University of Southern Mississippi

Grass shrimp of the genus *Palaemonetes* are an important prey species for estuarine nekton, transferring energy from producer and decomposer levels to higher consumer levels. Their role as a lower trophic level intermediary makes them a suitable candidate for inclusion in ecosystem models that investigate the effect of changing environmental parameters on food web dynamics. However, few exposure studies exist that are specifically designed for optimal inclusion in a habitat capacity model. The habitat capacity modeling component of the ecosystem modeling tool Ecospace, estimates habitat suitability using species-specific response curves over monthly timesteps. The goal of this study was to determine the tolerance of grass shrimp to different salinities over monthly periods to create response curves in an Ecospace model, at different temperatures to determine if there are salinity x temperature interactions. Over one-month long intervals, grass shrimp were exposed to six treatment levels of salinity (0, 2, 7, 13, 20, and 35 ppt) at three different temperatures (15°, 26°, and 30°C) within a controlled flow-through system. Lethal and sublethal effects were quantified by measuring survival, change in biomass, and caloric content of the grass shrimp at the end of each month. The results will be used to create response curves in an Ecospace model that simulates the effects of changing environmental parameters on an estuarine food web that experiences substantial freshwater inflow events.

Is Your Water Well? Stressors on Groundwater Quality for Private Well Users in the Alabama Gulf Coast

Ann Ojeda, Stephanie Rogers, Frances O'Donnell, John Beck, Jessica Curl, Eve Brantley
Auburn University

Access to clean drinking water is a cornerstone of community resilience and sustainability. Private well users are at a disproportionate risk for poor drinking water quality because the water is often under- or untreated compared to public water supplies. The objectives of this study are to measure and predict relationships between groundwater geochemistry, land use, and climatic stressors on groundwater quality, particularly for private well users. First, we've launched a citizen-science campaign to collect well water quality data across coastal Alabama, and we are working with private well users to calibrate the citizen-science data to laboratory analysis. The result of this effort will be a groundwater quality dataset that captures spatial and temporal variability of priority contaminants like nutrients, pesticides, heavy metals (e.g., As, Cr, Pb), pathogens (coliforms, *E. coli*), and volatile organic compounds (e.g., benzene, chlorinated solvents). We have developed a web-based portal to aggregate and analyze the data as a function of variables like hydrogeology, land cover and groundwater recharge potential to understand sources of contaminants in the water. The dataset will also be leveraged to determine the effect of precipitation extremes on the probability of adverse groundwater quality events that also consider the effect of sea level rise and changes in the depth to groundwater. Throughout the project, we are working closely with the Extension led Alabama Private Well Owner Program (APWP) at Auburn and other Extension professionals throughout the state to create resources for well users and increase stakeholder awareness of groundwater Alabama.

Lateral Dynamics in an Estuary with a Narrow, Deep Ship Channel and Wide, Shallow Shoals: Mobile Bay, Alabama

Harikrishnan Sreeshylam [1], Zhilong Liu [1], Brian Dzwonkowski [1], John Lehrter [1], Lisa Lowe [2], Jeff Coogan [3]
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Mobile Bay in the northern Gulf of Mexico is a shallow (~3 m) and broad (10-30 km) estuary with a deep (12-14 m), relatively narrow (120 m) ship channel along its length, providing an example of a 'channel-shoal' estuary. This type of geomorphology is common in the shallow estuaries of the Gulf of Mexico, where channels may be essential conduits of salt and other materials from deeper coastal waters. This numerical modeling study based on the Regional Ocean Modeling System (ROMS) will investigate the lateral circulation and associated forcing dynamics in this channel-shoal estuary, where the influence of the ship channel is poorly understood. Specifically, this study seeks to answer the question: How does the estuarine bathymetry affect the lateral exchange between the channel and shoals? A mid-bay cross-section was examined using the model to quantify the channel-shoal interaction in this system. The depth-averaged longitudinal saltwater intrusion is strongest in deeper channels and weakest in shallow shoals. The resulting differential advection from the channel to the shoals sets up a strong lateral salinity gradient, which provides a baroclinic driving force that may generate significant lateral circulation in this system. The shallower shoals are expected to limit the amount of lateral baroclinic forcing to the channel-flank transition zone. This study suggests that the lateral scale associated with the transition from channel to shoals, rather than the overall width of the channel-shoal estuary, affects the relative relevance of channel-shoal interaction.

Leveraging Adaptation Pathways to Identify Vulnerabilities and Opportunities for Resilience in Dauphin Island, AL

Stephanie Patch [1], Renee Collini [2]
[1] University of South Alabama; [2] PLACE:SLR

Adaptation pathways were developed for Dauphin Island by employing morphodynamic modeling and science extension methodologies, and engaging community leadership and members. Pathways identify ways to increase resilience by protecting built infrastructure and are comprised of several adaptation strategies for barrier island adaptation to future hurricanes and sea-level rise (SLR). The strategies are arranged based on their effectiveness in protecting the island from damage. "Tipping points" are identified as the moment a strategy no longer meets its original objective of mitigating storm damage, necessitating the implementation of another strategy. Four adaptation pathways were created for Dauphin Island: the east end pathway used overwash of saltwater into a freshwater source as a tipping point; and the three middle west end pathways used barrier island breaching, overwash onto Bienville Blvd, and overall island elevation as tipping points. The pathways show that, ultimately, beach nourishment is an effective strategy to mitigate damage to the Gulf-side of the island, but the backbarrier inundates as seas rise without raising backbarrier elevations. The adaptation pathways developed from this work identify best practices for increasing barrier island resilience to hurricanes under varying levels of SLR while also improving the understanding of developed barrier island responses to future storms. The pathways also inform coastal management officials of the critical moment to implement a certain adaptation strategy based on observed SLR rather than uncertain long-term predictions, thereby reducing unnecessary costs.

Little Billy Goat Hole and East End Improvements

Amanda Tinsley [1], Jeff Collier [2]
[1] Moffatt & Nichol; [2] Town of Dauphin Island

This session will discuss a project on the east end of Dauphin Island. The project was funded by the U.S. Fish and Wildlife Service (USFWS) Sport Fish Grant, the Gulf of Mexico Energy Security Act (GOMESA) Grant, and matching funds from the Town of Dauphin Island. The USFWS Sport Fish fund components of this project included dredging the boat basin of Little Billy Goat Hole and placement of the dredged material, improving the finger pier decks located at Little Billy Goat Hole, refurbishing the rock jetties at Little Billy Goat Hole, and resurfacing the Little Billy Goat Hole parking lot. The GOMESA fund components of the project included repairing the steel sheet pile bulkhead at Little Billy Goat Hole with a vinyl sheet pile, improving the portion of Bienville Boulevard between Little Billy Goat Hole and the Dauphin Island East End Beach, and improving the Dauphin Island East End Beach parking lot. In this design, we dredged the basin to an elevation of -5ft mean lower low water, used true grid pavers with an asphalt pavement or overlay depending on the section, used vinyl sheet piling to repair the existing (failing) steel sheet pile, restored the rocks on the existing jetty to +2.0 mean sea level with a tolerance of
± 0.5'and used permeable polypropylene decking to replace the existing deck boards that were not constructed with marine grade boards.

Living Shorelines: Large-scale Impacts from Small-scale Decisions

Sara Martin, Eric Sparks
Mississippi State University

Natural shorelines provide ecosystem services that are integral to maintaining healthy and resilient coastal ecosystems and communities. However, anthropogenic and environmental stressors are reducing the extent of natural shorelines and, thus, their capacity to provide critical ecosystem services. Small-scale private property owners own an overwhelming majority of waterfront property in coastal Mississippi and Alabama. Therefore, environmentally-focused management of private shorelines can provide large-scale benefits. Unfortunately, the most common shoreline management strategies for private property owners are hardened structures (e.g., bulkheads and seawalls) that are known to impair coastal ecosystems. An alternative to hardened shorelines is living shorelines, which are a collection of shoreline stabilization techniques that incorporate natural materials such as native shoreline plants. To promote living shorelines with private property owners, the Mississippi-Alabama Sea Grant Living Shorelines Program and its partners began producing guidance documents, offering technical assistance, and conducting trainings for private property owners and contractors. Throughout these interactions, property owners and contractors have expressed their potential barriers to living shoreline adoption and needs (living shoreline research, communication, and training). In this presentation, we will discuss the status of addressing those barriers and needs as well as introduce some new living shoreline assistance programs in Mississippi and Alabama.

Living Shorelines: Management Hurdles in Regulatory Requirements

Lee Yokel, Tom Hutchings
EcoSolutions, Inc.

Twenty years ago, estuarine shoreline protection was relegated to hardening techniques or none at all. Many private property owners did not want to riprap or bulkhead their estuarine beaches, preferring the natural intertidal zone. As shoreline erosion increased due to ship traffic, boat wakes, sea level rise, and bulkheads, they resorted to their only option, a hardened shoreline. Historically, residents in coastal Alabama went to the beach along Mobile Bay. A touch point to the area's most significant resource is important, but little access remains. Regulatory burdens drive the private property owner to cheaper hardening alternatives, damaging from both an ecological and cultural perspective. Today, there are more shoreline protection options. These maintain the integrity and attributes of a natural shoreline. For private property owners, burdens still exist for design options such as pocket beaches along estuarine intertidal areas. This presentation we will address three regulatory burdens: reclamation, federal and state design requirements, and fees. We will present the problem and workable management solutions to these shoreline protection hurdles.

Loss of Mississippi Diamondback Terrapin (*Malaclemys terrapin pileata*) Nesting Habitat and Implications for Restoration

Andrew Heaton, Michael Archer, Emmett Carstens, Kimberly Cressman, Jonathan Pitchford
Grand Bay National Estuarine Research Reserve

In the Grand Bay National Estuarine Research Reserve (GNDNERR), Mississippi diamondback terrapins *(Malaclemys terrapin pileata*) are known to primarily nest at two locations, Point Aux-Chenes and Grand Battures, whose shorelines are retreating at rates of 0.50.-1.99 and 2.0-6.55 meters per year, respectively. Nest monitoring efforts have been predominantly conducted at Grand Battures, the location with the most ongoing nesting habitat loss. Grand Battures has received depredated nest surveys in 1995, 2007, 2009, 2014, and 2021. The 2021 surveys reported the lowest number of depredated nests to date with increased search effort, and the available shoreline nesting habitat has decreased from 2.34 km to 1.45 km since 2014. During the 2022 nesting season, we surveyed abiotic factors associated with terrapin nest site selection at three sites – Point Aux-Chenes, Grand Battures, and Graveline Bay (outside of the GNDNERR). We collected precise elevation data, vegetation community data, and soil characteristics for each depredated nest we encountered as well as for paired random points along the beach. These data are being analyzed to determine preferred nest site characteristics and we hope that this information can be used to support future nesting habitat restoration initiatives along the northern Gulf of Mexico.

Marine Connectivity in the Mississippi Bight: Whose Larval Fish and Crabs Are They?

Donald Johnson, Harriet Perry, Jim Franks
University of Southern Mississippi

Fishery management requires an understanding of the variables that influence year-class strength, particularly those responsible for the year-to-year fluctuations in larval recruitment. This is especially difficult for species whose life history includes a lengthy planktonic larval duration that allows for wide dispersal through transport mechanisms set by seasonal meteorological and oceanographic conditions. Recruitment success is determined by these basin-scale hydrological processes that respond to variations in climatic wind stress patterns during larval development at sea. The emerging science of marine connectivity addresses the questions of timing of spawn, duration of larval stage, distance of travel, mechanics of transport and the eventual settlement on juvenile nursery grounds. Studies of red Snapper (*Lutjanus campechanus*) on the continental shelf and crossing the deep basin will be discussed as illustration. But because of its complexity, determining connectivity within the Mississippi Bight in the north central Gulf of Mexico has been uncertain especially in the western portion of the Bight involving the Mississippi Sound. In shallow waters, neither the present operational models nor drifter observations are sufficient to describe transport from Coastal Boundary waters to nursery grounds in the Sound. Blue Crab (*Callinectes sapidus*) and Atlantic Tarpon (*Megalops atlanticus*) are used to illustrate gaps in our understanding of nearshore transport. The authors have access to extensive biological databases and are testing inexpensive surface drifters that can be used to track nearshore currents. We are hopeful of attracting a regional interest in improving operational models for use in shallow water marine connectivity.

Marlow Spring Branch Restoration

Nick Combs
Thompson Engineering

Thompson Engineering was contracted to lead engineering and design activities for the Marlow Stream Restoration Project in Baldwin County, Alabama. Located in the Lower Fish River Watershed, this unnamed tributary, locally known as Spring Branch, had severe bank erosion, and was contributing significant amounts of sediment to Fish River. Contributing factors were changes in land-use, increased impervious surfaces, stormwater runoff, inadequate channel dimension, insufficient floodplain connectivity, and stream channel degradation. Implementation of this top priority recommendation of the Weeks Bay Watershed Management Plan utilized Natural Channel Design techniques to restore over 1,400 linear feet of channel. Completed in August 2022, primary objectives for the project included reducing downstream sediment loading, reducing geomorphological failures, and reconnecting the floodplain. Additional discussion will include Natural Channel Design techniques, which involves design of proper channel dimension, pattern, and profile based on reference reach data, instream channel and floodplain stabilization structures, and re-planting with appropriate native vegetation; and project challenges, strengths, and lessons learned.

Marsh Vertical Profiling on Belowground Biomass, Salinity, and Elevation: Enhancing Predictive Modeling on Sea Level Rise and Vertical Accretion Rates

Makenzie Holifield, Kodi Feldpausch, Wei Wu
University of Southern Mississippi

The Mississippi Sound is an intensely protected and studied ecosystem with extensive and unique onshore, offshore, and marsh habitats. The economy of several northern Gulf of Mexico states relies on the health and productivity of this estuarine basin, as the marshes that span from Louisiana to Alabama are historical hatcheries and nurseries as well as storm buffers and tourist industry hotspots. Global climate change threatens this ecosystem on the waterfront, with sea level rise (SLR) and irregular flooding causing decreases in marsh coverage as open water coverage increases and encroaches upon the shoreline. Marsh ecosystems survive SLR via vertical accretion through mineral deposits and organic matter accumulation; the rate of vertical accretion is strongly dependent on location, sediment deposition, yearly storm activity, and vegetation productivity. Using linear mixed effects models or ordinary regression, we evaluated how belowground biomass from 0 to 30 cm depth in Hancock County, MS marshes (HC) and Grand Bay National Estuarine Research Reserve (GBNERR) responded to soil porewater salinity and elevation at mean high water datum (a proxy for inundation). The field sampling was conducted in summer 2020, summer 2021 (peak growth), and winter 2021 (die-off). The results show that belowground biomass was significantly affected by salinity, elevation, and their interaction in all three sampling seasons at GBNERR and two at HC. In summer 2020 at HC, only salinity significantly affected belowground biomass. As the relation between biomass and salinity is in quadratic functions, there existed an optimum salinity at which belowground biomass reached maximum.

Maximizing Back-Barrier Island Marsh Habitat Through Innovative Solutions

Peyton Posey [1], Nick Cox [1], Jeff Collier [2], Meg Goecker [1]
[1] Moffatt & Nichol; [2] Town of Dauphin Island

The Graveline Bay Marsh Restoration Project was designed to restore and supplement historical marsh habitat and support Dauphin Island resilience in the face of long-term erosive forces. This project builds on successful marsh mound projects across the Gulf Coast to explore methods of design that mimic the natural environment and maximize the ecological value of marsh edge habitat. Through the utilization of marsh mounds this restoration design increases the environmental uplift by providing additional marsh edge habitat per area of constructed marsh compared to a contiguous marsh platform. The marsh mound design also reduces the unit cost of marsh restoration per acre. The Graveline Bay project utilizes large marsh mounds to buffer against wave erosion in place of hardened shoreline alternatives. Ten large marsh mounds are located on the bay side of the project and 45 small mounds are located landward of the large mounds. The design expects the large mounds on the windward side to reform to an outer berm feature over time, which will be sacrificial and protect the smaller restored marsh mounds. This berm will mimic natural sand berms found in the existing island marsh habitats. Additionally, based on typical wave directions, the expected crenulate shape of the berm would direct alongshore transport toward the middle of the outer row of marsh mounds, increasing the likelihood that sediment stays within the marsh mound system. With construction in the summer and fall of 2022, the final project design will restore approximately 60 acres of marsh habitat.

Measuring the Refractive Index of Marine Microbes using a 3D Holo-Tomographic Microscope

Michael Kamowski
University of Southern Mississippi

The refractive index (RI) of microbes is determined through its cellular composition. Knowledge of the internal variability of RI not only reveals the structure within these organisms but is also essential to optically modeling them as well interpreting these models. Due to technical limitations, current knowledge of the RI of these microbes is very limited. The Nanolive 3D Cell Explorer is a high precision tomographic microscope that maps the internal structures through their RI based on a rotational interferometric technique to create holographic images. The instrument was calibrated and validated in the lab using materials with known RI values. We measured the RI of marine microbes in near surface waters collected during two experiments, NASA EXPORTS in the North Atlantic in May of 2021 and a pre-PACE cruise in the GoM in March of 2022. In the collected samples, several microbial groups were identified, including Dinoflagellates, Diatoms, and Cilliates. The internal structures can be clearly differentiated based on RI and a general trend in terms of RI values was observed (chloroplast > membrane). For the external membrane, we were able to identify their composition (Calcium Carbonate vs Silica) based on their measured RI values. We were able to differentiate zooplankton, bacteria, and flocculates composed of sediment and oil as well. To the best of our knowledge, this is the first time that the internal variations of refractive index within microbes is being directly measured. These results will allow us to better model the optical properties of these marine particles.

Meiofaunal Diversity as a Tool for Understanding and Monitoring Northern Gulf of Mexico Environments

William Ballentine [1], Kelly Dorgan [1], Kevin Kocot [2], Nickellaus Roberts [2], Kenneth Halanych [3]
[1] Dauphin Island Sea Lab/University of South Alabama; [2] University of Alabama; [3] Auburn University

Meiofauna, animals which are < 1mm and live between sand grains, are essential for ecosystem functions as they are near the base of the food web and facilitate benthic-pelagic coupling. They have been shown to be reliable bioindicators in both single- and multiple-stressor scenarios; their utility for assessing environmental impacts was demonstrated following the 2010 Deepwater Horizon oil spill. The overarching goal of this project is to develop a framework to use meiofaunal communities as indicators of short-term disturbances and long-term changing environmental conditions along the Northern Gulf of Mexico. We will use high-throughput DNA metabarcoding to assess meiofaunal diversity, and community structure in the northern Gulf of Mexico. Whereas metabarcoding often yields a long list of taxa that can only be identified to higher levels, we will use traditional morphological approaches and individual DNA barcoding and mitogenomics in conjunction with metabarcoding to enable specific identification of taxa recovered in our metabarcoding. Metabarcoding results will be correlated to environmental parameters, including granulometry and carbon and nitrogen content, to understand larger ecological patterns and inform future monitoring work. In support of these objectives, a meiofauna taxonomy workshop will be held at the Dauphin Island Sea Lab where guest taxonomic experts will identify Alabama's diverse meiofauna and help train the next generation of meiofaunal taxonomists. Meeting these objectives will allow us to ground truth high-throughput DNA sequencing techniques for use in environmental assessments of meiofauna, ameliorating the labor intensive and specialized training required in traditional taxonomic approaches.

Mississippi River Reiroduction into Maurepas Swamp

Ranjit Jadhav [1], Bradford Miller [2]
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Maurepas swamp is a coastal forested wetland on the east bank of the Mississippi River between Baton Rouge and New Orleans and is connected to Lake Pontchartrain via Lake Maurepas. Due to the lack of the regular freshwater and nutrient supply from the seasonal Mississippi River floods after construction of the river levees, the swamp has been transitioning to marsh and open water. A project is being designed to reintroduce up to 2,000 cfs river water into the swamp. The specific objectives of the project are to: restore natural swamp hydrology, increase sediment and nutrient loading to the project area, increase substrate accretion, retain and increase existing areas of swamp vegetation including overstory cover, and reduce salinity levels. To assist in the evaluation of the water quality and hydrologic benefits, a two-dimensional numerical model was developed using Delft3D software. The model was calibrated and validated under normal tidal conditions as well as tropical storm conditions. The model was utilized to evaluate distribution of river water throughout the swamp, and to evaluate fate and transport of total nitrogen and total phosphorous. The model was also applied to evaluate potential freshening of the swamp following saline conditions after a tropical storm surge. The output data were used in a Wetland Valuation Assessment Model to estimate project benefits. The analysis indicated that the proposed project can provide significant benefits to maintain a controlled supply freshwater and nutrient to the swamp. The project can be effectively operated to reduce salinity following a tropical storm surge.

Mitigating Flood Risks on the Mississippi Gulf Coast Using Equity-based and Stakeholder-informed Multi-scale Nature-based Solutions

Wei Wu [1], Patrick Biber [1], Stephen Deal [2]
[1] University of Southern Mississippi; [2] Mississippi-Alabama Sea Grant

Flooding is the most destructive natural hazard in the U.S. Nature-based solutions (NBS) provide an effective way to mitigate flood risks while maintaining integrity of ecosystem services and generating co-benefits. However, research on urban NBS projects show that they often cause gentrification and displacement. Vulnerable communities can take advantage of NBS and simultaneously promote social equity through carefully designed multi-scale projects that improve the connections between NBS and community development. This research will co-identify feasible NBS at multiple spatial scales (household/site, coastal area) for Moss Point, an underrepresented city on the Mississippi Gulf Coast, to mitigate flood risks and adapt to climate change while promoting discounts in flood insurance premiums using the Community Rating System (CRS). We will co-produce planning data to inform potential project design of NBS options identified by the resident stakeholders. We implement a multi-disciplinary approach that involves mapping, hydrological modeling, competency group engagement, surveys, and outreach activities. We leverage the community's capacity building in an ongoing green infrastructure project funded through EPA. We will link NBS to reduced flood insurance premiums by focusing on utilizing NBS as a mechanism to help Moss Point join the CRS, an incentive program of the National Flood Insurance Program of FEM. Here we report the findings from the meetings with the city officials and competency group. We expect the project can provide road maps on how to help underserved communities build NBS planning capacity which can be widely applied.

Modeling Oyster Larval Development and Success to Metamorphosis in the Mississippi Sound

James Klein [1], Eric Powell [1], Xiaodong Zhang [2], Danielle Kreeger [3], Sara Pace [1], Thomas Wissing [1]
[1] University of Southern Mississippi; [2] University of Alabama; [3] Partnership for the Delaware Estuary

Eastern oysters (*Crassostrea virginica*) are critical estuarine organisms for the various ecosystem services they offer and for their economic value as a fishery resource. Therefore, successful reef recovery is a central concern for the western Mississippi Sound after the 2019 Bonnet Carré freshwater diversion mass mortality event. Effective oyster reef recovery requires an adequate larval stock competent of timely development and metamorphosis. The health and growth of oyster larvae through to metamorphosis is determined by ambient water conditions, food quantity, and also food quality. Oyster larvae require a balanced protein, carbohydrate, and lipid diet to sufficiently develop, survive, and successfully metamorphose. Water samples were collected at seven established western Mississippi Sound oyster reefs to quantify the biochemical constituents in the available food supply alongside temperature and salinity measurements throughout the 2021 spawning season (May through October). Environmental data were incorporated into a previously developed biochemically based larval performance model to estimate survivorship and success at metamorphosis. The model is unique in that it includes genetic variation among larval cohorts, tracks weight and length separately to assess condition index, and characterizes larvae and food by their biochemical composition. Simulations suggest that conditions at four of the seven reefs promoted metamorphosis, although larval survivorship was constrained to a 100-day period within the entire spawning season. Low salinity and inadequate food supply account for high larval mortality. Model estimations are corroborated by observations of minimal recruitment to the oyster reefs.

Modeling the Impacts of Coastal Flooding on Gulf Coast Tourism Resilience

Jeffrey LaMondia, Christopher Gerber
Auburn University

While much resilience planning in Gulf Coast communities has focused on measuring physical structure resilience (e.g., roads and buildings), less work has considered how flooding-related roadway closures and infrastructure damage influence coastal community tourism resilience. Therefore, the goal of this work is to determine how coastal flooding impacts, demographics, and planned trip characteristics affect visitors' likelihood of taking a trip to a Gulf Coast Community under different flooding scenarios. This work utilizes data from a 2022 survey collected in the Mobile Bay region of Alabama, where seventy-five visitors were asked about their current trip and how they would change their travel plans due to a series of potential flooding scenarios, including if beaches were flooded, restaurants were closed, shopping areas were closed, driving was restricted, etc. Specifically, two models were estimated to quantify visitor resilience: (a) an ordinal logistic regression on how significantly a respondent would change their trip (e.g., from taking to cancelling the trip) and (b) a binomial regression on how much the respondent spent on this trip. Independent variables included respondent demographics, trip characteristics and flooding impacts in both models. Results highlight, regardless of the reasons for their trip or demographics, nearly 80% of visitors would cancel their trip or at the least reschedule if either the beach or restaurants were specifically closed. This suggests that to maintain Alabama's Gulf Coast tourism industry and the crucial income it provides, planners should focus their flood relief efforts on the resilience of public beaches and local restaurants.

