The Building Blocks of Coastal Resilience

Proceedings

December 2-3, 2014, Arthur R. Outlaw Mobile Convention Center - Mobile, Alabama

WATER QUALITY SESSION - TUESDAY, DECEMBER 2, 2014

Time	Title and Authors
9:30 a.m.	**Environmental Drivers of Ecosystem and Plankton Metabolism in Pensacola Bay, Florida.** *Michael Murrell[1], Jim Hagy[1], Jessica Aukamp[1], Marcus Beck[1], David Beddick[1], George Craven[1], Ally Duffy[1], Brandon Jarvis[1], Mike Marcovich[1], Diane Yates[1] and Jane Caffrey[2];* [1]U.S. Environmental Protection Agency and [2]University of West Florida
9:50 a.m.	**Net Ecosystem Metabolism Trends in the Mobile Bay Delta.** *Renee Collini[1], Michael Dardeau[1] and Behzad Mortazavi[2, 1]*; [1]Dauphin Island Sea Lab and [2]University of Alabama
10:10 a.m.	**Sediment Denitrification Overcomes Sulfides Inhibition under Low Salinity Environment.** *Lei Wang[1,2], Behzad Mortazavi[3,2] and Alice Ortmann[1];* [1]Department of Marine Sciences, University of South Alabama, [2]Dauphin Island Sea Lab and [3]Department of Biological Sciences, University of Alabama
10:50 a.m.	**Predicted Climate Change Effects on Northern Gulf of Mexico Hypoxia.** *John Lehrter[1], Dong Ko[2], Lisa Lowe[3] and Brandon Jarvis[1];* [1]U.S. Environmental Protection Agency, Gulf Ecology Division, [2]Naval Research Lab, [3]EPA/Lockheed Martin
11:10 a.m.	**Hypoxia in Mississippi Coastal Waters: Insights from δ18O and Trace Element Distributions.** *Peng Ho, Melissa Gilbert and Alan Shiller*; University of Southern Mississippi
11:30 a.m.	**Modeling Remediation of Aquatic Life Impacts of Episodic and Diel Cycling Hypoxia via Nutrient Loading Rate Reductions.** *James D. Hagy III[1], Brandon M. Jarvis[1], Michael C. Murrell[1] and Marcus W. Beck[2]*; [1]U.S. Environmental Protection Agency, Office of Research and Development and [2]Oak Ridge Institute for Science and Education
1:30 p.m.	**Planning the Future with an Eye to the Past: Land Use and Water Quality on the Mississippi-Alabama Coast.** *R. H. Carmichael[1,2], E. Darrow[1,2], W. Wu[3,4] and H. Huang[3,4], K. R. Calci[5], W. Burkhardt II[5], W. Walton[6], A. Pasch[7], M .S. Woodrey[7,8] and M. Hanisko[9];* [1]Dauphin Island Sea Lab, [2]University of South Alabama, [3]Gulf Coast Research Laboratory, [4]University of Southern Mississippi, [5]Gulf Coast Seafood Laboratory/U.S. Food and Drug Administration, [6]Auburn University Shellfish Laboratory, [7]Grand Bay National Estuarine Research Reserve, [8]Mississippi State University and [9]NOAA Ocean & Coastal Resource Management, Coastal Services Center
1:50 p.m.	**Water Quality in Mobile Bay Tributaries: Conditions, Causes, and Corrections.** *Marlon Cook;* Geological Survey of Alabama
2:10 p.m.	**Cyanobacterial Harmful Algal Blooms (cyanoHABs) in Mobile Bay: An Emerging Threat to Ecosystem Health.** *Alison Robertson[1] and Alan Wilson[2]*; [1]University of South Alabama, Department of Marine Sciences and [2]Auburn University, School of Fisheries, Aquaculture and Aquatic Sciences

2:30 p.m. **Assessing the Abundance, Distribution and Toxicity of Microplastics in Mobile Bay, AL.** *Caitlin Wessel[1, 2], Just Cebrian[2, 1] and David Battiste[1]*; [1]University of South Alabama and [2]Dauphin Island Sea Lab