Monitoring Wetland Vegetation in Response to Climate Changes with NDVI

Sadia Alam Shammi, John Cartwright
Mississippi State University, Geosystems Research Institute

Coastal wetlands are important for the function and balance of natural ecosystems. Factors related to climate change, sea level rise, natural and man-made hazards, and hydrologic modifications (including channelization, surface water diversions, dredging, etc.) impact the viability of coastal wetlands. Regular monitoring of wetland environments is possible through the utilization of geospatial technologies and satellite imagery providing a method of improved assessment and management. This study provides an assessment of the wetlands associated with the Weeks Bay National Estuarine Reserve located in southeast Alabama. The assessment was performed from the analysis of Normalized Difference Vegetation Index (NDVI) data derived from the Landsat 8 satellite. NDVI values were analyzed at both seasonal and annual time frames from 2013 to 2021. This analysis helps to identify changes in the overall health, biomass, and greenness of the selected wetland environments. The initial results showed a decrease in wetland NDVI values over the eight-year period. The current analysis is comparing wetland NDVI values with climate related variables for an improved understanding of the wetland dynamics in this region. Climate data for precipitation amounts, duration, and intensity are being used to evaluate the impact of precipitation days (days with and without rain) for annual and seasonal trends in change.

Neighbors Helping Neighbors: Community Centered Severe Weather Preparedness and Resilience

Tracie Sempier
Mississippi-Alabama Sea Grant Consortium

The southeast United States has a disproportionately large number of tornadoes resulting in fatalities compared to the rest of the country. Researchers have attributed this to several factors including, tornadoes that occur at night across rugged terrain and tornadic activity that persists throughout the year rather than within a defined season. Of importance prior research has identified lack of adequate shelter, a high number of people in vulnerable conditions and lack of visibility of tornadoes as contributing factors to higher fatality rates. In order to address these vulnerabilities, the National Severe Storms Laboratory and the Mississippi-Alabama Sea Grant Consortium have partnered to build an extension program centered around community severe weather preparedness and resilience for VORTEX-SE (Verification of the Origins of Rotation in Tornadoes Experiment Southeast). As severe weather continues to place people and property at risk, we are continually striving to be creative in bridging the gap that exists between research, forecasting, and local action (individuals/families). The neighborhood level approach outlined in this presentation is aimed at empowering individuals to understand their role in helping one another in the event of severe weather and acquiring the skills to respond. The development of neighborhood level curriculum and training will be discussed which aims to strengthen social networks within neighborhoods and identify safe sheltering options for those with/without transportation, as well as disseminate information on how to find shelters. Neighbors can acquire skills necessary for appropriate response during a disaster and can collectively take action to protect people and property.

Nekton and Submerged Aquatic Vegetation Abundance and Distribution Across the Vegetation Growing Season in the Atchafalaya Basin

Shannan McAskill [1], Tom Sevick [2], Tim Carruthers [2], Kelly Darnell [1]
[1] University of Southern Mississippi; [2] The Water Institute of the Gulf

Submerged aquatic vegetation (SAV) provides critical habitat for many fish and invertebrate species, with peak biomass and growth for many SAV species occurring during the summer to early fall along the northern Gulf of Mexico. This study investigated spatio-temporal changes in SAV occurrence and nekton community abundance and distribution across the peak SAV growing season in the Atchafalaya Basin, Louisiana. SAV surveys were conducted monthly at 31 stations from June to September 2015, with species percent cover being averaged across four quadrats per station. Mean SAV species percent cover and canopy height were then compared across months. Concurrent to SAV surveys, nekton samples were collected using throw traps within *Vallisneria americana* and *Myriophyllum spicatum* SAV beds and three bare sediment stations per month from June to September 2015. Nekton community composition was compared between months, habitat types, and their interaction to determine how nekton communities change throughout the SAV growing season. Additional analyses were run to evaluate potential environmental drivers of SAV species percent cover and nekton community composition. Results from this study provide insight into how SAV species coverage and nekton communities change over space and time during the SAV growing season and can assist with the development of management plans for the Atchafalaya Basin.

NOAA Firebird: Fire Effects in Gulf of Mexico Marshes on Mottled Ducks, Black and Yellow Rails

Mark Woodrey [1], Mike Brasher [2], Chris Butler [3], Wyatt Cheney [1], Robert Cooper [4], Warren Conway [5], Jim Cox [6], Nicholas Enwright [7], Kristine Evans [1], Karen Hondrick [5], Erik Johnson [8], Peter Kappes [1], Chelsea Kross [10], Joe Lancaster [9], Heather Levy [6], Jonathan Lueck [1], Jim Lyons [7], Lauren Monopoli [10]

[1] Mississippi State University; [2] Ducks Unlimited Inc.; [3] University of Central Oklahoma; [4] University of Georgia; [5] Texas Tech University; [6] Tall Timbers Research Station; [7] U.S. Geological Survey; [8] National Audubon Society; [9] Gulf Coast Joint Venture/Ducks Unlimited; [10] University of Illinois

Although extensive work has been done in upland systems to understand the role of fire in maintaining ecosystem functions, little has been done on the maintenance of coastal wetlands, or the response of birds in high marsh wetlands. High marsh is a unique habitat type, imminently threatened by sea level rise and characterized by a community of specialized emergent vegetation that tolerates irregular tidal inundation. Land managers' decisions about prescribed fire in high marsh systems are complicated by uncertainty around the response of birds to the application of prescribed fire. Without an understanding of how prescribed fire impacts high marsh ecosystems, natural resource managers will be limited in their ability to manage and conserve the biodiversity of the Gulf of Mexico Coastal Region. Black rail, yellow rail, and mottled duck are birds of conservation concern, and uncertainty currently limits the application of prescribed fire for the benefit for all three species. We will present our work to date in monitoring the response of our three focal species to prescribed fire management of their habitats, and what we've learned along the way in terms of sampling design for three birds that can be challenging to study.

Not All Marsh Edge is Equally Valuable Fish Habitat: Variation in Fish Community Structure Across Mississippi Sound, Alabama

Ronald Baker [1], Rebecca Gilpin [2], Alexandra Rodriguez [3], Tia Offner [2], Just Cebrian [2]

[1] Dauphin Island Sea Lab/University of South Alabama; [2] Mississippi State University; [3] Dauphin Island Sea Lab

The seaward fringes of salt marshes are widely recognized as essential habitat for a diversity of ecologically and economically important species. However, spatial variation in the value of marsh-edge habitat remains largely unexplored. To explore variation in the value of marsh edge as nekton (fish and mobile crustaceans) habitat, we quantified nekton density with a drop sampler in marsh edge (outer ~1 m of flooded salt marsh grass) and adjacent open water (~10 m offshore from marsh edge) habitats. We collected 60 drop samples each in summer and fall of 2022 at 10 sites spanning Mississippi Sound, AL, in contexts ranging from open coastal shorelines, through sheltered bays, to tidal marsh creeks, and along upstream- downstream gradients in riverine environments. Sites also varied in fetch, the extent of adjacent SAV, elevation profiles, and flooding patterns. As expected, nekton densities were far higher in the flooded marsh edge than in adjacent unvegetated open water habitats. Further analysis will identify key drivers of variation in the value of marsh edge, and quantify the relative importance of marsh edge and adjacent SAV for various species. These findings will refine designations of Essential Fish Habitat, help guide the design of marsh creation and restoration projects that seek to maximize fishery habitat benefits, and help predict the responses of fisheries species to future changes in habitat extent and configuration.

Optical Characterization of Water Column Constituents in Support of Oyster Larval Development Investigations

Thomas Wissing [1], Xiaodong Zhang [2], James Klein [2], Eric Powell [1], Kacey Lange [1], Michael Kamowski [1]
[1] University of Southern Mississippi; [2] Ohio State University

In 2021-22, an MBRACE sponsored investigation, O3L, measured in-water parameters at 7 oyster reefs across the Mississippi Sound, ranging as far west as St. Joe's Reef and east to Pass Christian Tonging Reef. The purpose of O3L was to see if optical sensors, down to microscopic levels, could help characterize the food type & quality that oysters (*Crassostrea virginica*) take-in while spawning. By characterizing the food source, one can better understand larval survivability and harvest during and after the spawn. Data was collected during the oyster spawning season of May through October (of both '21 and '22). Following the extended freshwater diversion of 2019 (Bonnet Carré spillway opening), salinity in the sound was below normal and mass mortality had been noted. Therefore, to help track subsequent years, water samples were collected and analyzed for biochemistry, and later compared to in-situ collected optical data. Our results will include the inherent optical properties of the sound, the pigment changes throughout each station for the two spawning seasons, particle size distributions, and temperature and salinity dynamics as they impact the oyster beds. This work is in collaboration with Klein et al, titled Modeling oyster larval development and success to metamorphosis in the Mississippi Sound.

Oyster Farming Resilience Index

LaDon Swann, Russell Grice, Stephen Deal, Tracie Sempier, Steve Sempier
Mississippi-Alabama Sea Grant Consortium

Mississippi and Alabama seafood producers have dealt with many environmental and human-caused disasters that have affected the region's ability to supply seafood. The COVID-19 pandemic, economic recessions, the Deepwater Horizon Oil Spill, coastal storms, extreme rain events and harmful algal blooms have had significant negative impacts on the seafood industry, including oyster farming. The COVID-19 pandemic is a unique challenge that is unlike any the region has faced. While past events significantly disrupted seafood stock and supply, the COVID-19 pandemic has been a major disruptor for seafood demand and the distribution chain for seafood products. Increasing oyster farmers' resilience to disasters will increase the sustainability of the oyster farming industry. In this project, the Mississippi-Alabama Sea Grant Consortium will lead the development of an Oyster Farming Resilience Index. Oyster farmers who complete the self-assessment tool will have a better understanding of their vulnerabilities and how to become more resilient to a range of disasters. The Oyster Farming Resilience Index will be created, implemented and evaluated through the following objectives: 1) To create a new Oyster Farming Resilience Index that accounts for a variety of disasters and emerging needs; 2) To facilitate oyster farmers' use of the index within Alabama and Mississippi to identify common vulnerabilities; 3) To address common vulnerabilities that the index identified and provide technical support to increase the resilience of the oyster farms by delivering engagement and education programs that better equip industry members in addressing common vulnerabilities; 4) To conduct an evaluation to assess the success of the project.

Oyster Gardening: An Implement for Extension Programming

Emily McCay, P.J. Waters
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Oyster gardening presents a direct, hands-on experience for participants to learn about and aid in oyster reef restoration. Our five-year review analyzes oyster gardening as a valuable tool in extension work with stakeholder groups. The Mississippi Oyster Gardening Program (MOGP) was established to provide the local community an opportunity to have a direct environmental impact, with a total of 143,219 oysters grown and planted since beginning in 2016. We take into consideration how oyster gardening can track the causation and impact of low salinity, bringing awareness to a broader audience.

Pedigree Reconstruction and Estimates of Genetic Parameters for Growth Traits in Gulf of Mexico Eastern Oyster Families Reared Communally

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The eastern oyster, *Crassostrea virginica*, supports large markets throughout the United States. In recent decades, wild stocks have incurred major declines across the species' range including in the Gulf of Mexico (Gulf). In 2019, the SALT consortium initiated a breeding program to support the developing Gulf industry with oysters bred for improved performance in different salinity environments. In September of 2020, the first generation was produced at the Auburn University Shellfish Lab using 102 males and 102 females collected from 17 natural reefs between San Antonio Bay (Texas), and Cedar Key (Florida). Families were bred according to a series of 51 non-overlapping 2 x 2 factorial crossing design, pooled for common garden culture, and deployed at 7 growout sites in April 2021. Based on salinity conditions recorded during the growout period, sites that represented high (one site), and variable-low (three sites) salinity environments were selected and harvested for phenotype measurement and genetic analysis. The 204 founders and 6,414 offspring were assayed at 192 Single Nucleotide Polymorphism markers and the obtained genotypes were used to assign offspring to parent pairs using a likelihood ratio approach. Family distributions differed between the high-salinity site (66% mortality), and the three lower-salinity sites (7-22% mortality) supporting separate breeding for performance at high and low salinity. Heritability estimates for growth rate characterized as shell height at harvest were above 0.38 ± 0.05. Genetic correlations across environments were high (average 0.87, range 0.79-1) suggesting low genotype x environment interactions for growth.

PFAS Bioaccumulation, Depuration, and Energetic Cost in the Eastern Oyster, *Crassostrea virginica*

Kayla Boyd, Joel Hayworth, Vanisree Mulabagal, James Stoeckel
Auburn University

Per- and poly- fluorinated chemicals (PFAS) are a class of man-made chemicals that are widespread and persistent in the environment, including Mobile Bay, AL. They have a high potential to bioaccumulate in many aquatic organisms. Oysters are chronically exposed to PFAS through filtering activities, which calls into question the health of wild and farmed populations. Depuration of contaminants has been shown to be efficient but energetically expensive in some bivalves, with previous studies primarily focusing on single compounds rather than mixtures. In this study we investigate whether oysters can efficiently depurate an ecologically relevant mixture of PFAS compounds and whether depuration is energetically expensive with potential negative effects on organismal health. Eastern oysters (*Crassostrea virginica*)were exposed to a mixture of PFAS (PFPeA, PFHxA, PFBS, PFOA, and PFOS) at an ecologically relevant cumulative concentration (< 2 ug/L) to estimate bioaccumulation during exposure and depuration after being transferred to clean water. Optical respirometry was used to assess energetic costs associated with exposure and subsequent depuration. Results show that at ecologically relevant concentrations, PFAS did bioaccumulate at low levels, but compounds were depurated below detection limits within 24 hours of being placed in clean water. We found no evidence for increased energetic costs related to exposure and/or depuration. It is unlikely that the mixtures of dominant PFAS compounds recently detected in and near Mobile Bay are negatively affecting the energetic health of oysters. Oysters appear to have the capacity to quickly and efficiently depurate ecologically relevant mixtures of PFAS when transferred to clean water.

Plastic Pollution Awareness in Educators

Tracy Jay, Sommer Calderone, Tracy Delcambre, Troy Latham
Environmental Studies Center

The Environmental Studies Center provided teacher professional development entitled "Plastic Pollution in our Environment." Working in conjunction with the Mobile County Recycling Center we hosted a group of high school and middle school teachers and give them the opportunity to see how recycling takes place in our community and to hear guest speakers within the coastal recycling industries. Our professional development included a total of twenty-two environmental science teachers from the Mobile County Public School System. This program provided an opportunity for conversations with experts on community pollution. Teachers were then able to brainstorm and generate viable solutions for organizing clean-up initiatives of local waterways within their own school communities. The goal was to provide teachers with the knowledge and tools to prepare students to make better environmental decisions as adults.

Quantitative Assessment of Natural Capital for Restoration Projects

Eldon Blancher, George Ramseur, Meg Goecker
Moffatt & Nichol

Natural capital stocks are the durable physical or biological elements of nature that persist through time to contribute to current or future economic production. In October of 2022 the White House Office of Science and Technology introduced a national strategy to develop statistics for environmental decision making and proposed creating a system of natural capital accounting and associated environmental-economic statistics. While restoration ecologists have used multiple measures for determining the success of restoration projects, it is important that the measures proposed represent an accurate accounting of environmental capital stocks and flows produced by the project. Understanding how projects increase biological productivity and increase habitat services is an important step for providing data for the environmental-economic linkages. We have demonstrated natural capital increases for several environmental restoration projects in Alabama and Louisiana which show natural capital benefit: cost ratios of 4:1 and higher. The use of both calibrated ecological models and habitat and resource equivalency analysis increases the robustness of natural capital estimates. We present examples of natural capital increases for both living shoreline and marsh creation projects which show significant increases in net-natural capital benefits and illustrate the methods used to provide meaningful quantitative measures.

Recovery of Nitrogen Removal Capacity in Restored Tidal Marshes of the Mississippi-Alabama Gulf Coast

Behzad Mortazavi, Taylor Ledford, Corianne Tatariw, Jacob Dybiec, Shelby Rinehart, Emily Fromenthal, Julia Cherry
University of Alabama

Human activities and sea-level rise are resulting in losses of global marsh area and the ecosystem functions they provide. Despite restoration and construction efforts to counter marsh loss, the extent of functional recovery following these projects is highly variable. We assessed functional recovery of nitrogen (N) removal capacity over two summers by comparing rates of denitrification, anammox, and dissimilatory nitrate reduction to ammonium (DNRA) in 12 constructed/restored and four paired reference natural marshes across the Northern Gulf of Mexico. Denuded marsh areas were also assessed for N-removal capacity. Average N-removal through denitrification and anammox across natural marshes was ~38 µmol N kg-1hr-1 and was lower than N-retention through DNRA (44.4 µmol N kg-1hr-1). N-removal recovery varied with construction/restoration type with beneficial use and constructed marshes reaching about half the removal efficiency compared to reference sites. Living shoreline marshes were comparable to reference marshes in N-removal capacity and shoreline restoration marshes exceeded reference N-removal capacity by 76%. Denuded marsh areas had the lowest N-removal capacity (17.8 µmol N kg-1hr-1) with exception of two plots which had high organic matter content. While N-removal capacity was variable across restoration/construction techniques, the relative proportion of N-removal was similar across most restoration techniques and comparable to reference marshes. Marsh restoration is an effective strategy to recover some ecosystem services; however, recovery in N-removal capacity was highly variable and appears to depend on the type of restoration effort undertaken.

Recruit and Support Sustainably: Early Successes Through the Ocean Exploration Club at Tuskegee University

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[1] University of Southern Mississippi; [2] Tuskegee University

The NOAA Ocean Exploration Cooperative Institute (OECI) formed to explore the unknown areas of the U.S. Exclusive Economic Zone, develop and implement new technologies, and empower the next generation of ocean scientists. The University of Southern Mississippi's (USM) Marine Education Center (MEC) and Tuskegee University's College of Agriculture, Environment and Nutrition Sciences (CAENS) coordinate the Ocean Explorers internship that engages undergraduate students from Tuskegee University (TU). Selected students contribute to research and data collection efforts across OECI partners, while also charting a path for a more inclusive ocean exploration workforce. The Ocean Exploration Club (OE Club) cultivates a relationship among the MEC and TU faculty, and the TU student body, enabling recruitment for the paid summer internships. During the academic year, OE Club members participate in various educational and scientific activities with project staff, OECI research partners, or other guest speakers. Activities foster interpersonal skills through professional development, networking, community building, and outreach events. In addition to on-campus club activities, several field trip opportunities are available to coastal Mississippi and Alabama. Dedicating staff to the program at both the MEC and TU provides consistent, long-term mentors to student members and Ocean Explorer interns. This session explores the early successes of sustainable recruitment and support as seen through the OE Club and offers a preview of the next steps. In addition to facilitating intern research and career exploration opportunities, this collaboration across universities advances the science in student retention in ocean exploration.

Regional Economic Impacts of Harmful Algal Blooms and Enterococcus in Florida and Mississippi

Jessica Browne [1], Ayoung Kim [1], Seong Yun [1], Dan Petrolia [1], Melissa Partyka [2]
[1] Mississippi State University; [2] Auburn University Marine Extension and Research Center/Mississippi-Alabama Sea Grant Consortium

Beach closures and advisories caused by various environmental threats are one of the major concerns of tourism-dependent coastal communities. Among these various causes of beach restriction, harmful algal blooms (HABs) and high levels of Enterococcus have drawn special attention due to their increasing frequencies. These threats pose dangers to beachgoers, leading beach monitoring stations to restrict or eliminate access to beaches. While it is imperative to protect the health of beachgoers, limited beach access may discourage tourists from traveling to coastal areas, affecting their regional economies. Considering the anthropogenic triggers of HABs and high Enterococcus levels, the goal of this study is to highlight the economic consequences of certain human activities along coastlines that could be reduced via policy. Focusing on the coastal areas of Mississippi and Western Florida, this study aims to 1) analyze the regional economic impact of beach closures and advisories using panel regressions at the county level, 2) show the regional economic impacts of beach closures and advisories due to HABs and high levels of Enterococcus, and 3) discuss related policies.

Relax, Reconnect, Restore: City of Mobile Park Improvements and Access Enhancements along Mobile Bay

Jennifer Greene [1], Meg Goecker [2]
[1] City of Mobile; [2] Moffatt & Nichol

Through an interconnected parks and trails system, the City of Mobile is improving access to Mobile Bay through several efforts. With the purchase of the Brookley properties through several funding sources, the City is master planning to create an iconic, nature-based park to allow for ADA accessible waterfront access and educational opportunities. Near Dog River, on Perch Creek, the City has purchased 90 acres of natural areas to conserve one of the last undeveloped tributaries of the River and to eventually provide nature-based walking trails and kayaking opportunities. By working with ALDOT to raise the Perch Creek Bridge, further water access into these natural areas has been enhanced. Along the Bay in this same area, improvements to McNally Park and the re-use of the historic Ziebach Property, will allow for improved bay front access for the Dauphin Island Parkway communities. The City has made extensive outreach efforts to meet the needs of these communities and continue to improve nature-based and bay front access.

Reproductive Success of Shorebirds in Alabama

Olivia Morpeth [1], Lianne Koczur [1], Fallan Batchelor [2]
[1] Alabama Audubon; [2] City of Orange Beach

Nest and fledging success are important metrics to study to get a holistic understanding of the population dynamics of birds and to identify stages that might be limiting to population stability and growth. Prior to 2018, there was limited information available on the breeding population sizes and reproductive success of shorebirds in Alabama. There were censuses conducted throughout the state, with the most recent in 2015; however, these data did not provide information on the numbers of nests or fledglings. We surveyed for and monitored nesting Snowy Plovers, American Oystercatchers, Least Terns, and Black Skimmers along mainland and barrier island beaches and nearshore islands beginning in 2018. Most species had low productivity across years, with causes of nest failure and chick loss including weather (i.e., overwash from storm-driven high tides, high winds), and depredation by avian and mammalian predators. These were the first consistent, coastwide shorebird monitoring efforts in the state and provided needed insight into the population sizes and reproductive success of these species. These data can be used as a baseline for future monitoring and to identify targeted management strategies to increase reproductive success of shorebirds.

Resilience Readiness: A Community-Based Participatory Assessment in the City of Pensacola, Florida

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The Pensacola & Perdido Bays Estuary Program (PPBEP) has worked with collaborators from the University of West Florida, the City of Pensacola, Escambia County, and the Program for Local Adaptation to Climate Effects: Sea Level Rise (PLACE:SLR) to develop and administer "resilience readiness" surveys in the City of Pensacola. "Resilience readiness" is defined in this project as a community's understanding of local risk to climate change impacts. Specifically, this project targets residents of the City of Pensacola in an attempt to assess the City's resilience readiness following the economic and social impacts felt throughout the community after the landfall of Hurricane Sally and other recent severe weather events. This project is ongoing and seeks to supplement the City of Pensacola's current resilience planning efforts. This presentation will share the results of the community resilience survey and preliminary actions identified for the priority planning areas. This project takes a novel approach to addressing local vulnerability by assessing local risk perceptions around sea level rise to inform pilot, community- based resiliency action. This project seeks to address local climate vulnerabilities by aspiring to the following goals: Enhancing resilience planning efforts in the City of Pensacola by creating new vulnerability data that will be measured by assessing local perceptions of climate risks and resilience; Engaging students in meaningful research experience that will emphasize learning and development in resiliency and environmental science; and Building community resilience through partnership building and community participation in pilot project development and maintenance.

Responses of Juvenile Spotted Seatrout *Cynoscion nebulosus* to Experimental Acute and Chronic Low Salinity Exposure

Ronald Baker, Jonathan Chapman
Dauphin Island Sea Lab

Spotted seatrout are a highly important fishery species. Alabama's stock is declining, and a recent stock assessment identified factors regulating juvenile survival as critical for future recruitment success. State monitoring data suggests juvenile habitat may be limited by salinity. To evaluate the tolerance of juvenile trout, we exposed hatchery-reared juveniles (35-60 mm TL) to acute and chronic low salinities. For acute exposure, we acclimated individuals to 10 or 20 ppt salinity before reducing salinity at a rate of ca. 1.5 ppt/hr to reach ≤1 ppt in 6 (10 ppt tanks) to 13 hours (20 ppt tanks). Fish in all tanks exhibited reduced feeding rates, most likely due to disturbance from the manual water changes during salinity reduction, while none showed signs of stress related to salinity treatment. For the chronic experiment, fish were acclimated to 10 ppt before half the tanks were reduced to near 0 ppt over a 2-day period, and monitored over the next 8 days. Fish at 10 ppt continued feeding vigorously throughout the experiment, and none lost equilibrium. Fish in near 0 salinity declined in feeding rates from day 4 onwards, and 54% of individuals lost of equilibrium between day 8 and 11. Our findings show that post-settlement trout can survive brief periods of low salinity exposure, but probably cannot tolerate it for more than a few days. Future changes in salinity regimes in coastal Alabama may alter the amount of suitable juvenile habitat, with subsequent impacts to the population.

Restoration Monitoring in the Three Mile Creek Watershed

Alex Beebe
University of South Alabama

Twelve Mile Creek originates in the extreme southwestern portion of the Three Mile Creek Watershed, drains a total area of approximately 2.9 square miles, and flows a little over three miles north and east to its confluence with Three Mile Creek. Major challenges to the Watershed identified in the Watershed Management Plan (Dewberry, 2014) included altered watershed hydrology and geomorphology that reduce the amount of floodplain connectivity and riparian buffer and increase stream bank erosion and sedimentation. Increased stream bank erosion and subsequent sedimentation in downstream reaches have reduced stormwater capacity and conveyance in portions of the Watershed including Twelve Mile Creek and Langan Park Lake and increased sediment oxygen demand and eutrophication in the Lake. Increased stormwater velocity associated with the urbanized stream morphology and hydrology also threatens municipal infrastructure including exposed sanitary sewer pipes. In an effort to ameliorate the negative effects of the urbanized stream morphology on the condition of Three Mile Creek, a pair of stream stabilization and restoration projects are currently in process by the Mobile Bay National Estuary Program and the City of Mobile. Common goals for both projects are reduced stream bank erosion and downstream sediment loading. To that end stream restoration monitoring is being undertaken to address bed, suspended, and total sediment loading at key locations within Twelve Mile Creek under both pre-and post-restoration conditions. Data gathered from this effort will be compared to evaluate the efficacy of registration activities in reducing sediment loading in the Watershed.

Restoring and Enhancing Habitat and Access along the Dauphin Island Causeway

S. Matthew Jones [1], Karina Calhoun [1], Meg Goecker [2]
[1] Mobile County ; [2] Moffatt & Nichol

The Dauphin Island Causeway serves many purposes both as a corridor and access destination, but also has extensive adjacent marsh and oyster habitat. Mobile County has been working to restore these habitats and address safe managed access along this corridor. The Dauphin Island Shoreline Restoration project will be implemented in the coming year to protect the causeway and create more marsh and oyster habitat. Bayfront Park is being restored for improved access and facilities including pocket beaches. The County is exploring opportunities to improve the Cedar Point pier parking and potential boat ramp and parking on the east side of the highway to improve safety and access opportunities that are more organized than current uses. Mobile County has engaged local stakeholders to better understand safety and managed access concerns. The County is working to ensure these complementary projects and future potential projects balance habitat restoration, causeway protection, and safe managed access.

Restoring Little Dauphin Island through Collaborative Partnerships

Justin McDonald, David Newell
U.S. Army Corps of Engineers

Little Dauphin Island is an extremely valuable coastal feature located just north of the east end of Dauphin Island, Alabama. A significant portion of the island is owned by the U.S. Fish and Wildlife Service (FWS) as part of the Bon Secour National Wildlife Refuge and the remaining part was recently purchased by Mobile County from private ownership. The U.S. Army Corps of Engineers, partnered with the FWS, Mobile County, the State of Alabama, the Town of Dauphin Island, and the National Fish and Wildlife Foundation, is leading a collaborative effort to restore the coastal resource and ensure the future resilience of the island, the critical habitat it provides, and the protection it yields to the northern populated shoreline of Dauphin Island. Little Dauphin Island is currently breached in three locations and has experienced significant erosion due to storms and sea level change. Additionally, one of the breaches resulted in substantial impacts to the adjacent federal navigation channel and surrounding private properties. This presentation will focus on the role each organization is playing to make the holistic restoration of Little Dauphin Island a sustainable reality, and it will highlight the collaborative value of leveraging technical capabilities and financial resources across multiple agencies for a common goal.

Restoring Three Mile Creek One Neighborhood at a Time

Christian Miller
Mobile Bay National Estuary Program

In January 2014, the Mobile Bay National Estuary Program (MBNEP) released the completed watershed plan (WMP) for the Three Mile Creek Watershed (TMC). The majority of TMC's 30-square mile watershed lies within Mobile city limits and includes portions of five City Council Districts, all three Mobile County Commission Districts, and portions of three Prichard City Council Districts. TMC is highly urbanized with over 90% of the land developed with greater than 37% impervious cover. Untreated stormwater runoff and pollutant loads from developed areas discharge directly into TMC and its tributaries. This discharge of untreated stormwater is primary among sources of surface water quality degradation and management measures recommended in the WMP are currently being implemented by a host of partners to mitigate associated impacts. The implementation of the Three Mile Creek WMP can be divided into three different overarching programs- Environmental restoration; expanding access to the water and open spaces along the creek through the creation of 10 miles of trail; and a comprehensive program of community engagement to ensure each program learns from and listens to affected residents, businesses, churches, schools and other entities to the greatest extent feasible to ensure projects undertaken to meet the needs of the communities who live closest to the creek and its tributaries. Three Mile Creek presents an extraordinary opportunity for the cities of Mobile and Prichard to turn what is now a community liability, due to its degraded condition, into a community asset and a waterway destination.

Science for the Community – One Step at a Time

Jessie Kastler [1], Thao Vu [2], Candace Bright [3]
[1] University of Southern Mississippi; [2] Mississippi Coalition of Vietnamese American Fisher Folks and Families; [3] East Tennessee State University

Environmental events that damage a natural resource can have devastating effects on many different communities in a region. The future capacity of a given community to thrive after a disaster can depend on the nature of interactions between community leaders and representatives of local government and agencies. Limitations in communication can lead to a lack of trust that reduces community capacity to thrive. The multi-ethnic fishing community of the Mississippi Sound experienced devastating impacts of Hurricane Katrina in 2005, the Deepwater Horizon Oil Spill in 2010, and the Bonnet Carré Spillway opening in 2019.The USM Marine Education Center and the Mississippi Coalition of Vietnamese American Fisher Folks and Families collaborated on a series of grant projects from 2013-2019 to address the lack of trust in science among members of the fishing community, while also contributing to the body of scientific knowledge related to the 2010 oil spill. These projects varied greatly to meet the needs of different project investigators responding to the needs of different funding opportunities. Each funding opportunity required some form of outreach which was addressed, at least in part, by interactions among educators, scientists, and fisher folks. Projects ranged from investigating the impact of oil on larval crab development (EPA), organisms moving along the coast near rivers (GoMRI), and Mississippi Sound oyster reefs (NAS). This presentation will describe how the partnership began, the changing role of scientists, educators, and fisher folks as the relationship progressed, and lessons learned along the way.

Seasonal Patterns of Fish Habitat Use in the Grand Bay National Estuarine Research Reserve from 2005 - 2014

Jonathan Pitchford [1], Kimberly Cressman [2], Michael Brochard [1], Ayesha Gray [1], Paul Mickle [3]

[1] Grand Bay National Estuarine Research Reserve; [2] Catbird Stats, LLC; [3] Mississippi State University, Northern Gulf Institute

The Grand Bay National Estuarine Research Reserve (GNDNERR) is a retrograding delta in the northern Gulf of Mexico with a variety of habitats for resident and transient fish. To understand seasonal habitat use, fish communities were sampled seasonally by seining five nearshore habitat types, including replicate sites representing depositional edge (n=2), erosional edge (n=3), seagrass (n=3), shell midden (n=3), and beach (n=2) from 2005 – 2014. Data was analyzed using Analysis of Similarity (ANOSIM), Non-Metric Multidimensional Scaling (NMDS), and Similarity of Percentages (SIMPER) to quantify differences in fish communities among habitat types for each season across the period of record. A total of 532 samples and 111,563 fish were collected across the study period and the top three most abundant species were *Anchoa mitchilli* (32.9%), *Leiostomus xanthurus* (15.6%), and *Menidia beryllina* (12.5%). Total species richness was highest at erosional edges in spring (50 species) and lowest at shell middens in winter (13 species). Community analyses showed that several species were associated with certain habitat types for a given season. For example, 94% of *Fundulus similis* sampled during summer were found at beaches and 81% of *Lagodon rhomboides* sampled in spring were found at seagrass habitats. Further, 93%, 87%, and 62% of sampled *Brevoortia patronus* were found at erosional edges during winter, fall, and summer, respectively, which is an ecologically and commercially important species in this region. These associations can be used to inform restoration and/or conservation of habitat types within the GNDNERR in the coming years.

Seasonal Salinity Trends in the Central and Southern Biscayne Bay, Florida

Meena Raju [1], Anna Linhoss [1], Paul Mickle [2], Chris Kelble [3], Vladimir Alarcon [2]
[1] Auburn University; [2] Mississippi State University, Northern Gulf Institute; [3] National Oceanic and Atmospheric Administration

Salinity in estuaries varies naturally due to tides, weather, and climate. Historical water management in southern Florida focused on diverting freshwater quickly out to ocean to make room for development. Current management activities are aimed at slowing freshwater flow to the ocean, thereby decreasing salinity within Biscayne Bay. The spatiotemporal variability in salinity within the Biscayne Bay due to anthropogenic causes is a major concern for ecosystem restoration under the Comprehensive Everglades Restoration Plan (CERP). The hypothesis of this study is that due to restoration efforts, the trend in salinity should show a decrease in the dry and wet seasons since restoration began. In order to test the hypothesis, trend (decadal) tests on a seasonal timescale were analyzed. Seasonal (dry and wet) trends in salinity (minimum, average and maximum) from measured data across sixteen stations (2005 – 2020) within the central and southern regions of the Biscayne Bay were examined. The non-parametric trend test, Modified Mann Kendall (MMK) at 0.05 significance level, was used for the analysis. Trend results show increasing salinity in the wet season and decreasing salinity in the dry season, contradicting the hypothesis. Increase in salinity in the wet season amidst restoration efforts, indicate the role of sea level rise and/or changing seasonal rainfall patterns. This study's results are important for forecasting seasonal salinity patterns and help in managing salinity in the event of climate change and sea level rise in Biscayne Bay towards achieving the goal of CERP.

Sensitivity Analysis of Wave Modeling during Hurricane Ida in the Gulf of Mexico

Hafeez Oladejo, Diana Bernstein, M. Kemal Cambazoglu, Gowri Chinnathambi, Azadeh Razavi, Jerry Wiggert
University of Southern Mississippi

Hurricanes are among the major natural disasters facing the coastal United States. Hurricane waves, their associated surges and coastal inundations can be studied and monitored using wave models. The choice of wind forcing, numerical schemes, and grid configuration could significantly affect the accuracy of the model prediction and hinder our understanding of these extreme events. A spectral wave model (WAVEWATCH III) was used to study Hurricane Ida (2021) to reveal how applied wind forcing, grid resolution, and boundary conditions affect model fidelity. To properly resolve coastal geometrics and hydrodynamics, we set up three unstructured grids for the Gulf of Mexico (GOM) with different configurations ranging from 260,000 to 90,000 grid nodes. We used two wind forcings, European Center for Medium-Range Weather Forecasts (ECMWF) (9km-resolution), and ECMWF Reanalysis (ERA5) (28km-resolution). The simulations were run with and without incorporating boundary conditions around the open boundaries of the GOM. The results were validated against several buoys data in the GOM. Our sensitivity analysis showed that the model is most sensitive to wind forcing and least sensitive to grid resolution. The differences in simulation results were mostly found in the wave period and direction. Simulations without boundary conditions showed some relatively poor performance in predicting the peak period and mean wave direction but predict the mean wave period better than those with boundary conditions. While simulations forced by ECMWF overestimated the significant wave height (SWH) and mean period as Ida passes, those forced by ERA5 underestimated the SWH.

Shallow Seagrass Versus Fringing Marsh Habitat Use by Juvenile Recruits of Fish and Macroinvertebrates in the Northern Gulf of Mexico

Just Cebrian [1], Rebecca Gilpin [1], Laura West [1], Ryan Moody [2], Dottie Byron [2], Rachel Gamble [2], Ken Heck [2], Yee Lau [1], Whitney Scheffel [3]
[1] Mississippi State University, 2 Dauphin Island Sea Lab; 3 Pensacola and Perdido Bays Estuary Program

Shallow coastal systems act as nursery habitat for many species of fish and macroinvertebrates. Here we assess the use of fringing marsh over adjacent seagrass habitat in the Northern Gulf of Mexico by the juveniles of six widespread species with important commercial, recreational and/or ecological value. We compared monthly paired catches in the fringing marsh and adjacent seagrass bed in three sites along coastal Alabama over two years. Our results reveal a rather consistent species ranking across sites where use of fringing marsh over adjacent seagrass beds is lowest for pinfish and spotted sea trout, intermediate for American silver perch and brown shrimp, and highest for blue crab and white shrimp. Despite this consistent ranking, the extent of the differences in use of fringing marsh over adjacent seagrass among these three groups varied largely across sites. The results suggest some species make higher use of fringing marshes as juvenile habitat than do other species, and that such differences, while being similar in direction, are more pronounced in some sites. We also found potential evidence that, for the three species of macroinvertebrates, juveniles that use the fringing marsh are larger on average than those that do not, but confirming this requires more work. This study improves our understanding of the dependence of fish and macroinvertebrates on shallow coastal systems as recruitment grounds. Furthermore, we base our results on a habitat use metric that is robust to gear performance differences among the habitats compared, and thus offers promise for application elsewhere.

Shorebird Conservation and Habitat Management on Dauphin Island's West End

Lianne Koczur [1], Nicole Love [2], Eric Schneider [3], Barry Vittor [4]
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With completion of the acquisition of approximately 838 acres of privately owned, undeveloped beach and dune habitat at the far west end of Dauphin Island, the Town of Dauphin Island and Mobile County are developing the Dauphin Island West End Bird Conservation and Management Plan (Plan). Funding for this effort was provided by the Deepwater Horizon oil spill settlement through the Alabama Trustee Implementation Group Restoration Plan III and the Alabama Department of Conservation and Natural Resources (ADCNR). In collaboration with the Town of Dauphin Island and Mobile County, and in partnership with the Department of the Interior and ADCNR, a team of biologists, ecologists, and coastal engineers is developing a plan to guide future implementation of management activities with the goal of enhancing habitat quality and availability for the many species of birds that nest and forage there. The plan also addresses habitat management for protected species of sea turtles that use the Island's shoreline for nesting.

Simulating how the Bonnet Carré Spillway Impacts Salinity in the Mississippi Sound

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The Bonnet Carré Spillway is a large flood control structure that diverts Mississippi River floodwaters into Lake Pontchartrain and the Mississippi Sound to prevent flooding in southern Louisiana and New Orleans. When operating at full capacity, the spillway releases water at a rate of 7,080 m3/s. Spillway openings regularly last a month or more. The enormous amount of freshwater that is diverted through the spillway impacts salinity and nutrients in the Mississippi Sound. The objective of this research is to use a hydrodynamic model to simulate the impact of Bonnet Carré Spillway openings on the salinity of the Mississippi Sound over multiple years. Specifically, four hypothetical simulations of spillway openings are compared to simulations during the same time when the spillway is closed. The results show how much, how long, and where salinity is impacted. The maximum difference in salinity, at any given location over the mapped dates between the non-opening and hypothetical opening scenarios, vary between 22 and 30 in each year. Differences in salinity between the opening and non- opening scenarios begin to decline approximately 18 days after spillway closure. Decreases in salinity in Lake Borgne persist over a year. The Bonnet Carré Spillway affects salinity most in Lake Borgne and along an east/west ribbon that hugs the northern coastline. Decreases in salinity caused by spillway openings are seen up to 200 km east of the spillway. These results are important for planning the management of estuarine resources during spillway openings.

Source Contributions to Nekton in an Oligohaline Ecosystem

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Fringing salt marshes and submerged aquatic vegetation are critical components of estuarine ecosystems that provide benefits to nekton. Since these two habitats are adjacent, nekton could potentially move interchangeably particularly during tidal ingress/egress. Numerous studies have been conducted in meso- or polyhaline environments where true seagrasses are the dominant type of aquatic vegetation and the faunal community is marine. These studies suggest that salt marshes and seagrasses serve as redundant habitats. However, the roles of aquatic vegetation and fringing marshes at providing habitat benefits are poorly understood in oligohaline environments, particularly in the northern Gulf of Mexico. The overarching goal of this study is to determine the dominant source of basal carbon in west Back Bay of Biloxi using stable isotope analysis. Samples were collected bimonthly from May 2021 to May 2022. Fyke nets and a seine net were used to sample marsh and aquatic vegetative habitats. Faunal samples consisted primarily of small decapod crustaceans and fishes. Vegetation samples were collected haphazardly by hand within each sampling site. In total, 220 individuals spanning 9 species of fishes were analyzed. Including particulate organic matter, epiphytes, and benthic macroalgae, 7 sources of basal carbon were analyzed. Results to date are variable and incomplete, however most consumers appear to be obtaining nutrition from both marsh grasses and aquatic vegetation. Results of this study will improve understanding of the food web in oligohaline environments and could directly inform future restoration efforts as well as fishery management strategies in similar ecosystems.

Strategic Habitat Acquisition on Dauphin Island

Meg Goecker [1], Judy Haner [2], Jeff Collier [3], Connie Whittaker [4]
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Strategic land acquisition on Dauphin Island over the last five years, by multiple groups, have now placed over 50% of the island under conservation for barrier island habitat value. With the purchase of the west end of Dauphin Island with NRDA funds, some 838 acres of beach and dune habitat is now under Town ownership and a management plan is being drafted with support from Mobile County and ADCNR. With the National Fish and Wildlife Foundation Gulf Environmental Benefit Fund, The Nature Conservancy helped to secure 9.4 acres of beach and dune habitat connecting to the public beach in the middle of the island, which was recently turned over to the Town. The Dauphin Island Bird Sanctuaries land trust and partner, the South Alabama Land Trust, also with NFWF GEBF, has helped to purchase some 20+ acres of contiguous forested wetlands on the east end, that are protected by a conservation easement in perpetuity. These strategic land purchases help to preserve unique and diverse barrier island habitats; the subsequent management will be important for restoring and maintaining these habitats in the long term.

Supporting Local Businesses Through an Enhanced Gulf Coast Outpost Program

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While coastal Mississippi's natural habitats are easily accessible and provide opportunities for many outdoor activities, there are relatively few nature-based tourism (NBT) businesses in the area. The Mississippi Department of Marine Resources established the Gulf Coast Outpost Program in 2016 to promote NBT-focused businesses owned by people who are knowledgeable about the coast's natural environment. When business owners complete training focused on sustainability and environmental stewardship, they gain access to unique marketing opportunities and promotional materials. However, limited training availability has made it challenging for business owners to complete the certification requirements; thus, few businesses have taken advantage of the course and its incentives. In response, we expanded the program by redesigning the course structure and developing a library of online training modules covering a variety of locally-relevant topics from living shorelines to sea level rise resilience. The modules consist of video lessons and accompanying assessments. They are asynchronous, granting business owners flexibility to complete the training requirements at their convenience. Presently, the online library contains six training modules and will continue to be expanded upon indefinitely. Ultimately, the enhanced Gulf Coast Outpost Program will increase the awareness and abundance of nature-based tourism businesses in coastal Mississippi, and in turn, will promote a more environmentally-conscious public.

Supporting Scientific Discovery and Science-Based Guidance for Restoration and Management through the Mississippi Based RESTORE Act Center of Excellence (MBRACE)

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The Mississippi Based RESTORE Act Center of Excellence (MBRACE) was designated as Mississippi's Center of Excellence in September 2016. MBRACE is a consortium of Mississippi's four research universities (Jackson State University, Mississippi State University, University of Mississippi, and The University of Southern Mississippi). The mission of MBRACE is to seek sound comprehensive science-and technology-based understanding of the chronic and acute stressors on the dynamic and productive waters and ecosystems of the northern Gulf of Mexico and to facilitate sustainable use of the Gulf's important resources. Since 2016, MBRACE has funded research projects totaling over $7M. So far, MBRACE has funded two rounds of the Core Research Program (2017, 2020), with four ongoing projects examining the effect of varying ecological conditions on restored and unrestored oyster reefs in Mississippi Sound. The Competitive Research Program was establish in 2020, funding three projects focused on water quality and oyster sustainability in Mississippi. Additionally, MBRACE has funded an undergraduate research internship and a research synthesis of the work from Core 1 for the development of peer-review publications, application to management decisions, and recommendations for future projects. In 2023, MBRACE will fund the next round of Core and Competitive proposals. These projects contribute to scientific discovery within the Gulf and, through the Center's close partnership with state managers, provides science-based guidance for state restoration and management priorities. This presentation will provide information and updates on MBRACE and MBRACE-funded research activities, including new projects, products, and other developments.

Sustainability and Vulnerability of Southern Alabama Groundwater Under a Changing Climate

Yong Zhang, Chaloemporn Ponprasit, Hossein Gholizadeh, Olaoluwa Oluwaniyi
University of Alabama

Alabama's coastal aquifers provide freshwater for the Gulf Coast Region, but because groundwater is hidden, this valuable resource has not received enough attention. Large data gaps and incomplete quantifications at almost all spatiotemporal levels challenge the sustainability of Alabama groundwater. Long-term coastal societies, economies, and/or ecosystems may not be expected to remain sustainable without properly managing the valuable groundwater resources by which they all depend upon. This project applies process-based models, machine learning approaches, and statistical analyses to systematically quantify sustainability and vulnerability of Southern Alabama groundwater under a changing climate. First, a three-dimensional (3D) steady-state groundwater flow model is built using MODFLOW and incorporating geologic/hydrologic information to define/calibrate main hydrostratigraphic units in southern Alabama. Backward particle tracking schemes are then applied to calculate groundwater ages, whose mean values are checked against isotope age data and wavelet analysis, providing a 3D index map for assessing vulnerability of Alabama aquifers. A stochastic model is also built using fractional calculus to calculate water flow through unsaturated soil, to quantify the impact of heterogeneous vadose zone on groundwater susceptibility. Second, long short-term memory networks (LSTMs) are applied to explore the spatiotemporal evolution characteristics of surface/subsurface water resources in Alabama under a changing climate. Results show that LSTMs capture the general trend of daily discharge at 17 gauged basins and the corresponding groundwater depth fluctuations in Alabama. Third, statistical analyses reveal the nonstationary, temporal evolution of groundwater resources at Alabama's coastal aquifers under a changing climate since 1981.

Sustainability of Current and Future Shoreline Solutions Under Rising Sea Level Scenarios

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Natural shorelines provide ecosystem services that are integral to maintaining healthy and resilient coastal ecosystems and communities. However, anthropogenic and environmental stressors are reducing the extent of natural shorelines and, thus, their capacity to provide critical ecosystem services. Some of the largest losses or impairment of natural shorelines can be attributed to the combined effects of shoreline hardening (bulkheads and seawalls), boat wakes, and sea level rise. A more adaptable alternative to hardened shorelines in the face of sea level rise is living or natural shorelines. This collection of shoreline stabilization techniques incorporates natural materials such as native shoreline plants and provides myriad ecosystem services. To increase the effectiveness and prevalence of living shorelines, a team of researchers and extension specialists are collecting field data to inform shoreline sustainability modeling. Field data collection includes aerial imagery, shoreline classifications, wave energy, and nearshore topography and bathymetry throughout Weeks Bay and Fowl, Dog, Fish, Magnolia, and Bon Secour rivers. These data will be used to develop conceptual living shoreline designs for each waterbody. Designs and data will then be used to create inputs for the morphodynamic model, XBeach, which will predict the protection capacity of current and projected shoreline management scenarios. Results will be used to develop a catalog of ideal living shoreline designs for shoreline scenarios across those waterbodies. This information will be accessible for immediate use by shoreline property owners, consultants, contractors, and state resource agencies.

Taking Coastal Monitoring to New Heights: UAS Use for Streamlined Restoration Monitoring

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With increasing coastal erosion, high-accuracy monitoring of coastal ecosystems and restoration sites is imperative. Researchers, resource managers, and other stakeholders greatly benefit from low-cost alternatives to traditional monitoring methods. Unoccupied aircraft systems (UAS), commonly known as drones, provide a rigorous solution to this issue with the added benefits of reduced disturbance of monitoring sites, lessened field effort for monitoring, and flexibility of monitoring frequency. We explore the utility of high-resolution UAS paired with a primarily open-source processing workflow at a Living Shoreline restoration site on Dauphin Island, AL. To investigate a range of cost options, we tested RGB and multispectral imagery for spatial extent, elevation, and vegetation composition both before and directly after the construction of planted marsh mounds. UAS data was directly compared to field-based ground truth data to assess the accuracy of UAS methods. In addition to the benefits of using UAS for research and monitoring, we discuss how it can greatly enhance public engagement with restoration projects. When creatively leveraged, UAS assets can aid in the explanation of restoration goals, provide robust time-series records, and illustrate project outcomes to wide audiences.

The Aristotelian Philosophy of Oyster Management: Good Habit[at]s Formed at Youth Make All the Difference

Scott Milroy, M. Kemal Cambazoglu, Jerry Wiggert, Brandy Armstrong, Tasheena Powers
University of Southern Mississippi

In response to changing climate, flood protection response, and land use patterns, the historic oyster reefs in Mississippi have endured unprecedented declines in recent years, despite significant resources committed to their recovery. For such restoration efforts to succeed, it is critical that we understand how changes to coastal water quality/quantity will affect habitat suitability for the gamut of oyster age classes throughout the MS Sound, and how this information can be used to inform and improve natural resource management policy. To this end, we have developed a Habitat Suitability Index (HSI) model of the four main age-classes of Eastern oyster (larvae, spat, seed, and sack), coupled with water quality observations and hydrodynamic model output from the Coupled Ocean Atmosphere Wave Sediment Transport Modeling System (COAWST) in a domain that captures riverine forcings to the Mississippi Sound & Bight, from Mobile Bay to the Birdfoot Delta. HSI model analyses comparing the likely performance among spat, seed, and sack oysters on existing reefs within MS Sound, in response to seasonal temperature and salinity dynamics, indicate that spat are the most sensitive age-class to "within-year" environmental impacts on habitat suitability. In the warm waters of the MS Sound, spat are promoted to seed within a matter of months, whereafter seed oysters become the most sensitive age-class to "across-year" environmental stressors, particularly November to March. Thus, future oyster restoration efforts should focus on maximizing habitat suitability relative to temporal gradients of environmental stress, particularly for younger classes of settled oysters.