3:10 p.m. **The Role of Headwater Wetlands for Water Quality along the Northern Gulf of Mexico.** *Christopher J. Anderson[1], Latif Kalin[1] and Charlene LeBleu[2];* [1]Auburn University School of Forestry and Wildlife Sciences and [2]Auburn University School of Architecture, Planning, and Landscape Architecture

3:30 p.m. **Water Level Prediction in Headwater-Slope Wetlands of Coastal Alabama.** *Mehdi Rezaeianzadeh, Latif Kalin and Chris Anderson;* Auburn University

3:50 p.m. **Water Quality as a Nexus between Land Use/Cover and West Nile Virus Incidence.** *Navideh Noori, Latif Kalin, Graeme Lockaby*; Center for Forest Sustainability, School of Forestry and Wildlife Sciences, Auburn University

4:10 p.m. **Water Resources Research in Coastal and Poorly Drained Forests of the Southeastern U.S.** *Jami Nettles[1], George Chescheir[2], Devendra Amatya[3] and Erik Schilling[4];* [1]Weyerhaeuser Company, [2]North Carolina State University, [3]U.S. Forest Service and [4]NCASI

4:30 p.m. **Low Impact Development Strategies for Protecting Headwater Wetlands.** *Charlene M. LeBleu and Kenneth Dale Speetjens*; Auburn University Landscape Architecture

WATER QUALITY SESSION - WEDNESDAY, DECEMBER 3, 2014

Time	Title and Authors

9:40 a.m. **REACH: Monitoring the efficacy of agricultural Best Management Practices to Reduce Nutrient Loading to the Gulf of Mexico.** *Beth Baker[1], Dan Prevost[2], Troy Pierce[3] and Joby Prince-Czarnecki[1]*; [1]Mississippi State University, [2]Delta F.A.R.M. and [3]U.S. Environmental Protection Agency

10:00 a.m. **Effects of Upstream Disturbances on Sediment Yield Downstream Where Best Management Practices are Present.** *Ilkim Cavus, Latif Kalin and Ferhat Kara;* Auburn University, School of Forestry and Wildlife Sciences

10:20 a.m. **Design and Construction of a Step Pool Storm Conveyance (SPSC) System on an Unnamed Tributary to Joe's Branch, D'Olive Bay Watershed, Baldwin County, Alabama.** *Wade Burcham;* Thompson Engineering

11:00 a.m. **Improving Water Quality through Watershed Planning, Design and Innovative Outreach Activities.** *Kelsey Johnson[1] and Judy Steckler*; [1]Mississippi State University's Gulf Coast Community Design Studio and [2]Land Trust for the Mississippi Coastal Plain

11:20 a.m. **Evolution and Fate of a Mobile Bay Discharge Plume.** *Brian Dzwonkowski[1], Kyeong Park[2] and Stephan Howden[3];* [1]University of South Alabama, [2]Texas A&M University at Galveston and [3]University of Southern Mississippi

11:40 a.m. **Swim Guide in Coastal Alabama.** *Renée Edwards and Laura Byrne (Erin Rockwell, Presentor);* Mobile Baykeeper

LIVING RESOURCES SESSION - TUESDAY, DECEMBER 2, 2014

Time	Title and Authors
9:30 a.m.	**Estimates of Growth and Mortality for Spotted Seatrout in Alabama Coastal Waters.** *Will Patterson[1, 2], Brian Klimek[1, 2], John Mareska[3]*; [1]University of South Alabama, [2]Dauphin Island Sea Lab and [3]Alabama Department of Conservation Marine Resources Division
9:50 a.m.	**Do Restored Oyster Reefs Affect Seagrass Dynamics? An Experimental Study in the Northern Gulf of Mexico.** *Shailesh Sharma[1], Joshua Goff[2], Kenneth L Heck, Jr.[2, 1] and Just Cebrian[2, 1];* [1]University of South Alabama and [2]Dauphin Island Sea Lab[2]
10:10 a.m.	**Linking Structural and Process-Based Attributes of Salt Marshes and Mangroves to Ecosystem Service Provision.** *Lauren Hutchison[1], David Yoskowitz[1] and Just Cebrian[2, 3];* [1]Harte Research Institute, Texas A&M University-Corpus Christi, [2]Dauphin Island Sea Lab and [3]University of South Alabama
10:50 a.m.	**Defining Fish Communities: Factors Affecting the Organization of Fish Communities in the Mobile Bay Estuary.** *Christopher M. Kemp, Dennis R. DeVries and Russell A. Wright;* Auburn University, School of Fisheries and Allied Aquaculture
11:10 a.m.	**Reproductive Ecology of the Mississippi Diamond-Backed Terrapin (*Malaclemys terrapin pileata*).** *Andrew Coleman and Jonathan L. Pitchford;* Institute for Marine Mammal Studies
11:30 a.m.	**An Examination of Inter-Annual Variability of Gulf Menhaden Condition.** *Robert Leaf;* University of Southern Mississippi
1:30 p.m.	**Size-Scaling Trends in Aerobic and Anaerobic Respiration of the Model Tolerant Polychaete, *Capitella teleta*, Change under Varying Combined Levels of Dissolved Oxygen and Temperature.** *Kelsey Burns, Chet F. Rakocinski and Alyssa Bennett;* Gulf Coast Research Lab
1:50 p.m.	**Parasites Can Cause Lesions on Gulf of Mexico Fishes.** *Stephen A. Bullard, Margaret Maynard, Matthew Womble and Raphael Orelis-Ribeiro*; Auburn University, School of Fisheries, Aquaculture and Aquatic Sciences
2:10 p.m.	**Predictive Spatial Modeling of Seasonal Bottlenose Dolphin (*Tursiops truncatus*) Distributions in the Mississippi Sound.** *Jonathan Pitchford, Victoria Howard, Jamie K. Shelly and Billie J. S. Serafin;* Institute for Marine Mammal Studies
2:30 p.m.	**Dynamic Habitat Use of Young Bull Sharks (*Carcharhinus leucas*) in a Northern Gulf of Mexico Estuary.** *J. Marcus Drymon[1], Matthew J. Ajemian[2] and Sean P. Powers[1];* [1]University of South Alabama and [2]Texas A&M Corpus Christi
3:10 p.m.	**Identifying Trends in Gulf of Mexico Research Priorities over Time and Between Groups.** *Stephen H. Sempier and D. LaDon Swann;* Mississippi-Alabama Sea Grant Consortium
3:30 p.m.	**Fitting Mobile-Tensaw Delta Bass into the Black Bass Puzzle: New Molecular Tools and New Insights.** *Ammu Anil, Spencer Gowan, Wilawan Thongda, Huseyin Kucuktas, Chao Li, Dennis R. DeVries, Russell A. Wright and Eric Peatman;* Auburn University, School of Fisheries, Aquaculture and Aquatic Sciences

3:50 p.m. **Regulating Oyster Aquaculture in the Gulf of Mexico and Beyond.** *Melissa Daigle[1] and Niki Pace[2];* [1]Louisiana Sea Grant Law & Policy Program and [2]Mississippi-Alabama Sea Grant Legal Program

4:10 p.m. **Using Acoustic and Satellite Telemetry to Track Movements of Alabama's State Saltwater Fish, Atlantic Tarpon (*Megalops atlanticus*).** *Andrea M. Kroetz, J. Marcus Drymon and Sean P. Powers;* University of South Alabama, Dauphin Island Sea Lab

4:30 p.m. **The Exposed Surface Area to Volume Ratio: Is Shell More Efficient than Limestone in Promoting Oyster Recruitment?** *Kelsey Kuykendall[1], Paula Moreno[1], Eric N. Powell[1], Thomas Soniat[2], Susan Colley[2], Roger Mann Roger Mann[3] and Daphne M. Munroe[4];* [1]Gulf Coast Research Laboratory, University of Southern Mississippi, [2]Department of Biological Sciences, University of New Orleans, [3]Virginia Institute of Marine Science, College of William and Mary, [4]Haskin Shellfish Research Laboratory, Rutgers University

LIVING RESOURCES SESSION - WEDNESDAY, DECEMBER 3, 2014

Time **Title and Authors**

9:40 a.m. **Variable Response of Natural Mesozooplankton and Ichthyoplankton Assemblages to the Deepwater Horizon Oil Spill.** *Frank Hernandez[1], Laure Carassou[2], Jesse Filbrun[3], John Ransom[1], William Graham [4], Carla Culpepper[1] and Jeffery Fang[5];* [1]Department of Coastal Sciences, University of Southern Mississippi, [2]Department of Marine Science and Fisheries, Sultan Qaboos University, [3]Department of Biology, Southern Arkansas University, [4]Department of Marine Science, University of Southern Mississippi and [5]Department of Biology, University of Portland