The Development and Application of a Geospatial Coastal Vulnerability Grid

Claire Babineaux, Andrew Nagel, Kate Grala, John Cartwright
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The monitoring and assessment of natural resources and man-made systems in the coastal environment are essential with increasing sea levels, storm frequency, and storm duration. Data and tools that improve decision-making efforts related to impacts from increased storm surge and high-tide flood inundation events affecting these natural resources and man-made systems are beneficial in planning and building community resiliency and adaptation strategies. A multi-scale geospatial framework has been developed to aid coastal resource managers and planners with the synthesis and visualization of impacts to areas of interest. Geospatial workflows are used to develop one square kilometer and one-hectare hexagonal grids for the estuarine drainage areas, from Texas to Florida, associated with the Gulf of Mexico. The multiscale approach allows for a more regional assessment to be isolated down to develop visualizations and planning at local levels. Foundational data are summarized at both grid scales and specific data needs will be determined with engagement at the community level for specific planning. As an example, data synthesis within this framework would allow managers to not only identify if an area has a potential impact, but it will also provide information related to percent land cover, population estimates, number of structures, transportation mileage, etc. related to that impact. The use of this framework provides for the mapping and visualization of vulnerable environments to analyze the potential impacts on a region or community allowing coastal managers to make well-informed decisions and better communicate with impacted populations.

The Distribution and Direct Economic Impacts of Marine Debris on the Commercial Shrimping Industry

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Commercial shrimpers in the north-central Gulf of Mexico frequently encounter marine debris in their nets, resulting in the loss of time and catch, and added repair costs. Before this study, no information existed on the spatial and temporal distribution of marine debris that shrimpers encounter within the north-central Gulf of Mexico and the subsequent economic impact on commercial shrimping. The collection of this information will help improve our understanding of the potential impacts of marine debris and the implementation of preventive measures. Twenty commercial shrimpers participated in a comprehensive data collection program within the north-central Gulf of Mexico to characterize the quantity and impacts of marine debris. Results showed that derelict crab traps were an overwhelming issue for shrimpers. The type of fishing gear used influenced the type of marine debris encountered and the subsequent economic impacts. Surveyed shrimpers encountered marine debris on 19% of tows and lost an average of 18.21 minutes, 7.88 kg of catch, and $6.37 in gear damage per tow with encounters, resulting in losses of $7,683 per year, per shrimper.

The Greater Amberjack Count: An Overview

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Reef fish management in the Southeastern US has been contentious due to disagreements regarding stock status and catch levels. This has caused the public to question the scientific basis for management decisions. Since stakeholder buy-in is critical to effective management, the US Congress has responded to this situation by funding, to date, two large collaborative studies to help guide future management and build stakeholder confidence by providing independent estimates of the absolute abundance of important fisheries species. The first of these, the Great Red Snapper Count, has been completed successfully. Here we present an overview of the second such study, the Greater Amberjack Count. The primary goals of this ongoing study are (1) to provide an independent estimate of Greater Amberjack (GAJ) absolute abundance in the US Gulf of Mexico and South Atlantic regions using fisheries independent sampling, and (2) to expand our general biological knowledge (spatial ecology, movement, connectivity, growth, mortality, etc.) of GAJ to inform management decision making and to address some of the key assumptions of our abundance estimate. To meet these goals, we have established a phased approach that is adaptable to differences across regions and habitats, scalable from local to regional spatial scales, and efficient in terms of leveraging existing catch data, stakeholder knowledge, and ongoing complementary research.

The Impact of Inundation and Nitrogen on Common Saltmarsh Species Using Marsh Organ Experiments

Kelly San Antonio, Kodi Feldpausch, Devin Jen, Makenzie Holifield, Hailong Huang, Wei Wu
University of Southern Mississippi

Sea level rise is an escalating threat to saltmarsh ecosystems as increased inundation is a known stressor for marsh plants, with consequences of decreased biomass, lowered productivity, and plant death. Another potential stressor is elevated nitrogen, which has a controversial impact on belowground biomass, potentially affecting the stability of saltmarshes and is relevant due to additional nitrogen brought into coastal regions via freshwater diversions. Our objective is to examine the combined effects of inundation and nitrogen on common saltmarsh plants (Spartina alterniflora and Spartina patens). We set up two marsh organs with six rows and eight replicates in each row, one planted with Spartina alterniflora, the other with Spartina patens. We randomly selected four replicates in each row to add 25 g/m2 of nitrogen in the form of ammonium nitrate every two or three weeks in the growing season. With the same frequency, we collected morphological characteristics such as plant height, leaf count, and stem count to represent vegetation conditions in different dimensions. We developed multilevel Bayesian models to evaluate how inundation and nitrogen affected these characteristics. The results show plants with the nitrogen addition generally have higher productivity when compared to non-fertilized plants. Additionally, the different plant characteristics show various responses to inundation, with plant height being the lowest and leaf counts the highest in the intermediate inundation, indicating some tradeoff at horizontal and vertical directions. This work will facilitate more-informed restoration and conservation efforts in coastal wetlands while accounting for climate change and sea-level rise.

The Impact of Soil Porewater Salinity and Fire Management on the Salt Marsh, Ecotone, and Forest Habitats

Devin Jen, Wei Wu, Patrick Biber
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Coastal marshes are one of the most productive and intensively used ecosystems in the world, providing numerous ecosystem services that are critical to the communities that surround them and beyond. However, they are under threat due to a variety of natural and anthropogenic stressors, such as climate change and sea-level rise (SLR). SLR can cause marshes to drown, converting them to open water. Meanwhile, marshes can respond to SLR through landward migration when suitable geomorphological condition and habitat are available. This research focuses on the mechanisms that drive landward migration of salt marshes including the role of proscribed fire. The objective is to predict how soil porewater salinity and prescribed fire affect productivity of salt marsh and understory vegetation along the gradient of salt marsh-ecotone-pine savanna in the Grand Bay National Estuarine Research Reserve, MS. Using Bayesian multi-level models, we found that fire management likely helps facilitate landward migration of coastal marshes by increasing productivity of salt marsh vegetation and understory vegetation in ecotone and upland forests as well as decreasing tree height growth through increased salinity stress. The findings provide insights as to how salt marshes respond to SLR and fire management.

The Influence of Changing Environmental and Management Conditions on Past and Present Mississippi Oyster Reefs

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The Eastern oyster (*Crassostrea virginica*) is an ecologically and economically important species that provides invaluable services for coastal communities. The oyster industry has a long history and tradition in the U.S. Gulf states, but this fishery has declined dramatically in recent years following Hurricane Katrina, the Deepwater Horizon oil spill, and climate change- mediated flooding events. Mississippi was once known as the "seafood capital of the world", but there has been no public harvest of oysters in Mississippi since 2018. Significant resources have been invested in the northern Gulf of Mexico to restore wild oyster populations and re-establish an oyster aquaculture industry, but these projects have faced many challenges, and the baseline to assess restoration progress is not well defined. We conducted a review of the Mississippi oyster industry to establish the history of oyster reefs in this region and gain insights from causes of previous fishery collapses including factors that promoted or hindered oyster population recovery in the Mississippi Sound. This project also synthesizes data related to abiotic and biotic conditions on current Mississippi oyster reefs to improve our understanding of key drivers that influence oyster reef health and resilience to help inform oyster reef restoration efforts in the face of increasing frequency of natural disasters. Successful restoration and persistence of sustainable oyster reefs in Mississippi will require continual investment and implementation of management practices that provide suitable substrate for larval settlement and enhancement of existing stock to promote increased larval supply.

The Long-term Evolution of Riverine Nitrogen Export to the Mobile Bay under the Influences of Climate Change and Anthropogenic Activities

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The coastal eutrophication driven by enhanced riverine nitrogen exports continues to be one of the most serious problems in the Gulf of Mexico. Nitrogen inputs from terrestrial ecosystems through river systems are the key sources which have significant implications to the biogeochemical processes within aquatic ecosystems. Here, we used the Dynamic Land Ecosystem Model (DLEM) to evaluate how climate extremes, land conversion, and anthropogenic nitrogen inputs (fertilizer, manure, and atmospheric deposition) have affected the riverine exports of ammonium (NH4+), nitrate (NO3-), dissolved organic nitrogen (DON), and particulate organic nitrogen (PON) from the Mobile River Basin into the bay zone during 1900- 2018. Our results show that the annual fluctuations of four nitrogen species were primarily dominated by the variations of precipitation and temperature. Extreme precipitation events (extreme wet year followed by an extreme wet year) can lead to the highest nitrogen exports. Land conversion from cropland to forest substantially decreased soil erosion rate, which caused less PON entering into the rivers in recent decades. The extensive application of nitrogen fertilizer became an important nitrogen source in recent decades, which enhanced the leaching rates of organic and inorganic nitrogen from the soil into the rivers.

The Response of Bats and Their Insect Prey to Different Coastal Upland Habitat Management Techniques

Mandy Sartain, Jonathan Pitchford, Scott Rush, Eric Sparks
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Coastal upland forests are home to a variety of flora and fauna, including forest-dwelling bats. Bats play a crucial role within forested ecosystems as the primary predators of night-flying insects, but global declines in some bat populations have reduced many of the ecological and economic services bats provide. As threats increase, coastal forests have the potential of being a vital refugia for their residential and migrating bats. Many forested areas are managed in an effort to improve overall forest habitat quality and increase biodiversity. Understanding how bats respond to land management-induced changes within forest habitats is necessary for the conservation of these species. Leveraging the large-scale land management projects at the Grand Bay National Estuarine Research Reserve (GNDNERR) in Jackson County, Mississippi, this project will determine if the activity and diversity of bats and their insect prey is affected by different coastal upland land habitat management techniques, such as prescribed fire and mechanical clearing. Analysis of bat species presence and activity was assessed using acoustic surveys. Passive insect traps were used to trap flying insects for analysis of abundance and diversity relationships among potential bat prey between the land management techniques. Findings from this study could be used to inform land managers of the potential benefits and impacts of land management practices on forest bats and their insect prey.

The Spatiotemporal Patterns of Community Vulnerability in Mobile Bay from 2000-2020

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The coastal region is facing heightened risks posed by climate change. Mobile Bay, part of the Alabama coastal area, is prone to storm surge given its physical configuration and is likely to experience high surges under climate change. It is thus imperative to prepare the coastal community in Mobile Bay area for future climate change risks. The first necessary step would be to understand the spatiotemporal patterns of community vulnerability in recent history so that the information can guide future resilience plans. Using data from the American Community Surveys, we construct social vulnerability indexes at the block group level for Mobile County and Baldwin County for 2000, 2010, and 2020. To further investigate the spatiotemporal patterns of changing social vulnerabilities over the past 20 years, we conduct hotspot analysis and cluster analysis. Results suggest that the area with heightened social vulnerability has clearly expanded in Mobile County. Some consistent hotspots in Mobile city are detected. In addition to social vulnerability analyses, we depict the spatiotemporal patterns of changing land use land cover (LULC) from 2001 - 2019 by using the National Land Cover Database. Examining the changing spatial patterns of both social vulnerability and LULC highlights areas that need allocation of resources to build resilience to future climate change.

Three Mile Creek: Restoring a Community Amenity for the City of Mobile

Lance Slater
City of Mobile

The Three Mile Creek Watershed is located on the northern edge of the City of Mobile and drains a total area of approximately 30 square miles, mostly within the City of Mobile. The City has multiple projects underway that involve reducing further bank destabilization along the upper portions of Three Mile Creek and reducing sedimentation to downstream features like Langan Park Lake and Three Mile Creek. Improvements in water quality, stormwater management, flood control, and recreational access are underway with the goal of restoring Langan Park Lake, improving water quality, and establishing what is currently a community liability as an amenity for the citizens of Mobile. Activities include stabilization of Twelve Mile Creek from East Drive to Langan Park Lake, leveraging stream improvements occurring upstream (east Drive to the headwaters), and hydrologic modeling occurring for the sub-watershed and dredging Langan Park Lake to alleviate flooding. Additional projects focus on restoring hydrologic function in the lower reaches of TMC through the reestablishment of the historic stream channel and the development of over nine miles of multi-use recreational trail spanning the length of Three Mile Creek from the University of South Alabama to the lower reaches of the Creek.

Tidal Creek Ecosystem Structure and Function Changes Associated with Coastal Watershed Development

Samuel Bickley, Christopher Anderson
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Freshwater runoff into tidal creeks has been shown to increase with coastal watershed development, leading to increased variability of salinity. To evaluate potential development effects, we examined 12 tidal creeks along the Alabama and west- Florida coast across an urban watershed gradient. Using field data and watershed models, we examined creek response to watershed development by measuring changes in salinity variation, gross primary production (GPP), ecosystem respiration (ER), and resident fish abundance, diet, and caloric density. As predicted, salinity in more developed tidal creeks was more variable and flashier (as measured using a modified Richard-Baker index) ($p < 0.01$, r-2 = 0.39). Further, salinity flashiness was related to decreased creek GPP ($p < 0.01$, r2 = 0.44) and ER ($p < 0.01$, r2 = 0.31) (n=6). Through seasonal trapping of resident fish, we found that *Fundulus grandis* (Gulf killifish) was the most common species and its catch per unit effort decreased with salinity flashiness ($p = 0.03$, r2= 0.18) and modelled estimates of NO3- concentration ($p = 0.05$, r2 = 0.11)- both measures of watershed development. *F. grandis* diets were broad and dominated by fish but no relationship to watershed development was detected. Likewise, *F. grandis* caloric density was not related to development. As coastal urbanization continues in the region, research on the effects of runoff is still needed to improve management and protections designed to minimize urban effects.

Tidal Marsh Bird Population Monitoring and Conservation Applications for the Gulf of Mexico

Rachel Anderson, Jared Feura, Ray Iglay, Kristine Evans, Carlos Ramirez, Mark Woodrey
Mississippi State University

Long-term monitoring of wildlife populations is necessary to detect population changes over time and apply necessary conservation measures. The benefits of long-term monitoring are most noticeable in dynamic ecosystems with numerous ecological stressors, such as tidal marshes. Along the northern Gulf of Mexico, secretive tidal marsh birds are understudied, despite their role as bio-indicators of marsh ecosystem health. Furthermore, the Gulf and its bird communities face myriad disturbances such as hurricanes, oil spills, land use change, and sea-level rise. Long-term monitoring strategies are crucial for assessing tidal marsh bird populations and associated distributions. We generated preliminary species-specific population estimates of secretive marsh birds across the Mississippi Gulf Coast in 2019 and 2021 utilizing a robust sampling design, standardized monitoring protocol, and spatially explicit abundance modeling. The most abundant species included Red- winged Blackbirds, Clapper Rails, Seaside Sparrows, Common Yellowthroats, Boat-tailed Grackles, and Least Bitterns. We estimated a total of 32,635 ± 1,196 Clapper Rails, our most abundant species, across 264 points distributed among 12 marsh complexes. Clapper Rail abundance was negatively impacted by percent of developed land and distance from the marsh- water edge. Using this multi-faceted framework, we demonstrate the importance of investigating site-level and landscape- level variables that affect species-specific abundance. We also propose further application of abundance and distribution estimates including projecting the effects of sea-level rise and urbanization on future populations to help identify best practices for conserving species of concern.

Twelve Mile Creek Headwater Stream Restoration

Ryan Stokes, Carl Ferraro, Stephanie Coffman
Stantec

The Mobile Bay National Estuary Program (MBNEP) secured funding to restore a portion of Twelve Mile Creek in Mobile, Alabama. Twelve Mile Creek is one of six main tributaries within the 19,000+/- acre Three Mile Creek Watershed. A portion of this stream was selected for restoration, approximately 1,800 linear foot (LF) of ephemeral stream located between Dickens Ferry Road and Foreman Road in the City of Mobile. This restoration project reach was selected due to the more natural setting and absence of engineered creek hardening. The reach originates northwest of the project site and travels through multiple piped crossings and an urbanized watershed before entering the site. The project reach was a heavily degraded channel with extensive vertical and horizontal instabilities. Streambank erosion has caused the lowering of the channel bottom, bank slope failures, tree loss, and habitat impairment. It also lacked access to the adjacent floodplain and the riparian corridor was overwhelmed with invasive vegetation. Restoration efforts included the reconstruction of the existing channel based on stable morphological dimensions with a meandering alignment and a modified profile. The stream incorporated natural channel design structures such as toe wood, and brush runs. These components provided vertical and lateral stability and improved habitat diversity. Hydrologic connectivity was also improved through the grading in of a floodplain. Riparian improvements included the removal of invasive species and supplemental planting of native species. This project represents an option for a more natural configuration of stormwater management while maintain and protecting public infrastructure.

Understanding the Interactive Effects of Predation and Ocean Acidification on Economically Important Oyster Variants in the Northern Gulf of Mexico

Randi Cannon [1], Jicayla Johnson [1], Shannon Dalessandri [1], Jessica Lunt [1], Sean Lowry [1], Dustin Kemp [2], Kenneth Hoadley [1], Delbert L. Smee [1]
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Oysters are economically and ecologically important and remain a focus of intensive management and restoration efforts to combat declining populations. Ocean acidification (OA) caused by excess CO 2 being absorbed into the ocean is problematic for numerous marine species, particularly those that build calcareous shells. Although often thought of as a single stressor to physiology, OA can cause other stresses too such as by modifying food availability or susceptibility to predators and contemporary studies are needed that investigate the effects of OA on entire food webs. Our project will empirically test how OA affects both plankton selection and their energetic value to oysters, oysters' ability to build their shells and respond to predation threats, and the foraging ability of two common oyster predators in the northern Gulf of Mexico. We will perform an initial field study to determine how spatial differences in water quality affect plankton community composition and oyster feeding, growth, and survival. Environmental DNA and metabarcoding methods will be utilized on oyster biodeposits (feces vs. psuedofeces) to assess changes in oyster feeding and plankton prey preference in response to environmental stress. Simultaneously, we will manipulate ambient CO 2 levels in a flow-through seawater system to ascertain how CO 2 changes affect oyster feeding and growth as well as oysters' ability to react to predation threats. The resulting data will provide novel insights into multi-stressor effects on oyster physiology while eDNA data will also provide new molecular tools for monitoring food quality at potential oyster reef sites.

Using Computer Vision Toward Automation of Fish Ageing

Ralf Riedel, Robert Leaf
University of Southern Mississippi

Estimates of fish age form the basis of calculating key biological variables for resource management. Hard structures used in age estimation are of different efforts to extract and process for reading. Of such hard structures, fish scales are among the lowest in time and dollar cost to process. Scale reading, however, still requires significant costs to complete. To assess the potential for scale reading automation in allaying such costs, the feasibility of computer vision has been assessed. Convolutional neural networks (CNN) and deep neural networks (DNN) have been used in this study to classify scale images of Gulf menhaden (*Brevoortia patronus*). Three datasets have been generated for testing. The first one consisted of scales estimated to be from fish ages zero and one. The second dataset was for fish ages zero to four. The last dataset was for scales ages zero, one, and two where scale readings agreed with that from otoliths for the same individual fish. Model classification of ages were best when using CNN on the first dataset. The poorest classification was for the DNN model using the second dataset. Although computer vision showed promise for fish ageing automation, the need for image preprocessing and selection of ages where scale annuli are well defined is still necessary. With the continuous enhancements of computer vision models and improvements in quality of scale images, the promise of computer vision in reducing age estimation time and increasing accuracy is not far from realization.

Using Fish Community Metrics as Indicators of Habitat Enhancement in Restoration Projects: A Case Study in Coastal Alabama

Matheus de Barros [1], Alexandra Rodriguez [2], Aaron Bland [1], Ronald Baker [1]
[1] Dauphin Island Sea Lab/University of South Alabama; [2] Dauphin Island Sea Lab

The enhancement of essential fish habitat is one of the most widely stated goals of ecological restoration projects. However, coastal nektonic communities are inherently variable and stochastic, making quantitative sampling with the power to detect subtle changes considerably time-consuming and expensive. As a result, studies aiming to verify the effectiveness of restoration in enhancing fish habitat often present mixed results. In this study, we sampled nekton communities along multiple living shorelines (LS), natural controls, and hardened shorelines, to assess how useful community metrics are in assessing nekton responses to restoration efforts. LS and control sites were different from and more diverse than hardened shorelines. However, most sites showed no stabilization in species accumulation curves, suggesting that the level of sampling effort was inadequate to capture the entire diversity of nekton at each site. Furthermore, all community-based metrics displayed considerable between-site variability, with no detectable differences between LS and control sites. Importantly, most of the variation in community composition could not be explained by the data (residual variation > 50%). Although such results could indicate that LS achieves ecological parity to natural marshes, another interpretation is that community-based metrics may need very high levels of effort and replication within control and reference sites to detect any distinguishable, subtle effects. Such a level of effort may not be feasible for many projects that are usually interdisciplinary; we suggest alternative metrics that may be more sensitive and cheaper for monitoring restored sites.

Using Optical and Metabolomic Approaches to Predict the Nutritional Quality of Plankton Communities for Shellfish Consumption Under Multi-Stressor Climate Conditions

Kenneth Hoadley, Alison Siersma, Shannon Dalessandri, Sean Lowry, Alison Robertson, Jeffrey Krause
Dauphin Island Sea Lab/University of South Alabama

Marine fisheries and aquaculture initiatives in Alabama coastal waters are reliant on the quantity and nutritional quality of the residing phytoplankton communities. Using multi-stressor experimental systems, coupled to custom-built physiological-measurement platforms, we will characterize how relevant phytoplankton species respond to environmental change. Newly developed multi-stressor experimental systems at the Dauphin Island Sea Lab (DISL) will serve as a highly controllable platform for conducting ocean acidification studies on bulk-seawater samples collected locally. All bulk-seawater samples will be serially diluted using filtered seawater, allowing for determination of phytoplankton growth rates and predation pressure. Seawater samples will be exposed to treatment conditions for a 7-day period and all experiments repeated at various times of the year, when seasonal differences in salinity and temperature may influence plankton community dynamics. Key phytoplankton species, e.g., diatoms and dinoflagellates, have been isolated and established as monocultures. These species will facilitate additional experimental manipulation to isolate effects of stressors on metabolites and growth metrics; such species-specific information cannot be disentangled in a mixed community. Additionally, high temporal resolution measurements of chlorophyll fluorescence will provide continuous estimates of primary productivity and photo acclimation strategies that may differ across species and environmental conditions. Resulting datasets from bulk-water and monoculture isolates will provide a basis to predict the nutritional quality and quantity of the phytoplankton community under various environmental conditions occurring presently and in the future for our region.

Using Unoccupied Aircraft Systems to Monitor Restored Wetland Vegetation Communities

Alexandra Rodriguez [1], Megan Laufer [2], Ronald Baker [2]
[1] Dauphin Island Sea Lab; [2] Dauphin Island Sea Lab/University of South Alabama

Acquiring detailed information on wetland plant communities is critical for monitoring wetland ecosystem restoration and management. Field data collection is often costly and time-consuming. Remote sensing with unoccupied aircraft systems (UAS) provides high-resolution aerial images with the potential for vegetation mapping. This high-resolution imagery comes with its own challenges, including large data storage needs, technical knowledge needed for processing, increased spectral variability within vegetation patches, and expensive post-processing software. These challenges are exacerbated with sites larger than 20 ha. We discuss an alternative method to monitoring wetland vegetation community composition at several restoration sites throughout Alabama and Florida using randomly generated points to sample a percentage of the total site area. Flight plans were preprogrammed with the UAS capturing an aerial image at a fixed altitude at each previously determined point. All flora present in the middle 1 m2 square were identified in post-processing, and on-ground vegetation density counts were conducted in a random subset of points for ground-truthing. These early efforts in applying UAS technology show great promise as a cost-effective option for wetland vegetation monitoring.

Utilizing Water Isotopes to Differentiate Mississippi River, Local Rivers, and Groundwater Sources to the Mississippi Sound and Lake Pontchartrain Area

Melissa Gilbert [1], Jessalyn Davis [2], Amy Moody [3], Alan Shiller [1]
[1] University of Southern Mississippi; [2] University of Washington; [3] U.S. Environmental Protection Agency, Gulf of Mexico Division

The Mississippi Sound, and adjoining Lake Pontchartrain, Louisiana, are complex fluvial dominated regions connected to the Mississippi River only during flooding periods through the Bonnet Carré Spillway. We utilize water isotopes (δ18O and δD) in conjunction with salinity to differentiate the sources of freshwater. During the Bonnet Carré Spillway opening of 2019, Mississippi River water was identified throughout the Mississippi Sound, with Mississippi River water being the dominant source of fresh water in many areas. Mississippi River water lingered in the Mississippi Sound until the wind and current patterns shifted and brought in saltier offshore water, flushing the area. Following the Bonnet Carré Spillway closure, a period of low river discharge persisted. During this time, we observed increased δ18O and barium concentrations that were not associated with the Mississippi River, local fluvial inputs, or particle barium desorption. It was determined that δ18O of groundwater has a unique signal of -3.0‰ which differs from the local rivers (-3.8‰). This more positive δ18O signal was observed in local waters of Chef Menteur Pass, the Rigolets, Lake Pontchartrain, as well as the Mississippi Sound, suggesting groundwater input was present. Furthermore, elevated barium concentrations that could not be accounted for by river sources enhances the argument that we are observing a groundwater signal through δ18O when local river discharge is low.