10:00 a.m. **Marsh Elevation Dynamics at the Grand Bay National Estuarine Research Reserve: A Three Year Sentinel Site Retrospective.** *William V. Underwood[1,2], Mark S. Woodrey[3,1] and Lindsay T. Spurrier[1,2];* [1]Grand Bay National Estuarine Research Reserve, [2]Mississippi Department of Marine Resources and [3]Mississippi State University Coastal Research and Extension Center

10:20 a.m. **Evaluating the Current Status of Red Drum (*Sciaenops ocellatus*) in Offshore Waters of the North Central Gulf of Mexico: An Update on Abundance, Age Composition, and Mortality.** *Crystal L. Hightower, Sean P. Powers, J. Marcus Drymon;* University of South Alabama

11:00 a.m. **How Do Stressors Associated with Stock Enhancement Processes affect Stress Response and Post-Release Success of Spotted Seatrout?** *Taylor Guest, Andrew Evans, Chet Rakocinski and Reginald Blaylock;* Gulf Coast Research Laboratory, University of Southern Mississippi

11:20 a.m. **The Ecological Impact and Pedal Ultrastructure of *Rangia cuneata* in Johnson Bayou, MS.** *Brandon Drescher and Jennifer Walker;* University of Southern Mississippi, Department of Biological Sciences

11:40 a.m. **Preliminary Results of the Effects of Culture Practices on Vibrio Spp. Abundances in Farmed Oysters.** *William Walton[1], Covadonga Arias[1] and Jessica L. Jones[2];* [1]Auburn University School of Fisheries, Aquaculture & Aquatic Sciences and [2]Food & Drug Administration, Division of Seafood Science & Technology, Gulf Coast Seafood Laboratory

HABITAT MANAGEMENT SESSION - TUESDAY, DECEMBER 2, 2014

Time	Title and Authors
9:30 a.m.	**A Primer on Coastal Engineering for "Living Shorelines".** *Scott Douglass[1, 2], Bret M. Webb[2] and Kari Servold[2];* [1]University of South Alabama and [2]South Coast Engineers
9:50 a.m.	**10 Years Later – A Retrospective Investigation of Design Elements used to Develop Successful Living Shorelines in Alabama.** *Kari P. Servold, Scott L. Douglass and Bret M. Webb;* University of South Alabama
10:10 a.m.	**A Discussion of Multiple Techniques Used in Alabama for Living Shorelines and Oyster Reef Breakwaters**. *Judy Haner;* The Nature Conservancy
10:50 a.m.	**Community Based Restoration: A Living Shoreline for Mon Louis Island, Alabama.** *Bret Webb[1], Scott Douglass[2] and Tom Herder[3];* [1]University of South Alabama, [2]South Coast Engineers and [3]Mobile Bay National Estuary Program
11:10 a.m.	**Alternative Shoreline Management Manual for Coastal Mississippi Property Owners.** *Melissa Pringle[1] and Willa Brantley[2];* [1]Allen Engineering and Science and [2]Mississippi Department of Marine Resources
11:30 a.m.	**Resilient Coastline Protection – Living Shorelines and the MBNEP.** *Tom Herder;* Mobile Bay National Estuary Program
1:30 p.m.	**Community Structure and Secondary Production of Benthic Biota Associated with Artificial Reefs with Differences between Oyster Shell and Rubble Substrata and between High and Low Profile Reef Structures in the Mississippi Sound.** *Patrick D. Gillam and Chet F. Rakocinski;* Gulf Coast Research Lab
1:50 p.m.	**Evaluating the Benefits of Intertidal Structure in Coastal Restoration Using Assessments of Sediment Dynamics and Vegetation.** *Joshua Goff [1], Shailesh Sharma[2, 1] and Just Cebrian[1, 2];* [1]Dauphin Island Sea Lab and [2]University of South Alabama
2:10 p.m.	**Living Shoreline Demonstration Project – Analysis of Performance of Oyster Reef Concepts**. *Josh Carter[1] and Arpit Agarwal[2];* [1]Coast & Harbor Engineering, a Division of Hatch Mott MacDonald, New Orleans LA and [2]Coast & Harbor Engineering, a Division of Hatch Mott MacDonald, Austin TX
2:30 p.m.	Clean Water Future: An Innovative Public Outreach Campaign to Protect Estuarine Habitats from Stormwater Impacts. *Ashley Campbell*
3:10 p.m.	**Living Wave Barrier**. *David Walter;* Walter Marine
3:30 p.m.	**A Regional Vulnerability Assessment of Gulf of Mexico Habitats and Species to Changing Environmental Conditions.** *Amanda Watson;* Northern Gulf Institute, Mississippi State University
3:50 p.m.	**Shoalgrass Patch Mapping On Horn Island to Assess Landscape Structure.** *Patrick Biber and Linh Thuy Pham;* University of Southern Mississippi