Validation of a Modeling System for Freshwater Diversion Events: A Case Study for 2019 Bonnet Carré Spillway Opening

M. Kemal Cambazoglu, Shihab Hossain Saran, Ali Emre Koruk, Brandy Armstrong, Jerry Wiggert
University of Southern Mississippi

Understanding the impacts of river diversion openings is important for natural resource managers and synthesizing modeling products with field measurements can provide the big picture required for critical decision-making in near-coastal and estuarine systems. Bonnet Carré Spillway (BCS) is a floodway on Mississippi River, which has been operated more frequently than ever within the last 11 years. The unprecedented double opening of 2019 devastated the oyster habitat in the Mississippi Sound. We developed a COAWST-based modeling system (msbCOAWST) to hindcast 2019 BCS openings. The University of Southern Mississippi led a water quality monitoring campaign from June to August 2019 following the 2019 BCS opening. Temperature, salinity, and other parameters were measured over the water column at select stations from Western to Eastern Mississippi Sound. The goal of this study is to validate msbCOAWST results using the measurements from the 2019 monitoring campaign to show the model's capability in predicting the impact and spatio-temporal variability of freshwater in the Mississippi Sound for past and potential future events. We also compare with the continuous measurements collected at the Mississippi Department of Marine Resources stations operated by USGS. Our modeling system has been developed to aid ongoing and future restoration work, coastal management efforts, and to guide operational practices to minimize the environmental impacts of future diversion activities. These validation efforts also help us improve the capabilities of the modeling system while also providing valuable data to help interpret the temporally or spatially sparse measurements in the study area.

Validation of Field-Applicable Detection Kits for Total and Pathogenic *Vibrio parahaemolyticus* in Oysters

Taejo Kim [1], Angelo DePaola [2], Bill Dewey [3]
[1] University of Wisconsin; [2] Angelo DePaola Consulting; [3] Taylor Shellfish Farms

Despite *V. parahaemolyticus (Vp)* management plans and industry efforts, illness rates continue to increase. Rapid industry- friendly assay kits for enumeration of total and pathogenic *Vp* in oysters would provide industry a tool to investigate current practices and evaluate potential mitigations on reducing *Vp* risk. MASGC funded collaborative research between Mississippi State University and FDA to develop and evaluate simple, rapid and low cost *Vp* assay kits. Biphasic media with an agar bottom layer for selection and differentiation of *Vp* covered with a liquid phase for enrichment were formulated and evaluated. Combining these three steps into a single step saved 2 days by providing next day results. The preferred formulation was converted to a 96-well format and demonstrated 100% inclusivity with positive results for 48 *Vp* strains, 100% specificity for negative results with 26 non-*Vp* and sensitivity of < 10 cells/test. The kit results were well correlated with NSSP accepted PCR assays in 183 oyster samples collected from the Gulf, Atlantic, and Pacific Coasts (P 0.05).>This assay was transferred to Taylor Shellfish Farms in the Summer of 2022. Over 1000 oyster samples were tested and provided considerable insight on within lot variability and the effectiveness of reducing *Vp* levels in oysters during refrigerated wet storage.

Valuation of Oyster Reef Restoration along the Gulf Coast

Freedom Enyetornye, Daniel Petrolia, Seong Do Yun, Zhenshan Chen
Mississippi State University

The objective of this study is to gauge public support for oyster reef restoration throughout the five U.S. Gulf Coast states. The Gulf Coast is the leading commercial oyster producing region in the United States, accounting for approximately 52% of the total commercial oyster harvest in 2021. The global decline of oyster reefs is estimated at 50–90% of historical levels, prompting restoration efforts and studies. This work will estimate the economic value associated with oyster reef restoration. Estimates will be based on data obtained from a survey of approximately 6,800 Gulf Coast households regarding proposed oyster reef restoration programs in each Gulf state. Considering the future outcome of oyster harvests, we employed different scales in our survey. We will test how each scale affects households' willingness to pay. One methodological contribution is a test of how uncertainty in the proposed scenario outcome affects the willingness to pay of households. Uncertainty, in this case, is providing households with range values for the future outcome of the oyster harvest. The survey collected information on general bids, households' saltwater fishing experiences, and households' demographic information. Statistical analysis and regression methods will be applied to estimate the willingness to pay of households towards oyster reef restoration. Our policy contribution is to provide state specific estimates of the benefits of restoration that can be used to analyze the return on investment of ongoing restoration efforts along the Gulf Coast. The average cost of recent oyster reef restoration projects is $299,999 per hectare.

Water Quality is Changing in Mobile Bay and Mississippi Sound - What Are the Mechanisms and What Are Our Options?

John Lehrter, Zhilong Liu, Mai Fung
Dauphin Island Sea Lab/University of South Alabama

Identifying trends in estuarine water quality is important for understanding environmental change, determining natural and human causes of change, and informing management actions. In this study, data from several long-term monitoring efforts were combined and analyzed to identify water quality trends in Mobile Bay and Mississippi Sound. The datasets included: 1. Estuarine temperature, salinity, and oxygen concentration time-series data collected nearly continuously, 30-minutely, across sites in the bay and sound by the Alabama Real-time Coastal Observing System (ARCOS, 2003 to present, operated by the Dauphin Island Sea Lab), 2. Lower Alabama River and Tombigbee River daily discharge rates (USGS, 1930s to present) and monthly to seasonal concentrations of nitrogen and phosphorus (ADEM, 1970s to present), 3) Coastal daily satellite ocean color products for organic carbon, chlorophyll a, suspended particulate matter, and light attenuation (NASA VIIRS, 2012 to present), and 4) Field observations of ocean color variables from a bay-wide, monthly sampling program (2019-present, this study) used to validate the satellite products. Time-series trend analyses on the datasets revealed statistically significant trends over the last several decades of increasing bay temperature, river discharge, and river nutrient concentrations and decreasing bay salinity, bay oxygen, and ocean color variables. Potential mechanisms causing change and their interactions such as land-use change and climate both affecting river discharge and nutrients and downstream temperature, salinity, oxygen, and ocean color variables will be discussed. Implications for future water quality conditions will be presented with potential management options to consider.

Watershed Management Plan Implementation in the Fowl River Watershed in Mobile County, Alabama

Jason Kudulis
Mobile Bay National Estuary Program

In 2013, the Mobile Bay National Estuary Program (MBNEP) secured funding from the National Fish and Wildlife Foundation's Gulf Environmental Benefit Fund to develop a comprehensive watershed management plan (WMP) for the Fowl River Watershed. Despite being considered one of the healthier intertidal watersheds draining to Mobile Bay, with extensive wetlands and a predominately rural setting, Fowl River is not without its challenges or exempt from impacts to habitat and water quality resulting from increasing development pressures. Published in 2015, significant progress to implement priority management measures in the Fowl River WMP continues. This presentation will provide an update on implementation of priority WMP recommendations, both completed and in process, with a goal of improving water quality, restoring and conserving habitats necessary to support healthy populations of fish and wildlife, improving environmental and community resilience, enhancing access to waters and open spaces, and monitoring Watershed conditions to better understand impacts and identified stressors.

We Can All Do More to Help with Sustainability! So What is Manufacturing Doing to Help the Local Environment?

Steven Stewart [1], Jennifer Denson [2]
[1] SCS Engineers; [2] Partners for Environmental Progress

Manufacturing facilities within the Mobile Bay area are now facing increased pressures to be more sustainable as it relates to climate change and overall environmental footprints as a result of manufacturing operations. Pressure is being applied by stakeholders in the community, employees, customers, and shareholders for companies to reduce their impacts in areas of water consumption, waste disposal to landfills, carbon dioxide emissions, and energy consumption. Mr. Stewart has aided several large manufacturers to reduce their footprints in a more intentional effort and is sharing best practices and offering collaboration with local industry leaders through the Partners for Environmental Progress (PEP), a coalition of business and education leaders who share the vision of applying science-based environmental best practices to business and community issues. PEP recently awarded seven of its member companies this year for decreasing Carbon Dioxide (CO2) emissions by a combined 66,500 metric tons or the equivalent of 3.7% of vehicles registered in Mobile County driven annually. This presentation will be focused on innovative approaches and examples of best practices by companies in the area to reduce their environmental footprint by minimizing solid waste generation by identifying recyclable materials to minimize landfilled materials, identifying and implementing energy conservation measures, reducing water resources consumption as well as carbon capture and sequestration opportunities in large manufacturing. The presentation is intended to educate the audience on sustainability progress within the Mobile area manufacturing community and a peek into its sustainable future.

Where Are You From? Sorting Out Sediment Provenance Deposited on a Transgressive Marsh

Christopher Smith, Alisha Ellis, Kathryn E. L. Smith
U.S. Geological Survey

The Grand Bay system, located on the coast of Alabama and Mississippi, has been naturally transgressing in response to sea- level but has an uncertain future as sediment is in deficit for the marsh. Dominated by residual ebb tidal currents, the system tends to export more sediment from the tidal creeks and estuaries than it imports onto the marsh. Riverine sediment inputs are limited or non-existent leaving estuarine bed erosion or marsh bank erosion as the dominant sources of suspended sediment. However, published sediment budgets along two shoreline-proximal marsh sites suggest marsh-estuarine shorelines are well balanced with nearly equivalent erosional and depositional mass fluxes across temporal scales (annual to decadal). In the present study, we further examine cored sediments collected along two shore-perpendicular transects at these two sites (i.e., Sites-1 and -3) for environmental proxies to help constrain the source and accumulation of sediment delivered to the marsh surface. Site-1 is located along a high-wave-energy shoreline while Site-3 is located along a low-wave-energy shoreline with more protection from waves. Vertical 1-cm intervals were analyzed for benthic foraminifera, natural and anthropogenic radionuclides (210Pb and 137Cs), and sediment properties. A cluster analysis was used to identify foraminiferal assemblages and subsequently interpret biofacies: estuarine-influenced marsh; middle marsh; marsh-to-upland transition. The geometry and volumetric budgets of the age-correlated biofacies suggest that both estuarine-sourced sediment and bank eroded sediment are inputs to the shoreline-proximal marsh transect.

POSTER SESSION JANUARY 24, 2023

1. **Nurdle Patrol at Saint Stanislaus** - Avery Matheson (S), St. Stanislaus Catholic High School
2. **Oyster Gardening Program at Saint Stanislaus** - Hill Gainey (S), St. Stanislaus Catholic High School
3. **Vadose Zone Fate and Mobility of Phosphorus in the Little Lagoon Watershed** - Adele Magaud (S), University of South Alabama
4. **Viability of Native Vegetation and Locally Sourced Substrate Mix in Green Roof Modules Under South Louisiana's Subtropical Climate** - Clara Jimenez (S), Louisiana State University
5. **Developmental Trajectories of Sedimentation in Restored and Created Coastal Wetlands Along the Mississippi-Alabama Gulf Coast** - Morgan Sharbaugh (S), The University of Alabama
6. **Identifying Potential Drivers of Fish Community Composition on Restored Oyster Reefs in East Bay, Pensacola** - Christopher Grant (S), Dauphin Island Sea Lab
7. **Evapotranspiration Over Different Terrestrial Ecosystems in the Lower Mobile-Tensaw Delta Using Remote Sensing Data** - Skye Hellenkamp (S), University of South Alabama
8. **Expanding Understanding of a Critically Imperiled Ecological Indicator - the Florida Pondweed (*Potamogeton floridanus*)** - Kaitlyn Sampson (S), University of South Alabama
9. **High Resolution Photo-Optical Study Reveals Unique Changes in Photo-Acclimation and Productivity Within Two Closely Related Green Algal Species (*Micromonas* sp.) Under Nitrogen Replete and Limited Conditions** - Shannon Dalessandri (S), Dauphin Island Sea Lab/University of South Alabama
10. **Monitoring the Success of Planted Oysters in Mobile Bay** - Bekah Farmer (S), University of South Alabama/The Nature Conservancy
11. **Patterns and Trends in Chlorophyll a Concentrations Across the Mobile Bay Salinity Gradient** - Alyssa Bourne (S), Dauphin Island Sea Lab/University of South Alabama
12. **Abrupt Chlorophyll Increase Driven by Phosphorus Threshold in Weeks Bay, Alabama** - Mai Fung (S), Dauphin Island Sea Lab/University of South Alabama
13. **The Influence of River and Bonnet Carré Freshwater Discharge on the Exchange Mechanism in Cat Island Channel** - Hameed Ajibade (S), The University of Southern Mississippi
14. **Hydraulic Impact on Fish Migration in Sariakandhi Fish Pass of Bangladesh** - Bijoy Ghosh (S), Bangladesh Technical Education Board Ministry of Education

15. **An Exploration of Heavy Metal Contamination and Salinity Synergies on Mobile Delta Submerged Grasses** - Christopher Mikolaitis (S), Dauphin Island Sea Lab/University of South Alabama
16. **Development of DNA Barcodes for *Lepidophthalmus louisianensis* and Their Use in Developing Blocker Primers for Fecal DNA Metabarcoding** - Julian Venable (S), Jackson State University
17. **Using Environmental DNA to Detect Hypoxia in Marine Waters** - Reneisha Sweet (S), Jackson State University
18. **Relationships Between Freshwater Discharge and Organic Matter Movement Through the Mobile Bay Estuary** - Akela Yuhl (S), Dauphin Island Sea Lab/University of South Alabama
19. **Generation of DNA Barcode Data for *Callichirus islagrande*, a Beach Ghost Shrimp, and Generation of Blocker Primers for Fecal DNA Metabarcoding** - Kambrial Love (S), Jackson State University
20. **Differences in Responses to Thermal Stress Between Predator and Prey: *Crassostrea virginica* (Eastern Oyster) and *Stramonita haemastroma floridana* (Southern Oyster Drill)** - Kayla Boyd (S), Auburn University Shellfish Laboratory
21. **Generation of DNA Barcodes for the Atlantic Mole Crab, *Emerita talpoida*, and the Development of Blocker Primers for Fecal DNA Metabarcoding Analysis** - Dwan Jackson (S), Jackson State University
22. **Gaping Behavior in Triploid and Diploid Eastern Oysters Before and After Desiccation** - William Kleist (S), Auburn University
23. **Gulf Coast Dune Mycorrhizae Improve Salinity Tolerance of a Common Coastal Dune Grass** - Emily Newman (S), University of South Alabama
24. **Comparing the Impact of Curricular and Extracurricular Environmental Education Programs on the Environmental Literacy of High School Students** - Jessie Howington (S), Mississippi State University, Coastal Research and Extension Center
25. **Plastic Potential Degradation and Fragmentation Through a Sequence of Terrestrial and Aquatic Environments** - Anthony Vedral (S), Mississippi State University, Coastal Research and Extension Center
26. **Protecting the 5 Most Critical Wetland Areas in the Lower Galveston Bay Watershed Through Mapping and Community Engagement** - Mashal Awais (S), Bayou City Waterkeeper
27. **Preliminary Winter Bird Community Data for Tracking Pine Savanna Restoration in the Mississippi Gulf Coast** - Sofia Campuzano (S), Mississippi State University, Coastal Research and Extension Center
28. **Per- And Poly- Fluoroalkyl Substances (PFAS) Body Burden and Exposure-Induced**

(S) designates student presenter

Stress Responses of Eastern Oysters in the Mobile Bay Region - Ayesha Alam (S), Auburn University

29. **Incorporating In Situ Wave Energy Measurements into a Living Shoreline Suitability Model** - Ashleigh Dunaway (S), Mississippi State University, Coastal Research and Extension Center
30. **Effects of Structural Design on Oyster Survival in Artificial Reefs** - Jaden Akers (S), Mississippi State University, Coastal Research and Extension Center
31. **The Forgotten Forest: Habitat Assessment of Eroded Forest, Marsh, and Beach Shorelines** - Cynthia Lupton (S), Mississippi State University, Coastal Research and Extension Center
32. **Advanced Microbial Source Tracking for Source-Specific Management of Water Quality** - Penny Demetriades (S), Dauphin Island Sea Lab/University of South Alabama
33. **Development of Automated, In-Situ, Aquatic Environmental DNA Sampler** - Kamal Ali (S), Jackson State University
34. **Rapid Changes in Tropical Cyclone Intensities over the Coastal Oceans: A Global Perspective** - Devanarayana R. M. Rao (S), Dauphin Island Sea Lab/University of South Alabama
35. **G.R.I.T.S: Fostering Green and Resilient Infrastructure Technical Skills in High School Aged Youth** - Allie Koehn (S), Mississippi State University, Coastal Research and Extension Center
36. **Plan-It Dunes: Fostering Dune Restoration and Conservation in Mississippi High Schools** - Nora Skinner (S), Mississippi State University, Coastal Research and Extension Center
37. **Effect of Training Level and Demographics on Quality of Citizen Science Collected Litter Data** - Jessi James (S), Mississippi Inland Cleanup Program
38. **Identifying Fecal Contamination Sources in the Grand Bay National Estuarine Research Reserve** - Amanda Free (S), Mississippi State University, Coastal Research and Extension Center
39. **Evaluating the Efficacy of Recycled Glass Sand as a Soil Substrate for Gulf Coast Marsh and Dune Plants in Restoration Projects** - Ansley Levine (S), Mississippi State University, Coastal Research and Extension Center
40. **Successful Strategies in Planning and Design of Critical Assets and Infrastructure in Three Communities Along the East Coast in the United States** - Hannah Hart, Dewberry Engineers, Inc.
41. **Patterns and Trends in Nutrient Concentrations Across Mobile Bay Salinity Gradient** - Nick LaBon, Dauphin Island Sea Lab
42. **Lillian Park Beach Habitat and Shoreline Protection Project** - Glenn Ledet, Neel-Schaffer, Inc.
43. **Eyes on Seagrass for Pensacola Bay** - Rick O'Connor, Florida Sea Grant/University of

Florida IFAS Extension

44. **Pilot Project for Multi-Species Farming in Coastal Alabama Waters: Initial Developments and Early Engagement Activities** - Stephen Sempier, Mississippi-Alabama Sea Grant Consortium
45. **Impacts of Disturbance and Resource Availability on Coastal Dune Ecosystems** - Jeremiah Henning, University of South Alabama
46. **Preliminary Study of Recruitment Patterns of *Crassostrea virginica* in the Mississippi Sound** - Katherine Glover, Mississippi Department of Marine Resources
47. **Results of the Remote Oyster Setting 2022 Medium Scale Production Season in the Mississippi Sound** - Ellen Coffin, Mississippi Department of Marine Resources
48. **A Preliminary Assessment of Marsh Bird Nesting Ecology Response to Tidal Marsh Restoration** - Matt Sukiennik, Mississippi State University, Coastal Research and Extension Center
49. **Avenues to Science: Internships at the Marine Education Center** - Laura Blackmon, University of Southern Mississippi, Gulf Coast Research Lab's Marine Education Center
50. **Manual and Chemical Removal of Invasive Apple Snails in Mobile, Alabama** - Susanna Robinson, Osprey Initiative
51. **Sea Grant Offers Fellowship Opportunities for Grad Students** - Loretta Leist, Mississippi-Alabama Sea Grant Consortium
52. **Trends of *Karenia brevis* Blooms in the Northcentral Gulf of Mexico** - Jonathan Jackson, NOAA NCEI / Mississippi State University, Northern Gulf Institute
53. **Does Sediment and Microplastic Type Affect the Adsorption of Heavy Metals in Marine Systems?** - Allison Fletcher, Dauphin Island Sea Lab/University of South Alabama
54. **Dissolved Rhenium Reveals Freshwater Sources to Mississippi Sound -** Amy Moody, University of Southern Mississippi
55. **Early Recruitment Limitation Impedes the Recovery of the Eastern Oyster (*Crassostrea virginica*) in Mississippi Sound** - Chet Rakocinski, University of Southern Mississippi, Gulf Coast Research Lab
56. **The Misunderstood Groin: Structure and Sand Movement in Living Shorelines** - Lee Yokel and Tom Hutchings, EcoSolutions, Inc.
57. **Identification of Research Needs, Environmental Concerns, and Logistical Considerations for Using Livestock for Coastal Upland Habitat Management** - Kristie Gill, Plastic Free Gulf Coast/Mississippi State University CREC
58. **Planning for Balance: Sea Grant Looks Ahead to 2024-2027** - Kelly Samek, National Oceanic and Atmospheric Administration
59. **Recovery of Planktonic Invertebrate Communities in Restored and Created Tidal**

Marshes Along the Mississippi-Alabama Gulf Coast - Shelby Rinehart, University of Alabama

60. **Sediment Characterization and Geochemistry Distribution Within Mobile Bay and Mississippi Sound, Baldwin and Mobile Counties, Alabama: An Overview** - Mac McKinney, Geological Survey of Alabama
61. **Biodiversity, Relationships, and Aquatic Chemistry Knowledge in Saline Habitats (BRACKISH)** - Brianna Andrews, Grand Bay National Estuarine Research Reserve
62. **The Long-Term Evolution of Riverine Nitrogen Export to the Mobile Bay Under the Influences of Climate Change and Anthropogenic Activities** - Shufen Pan, Auburn University

(S) designates student presenter

ABSTRACTS (POSTER PRESENTATIONS)
(Alphabetical by Title)

Abrupt Chlorophyll Increase Driven by Phosphorus Threshold in Weeks Bay, AL

Mai Fung [1], Scott Phipps [2], John Lehrter [1]
[1] Dauphin Island Sea Lab/University of South Alabama; [2] Weeks Bay National Estuarine Research Reserve

The under-characterization of chlorophyll trends in subtropical and tropical estuaries has resulted in an incomplete understanding of estuarine phytoplankton dynamics. Detection of trends requires long-term monitoring programs, but these are rare. In our study, we analyzed an 18-year chlorophyll-a time series from Weeks Bay, AL, to detect and quantify trends in chlorophyll variability over multiple time scales. The time series was recorded from 2002 to 2020, and our analysis included contemporaneous measures of variables relating to hydrology, climate, and nutrient loading. We found that there was an abrupt chlorophyll-a increase in Weeks Bay, which opposed the pattern of proportional change usually observed as a result of nutrient enrichment in temperate estuaries. We propose that this abrupt increase was caused by the exceedance of a total phosphorus threshold at 0.1 mg l-1, combined with a period of very low river discharge variability. The existence of a total phosphorus threshold, while unusual in the context of temperate estuaries that are generally nitrogen-limited, was supported for the phosphorus-limited Weeks Bay estuary.

Advanced Microbial Source Tracking for Source-specific Management of Water Quality

Penny Demetriades [1], Ania Brown [1], Dakota Bilbrey [1], Ruth Carmichael [2], Sinéad Ní Chadhain [1], Brandi Kiel Reese [1]
[1] Dauphin Island Sea Lab/University of South Alabama; [2] Dauphin Island Sea Lab

The urbanization of coastal areas allows for the introduction of contaminants from various terrestrial sources into aquatic systems. Pathogens can be conveyed to waterways from both human (e.g., wastewater treatment plants, septic systems) and non-human (e.g., livestock, wildlife, domesticated pets) sources. Pollution loads and sources vary within coastal areas, and differing levels can pose human health risks through contaminated swimming waters and consumption of contaminated fisheries. Water quality degradation, therefore, poses a significant threat to human health, coastal resources, and coastal economies on the Mississippi-Alabama coast. Microbial sources to Alabama waters are largely undefined, and a better understanding of these sources can inform system-scale management to improve community and ecosystem health. The proposed study will identify and quantify potential fecal sources from subwatersheds along the Alabama coast via microbial source tracking that will align traditional microbial indicators with environmental DNA (eDNA) and quantitative PCR (qPCR); advanced molecular technologies that can identify human and non-human sources of contamination to aquatic systems. This study will target different groups of Bacteroidales bacteria for source identification (due to their high host specificity), and incorporate metagenetic eDNA analyses in tandem to provide valuable ecological context to specific field sites and refine geographic locations of contamination sources for management. Monthly sample collection will occur at each of 13 sites identified to be key potential entry points of contamination to Alabama's coastal waters. Data will immediately support shellfish aquaculture and seafood safety, safe swimming areas, tourism, and ecosystem health across state borders.

An Exploration of Heavy Metal Contamination and Salinity Synergies on Mobile Delta Submerged Grasses

Christopher Mikolaitis , John Lehrter
Dauphin Island Sea Lab/University of South Alabama

In recent decades, many species of macrophytes are in decline across the Gulf coast due to a variety of stressors including changing salinity regimes and heavy metal pollutants. Changing salinity places ionic and osmotic stress on submerged macrophytes, and in particular affects freshwater to oligohaline regions of estuaries where the plants have little tolerance for salt. Heavy metals such as cadmium (Cd) can have a variety of detrimental effects on submerged macrophytes such as oxidative stress. Less understood is how combined multiple stressors interactions, such as combined increases in salinity and heavy metal concentrations affect submerged macrophytes and their corresponding microbial community. In this study we evaluate the combined effect of salinity and Cd on *Vallisneria neotropicalis*, a submerged macrophyte that inhabits the oligohaline range of Mobile Bay. Salinity and Cd stressors were modulated in a three by three factorial mesocosm experiment over the course of twelve weeks. *V. neotropicalis* has a salinity tolerance up to 5 after which the measured growth rate is expected to be impaired. In treatments with high salinity conditions, the combined effect of Cd and salinity is expected to be more than additive, as the higher concentration of chloride ions is expected to make otherwise sulfide bound Cd more bioavailable. However, preliminary results indicate the opposite at low concentrations. *V. neotropicalis* demonstrates greater growth in the presence of low concentrations of both stressors than in single stressor treatments. Further work is being conducted to ascertain body burden and collocal microbial community shifts.