4:10 p.m. **Comparison of Floc Growth and Stability in Four Estuarine Clay Simulations.** *Allen H. Reed[1], William Gurzynski[2], Guoping Zhang[3] and Joseph P. Smith[2];* [1]Seafloor Sciences Branch, Naval Research Laboratory, [2]United States Naval Academy and [3]University of Massachusetts at Amherst

4:30 p.m. **Sediment Quality Assessment and Management.** *Jennifer Sagan[1], Gerold Morrison[2], Ed Sherwood[3] and Pamela Bellotti[1];* [1]AMEC Environment & Infrastructure, Gainesville FL, [2]AMEC Environment & Infrastructure, Tampa FL and [3]Tampa Bay Estuary Program

HABITAT MANAGEMENT SESSION - WEDNESDAY, DECEMBER 3, 2014

Time	Title and Authors

9:40 a.m. **Assessing the State of Gulf Coast Habitats in the Gulf Coastal Plains and Ozarks LCC.** *Kristine O. Evans[1], John Tirpak[2], Todd Jones-Farrand[3,4] and Yvonne Allen[4];* [1]Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative/Mississippi State University, [2]Gulf Restoration/U.S. Fish and Wildlife Service, [3]Central Hardwoods Joint Venture and [4]U.S. Fish and Wildlife Service

10:00 a.m. **Connecting the Dots in Whole System Conservation Planning.** *Mary Kate Brown,* The Nature Conservancy

10:20 a.m. **Influence of *Avicennia germinans* on Ecosystem Dynamics at the Edge of Their Northern Limit**. *Aaron Macy, Just Cebrian, Shailesh Sharma and Whitney Scheffel;* Dauphin Island Sea Lab, University of South Alabama

11:00 a.m. **Ichthyoplankton Community Composition and Patterns of the Loop Current.** *Stephanie M. Taylor, Robert T. Leaf, Frank J. Hernandez, Jr. and James S. Franks;* Gulf Coast Research Laboratory

11:20 a.m. **Mississippi Habitat Stewards.** *Peggy Stowers;* Mississippi Wildlife Federation

11:40 a.m. **Some Effects of Global Climate Variations on Red Snapper and Other Important Fisheries in The Gulf of Mexico.** *Donald R. Johnson, Harriet M. Perry and Guillermo Sanchez;* Center for Fisheries Research and Development, University of Southern Mississippi