Avenues to Science: Internships at the Marine Education Center

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University of Southern Mississippi Marine Education Center

The USM Marine Education Center is an environmental teaching facility located in a forested area adjacent to Davis Bayou in Ocean Springs, MS. Each year the center aids in facilitating internship opportunities focused on coastal processes in Mississippi and works with USM research and teaching faculty. This summer, three talented undergraduate students participated in internships tailored to their unique interests in science education. One internship focused on dendrology and recording the variety of native tree types found on the MEC property in an outdoor education context. This student was able to map tree populations on the grounds and begin the process of establishing an arboretum at the MEC. Another internship focused on Deer Island, one of Mississippi's nearshore island outcroppings commonly used in educational programming for K-12 and adult audiences. This student intern was able to prepare materials and interact with the education community, teaching about the island and its processes during a professional development workshop held each summer at the MEC. One additional internship worked closely with MEC education staff to explore science communication. This student did a review on an established teaching program offered with the MEC, and interviewed past students, instructors, and mentors in the teaching program. Overall, the students participating in the MEC summer internships gained valuable knowledge and experience in internships aligning with their scientific interests. The students were all recruited from Historically Black Colleges or Universities and were fully supported during their time in coastal Mississippi, learning to collect, analyze, and communicate science.

Biodiversity, Relationships, and Aquatic Chemistry Knowledge in Saline Habitats (BRACKISH)

Dennis McGrury, Brianna Andrews
Grand Bay National Estuarine Research Reserve

The Biodiversity, Relationships, and Aquatic Chemistry Knowledge in Saline Habitats (BRACKISH) project will use place-based learning approaches to foster environmental literacy in eighth grade students in Moss Point and Pascagoula. The program will take place at the Grand Bay National Estuarine Research Reserve (NERR), an estuary located in Moss Point, Mississippi with approximately 18,000 acres of protected coastal, terrestrial, and wetland habitats. On the first day of the program, the project team will travel to a participating school and provide basic knowledge of the GNDNERR, common species, and the importance of water quality and other abiotic factors in the survival of estuarine organisms. During the second day, students will take a boat trip around the estuary, monitoring water quality, fish populations, and marsh vegetation. Student participation in these activities will encourage them to assess and draw conclusions about impacts these parameters have on aquatic organisms. On the third day, the BRACKISH team will return to the school and students will be introduced to mock case studies that are directly related to water quality issues in their community and participate in student-led discussions to identify pros and cons of these activities. As a result of the BRACKISH project, we hope students will become more aware, knowledgeable, and appreciative of their local environment. Science and environmental literacy skills will be enhanced by giving students the opportunity to explore their environment, critically think about human impacts on the environment, and encourage them to find solutions to local, environmental problems.

Comparing the Impact of Curricular and Extracurricular Environmental Education Programs on the Environmental Literacy of High School Students

Jessie Howington, Allie Barnett, Nora Skinner, Eric Sparks, Anthony Vedral, Stacy Hines
Mississippi State University

Environmental education programs aim to enable participants to become environmentally literate citizens with the knowledge, skills, and abilities to solve environmental problems. This project will compare the impact of curricular, or in-school, environmental education programs with extracurricular programs led by the Mississippi State University Coastal and Marine Extension Program to determine which program format and timeline contributes to greater changes in participants' knowledge, skills, and attitudes about coastal environments and sustainability. The Green and Resilient Infrastructure Technical Skills (GRITS) program is an extracurricular program available to high school juniors and seniors each semester focusing on the development of job skills such as drone piloting, geographic information systems, and data analysis that are highly valuable in STEM career fields. Plan-it Marsh and Plan-it Dunes are in-school programs facilitated by classroom teachers, in which students discern best practices for raising and propagating marsh and dune plants to restore shorelines. High school participants' mindsets and knowledge will be evaluated before and immediately after participation in these programs to determine if participation increases environmental literacy. Participants will also be asked about their intentions to pursue careers and post-secondary education in STEM fields, particularly jobs and programs that focus on environmental topics to further assess changes in their mindsets with a focus on career readiness.

Development of Automated, In-situ, Aquatic Environmental DNA Sampler

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The use of environmental DNA (eDNA) is increasingly transforming the way we monitor biodiversity in marine ecosystems. Despite the growing utility of eDNA in expanding our understanding of marine systems, the ability to capture eDNA samples across a time series, particularly from remote locations, remains problematic. Thus, the development of an automated device - that is fully submersible and field deployable - capable of capturing and preserving large numbers of aquatic eDNA samples would better allow for long-term monitoring of critical marine habitats. We are developing a fully submersible, in situ, automated aquatic eDNA sampler and deploying the sampler in a series of real-world applications to demonstrate its utility. Initial designs include a sampler capable of at least 30 days of submerged operation that has the ability to collect and preserve up to 100 individual eDNA samples. Samples will be collected at designated time intervals programmed prior to deployment. By using off-the-shelf components, we aim to keep costs as low as possible thus making the sampler available to researchers and resource managers. A peristaltic pump will be used to push water through an enclosed Sterivex filter to capture eDNA samples. The sampler will then flush the remaining water from the filter with a DNA preservative to prevent sample degradation. Prior to the collection of the next sample, the sampler will use X-Y-Z actuators to move to a discharge port allowing the system to be purged before moving to a new filter and collecting an additional sample.

Development of DNA Barcodes for *Lepidophthalmus louisianensis* and their use in Developing Blocker Primers for Fecal DNA Metabarcoding.

Julian Venable, Brent Thoma
Jackson State University

Lepidophthalmus louisianensis is a common prey to several species of conservation or fisheries concern and plays a critical role in estuarine communities both through the bioturbation and aeration of sediments. However, despite their importance in the estuarine environments of the northern Gulf of Mexico, the diet of *L. louisianensis* is currently unknown. While the literature suggests that this species is a filter feeder, observations of "grazing" on their burrow walls has led some to suggest that they might be deposit feeders that use their feces to grow bacterial and fungi in their burrow walls. Our primary objective is to use fecal DNA metabarcoding to determine the diet of *L. louisianensis* and we propose to use environmental DNA (eDNA) metabarcoding of the burrow walls and surrounding water to determine the diet and feeding ecology of *Lepidophthalmus louisianensis* by comparing the genetic composition of the feces to those of the burrow walls and the surrounding water. Metabarcoding of 4 genes COI, 16S, 18S, and rbCL is underway for the fecal, burrow wall, and water samples and these communities will be compared. A critical intermediate step in this process was the development of DNA barcode data for *L. louisianensis* and the use of those barcodes to generate blocker primers to prevent amplification of host DNA in fecal DNA metabarcoding reactions. Here we present the results of these efforts and discuss their importance in evaluating feeding ecology and diet in future studies.

Developmental Trajectories of Sedimentation in Restored and Created Coastal Wetlands along the Mississippi-Alabama Gulf Coast

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Coastal wetland loss is tied to several factors, including declines in sediment loading. A variety of restoration and creation techniques, such as mitigation and living shorelines, have been implemented to combat these losses and are thought to be more resilient. However, restored and created coastal wetlands often fail to recover ecosystem functions to levels that are similar to natural wetlands. It is unclear if this pattern extends to the recovery of sediment trapping and deposition, which are critical for wetland resilience to sea-level rise. Therefore, we compared sedimentation in created and restored wetlands of different ages and restoration types to natural wetlands along the Mississippi-Alabama coastline. We placed sediment traps in three created, six restored, and four natural tidal wetlands to quantify total sedimentation and accumulation of organic matter and carbon at each site. Additionally, we collected suspended sediment samples from adjacent open water to evaluate the sediment loading potential at each site. We found that living shorelines developed higher sedimentation rates than created, mitigation wetlands, despite having been built more recently. Additionally, sedimentation rates in living shorelines were equivalent to rates observed in natural wetlands. Collectively, our findings suggest that wetland creation and restoration techniques can produce distinct developmental trajectories, which can have consequences for sedimentation and wetland resilience.

Differences in Responses to Thermal Stress between Predator and Prey: *Crassostrea virginica* (Eastern Oyster) and *Stramonita Haemastroma Floridana* (Southern Oyster Drill)

Kayla Boyd [1], Scott Rikard [1], James Stoeckel [2]
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The southern oyster drill is a common gastropod in the Gulf of Mexico. They are an ecologically and economically important pest of oyster aquaculture in the warm waters of the northern Gulf of Mexico, but little is known about southern oyster drill physiology and thermal tolerance. Thermal tolerances have previously been related to predator/prey feeding habits in drills. A higher thermal tolerance of drills could allow them to take advantage of oysters undergoing thermal stress, making them easier prey than at non-stressful temperatures. However, the upper thermal limits of the southern oyster drill in the Gulf of Mexico have not been well studied. To gain insight into potential differences between predator and prey, we used a combination of optical respirometry, behavioral, and lethal assays to test for differences in responses to thermal stress between drills and the eastern oyster. Drills expressed a bimodal curve in metabolic response to acute thermal stress, displaying an adaptive temperature-insensitive metabolism commonly seen in intertidal animals. Oysters, on the other hand, exhibited a unimodal response to acute thermal stress. Drills displayed sublethal behavioral signs of thermal stress approximately 5 ˚C before oysters expressed sublethal behaviors. Drills also reached their thermal critical maximum (CTmax) approximately 5 ˚C before oysters did. Because of the lower tolerance to acute thermal stress, drills are likely not taking advantage of stressed oysters. Rather, it is possible that high temperatures may provide a thermal refuge to oysters from the southern oyster drill.

Dissolved Rhenium Reveals Freshwater Sources to Mississippi Sound

Amy Moody [1], Melissa Gilbert [2], Alan Shiller [2]
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In the coastal zone, tracing sources of materials such as nutrients and contaminants can be complex due to various possible water sources including rivers/estuaries, offshore surface and upwelled waters, and submarine groundwater discharge (SGD). This is particularly true in the northern Gulf of Mexico. In this environment, various groups have found water stable isotopes (δ18O and δD/H) are often useful for distinguishing freshwaters with different latitudinal sources. For instance, Mississippi River mainstem and Atchafalaya River outflow are isotopically distinct. Radium and radon isotopes are often keys to identifying SGD inputs, but these can also have multiple sources. Sometimes a given system may have a unique marker, such as the anthropogenic dissolved cesium enrichment in St. Louis Bay discharge to Mississippi Sound. Here, we present new evidence showing that dissolved rhenium can be a useful Mississippi Sound water source tracer. Rhenium (Re) behaves conservatively in seawater and is found in low concentrations (~41 pM); only in reducing environments, such as sedimentary pore waters, is Re appreciably removed. Rivers generally have lower Re than seawater, but some rivers can be enriched in Re relative to seawater. This appears to be the case with the Mississippi River and may be the result of anthropogenic Re inputs. In the Mississippi Sound, the contrast between freshwater components derived from the Mississippi River and local rivers is clearly revealed due to their contrasting Re concentrations. Interestingly, some SGD samples appear to have an intermediate Re concentration, suggesting possible use of Re in multiple endmember mixing models.

Does Sediment and Microplastic Type Affect the Adsorption of Heavy Metals in Marine Systems?

Allison Fletcher , John Lehrter
Dauphin Island Sea Lab/University of South Alabama

Microplastics and heavy metals are both anthropogenic pollutants in marine environments. Much is known about the negative impacts of microplastics and heavy metals on the environment and organisms as well as microplastics acting as a vector for heavy metals adsorbed to their surface. However, few studies have assessed which media presents the greatest risk. The purpose of this project was to evaluate the effect of sediment and microplastic type on heavy metal adsorption. For a span of seven days, microplastics and microfibers were placed in bottles with purified water and three different sediments of varying grain size for a total of six treatments with replication. Heavy metals were extracted from the microplastics and analyzed using Inductively Coupled Plasma Mass Spectroscopy. Based on these data, we have identified that microfibers in fine-grain organic rich sediment could pose the greatest hazard in terms of heavy metal adsorption. With these results, further research and data can be obtained on how microplastics and metals interact in the environment as well as their harmful effects on marine life. This information can also provide policy makers and stakeholders with the data needed to manage and reduce microplastic sources to estuaries and aquatic systems.

Early Recruitment Limitation Impedes the Recovery of the Eastern Oyster (*Crassostrea virginica*) in Mississippi Sound

Chet Rakocinski, Kathy VanderKooy, Geoffry Spooner
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Climate-related shifts in rainfall patterns currently hamper oyster recruitment throughout western Mississippi Sound. Multiple stressors associated with excessive freshwater discharge include extremely low and sustained salinity, as well as hypoxia and toxic effects of harmful algal blooms. Successful oyster recruitment requires a proper supply of planktonic larvae, suitable substrate for post-larval settlement, and successful survival and growth of early post-settlement stages. Prior to 2019, large- scale reef restoration efforts focused on alleviating substrate limitation as a deterrent to oyster recruitment in Mississippi waters. Early oyster recruitment was evident in 2018. However, the primary deterrent to oyster recruitment shifted from substrate limitation to recruitment limitation in 2019, when oyster spawning stocks were completely decimated by unprecedented freshwater discharge from the Bonnet Carré spillway. Consequently, early oyster recruitment was effectively eliminated in 2019. In 2020, early oyster recruitment resumed at low and regionally variable levels. Sustained low salinity conditions returned in 2021 in response to an elevated regional rainfall regime throughout the oyster recruitment period. Early oyster recruitment was sparse and varied regionally, commensurate with salinity levels. Variation in growth and mortality of transplanted hatchery-reared juvenile oysters varied regionally and between years in conjunction with salinity. Since 2018, commercial oyster landings from western Mississippi Sound have ceased. The development of an innovative adaptive oyster management strategy is essential given current environmental challenges.

Effect of Training Level and Demographics on Quality of Citizen Science Collected Litter Data

Jessi James
Mississippi State University

Citizen, community, or backyard science (hereinafter referred to as citizen science) has evolved from just a means to connect local communities to scientific research, to be actively used in a wide range of research efforts. There are many benefits to citizen science, but several perceived limitations. One limitation is citizen science data is often viewed as inferior or unusable by the broader science community. This stigma associated with citizen science data can often be attributed to a lack of data validation by trained professionals across user groups. Some of the main hindrances to the usability of citizen science data is the inherently different levels of background knowledge paired with training levels across participants. To increase the usability of data collected by citizen scientists, validity and confidence in the data must be established within the scientific community. To accomplish this usability, this study will evaluate the accuracy of two different marine debris data collection protocols by citizen scientists and the influence of individual characteristics, such as age, gender, educational background, socioeconomic status, and training level on the reliability and accuracy of collected data.

Effects of Structural Design on Oyster Survival in Artificial Reefs

Jaden Akers [1], Ashleigh Dunaway [1], Cynthia Lupton [1], Patrick Broussard [1], Just Cebrian [1], Nigel Temple [2], Eric Sparks [1]
[1] Mississippi State University; [2] University of South Alabama

Eastern oysters are well known ecosystem engineers responsible for water filtration, providing habitat and refuge for numerous species, and other ecosystem services. However, natural oyster reefs are declining due to several natural and anthropogenic threats. To mitigate for the loss of natural oyster reefs, many reef restoration projects have been completed and several more are being planned. It is known that variation in reef height, interstitial space, and slope can encourage oyster settlement, but little is known about how reefs can be designed to exclude predation of oysters by oyster drills, fish, crabs, and other predators. In this study, we seek to quantify the effectiveness of varying oyster reef designs at excluding predation. Sixteen replicates each of eight different reef designs varying in height, slope, and vertical spacing have been created from Portland cement and seeded with oysters from Auburn Shellfish Lab. These reefs have been deployed in Bayou La Batre, AL in a block design with two replicates of each reef design deployed in a single block. One of these replicates is in an exclusion cage to limit predation while the other is not. Monthly photographs to determine oyster growth and survival in addition to predator counts will be collected and analyzed. Results from this study can be used to inform the design of oyster reef restoration projects.

Evaluating the Efficacy of Recycled Glass Sand as a Soil Substrate for Gulf Coast Marsh and Dune Plants in Restoration Projects

Ansley Levine, Eric Sparks
Mississippi State University

Sea level rise and erosion are driving shoreline changes along the Gulf Coast, threatening coastal habitats and populations that rely upon them. To mitigate these impacts, a wide range of coastal restoration projects have been implemented, with many of them including sand fill to help combat sea level rise and serve as structural habitat for replenishing plant and wildlife. However, sand is becoming increasingly expensive and is often difficult to source and transport. A proposed method to help increase the accessibility and cost-effectiveness of sand fill is by using recycled glass that is crushed into sand-sized particles as a source material. This solution can simultaneously eliminate landfill waste and provide locally-sourced fill material for coastal restoration projects. Ecological testing is still needed to confirm the efficacy of using recycled glass sand instead of traditional quartz sand. Therefore, I plan to conduct mesocosm experiments to evaluate the ability of black needlerush (*Juncus roemerianus*), a dominant marsh grass along the northeastern Gulf Coast, and sea oats (*Uniola paniculata*), a common dune plant, to grow in recycled glass sand. I will compare plant biomass, growth rates, and root characteristics among different sand treatments (glass, mixture, natural) to assess the tradeoffs of glass sand use in marsh and dune restoration projects. Completion of this research could help inform the design of future coastal restoration projects and support more cost-effective and sustainable restoration efforts along the Gulf Coast.

Evapotranspiration Over Different Terrestrial Ecosystems in the Lower Mobile-Tensaw Delta Using Remote Sensing Data

Skye Hellenkamp, Gabriel de Oliveira
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The Mobile-Tensaw Delta is one of the most biodiverse regions within the United States, and is heavily understudied compared to other ecosystems of its size and significance. Different vegetation patterns can influence how water cycling occurs across the Earth's surface. In this regard, it is extremely important to track how plants can adapt and behave under critical environmental conditions. This study uses remotely sensed imagery to explore the water-use vegetation dynamics across different terrestrial ecosystem types within the Mobile-Tensaw Delta, southern Alabama. Using data obtained from NASA's Terra and Landsat satellites, evapotranspiration estimates were compared and analyzed on spatial and temporal scales. The four study areas compared in this research were evergreen forests, cultivated cropland, woody wetlands, and pasture/hay fields over roughly two decades, from 2001 to 2019. The areas displayed distinguished evapotranspiration magnitudes and temporal variability over a monthly, seasonal, and yearly basis. Our results evidence that land cover changes in the Mobile-Tensaw Delta impact the vegetation structure, which in turn affects the water-use in these areas, causing drier conditions and warmer land surface temperatures when natural ecosystems, such as mature evergreen forests, are replaced by annual crops in the region, such as cotton, corn, among others.

Expanding Understanding of a Critically Imperiled Ecological Indicator, the Florida Pondweed (*Potamogeton floridanus*)

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The Gulf Coast of the southeastern United States is a biodiversity hotspot, meaning the area exhibits high endemic biodiversity but is threatened by human disturbance. Rates of endemic species diversity for aquatic macrophytes in Gulf Coast states are among the highest in the world, on par with tropical ecosystems. Preservation of this biodiversity relies heavily on a detailed understanding the taxonomy, distribution, ecology, and evolutionary background of species. However, because endemics maintain small population sizes, occur in restricted geographical ranges, or both, they are grossly understudied and under-collected. This is especially true in aquatic plants because collection efforts tend to be biased towards terrestrial species. Pondweeds (*Potamogetonaceae*) directly contribute to endemic diversity as well as supporting broader freshwater biodiversity by providing food, shelter and habitat for insects, snails, fish, turtles, and waterfowl. The critically imperiled Florida pondweed (*Potamogeton floridanus*), endemic to coastal blackwater rivers, is of federal interest but not enough is known of its biology to adequately assess the species for conservation purposes. Previously known only from a few populations in the Blackwater rivershed in Santa Rosa County, Florida, my work with morphologically similar specimens collected in Baldwin County, Alabama suggests the species is more widespread. Using genetic tools, spatial analyses, and water quality data, we expand the known distribution of *P. floridanus*, identify other potentially suitable areas, and examine environmental tolerances to fill knowledge gaps for the ecologically important but understudied Florida pondweed.

Eyes on Seagrass for Pensacola Bay

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In lower Pensacola Bay, Big Lagoon and Santa Rosa Sound once had large meadows of seagrass that supported bay scallops among other species. These areas have seen declines since the 1960s however, recent studies show that there has been a 13% increase in seagrass coverage between 2010 and 2015.Since 2017 the University of West Florida (UWF), Escambia and Santa Rosa County Sea Grant Extension Program have worked together to enlist citizens and UWF students to monitor seagrass beds. Each month during the growing season (April-September), local citizens identify seagrass species and use quadrats to estimate coverage of seagrass and macroalgae at different locations in the Pensacola Bay system. They also collect water samples which are analyzed by students at UWF by students who measure salinity and total suspended solids. Students also measure water quality and collect water samples for dissolved nutrients and chlorophyll a from these locations two-three times during the growing season. The goals of this program are to develop an active community of citizen scientists, train students, develop long term monitoring of seagrass habitats in the Pensacola Bay system, and to use this data to increase our understanding of factors impacting seagrass in the rapidly growing region. In 2022 the project trained nine volunteers and expanded to locations in Choctawhatchee Bay. This presentation will provide updates for the 2022 season as well as some of the issues working with citizen volunteers.

G.R.I.T.S: Fostering Green and Resilient Infrastructure Technical Skills in High School Aged Youth

Allie Barnett, Nora Skinner, Anthony Vedral, Eric Sparks
Mississippi State University

Communities across coastal Mississippi are dependent on healthy natural resources to provide the ecosystem functions and services necessary for community resilience. Local youth are often interested in the environment; however, STEM careers involving habitat restoration and green infrastructure require a broad, yet technical skill set that is rarely introduced to high school. Lack of skills training, acts as a barrier to entry in STEM fields and reduces the capacity of the local STEM workforce. The GRITS (Green and Resilient Infrastructure Technical Skills) program was formed to address this issue through creating and implementing a comprehensive curriculum for STEM workforce development for high school students in coastal Mississippi. GRITS will provide hands-on training on six STEM skill groups vital to coastal habitat restoration and green infrastructure focused careers. The skills acquired through the program are directly applicable to various coastal STEM careers and include watercraft operation and certification; unmanned aircraft systems (UAS) operation and certification; navigation and mapping; basic electrical systems, sensor construction, and coding; nursery methods and planting techniques for coastal vegetation; and data analysis, interpretation, project design, and permitting. Additionally, students will receive certifications (i.e. watercraft and UAS) for completion of applicable courses. This training will significantly enhance their marketability and likelihood of employment in coastal STEM careers.

Gaping Behavior in Triploid and Diploid Eastern Oysters Before and After Desiccation

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Auburn University

The Eastern Oyster, *Crassostrea Virginica*, is a valuable product of off-bottom aquaculture farms in the northern Gulf of Mexico. Differences in mortality between diploid and triploid oysters have been documented in off-bottom farms, but the drivers behind these differences are not fully understood. Gaping behavior in oysters is important in that it determines the amount of time an individual is open and actively obtaining oxygen and food. Oysters are regularly subject to desiccation treatments in aquaculture for the purpose of controlling and limiting biofouling. During desiccation treatments typically lasting 12-24 hrs, oysters remain tightly closed, but must periodically open after re-immersion to resume aerobic respiration and feeding. To investigate gaping behavior before and after desiccation, we used a commercially available Aquadect MosselMonitor ® to monitor and record percent gape of individual oysters every 60 seconds. For each trial, four diploid and four triploid oysters from half-sib groups were glued into the MosselMonitor which was then placed into a mesocosm containing filtered saltwater at ~16 ppt salinity, and 26.6 ℃. Oysters were fed LPB shellfish diet and allowed to acclimate to the system for 7 days. The MosselMonitor was then raised from the water for 24 hrs to simulate a desiccation treatment, and then returned to the water for an additional 48 hours. Experiments are still ongoing. Preliminary analysis indicates that both diploids and triploids close less frequently in the 24 hrs following desiccation, compared to pre-desiccation behavior, but triploids show more individual variation than diploids.

Generation of DNA Barcode Data for *Callichirus islagrande*, a Beach Ghost Shrimp, and Generation of Blocker Primers for Fecal DNA Metabarcoding

Kambrial Love, Brent Thoma
Jackson State University

Callichirus islagrande, the beach ghost shrimp, is a burrowing shrimp endemic to the northern Gulf of Mexico where it is among the most abundant macroorganisms in shallow sand beach habitats. *Callichirus islagrande* is a common prey item of stingray, Florida pompano, Gulf whiting, and Gulf sturgeon. Although *C. islagrande* are known filter feeders and eject large amounts of fecal pellets from their burrows, which likely alter the nutrient and trophic dynamics of the nearshore environment, it is unclear if they are generalist, feeding on everything suspended in the water column or if they selectively target certain food items. In this study, we aim to analyze the diet of *C. islagrande* using fecal DNA metabarcoding. Before beginning metabarcoding analysis, we amplified and sequenced 3 loci (COI, 16S, and 18S) from *C. islagrande* and generated blocker primers to prevent amplification of *C. islagrande* DNA while conducting metabarcoding of fecal DNA and eDNA samples. DNA metabarcoding of 4 loci (CO1, 16S, 18S, and rbcL) will be conducted for both the fecal DNA and environmental DNA (eDNA) samples collected from the surrounding water and we will compare the community composition recovered from these analyses to determine how the community recovered from fecal DNA analyses compares to that recovered from the eDNA analyses. Here we present the results of these efforts and provide additional insights into the diet and feeding ecology of *C. islagrande*.

Generation of DNA Barcodes for the Atlantic Mole Crab, *Emerita talpoida*, and the Development of Blocker Primers for Fecal DNA Metabarcoding Analysis

Dwan Jackson, Brent Thoma
Jackson State University

The Atlantic mole crab, *Emerita talpoida*, is a common component of the sandy beach community from Massachusetts to Mexico where it commonly inhabits the swash zone. It is a common prey item for shorebirds and several sportfish (e.g., Gulf and Atlantic Whiting and Florida Pompano) and is harvested for human consumption in some communities making its biology, especially its diet, of particularly concern due to the potential for biomagnification along trophic levels. While it is well known that *E. talpoida*, like its congeners, is a filter feeder, to what extent it may be a selective filter feeder is largely unknown. We aim to examine the diet of *E. talpoida* using fecal DNA metabarcoding of 4 loci (16S, 18S, COI, and rbcL) and compare the composition of the fecal DNA community to that of the surrounding water to determine if individuals are filtering all particles from the water or are selectively ingesting certain particles (e.g., bacteria, phytoplankton, detritus, etc). Before metabarcoding reactions could be undertaken, we began by generating DNA barcode data for *E. talpoida* for COI and 16S and used these data to develop blocker primers to prevent the amplification of host DNA in metabarcoding reactions. Following metabarcoding communities recovered from both fecal DNA and surrounding water will be compared to determine if *E. talpoida* is a generalist or selective filter feeder. Given its importance in numerous food webs and as an occasional human foodstuff, understanding the diet of *E. talpoida* is critical to prevent biomagnification of marine pollutants.

Gulf Coast Dune Mycorrhizae Improve Salinity Tolerance of a Common Coastal Dune Grass

Emily Newman, Joshlyn Rowland, Jeremiah Henning
University of South Alabama

Arbuscular mycorrhizal fungi (AMF) are root-inhabiting fungi that form symbiotic associations with most land plants and can aid in survival, growth, and stress tolerance of colonized plants. Plants growing in coastal dune ecosystems face constant environmental stress from high temperatures, low moisture and nutrient retention, and frequent saltwater inundation. Frequency of inundation in coastal dunes is predicted to increase as sea levels rise and tropical storm frequency, intensity, and duration increases. To determine whether Gulf Coast AMF improve inundation tolerance of *Panicum amarum*, a common coastal dune grass, we grew *P. amarum* with and without native AMF under control conditions of watering once a week with freshwater, freshwater inundation (watering three times a week), and across a gradient of saltwater inundation concentrations: 0.25%, 0.50%, 1.00%, and 1.50%. Under 0.25% salinity inundation, *P. amarum* grown with native AMF had 46.6% greater survival; however, we found no significant differences in biomass of *P. amarum* between live and sterile soil treatments, suggesting AMF promote salinity tolerance for *P. amarum*. As salinity concentrations increase to 0.50%, 1.00%, and 1.50%, AMF offer no benefits to *P. amarum*, as salinity is still toxic to plants at higher concentrations. Surprisingly, under control conditions, plants grown with native AMF had 46.6% lower survival and 3´ greater biomass than those without native AMF communities. In conclusion, Gulf Coast dune AMF improve salinity tolerance of *Panicum amarum* at low levels of 0.25% salinity concentrations, however under normal conditions AMF may be a significant resource sink for *P. amarum* seedlings.

High Resolution Photo-optical Study Reveals Unique Changes in Photo-acclimation and Productivity within Two Closely Related Green Algal Species (*Micromonas* sp.) Under Nitrogen Replete and Limited Conditions

Kenneth Hoadley, Shannon Dalessandri, Alison Robertson, Jeffrey Krause, Sean Lowry
Dauphin Island Sea Lab/University of South Alabama

Phytoplankton primary productivity rates can be monitored using various currencies (oxygen evolution, carbon uptake, and electron transport rates through the photosynthetic apparatus). While each currency holds value, chlorophyll fluorescence-based measurements of electron transport are increasingly valued as an instantaneous and non-invasive means of measurement. However, fluorescence-based measurements of productivity still need further evaluation, especially for near- shore environments where fluctuating conditions are common. Climate change related shifts in primary productivity within coastal environments are expected, however accurate monitoring is difficult due to the heterogeneric nature of coastlines. Scalable methods are needed for monitoring productivity and low-cost chlorophyll fluorescence-based systems could prove useful. In this study, we coupled a custom-made chlorophyll a fluorometer to an algal culture system (photobioreactor) to monitor photosynthesis and productivity rates of algae under highly regulated conditions. Specifically, we chose to study two strains of the globally ubiquitous and highly diverse green algae family *Micromonas* under nitrogen replete and limited conditions. Different growth rates and photochemical responses to changes in nitrogen availability are observed between the two strains (CCMP 2709 isolated from the South Pacific and CCMP 493 isolated from the Gulf of Mexico) and lead to varying rates of productivity measured throughout each day and under varying light conditions. As fluorescence-based productivity rates become more common, high-temporal resolution instruments and datasets such as the one generated here could lead to lower cost field measurement platforms.

Hydraulic Impact on Fish Migration in Sariakandhi Fish Pass of Bangladesh

Bijoy Kumar Ghosh
Bangladesh Technical Education Board Ministry of Education

The importance of open water fish in our socio-economic regime has recently drawn the attention of the policy makers of the country. FCD/FCDI projects mainly serve the agricultural interests, but it interfere fish migration. The structures will also aid in efficient development of the carp fishes. Spawning migration, mainly in carp fish, in the study area was found to begin at the 2nd week of May and continue up to the 3rd week of July. Catfish migrations began at the last week of March and continue up to the 2nd week of June. Fish fry and hatching movement from Jamuna to Bangali river was the main objective of Sariakandi fish pass project.

Identification of Research Needs, Environmental Concerns, and Logistical Considerations for using Livestock for Coastal Upland Habitat Management

Kristie Gill, Keith Chenier, Eric Sparks
Mississippi State University

In the northern Gulf of Mexico, natural resource managers continually struggle with maintaining coastal uplands due to front- end costs, prolonged maintenance, and varying habitat-specific ecological needs. Removal of invasive species and the preservation of threatened and native species need to be addressed by conservation management strategies. Prescribed fire, chemical treatments, and mechanical removal are commonly used management techniques in the region. Each is associated with different levels of cost, intrusiveness, ecological damage, and logistical constraint. A potential alternative or complementary technique is using livestock for targeted grazing. In other regions targeted grazing has been recognized as one of the most cost-effective methods for habitat management. This method of using livestock for conservation or restoration of managed lands has shown to be a less intrusive, ecologically non-detrimental, and financially viable alternative. While targeted grazing is used extensively, this method is not a common practice within the northern Gulf of Mexico states. To better understand the research needs and environmental concerns related to using livestock grazing for habitat management in this area, an anonymous survey was distributed to natural resource managers, researchers, and livestock producers. Survey results show that there is interest in targeted grazing (96%), but very limited research and understanding. Throughout the survey groups, major research concerns consisted of grazer nutrition and impacts of grazing on water quality and wildlife habitat. The results of the survey have allowed the research team to narrow down what aspects of targeted grazing should be focused on in initial studies.

Identifying Fecal Contamination Sources in the Grand Bay National Estuarine Research Reserve

Amanda Free, Kim Cressman, Phil Lee, Eric Sparks
Mississippi State University

The Grand Bay National Estuarine Research Reserve (GNDNERR) has chronically elevated fecal coliforms counts; however, the source of the contamination is unknown. Due to the poor understanding of the local fecal pollution sources, this area has not been opened to shellfish harvesting since 2007. According to past sanitary surveys, there has been a history of malfunctioning residential septic systems and inadequate wastewater treatment in the upper watershed. Feral hogs and birds are also abundant in the estuary and could be a potential contributor to elevated fecal coliform levels in this area. The GNDNERR is located on the northern Gulf of Mexico coastline which is known to receive some of the highest annual precipitation totals in the United States. The intense rainfall can lead to a large fecal load from upland sources into the estuary. To better understand the temporal and spatial variation of fecal coliforms in the GNDNERR and inform oyster reef management, monthly sampling will take place over the course of a year at six sites within the main watershed of the GNDNERR and two sites upstream in the bayous. Having the two sites upstream will allow for a better understanding of how rainfall affects fecal contamination throughout the estuary. Quantitative polymerase chain reaction (qPCR) will be used for microbial source tracking to identify levels of potential fecal sources from humans, feral hogs, and birds have within the estuary as well as the concentrations of enterococcus, a fecal indicator bacteria.

Identifying Potential Drivers of Fish Community Composition on Restored Oyster Reefs in East Bay, Pensacola

Christopher Grant [1], Alexandra Rodriguez [2], Ronald Baker [1]
[1] Dauphin Island Sea Lab/University of South Alabama; [2] Dauphin Island Sea Lab

Oyster reef restoration typically aims to enhance or reinstate a range of ecosystem services, including restoring fish habitat values. Understanding how fish communities respond to restoration efforts can help guide future restoration efforts that wish to maximize fish habitat benefits. We surveyed fish communities across 14 cultch reefs in East Bay, Pensacola using underwater video. We found diverse assemblages, including important fisheries species such as sheepshead *Archosargus probatocephalus* and spotted seatrout *Cynoscion nebulosus*. Although oyster reefs can provide important nursery habitat, we observed few young-of-year fish in our samples, most likely due to the depth (>2 m) of these reefs. Potential drivers of variation in fish community composition were derived for each reef, including: proximity to ocean, distance to shoreline, nearest shoreline type, distance to nearest reef, substrate type, depth, as well as tidal stage and moon phase at the time of sampling. Further analyses will seek to identify the key drivers of variation in fish community structure across the East Bay reefs. Identifying the key drivers will help with future prioritization of restoration efforts by identifying candidate sites most likely to provide the greatest fish habitat benefits.

Impacts of Disturbance and Resource Availability on Coastal Dune Ecosystems

Jeremiah Henning, Emily Newman, Kayla Beitzel, Taylor Clay, Thelma Hammer, Chelsea Thornton
University of South Alabama

Globally, coastal ecosystems are threatened by the intensifying effects of global change and increasing disturbance through human activity. Although a global issue, these effects are being felt especially hard along the Alabama Gulf Coast where storm intensity and frequency, sea-levels, and the number of tourists continue to increase year after year. Storm events and human-mediated disturbance of coastal plant communities increase coastal erosion, impacting dozens of critically threatened or endangered organisms. To understand recovery of coastal dune ecosystems following disturbance and to quantify assembly dynamics through time, we established a mechanical disturbance × resource availability experiment on the west end of Dauphin Island, AL. In Spring 2020, we established 20 5×5m plots that were randomly selected to receive disturbance with a rototiller, application of 10g nitrogen, phosphorus, and potassium, rototilling plus nutrient addition, or to serve as a control. Overall, disturbance and resource availability are reducing plant diversity within coastal dune ecosystems. The impact of disturbance is cascading to reduce the diversity and abundance of dune insect communities, soil fungal activity, and is altering the activity of ghost crabs residing within our plots. Nutrient addition is having negligible impacts on plant, insect, and ghost crabs residing within our plots within the first two years of treatment. Over the next decade, our experiment will quantify the impacts of disturbance on coastal dune plant communities and will measure the changes in ecosystem function and trophic cascades.

Incorporating in Situ Wave Energy Measurements into a Living Shoreline Suitability Model

Ashleigh Dunaway, Vitor Martins, Eric Sparks
Mississippi State University

Natural shorelines are essential to maintaining a healthy ecosystem, but erosion accelerated by anthropogenic stressors greatly decreases the sustainability of some natural shorelines. Living shorelines are an alternative to shoreline hardening that protect and restore natural shorelines. However, many property owners and project designers do not know how to determine the best living shoreline solution for their location. To address this issue, the Virginia Institute of Marine Science created a living shoreline suitability model (LSSM) to inform living shoreline design recommendations in specific locations. This model has been applied to many waterbodies throughout the US, including the northern Gulf of Mexico, and uses data inputs such as fetch, land use, and bathymetry to categorize the shoreline. The LSSM uses fetch to calculate wave energy and classify the shorelines as "low, medium, or high" energy. However, many restricted waterways (e.g., narrow channels and rivers) have small fetch but high boat traffic, which has the potential to lead to under designed shoreline recommendations from the LSSM. To improve the recommendations produced by the model in restricted waterways, we will collect wave energy data using low- cost wave gauges throughout Biloxi Bay over several months and incorporate this data into the LSSM. Differences in shoreline management recommendations between the fetch-based LSSM and in situ wave energy measurement-based LSSM will be quantified and analyzed. This data will be used to create a more accurate representation of the shoreline and improve living shoreline recommendations.

Lillian Park Beach Habitat and Shoreline Protection Project

Glenn Ledet, Leah Selcer
Neel-Schaffer, Inc.

The Lillian Park Beach Habitat Shoreline Protection Project in Baldwin County, AL combines community function with coastal protection. The project provides a holistic approach to lessen existing conditions and coastal processes that have real and ongoing negative considerations to degradation of the immediate shoreline and littoral habitat, public safety and public access to the natural resource. The Lillian Park Beach and Boat Launch were constructed to facilitate greater public access to and enjoyment of the natural resources of the Perdido watershed and the Gulf of Mexico. The sand beach shoreline and coastal habitat are a preferred feature for recreation use. Erosion of bay shoreline, loss/degradation nearshore and littoral habitat is occurring at and adjacent to this location. Additionally, sedimentation is occurring in the boat ramp, hindering water access. Construction of a rock groin breakwater structure south of the existing boat launch will address ongoing sediment transport trends currently acting at the site, improving boat access and protection from high-energy waves, minimize the overall operations and maintenance of the park facility due to sand deposition in unwanted areas such as the boat ramp, and provide suitable public access for boats, fisherman, and enthusiasts to the natural resource. Additionally, construction of a sand pocket beach north of the existing boat launch will create a stable sand shoreline and effectively minimize beach erosion and habitat loss along Perdido Bay.

Manual and Chemical Removal of Invasive Apple Snails in Mobile, AL

Susanna Robinson, Jennifer Doan, Cassie Eldredge
Osprey Initiative

The apple snail (*P. maculata*) is an invasive mollusc species from Asia that was introduced to the Three Mile Creek watershed most likely by the aquarium trade. Apple snails exhibit high reproductive potential, growth rate, dietary flexibility, and resistance to several environmental conditions including hypoxia, high temperature and desiccation, making them a threat to native gastropods' as well as the environment. The goal of the project was to use environmentally low impact manual removal supplemented by molluscicide and herbicide applications to minimize the population and prevent spread into Mobile Bay. Snails and egg sacs were removed using twice weekly collection at Municipal Lake by a field crew consisting of two to four field technicians using grabbers in kayaks and canoes from 2020 to 2022. For each collection and removal effort, data was recorded based on location and individual counts, allowing for a trend line to show a decrease in the population. Molluscicide and herbicide were applied throughout the watershed based on recommendations from the field crew. In 2022, efforts were expanded to the entire watershed. This combination of manual and chemical methods was shown to be highly effective. Over the life of the project, the weekly average of both snails and eggs decreased significantly. Respectively, the yearly removed snail averages are as follows: 559 snails, 113 snails, and 33 snails. The removed egg sac averages are as follows: 2782 sacs, 570 sacs, 357 sacs. This targeted approach is efficient with little impact on the environment and native species.

Monitoring the Success of Planted Oysters in Mobile Bay

Rebekah Farmer [1], P.J. Waters [2], Katherine Baltzer [1]
[1] The Nature Conservancy; [2] Auburn University Marine Extension and Research Center/Mississippi-Alabama Sea Grant Consortium

The Eastern oyster, *Crassostrea virginica*, is a keystone species that provides numerous ecosystem services. Unfortunately, oysters have experienced a precipitous decline in population worldwide and in coastal Alabama. Currently, efforts are being made to restore the number of oysters in the region, a population that was so low that the 2018-2019 harvest season was closed in Alabama. These efforts include habitat restoration and planting oysters raised through the Mississippi-Alabama Sea Grant Consortium Oyster Gardening Program on suitable reef structures. The aim of this project was to determine the amount of spawning and recruitment of oysters planted from the gardening program on the Swift Tract breakwaters, located on the eastern side of Mobile Bay to protect the shoreline of the Weeks Bay National Estuarine Research Reserve lands. From April 2022 to October 2022, spat settlement plates were collected and deployed every 2-3 weeks at Swift Tract, followed by being evaluated for spat presence. After each site visit, no spat were found at the Swift Tract location urging for additional monitoring, hydrodynamic modeling, and water quality data collection to determine if the oyster planting will yield viable populations at Swift Tract in the future.

Nurdle Patrol at Saint Stanislaus

Avery Matheson, Hill Gainey, Kyle Stegall, Hudson Osborne, Evan Lafontaine, Mark Ray
Saint Stanislaus Catholic High School

Since 2019, the Saint Stanislaus Marine Science Program has been working with the Mission-Aransas National Estuarine Research Reserve, at the University of Texas at Austin, to monitor nurdle pollution. Nurdles are microplastics, less than five millimeters in size, that are melted down to make all other plastic products. Nurdles are escaping into our environment from manufacturing companies when they are packaged for transport on trains and barges. Nurdles, and all plastics, are known to absorb chemicals from the environment that can bioaccumulate in our food chains. As nurdles escape into our environment, animals mistake them for food, leading to detrimental effects on their health and populations. Nurdles have been found in twenty-eight of thirty-two countries and are currently being found all along the Gulf of Mexico region. Our community relies heavily on the fishing and seafood industry, so we feel the personal effects of nurdle pollution. Saint Stanislaus is doing monthly surveys on the beach in front of our school. Each survey takes ten minutes, looking for nurdles in the new strandlines. We then report this data to Nurdle Patrol which uses the information to work on stricter permit requirements for plastic pellet manufacturers and transporters, at the state and federal levels. In 2021 Saint Stanislaus collected a total of 10,695 nurdles on the beach in front of our school. So far, we have collected 5,373 nurdles in 2022. In total, 51,026 nurdles have been collected on our beach in front of our school since January 2019.

Oyster Gardening Program at Saint Stanislaus

Hill Gainey, Hudson Osborne, Kyle Stegall, Avery Mathenson, Mark Ray, Evan Lafontaine
Saint Stanislaus Catholic High School

Since 2017, the Saint Stanislaus College (SSC) Marine Science Program, under the supervision of Mississippi-Alabama Sea Grant Consortium (MASGC) and Mississippi Department of Marine Resources (DMR), has participated in the Mississippi Oyster Gardening Program. During this time, SSC has grown 21,222 oysters for restoration purposes in the Mississippi Sound. On August 16th, 2022 we received 1,200 oyster shells, covered in spat, averaging 0.6 mm. Since then, we have provided these juvenile oysters with a safe environment, free from predation. Every seven to ten days, the SSC Marine Science Interns and Marine Science students clean the oysters by removing sediment and algae, measure their growth, monitor water quality parameters with emphasis on salinity, and remove predators. We currently have seven gardens at the end of our pier, with plans to expand to 14 gardens. This year's oysters are currently averaging 25 mm and need more room to grow. We will continue to maintain and monitor the oysters' growth until they reach maturity, at which time we will return them to MASGC and Mississippi DMR. From there, the oysters that we grow will be counted, measured, and distributed around the Mississippi Gulf Coast to be placed on permanent oyster reefs where they can reproduce and contribute to future oyster populations. They will also create shelter for numerous species of fish and crustaceans. In addition, these oysters will help prevent erosion of the coastline for the many years to come.

Patterns and Trends in Chlorophyll a Concentrations Across the Mobile Bay Salinity Gradient

Alyssa Bourne , Allison Fletcher, John Lehrter
Dauphin Island Sea Lab/University of South Alabama

Coastal eutrophication driven by riverine nutrient loads continues to be one of the most prevalent water quality issues in estuarine and coastal waters. The process of anthropogenic eutrophication occurs when elevated nutrient loads result in increased phytoplankton biomass that may lead to harmful algal blooms, decreased water clarity, hypoxia, and coastal acidification. Recent studies have observed increased nutrient loading in watersheds draining to Mobile Bay. It is unknown if phytoplankton biomass in the estuary has increased in response to the increased loading. In this study, phytoplankton biomass was measured in Mobile Bay approximately monthly from 2019-2022 across the salinity gradient of tidal river (salinity < 0.5), oligohaline (salinity 0.5 to 5), mesohaline (salinity 5 to 18), and polyhaline (salinity 18 to 30) regions. Phytoplankton biomass was measured as chlorophylla (chla), which was extracted from bay samples with methanol and analyzed on a fluorometer. The data from 2019-2022 were compared to data from a previous bay-wide assessment conducted from the 1980s to 1990s (Pennock et al. 1994) to determine if there were any predominant trends in phytoplankton biomass. From 2019-2022, chla was highest in the oligohaline, followed by tidal river, mesohaline, and polyhaline with values of 16.3, 15.1, 14.5, and 7.6 mg m-3, respectively. These values are higher than the chla measured during the 1980s to 1990s, when the overall mean value for the bay was 6.5 mg m-3. Hence, the recent trends of increasing nutrient loads are resulting in increased chla in Mobile Bay.

Patterns and Trends in Nutrient Concentrations Across Mobile Bay Salinity Gradient

Nick LaBon, Allison Fletcher, John Lehrter
Dauphin Island Sea Lab/University of South Alabama

Coastal eutrophication driven by riverine nutrient loads continues to be one of the most prevalent water quality issues in estuarine and coastal waters. The process of anthropogenic eutrophication occurs when elevated nutrient loads result in increased phytoplankton biomass that may lead to harmful algal blooms, decreased water clarity, hypoxia, and coastal acidification. Recent studies have observed increased nutrient loading in watersheds draining to Mobile Bay. It is unknown, however, if phytoplankton biomass in the estuary has increased in response to the increased loading. In this study nutrient levels were measured in Mobile Bay approximately monthly from 2019-2022 across the salinity gradient form freshwater to coastal water. Nutrient levels were measured as percent carbon, percent nitrogen, and concentrations of NO3, NO2, NH4, PO4, and Si in each sample. The data from 2019-2022 was compared to phytoplankton biomass data collected at the same time and to data from a previous bay-wide assessment conducted from the late 1980's to 1990's (Pennock et al. 1994) to determine if there were any correlations between increasing nutrient levels and any trends in phytoplankton biomass. Overall there is an increasing trend in nutrient loads as well as an increasing trend of phytoplankton biomass in Mobile Bay from the 1980's to present. This indicates that increasing nutrient levels could contribute to the increased frequency of HAB's, decrease in water clarity, and increase in hypoxia in Mobile Bay.

Per- And Poly- Fluoroalkyl Substances (PFAS) Body Burden and Exposure-Induced Stress Responses of Eastern Oysters in the Mobile Bay Region

Ayesha Alam, Timothy Bruce, Joel Hayworth, Vanisree Mulabagal, James Stoeckel
Auburn University

Per- and poly-fluoroalkyl substances (PFAS) are ubiquitous in many ecosystems. Eastern oysters (*Crassostrea virginica*) are prominent ecological, economic, and cultural drivers in the Gulf of Mexico-including the Mobile Bay region (MBR). Previous studies have revealed multiple PFAS compounds in and around the MBR. We tested for multiple PFAS compounds (PFPeA, PFHxA, PFOA, PFOS, and PFBS) in wild and farmed oysters, water, and sediments from the MBR via ultra-high performance liquid chromatography, triple quadrupole mass spectrometer (UHPLC-MS/MS). Results showed combined concentrations of 5.4 ng L-1 in water and 0.7 ng g-1 dry wt in sediments. Concentrations of all five PFAS compounds in wild and off-bottom farmed oysters were below detection limits, although there were indications of low PFOA concentrations in all oysters. We conducted lab-based PFAS exposure studies to induce stress responses in *C. virginica* over 33 days. Hemolymph, total hemocyte counts, and phagocytic capacities were assessed. No differences were found concerning exposure time (P=0.171) or treatment (control vs. exposed; P=0.148) across the study period. Although exposure time impacted the phagocytic rate of oysters overall (P=0.049), exposure to PFAS did not influence the phagocytic rate compared to control oysters for the duration of this study (P=0.667). We are currently investigating stress-related enzyme activity of exposed oysters (i.e., catalase, superoxide dismutase, glutathione peroxidase). Findings will assist in defining potential risks associated with MBR PFAS exposure, informing decisions in aquaculture management and farming practices, and guiding oyster reef restoration efforts in the area.

Pilot Project for Multi-species Farming in Coastal Alabama Waters: Initial Developments and Early Engagement Activities

Stephen Sempier [1], Angelos Apeitos [2], Reginald Blaylock [2], Megan Gima [2], Kenneth Riley [3], Egan Rowe [2], John Valentine [4]

[1] Mississippi-Alabama Sea Grant Consortium; [2] University of Southern Mississippi; [3] National Oceanic and Atmospheric Administration; [4] Dauphin Island Sea Lab

The US imports roughly 90% of its seafood, which has led aquaculture to become one of the fastest growing sectors of food production. Locally, the expansion of oyster aquaculture along the entire Gulf Coast is evidence of this growth. Currently, there is an effort to continue development of this industry through a partnership among Dauphin Island Sea Lab, University of Southern Mississippi, University of New Hampshire, Gulf States Marine Commission, and NOAA. This innovative approach to produce seafood while minimizing environmental impacts includes growing oysters, macroalgae, and finfish in small-scale cages in Gulf coastal waters. The final, proposed location of the project was selected through a process that includes a NOAA- led site feasibility analysis, a Mississippi-Alabama Sea Grant Consortium-facilitated engagement process with fishermen, resource managers, researchers and others as well as a USM-led bathymetric survey. Soon, the team will be moving the project through the permitting process. Once completed, the pilot project will begin research on-site and in the lab and will include training fishermen as participants in the project. The exchange of knowledge among researchers, resource managers, and resource users (e.g. fishing/farming industry, tourism industry) will be fostered throughout the project, which will build capacity for larger scale seafood production in the future. This poster highlights key aspects of the project including public engagement and outreach, spatial planning and site selection, equipment for offshore farming, candidate species research, and science and technology.