RESILIENT COMMUNITIES SESSION - TUESDAY, DECEMBER 2, 2014

Time	Title and Authors
9:30 a.m.	**Determining Localized Risk Perception and Impacts of Predicted Sea-Level Rise (SLR) to Enhance Stakeholder Mitigation Planning through Visualization Tools.** *Matthew Bethel[1], Wei Wu[2] and Patrick Biber[1];* [1]Louisiana Sea Grant College Program and [2]University of Southern Mississippi-Gulf Coast Research Laboratory
9:50 a.m.	**Community Adaptation to Sea Level Rise on Georgia's Coast.** *Katherine Moore and Johanna McCrehan;* Georgia Conservancy
10:10 a.m.	**Making Resiliency Real with Laws that Support It.** *Bill Sapp;* Southern Environmental Law Center
10:50 a.m.	**Attributes of Resilience within Coastal Systems.** *Scott Thomas[1] and David Kerner[2];* [1]The Tauri Group and [2]Stetson Engineers Inc.
11:10 a.m.	**Climate Resiliency on Dauphin Island.** *Catherine Janasie;* Mississippi-Alabama Sea Grant Legal Program
11:30 a.m.	**The USA Center for Environmental Resiliency: Developing Multidisciplinary, Research-Based Environmental Solutions.** *Sean Powers, Steve Stokes, Lynne Chronister and James Connors;* University of South Alabama
1:30 p.m.	**The Working Waterfront Inventory Industry Overview.** *Derrick Robinson, Filz Atasoy and Diane Hite;* Auburn University, Department of Agricultural Economics & Rural Sociology
1:50 p.m.	**Clean and Resilient Marinas.** *Rhonda Price;* Mississippi Department of Marine Resources
2:10 p.m.	**Evaluating the Community Resilience Index as a Hazard Resilience Tool.** *Jody Thompson[1,2], Tracie Sempier[2] and La Don Swann[2];* [1]Auburn University Marine Extension Research Center and [2]Mississippi-Alabama Sea Grant Consortium
2:30 p.m.	**Developing a Resilience Index for the Fisheries and Tourism Industries.** *Colette Boehm[1] and LaDon Swann[2];* [1]Gulf Shores & Orange Beach Tourism and [2]Mississippi-Alabama Sea Grant Consortium
3:10 p.m.	**FEMA's New Alabama Coastal Storm Surge Model.** *Jason Wilson[1] and Leslie Durham[2];* [1]AMEC and [2]Alabama Office of Water Resources
3:30 p.m.	**The Coastal Resilience Web Mapping Decision Support Tool.** *George Raber[1], Zach Ferdana[2] and Nichole Love[2];* [1]University of Southern Mississippi and [2]The Nature Conservancy
3:50 p.m.	**Land Use and Marine Spatial Planning and Its Role in Coastal Planning and Management in the Peninsula of Mobile.** *Rebecca Retzlaff[1], Charlene LeBleu[2] and Debi Foster[3];* [1]Auburn University Community Planning Program, [2]Auburn University Landscape Architecture Program and [3]The Peninsula of Mobile

4:10 p.m. **Assessing Exposure to Coastal Flood Hazards: A Planning Tool for Gulf Coast Communities.** *Marian Hanisko and Lauren Long;* NOAA Office of Ocean and Coastal Resource Management and Coastal Services Center

4:30 p.m. **Storm Surge: An Interactive Visualization Tool.** *Tina Miller-Way[1], Carrie Riley[1], Thomas Richardson[2] and Carsten Neumann[3];* [1]Dauphin Island Sea Lab, [2]Jackson State University and [3]University of Louisiana Lafayette

RESILIENT COMMUNITIES SESSION - WEDNESDAY, DECEMBER 3, 2014

Time	Title and Authors
9:40 a.m.	**Flooding 101**. *Emily H. Sommer and Landon Smith;* City of Orange Beach, Alabama
10:00 a.m.	**Rapid Damage Assessment: Post-Hurricane Response at the Community Level.** *Henry B. Hodde III[1], Kathleen A. Garland[2] and Deanna Schmidt[2];* [1]NOAA National Ocean Services and [2]University of Houston Clear Lake
10:20 a.m.	**Planning for Disaster Recovery and Resilient Communities with Faith-Based and Secular Nonprofit Organizations.** *Liliya Kasatkina Quebedeaux, Deanna Schmidt and Kathleen A. Garland;* University of Houston Clear Lake
11:00 a.m.	**The 2013 Community Rating System: Developing a Program of Public Information.** *Niki L. Pace[1], Tracie Sempier[2] and Melissa Daigle[3];* [1]Mississippi-Alabama Sea Grant Legal Program, [2]Mississippi-Alabama Sea Grant Consortium and [3]Louisiana Sea Grant Law & Policy Program
11:20 a.m.	**The CIAP Smart Conservation: A Strategy for Incorporating Green Infrastructure into Hurricane Recovery and Renewal.** *Judy Steckler[1] and Jennifer Wagner[2];* [1]The Land Trust for the Mississippi Coastal Plain and [2]Mississippi Department of Marine Resources
11:40 a.m.	**A Comprehensive Watershed Management Plan for Three Mile Creek, Mobile, AL.** *Jerri Daniels[1] and Tom Herder[2];* [1]Dewberry and [2]Mobile Bay National Estuary Program