Plan-It Dunes: Fostering Dune Restoration and Conservation in Mississippi High Schools

Nora Skinner, Eric Sparks, Stacy Hines, Anthony Vedral, Allie Barnett, Jessie Howington
Mississippi State University

Dune systems provide important ecological and economic benefits to the coastal communities they inhabit, such as mitigating storm impacts and providing aesthetic values. Along the US Gulf Coast, the need for dune restoration projects has become imperative as increased development, poor beach management, and other factors have led to the degradation of dune habitats. The Plan-It Dunes program is an expansion of the Plan-it Marsh program and allows high school students the opportunity to gain an understanding and appreciation of dune systems while participating in hands-on field work to restore these habitats across their own communities. To achieve these goals, a curriculum will be created to pair with in-school educational training that develop skills in installation of green infrastructure through propagation and planting of native dune plants. Students will then have an opportunity to plant their plants at a restoration site as part of a project sponsored field trip. Additionally, students and educators will work with the project team to develop and install educational displays at restoration sites. The development and implementation of this program will lead to enhanced knowledge and stewardship of the coastal environment.

Planning for Balance: Sea Grant Looks Ahead to 2024-2027

Kelly Samek [1], Stephen Sempier [2], LaDon Swann [2]
[1] National Oceanic and Atmospheric Administration; [2] Mississippi-Alabama Sea Grant Consortium

The National Sea Grant College Program (Sea Grant) is a partnership between NOAA and 34 programs in every coastal and Great Lakes state, Puerto Rico, and Guam with the mission to enhance the use and conservation of coastal, marine, and Great Lakes resources to create a strong and sustainable economy, a healthy environment, and resilient and inclusive communities. Sea Grant's legislation mandates that a strategic plan be developed at least every four years in consultation with the Sea Grant colleges and institutes and the National Sea Grant Advisory Board that establishes program priorities and "provides an appropriately balanced response to local, regional, and national needs." During 2022, the National Sea Grant Office at NOAA and the programs undertook this exercise using a concurrent but iterative approach, resulting in a national strategic plan and 34 individual program plans to be implemented in the 2024-2027 period. Sea Grant's priorities remain described by four national "focus areas" established in earlier planning cycles: Environmental Literacy and Workforce Development; Healthy Coastal Ecosystems; Sustainable Fisheries and Aquaculture; and Resilient Communities and Economies. Linkages between the national and Mississippi-Alabama Sea Grant Consortium plans will be presented, with a particular focus on updates in the Environmental Literacy and Workforce Development space.

Plastic Potential Degradation and Fragmentation Through a Sequence of Terrestrial and Aquatic Environments

Anthony Vedral, Shane Brauer, Eric Sparks
Mississippi State University

Plastics are a diverse group of relatively inert polymer-based materials which contribute to the ever-increasing problem of marine litter and microplastic formation. Litter often originates from terrestrial sources and may experience different environments as it is transported to its eventual destination in marine environments. In this ongoing study, small specimens of three types of common plastics (high-density polyethylene, nylon, and polylactic acid) were fastened to large boards and exposed to different in-situ environments in coastal Mississippi, simulating various pathways (e.g., terrestrial to freshwater, terrestrial to saltwater, immediate freshwater, immediate saltwater) that litter might be subjected to as it transitions to marine waters. Total deployment durations in each environment were six months, with a maximum duration of twelve months for specimens undergoing a sequence of two environments. Subsamples of specimens were collected periodically to assess changes (e.g., mass, tensile strength, elasticity) to predict shifts in potential for fragmentation into microplastics. Collected specimens will also undergo an abrasion and impact simulation to demonstrate fragmentation potential from similar mechanical disturbances. Results from this ongoing study will reveal temporal and spatial insights into plastic fragmentation through typical pathways of marine debris transport from land to marine environments. This information will aid in improving future targeted cleanup efforts designed to prevent microplastic generation in coastal environments.

Preliminary Study of Recruitment Patterns of *Crassostrea virginica* in the Mississippi Sound

Katherine Glover, Ellen Coffin, Jason Rider
Mississippi Department of Marine Resources

Little is known about the spawning and settlement patterns of Eastern oysters (*Crassostrea virginica*) during seasonal time periods not considered "peak" seasons. There has been evidence from recent sampling efforts that would indicate some level of settlement and recruitment is occurring in the Mississippi Sound during the non-peak settlement season. In efforts to capture regional distribution of oyster spat settlement within the Mississippi Sound, specifically in near-shore waters, ceramic tile and clean oyster shell held in PVC coated wire cages were deployed at nine sites across the Mississippi Sound and monitored monthly. Each site was chosen to capture varying depths, currents, and salinity changes in the Sound and all show high historical spat recruitment numbers. Total spat counts and measurements were collected for each site every month starting January 2021. Preliminary data show continuous settlement period beginning in May and tapering off in September. The most prolific region is Biloxi Bay with double the amount of spat settlement than the western and eastern sides of the Sound. Results from this multiple year study can better identify and target oyster restoration efforts to more effectively take advantage of spat settlement and recruitment to cultch materials.

Preliminary Winter Bird Community Data for Tracking Pine Savanna Restoration in the Mississippi Gulf Coast

Sofia Campuzano [1], Mark Woodrey [1], Ray Iglay [1], Andrew Heaton [2], Jonathan Pitchford [2]

[1] Mississippi State University; [2] Grand Bay National Estuarine Research Reserve

North American grassland bird populations have declined, due in part to the loss of suitable winter habitats, including the longleaf pine (*Pinus palustris*) savanna ecosystem, across the Southeastern United States. Longleaf pine savanna coverage has vastly declined across the Southeast region of the United States from approximately 23 million hectares prior to European colonization to less than 1.2 million hectares in most recent years. This loss of habitat is thought to be due to habitat conversion, but perhaps most importantly, lack of fire which has recently caused a focus shift in the southeast to the application of fire. Several bird species of conservation concern are found during the winter in longleaf pine savanna ecosystems along the Gulf of Mexico coast, namely, Sedge Wren (*Cistothorus stellaris*), Henslow's Sparrows (*Ammodramus henslowii*), and Eastern Meadowlark (*Sturnella magna*). Our objectives in this study are to (1) document changes in bird communities associated with habitat management activities (i.e., mechanical clearing, prescribed fire, etc.) and (2) determine the presence/absence and density of winter grassland birds, with a primary focus on Henslow's Sparrows, in relation to pine savanna restoration efforts. Our results will be used to provide data-driven management decisions to effectively manage for and conserve this important ecosystem. Ongoing avian surveys have indicated that most of the restoration areas are dominated by bird species that are characteristic of shrub and forest communities, while few areas were dominated by grassland characteristic bird species presumably due to the lack of areas on a 1–3-year fire rotation.

Protecting the 5 Most Critical Wetland Areas in the Lowest Galveston Bay Watershed through Mapping and Community Engagement

Mashal Awais [1], Uilvim Ettore Gardin Franco [2], Carrie Smith [1]
[1] Bayou City Waterkeeper; [2] Rice University

Bayou City Waterkeeper (BCWK) is a nonprofit organization based in Houston, Texas that aims to foster just climate transitions throughout the Lower Galveston Bay Watershed (LGBW). BCWK understands that the collective vision for flood protection must shift towards one that protects our region more holistically by advocating for the protection of our coastal prairie wetlands as flood defense. To empower communities to conserve wetlands, thereby reducing flood risk and protecting water quality, BCWK developed tools to strengthen advocacy in LGBW. BCWK believes the region's community members are the experts who continue to protect our watershed, their surrounding wetlands and their community from future extreme weather-related flood events and rising climate risk. BCWK's story map of our 5 Most Critical Wetlands along with a wetland mapping app aim to create a sense of urgency and hope and give community members the information and tools they need to protect their region. The story map describes five pristine tracts of wetlands in LGBW that are under threat of development and explains the need to conserve large tracts of land to maintain their ecological function. The wetland mapping app allows stakeholders and community members an easy-to-use interface to engage with data and identify flood risk and wetland losses in their community and subwatershed. This presentation will describe how BCWK is using GIS tools to strengthen its legal advocacy and share with the community the importance of wetlands and the promise of nature-based solutions as a key tool for coastal resilience.

Rapid Changes in Tropical Cyclone Intensities over the Coastal Oceans: A Global Perspective

Devanarayana R.M. Rao [1], Brian Dzwonkowski [1], Severine Fournier [2]
[1] Dauphin Island Sea Lab/University of South Alabama; [2] National Aeronautics and Space Administration

Landfalling storms possess a high risk to the growing coastal population and the global economy. Prior studies indicate that the rapid intensification of landfalling storms could increase substantially in the coming years, especially in the Gulf of Mexico. Therefore, accurate predictions of the strength of TCs prior to landfall are extremely important. While tropical cyclones (TCs) are primarily driven by the physical processes in the atmosphere and open ocean, additional processes need to be considered as the TCs enter the continental shelves. The geographical barriers associated with coastal lines as well as the underlying shelf hydrographic conditions may contribute to the significant changes in TC intensity. In this study, we investigate statistical relationships associated with the rapid intensification and weakening of landfalling storms globally to better understand potential processes linked to changes in storm strength. Due to the importance of sea surface temperature, we hypothesize that the rapid changes (within 72 hours prior to the transit) in the thermal structure along the continental shelf, either warming or cooling will be directly linked to changes in TC intensity. We explore such relationships using a variety of datasets including satellite and in situ observations to examine the surface thermal conditions over the continental shelves prior to the storm transit.

Recovery of Planktonic Invertebrate Communities in Restored and Created Tidal Marshes along the Mississippi-Alabama Gulf Coast

Shelby Rinehart, Jacob Dybiec, Emily Fromenthal, Taylor Ledford, Behzad Mortazavi, Julia Cherry
University of Alabama

A significant amount of tidal marsh restoration has occurred over the past two decades. However, restored marshes often fail to recover biological structure and ecosystem functions comparable to reference marshes. We implemented a 13-site inventory to evaluate the recovery of aquatic invertebrate abundance and community composition along the Mississippi and Alabama Gulf coasts. Understanding the recovery of aquatic invertebrate communities in restored marshes is critical, as many invertebrate species contribute to nutrient cycling and food web dynamics. We found that aquatic invertebrate communities in restored tidal marshes were comparable in total abundance, taxonomic richness, and taxonomic composition to communities observed in reference tidal marshes - with composition being driven mainly by surface water salinity. But aquatic invertebrate communities in restored marshes did have lower evenness and diversity than comparable reference marshes. These results suggest that aquatic invertebrate communities in restored marshes along the Mississippi and Alabama Gulf coast tend to recover after 7-34 years and support robust populations of aquatic invertebrate prey items for larger, ecologically and economically-important species (e.g., fishes).

Relationships Between Freshwater Discharge and Organic Matter Movement Through the Mobile Bay Estuary

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To determine the function of the Mobile-Tensaw River (MTR) Delta in the export of organic matter from different sources to Mobile Bay, we will distinguish terrestrial/freshwater from marine sources to the system by measuring organic carbon (C) and nitrogen (N) stable isotope ratios in suspended and sediment particulate matter and biota. To define long-term spatial and seasonal patterns in organic matter flow through the MTR-fed estuary system relative to variation in discharge and salinity, we will compare stable isotope values through time in a historical data set (2008-present). Based on a previous study, we expect to find important trophic links between inland and near shore open water ecosystems. Freshwater discharge is expected to have short-term effects on trophic structure and movements of estuarine species. From this study, we can apply the variability of organic matter distribution down bay relative to seasonal river discharge to predict future responses of the system to changes in seasonal precipitation and sea level rise that may accompany long-term climate variation.

Results of the Remote Oyster Setting 2022 Medium Scale Production Season in the Mississippi Sound

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Mississippi Department of Marine Resources

The Mississippi Department of Marine Resources (MDMR) is in Phase I of the RESTORE Council-funded Remote Oyster Setting Facility Project. Remote setting is the process of taking oyster larvae and placing it in a system where it is protected from predators. The larvae are given substrate to settle on, food, and beneficial water quality conditions to ensure optimum survival. The purpose of the Remote Oyster Setting Facility Project is to provide a process that will restore Mississippi's decimated oyster reefs at a faster rate than could be achieved in the wild. Not only will this benefit oyster reefs, but it will also aid the oyster industry and increase ecosystem services performed by the oyster reefs such as providing a nursery for other important fisheries species. During Phase I, planning activities assess the overall feasibility of the process. To better facilitate a successful future for the Remote Oyster Setting Project, MDMR was able to complete the second year of preliminary medium- scale tests in 2022. MDMR acquired 80 million eyed larvae from the University of Southern Mississippi, Auburn University Shellfish Laboratory and L3 Hatchery. These larvae were set on oyster shells using natural seawater from Gulfport Harbor. Over a five-month period, 12,294,086 spat-on-shell oysters were produced resulting in a larval setting efficiency of 14.37% over the course of six individual production cycles. The average size of the oysters planted was 3.75mm.

Sea Grant Offers Fellowship Opportunities for Grad Students

Melissa Schneider, Loretta Leist
Mississippi-Alabama Sea Grant Consortium

The Mississippi-Alabama Sea Grant Consortium has several fellowship opportunities each year for graduate students who are looking for opportunities. This poster will focus on making graduate students, professors and agencies aware of these opportunities. The Sea Grant John A. Knauss Marine Policy Fellowship places graduate students in Washington, D.C., to work with federal agencies or legislative offices on national marine policy decisions. The National Marine Fisheries Service-Sea Grant Joint Graduate Fellowship offers graduate students the opportunity to work with a mentor in two fields: population and ecosystem dynamics involving fish populations and marine ecosystems or marine resource economics. Finally, the NOAA Coastal Management Fellowship offers on-the-job training for two years with a state coastal resource agency.

Sediment Characterization and Geochemistry Distribution within Mobile Bay and Mississippi Sound, Baldwin and Mobile Counties, Alabama: An Overview

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Sediments are inherently related to water quality and play a vital role in estuarine ecosystem health and function. Furthermore, sediments affect the quality of recreational and restoration activities undertaken within the watershed. Through the Gulf of Mexico Energy Security Act, the Geological Survey of Alabama (GSA), in collaboration with the University of Alabama, Department of Geological Sciences (UADGS), has been conducting a comprehensive study of sediment physical characteristics, mineralogy, and organic and inorganic geochemistry to better understand geospatial depositional patterns in Mobile Bay and Mississippi Sound. A comprehensive study of these waters and adjoining tributaries and inland areas has not previously been undertaken at this level of detail. The study area was divided into 4-km grids to acquire material for geochemical and mineralogical analysis, 1.5-km grids for supplemental sediment physical and chemical characterization, and contributing peripheral tributaries. Analyses were conducted for anions, mercury, total organic carbon (TOC), oil and grease, combustible organics, and standard field parameters in GSA's geochemical lab. Project partners in UADGS are performing the analyses for other parameters. These include X-ray diffraction for bulk and clay mineralogy with Rietveld refinement to quantify dominant mineralogy, ICP-OES analysis of digestate solutions produced using US EPA Method 3051A for extractable element concentrations, and laser diffraction particle size analysis. Organic geochemistry analyses include bulk organic matter characterization via measuring TOC, total nitrogen (TN), stable carbon isotope of TOC, and stable isotope of TN, with further molecular analyses for organic pollutants including polycyclic aromatic hydrocarbons, plasticizers, and fecal contaminants.

Successful Strategies in Planning and Design of Critical Assets and Infrastructure in Three Communities Along the East Coast in the United States

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Sea level rise and natural disasters are now considered a critical factor in infrastructure planning, design, and construction in many coastal communities. In the last 50 years, sea levels have risen by approximately one foot. Current data suggests sea levels may increase by another 1 to 5 feet over the next 50 years. Concurrently, eastern coastal states are experiencing more frequent and stronger natural disasters, and rainfall projections in many coastal communities are anticipated to increase significantly. Priorities to plan and design resilient and sustainable infrastructure for coastal communities vary, due to factors including state regulations, community capabilities and capacity, future climate conditions, economic barriers, and ability to leverage grants and funding, and cost-benefit analysis. Community leaders in Virginia Beach (VA), Newport News (VA), and St. Johns County (FL) are taking varied approaches to identifying hazards, assessing risks and developing adaptation strategies to address climate change. Successful communities are including a variety of strategies to ensure resiliency in infrastructure, such as policy revisions, development restrictions, structural defense, new design requirements, and nature-based strategies. For example, the City of Virginia Beach has identified and prioritized 32 strategies and over 200 action items traversing the City's government, with regional, state, and federal legislative connections and grant opportunities. Dewberry will provide an overview of three communities' adaptive approaches and priorities, and discuss design criteria for critical assets, stormwater management infrastructure, and waterway access. We will also highlight challenges and successes, plan integration strategies to leverage federal and state funding, and cost-benefit analyses.

The Forgotten Forest: Habitat Assessment of Eroded Forest, Marsh, and Beach Shorelines

Cynthia Lupton, Eric Sparks
Mississippi State University

Variations in shoreline type can be dramatic and produce a mosaic of habitat types within estuaries along the Gulf of Mexico. Research to date has shown that shorelines vegetated with marsh plants are typically associated with higher abundance and diversity of fauna; however, one increasingly common shoreline type that is understudied are eroded forested edges. Forested shorelines are common but have increased in prevalence due to erosion induced by boat wakes, sea level rise, development, and other factors leading to most forested shorelines in estuaries being eroded and characterized by a steep eroded bank intermixed with roots. To better understand the habitat benefits of eroded forest shorelines in comparison to gradually sloped beach and marsh shorelines, we are conducting a study within East Bay (Panama City, FL). The study consists of 10 replicates of each shoreline type that each contain a continuous 100m stretch of shoreline. Each month a combination of seining, gill netting, and benthic trays are used to quantify both the nekton and benthic communities. Results from this project can be used to better understand the tradeoffs associated with different shoreline habitat types and provide guidance for restoration efforts and management practices.

The Influence of River and Bonnet Carré Freshwater Discharge on the Exchange Mechanism in Cat Island Channel

Hameed Ajibade, Ardian Rizal, Brandy Armstrong, Sandeep Kalathupurath Kuttan, M. Kemal Cambazoglu, Jerry Wiggert
University of Southern Mississippi

After the Deepwater Horizon oil spill in 2010, concerns were raised about the impact of this pollution on the coastal resources in the Mississippi (MS) Sound and Bight. This created awareness of the need to understand the system in order to mitigate present and future occurrences. A 400 m resolution, 24-layer circulation model of the Mississippi Sound and Bight region based on a regional application established during the GoMRI-funded CONCORDE consortium (msbCOAWST) is employed to investigate. Twin experiments are conducted to examine the effects of changes in volume fluxes on water exchange between the MS Sound and Bight. The dynamism of the MS Sound is explored and the impact of water exchange processes in passes between barrier islands such as Cat Island Channel, which serves as an exchange conduit from the MS Bight to the Sound, is assessed. The opening of the Bonnet Carré spillway (BCS) is expected to influence water exchange through the Cat Island Channel as well as the hydrodynamic and biogeochemical properties on both sides of the barrier islands. This study examines the effects freshwater discharge from the Bonnet Carré spillway and neighboring rivers has on the domain's circulation pattern. We will present the results of the model solutions of 2019, with and without active BCS, to better understand the estuarine-shelf exchange processes. This enables us to provide answers to questions such as how the physical transport of river water and Bonnet Carré freshwater discharge influence exchange mechanisms between the MS Bight and Sound.

The Misunderstood Groin: Structure and Sand Movement in Living Shorelines

Tom Hutchings, Lee Yokel
EcoSolutions, Inc.

A groin, jetty, headland breakwater, and by any other name still holds sand. Public and private property owners struggle in estuarine settings to stabilize their shorelines in the face of sea level rise, tropical storm activity, increased coastal development pressure, and human use such as boat wakes. Development in estuarine areas of coastal Alabama is moving at a blistering pace. Private property owners are rapidly stabilizing their shorelines with revetments and bulkheads, destroying the valuable intertidal habitat necessary for flora, fauna, and human access. It is time to revisit the use of groins in coastal restoration and their ecological and cultural value in maintaining a sandy beach. This presentation will demonstrate the use of structure in stabilizing living shorelines in estuarine settings. We will highlight a shoreline restoration project that failed due to faulty regulatory construction guidelines. Conversely, we will demonstrate sandy shoreline restoration success using headland breakwaters and dredge sand.

Trends of *Karenia brevis* Blooms in the Northcentral Gulf of Mexico

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Blooms of *Karenia brevis* occur naturally in the Gulf of Mexico (GoM). These harmful algal blooms (HAB) events, known as "red tides", can have large impacts on coastal ecosystems and their sporadic occurrence is not completely understood. In this study we examined the spatial and temporal variability of *Karenia brevis* blooms in the northcentral GoM, based on the HAB observations available from the Harmful Algal BloomS Observing System (HABSOS). HABSOS, a database of HAB and associated environmental observations submitted by partner agencies and groups, is maintained by NOAA's National Centers for Environmental Information (NCEI). The data we analyzed identified that blooms were consistently initiated in the fall/early winter season, which agrees with other research findings. Another trend that was illustrated by the data was that bloom events with a longer duration were found to migrate further westward, while shorter lived blooms often failed to reach the MS or even the AL coastlines. This challenge of westward bloom migration was supported by significantly lower observed *K. brevis* cell density values from both the AL and MS regions when compared to bloom values found in the northcentral GoM FL region. While further studies are needed to present a closer look at HAB trends in this region, our work has clearly demonstrated trends associated with potential HAB migration westward from FL.

Using Environmental DNA to Detect Hypoxia in Marine Waters

Reneisha Sweet, Brent Thoma
Jackson State University

Here we examine the ability to detect hypoxia in marine waters using changes in community composition detected through environmental DNA metabarcoding. The use of environmental DNA (eDNA) is increasingly transforming the way we monitor biodiversity in marine ecosystems and has shown promise in detecting environmental stressors in other marine habitats. Environmental DNA samples were collected using 0.22um enclosed Sterivex filters from 1-liter of seawater taken every 5 m along a vertical profile at 3 sites in the northern Gulf of Mexico, with 3 replicates per depth. One of the sites had anoxic conditions near the bottom, one with slightly hypoxic conditions near the bottom and one site with normal oxygen conditions throughout. We are conducting DNA metabarcoding of 3 loci (COI, 18S, and 16S) to compare community composition, across depths and among samples. Using these data, we hope to determine if changes in community composition caused by low oxygen conditions can be readily detected in eDNA samples.

Vadose Zone Fate and Mobility of Phosphorous in the Little Lagoon Watershed

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Little Lagoon is a phosphorous-limited, groundwater-dominated coastal lagoon in Gulf Shores with a history of harmful algal blooms. Human activities on the land surface (e.g., fertilizer application and wastewater disposal) have the potential to contribute phosphorous to Little Lagoon via submarine groundwater discharge, although the fate and mobility of dissolved phosphorous in the subsurface is dependent on geochemical conditions within the vadose and saturated zones. Here we analyzed a sediment core collected from the vadose (unsaturated) zone near the shore of Little Lagoon to determine whether solid-phase (i.e., immobilized) phosphorous is correlated with iron oxides, clay minerals, and/or calcium minerals. Hand-held X-ray fluorescence (XRF) was used to quantify concentrations of elements in the core including potassium, calcium, aluminum, and iron. Further, grain size analysis was used to determine percentages of mud. Phosphorous concentration is significantly positively correlated to potassium, calcium, and aluminum oxide concentrations, suggesting that adsorption to clay minerals can sequester and immobilize dissolved phosphorous. There is no correlation between phosphorous and iron suggesting that phosphorous adsorption to iron oxides is limited, perhaps due to low iron oxide content or unfavorable redox conditions. Given the low percentage of clay minerals in the saturated zone of the surficial Gulf Sands aquifer, anthropogenic dissolved phosphorous is likely to remain mobile in groundwater and present a potential threat to the ecology of Little Lagoon.

Viability of Native Vegetation and Locally Sourced Substrate Mix in Green Roof Modules under South Louisiana’s Subtropical Climate

Clara Jimenez
Louisiana State University

Green roofs are increasingly used in urban areas where space constraints limit the use of other stormwater management practices. Green roofs are substrate-based architectural structures that accommodate a variety of plants to reduce runoff and heat island effect, in addition to providing ecological, psychological, and aesthetic benefits. Due to the benefits provided, these technologies have become more common worldwide; however, there is little research on green roof plant survival in subtropical climates such as the American Gulf South. Subtropical climates often present more drastic conditions such as heavy wind and rain, frequent drought, and heat stress. Louisiana's climate presents all the latter plus a high humidity, which means that typical green roof vegetation such as sedum tends to suffer from root rot. Since the vegetation layer on a green roof is its most critical component, this study argues that native vegetation species and locally sourced substrate is most suitable for green roof construction in subtropical climates such as south Louisiana. To demonstrate the feasibility of native vegetation and locally sourced substrate, ten LiveRoof modular green roof sections were tested under Louisiana's climatic conditions over four months (August-December 2022). Variability within the study included depth (i.e., intensive vs. extensive), irrigation, and substrate mix. Plant survival and suitability was measured through: plant health; monthly plant growth; species survival; and hydrologic behavior. Results presented will outline suitable native plant palettes, soil substrates, and the potential for flood and heat island effect reduction using green roof technologies in south Louisiana's cities.

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