MONITORING/MODELING SESSION - TUESDAY, DECEMBER 2, 2014

Time	Title and Authors
9:30 a.m.	**Activity Patterns of Gulf Sturgeon (*Acipenser oxyrinchus desotoi*) in the Staging Area of the Pascagoula River during Fall Outmigration.** *Paul Grammar[1], Mark Peterson[1], Todd Slack[2] and Robert Leaf[1];* [1]University of Southern Mississippi and [2]U.S. Army Corps of Engineers
9:50 a.m.	***Fundulus grandis* Otolith Microchemistry as a Metric of Estuarine Discrimination and Oil Exposure.** *T. Reid Nelson[1,2,3], Dennis R. DeVries[3], Russell A. Wright[2] and Joel E. Gagnon[4];* [1]University of South Alabama, [2]Dauphin Island Sea Lab, [3]School of Fisheries, Aquaculture, and Aquatic Sciences, Auburn University and [4]Great Lakes Institute for Environmental Research, University of Windsor
10:10 a.m.	**Has Black Mangrove Expansion Affected Northern Gulf of Mexico Salt Marsh Nursery Function?** *Whitney Scheffel[1,2], Kenneth L. Heck, Jr.[2,1], Matthew Johnson[3] and Just Cebrian[2,1];* [1]University of South Alabama, [2]Dauphin Island Sea Lab and [3]Bureau of Ocean Energy Management
10:50 a.m.	**A Simulation Model Evaluating the Efficiency of Adaptive Cluster Sampling.** *Jesse Aaron Marks[1] and Robert Thomas Leaf[2];* [1]Central Methodist University and [2]Department of Coastal Sciences, University of Southern Mississippi
11:10 a.m.	**Integrated Ecosystem Assessment for an Ecosystem Based Approach to Management in the Northern Gulf of Mexico.** *Steve Ashby[1], Cristina Carollo[2], Just Cebrian[3,4], Richard Fulford[5], William McAnally[6], Scott Milroy[7] and Erick Swenson[8];* [1]Mississippi State University Science and Technology Center, [2]Harte Research Institute for Gulf of Mexico Studies at Texas A&M University-Corpus Christi, [3]Dauphin Island Sea Lab, [4]University of South Alabama, [5]U.S. Environmental Protection Agency, [6]Mississippi State University, [7]University of Southern Mississippi and [8]Louisiana State University
11:30 a.m.	Regional Oyster Reef Restoration for a Cleaner Gulf though Stock Enhancement and Habitat Creation. *William Walton and Chris Nelson.* [1]Auburn University School of Fisheries, Aquaculture and Aquatic Sciences
1:30 p.m.	**Diet, Growth, and Condition of Larval Spanish Mackerel in the Northern Gulf of Mexico: An Assessment of Deepwater Horizon Oil Spill Impacts.** *John Ransom[1], Jesse Filbrun[2], Carla Culpepper[1] and Frank Hernandez[1];* [1]University of Southern Mississippi, Gulf Coast Research Lab and [2]Southern Arkansas University
1:50 p.m.	**Temporal and Spatial Dynamics of Diel-Cycling Hypoxia in Four Northern Gulf of Mexico Estuaries.** *Brandon Jarvis, James Hagy, John Lehrter and Michael Murrell;* U.S. Environmental Protection Agency, Office of Research and Development, National Health and Environmental Effects Laboratory, Gulf Ecology Division
2:10 p.m.	**Short Term Monitoring After Restoration of Highly Stressed Intertidal Marsh in Mobile, AL Indicates Ecosystem Enhancement.** *Ashley McDonald[1], Tom Herder[2] and Just Cebrian[1];* [1]Dauphin Island Sea Lab and [2]Mobile Bay National Estuary Program
2:30 p.m.	**Wind Characteristics around Mobile Bay: Sea Breezes, Tropical Storms, and Wind Energy.** *Sytske Kimball;* University of South Alabama

3:10 p.m. **A Long-term, Stakeholder-based Strategy for Gulf of Mexico Observing and Monitoring: The GCOOS Build-out Plan V.2.0.** *Stephanie Watson[1], Chris Simoniello[1], Landry Bernard[1], Barbara Kirkpatrick[1] and Stephan Howden[2];* [1]Gulf of Mexico Coastal Ocean Observing System (GCOOS) and [1]University of Southern Mississippi

3:30 p.m. **Sustaining Alabama Fishery Resources: A Risk-Based Integrated Environmental, Economic, and Social Resource Management Decision Framework.** *Michael Stovall[1] and David Hale[2];* [1]Ninth Generation Consulting and [2]University of Alabama

3:50 p.m. **Resilient Coasts Need Environmental Flows: A Lesson from the Lower Pascagoula River.** *Jeff Ballweber[1] and Jonathan Pote[2];* [1]Pickering Firm and [2]Mississippi State University, Department of Agricultural and Biological Engineering

4:10 p.m. **Lessons for Collaborative Governance of Coastal Restoration from the Carnarvon river diversion in Louisiana.** *Jae-Young Ko[1] and John W. Day[2];* [1]Jackson State University and [2]Louisiana State University

4:30 p.m. **Calibrating a Bio-Optical Model for Submerged Aquatic Vegetation Habitat Suitability in the Lower Mobile-Tensaw Delta and Lower Perdido Bay Systems.** *Dorothy Byron[1], Kenneth L. Heck, Jr.[1,2] and Mary Kennedy[2];* [1]Dauphin Island Sea Lab and [2]University of South Alabama

MONITORING/MODELING SESSION - WEDNESDAY, DECEMBER 3, 2014

Time	Title and Authors
9:40 a.m.	**Delivering Oil Spill Science to our Coastal Audiences.** *Larissa Graham, Stephen Sempier and LaDon Swann;* Mississippi-Alabama Sea Grant
10:00 a.m.	**Communicating Oil Spill Science: A Social Network Analysis of the Gulf of Mexico Resilience Initiative.** *Chris Ellis[1], Stephen Sempier[2] and LaDon Swann[2];* [1]NOAA, National Ocean Service and [2]Mississippi-Alabama Sea Grant Consortium
10:20 a.m.	**Using Mitigation to Create a Resilient Community.** *Jody Hodge;* Jefferson County Emergency Management Agency
11:00 a.m.	**Updating and Improving a Spatial Database of Priority Estuarine Habitats and Calibrating a Biological Condition Gradient Model Framework for the Alabama Estuary.** *Tim Thibaut[1], Roberta Swann[2], Tom Herder[2], Renee Collini[3], Michael Dardeau[3];* [1]Barry A. Vittor & Associates, Inc., [2]Mobile Bay National Estuary Program and [3]Dauphin Island Sea Lab
11:20 a.m.	**A Novel Approach for Evaluation of Water Quality Trends in Gulf Coast Estuaries.** *Marcus W. Beck[1], James D. Hagy III[2] and Michael C. Murrell[2];* [1]Oak Ridge Institute for Science and Education Research Participation Program and [2]U.S. Environmental Protection Agency
11:40 a.m.	**Application of RTK-GPS Derived Digital Elevation Models from Grand Bay National Estuarine Research Reserve.** *Lindsay T. Spurrier[1,2] and William V. Underwood[1,2];* [1]Grand Bay National Estuarine Research Reserve and [2]Mississippi Department of Marine Resources

POSTER SESSION - TUESDAY, DECEMBER 2, 2014

Title and Authors (***In alphabetical order by first author last name***) **Poster number listed in parentheses.**

Categorization of Annual West Indian Manatee Movements Informs Understanding of Species Response to Environmental Changes. *Allen Aven[1,2] and Ruth Carmichael[2,1];* [1]University of South Alabama and [2]Dauphin Island Sea Lab (12)

Analysis of Historic Rainfall and Flooding Events in the North-Central Gulf Coast. *Alex Beebe, Chad Shafer, Sytske Kimball and Wesley Terwey;* University of South Alabama, Department of Earth Sciences (44)

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ABSTRACTS

(In alphabetical order by last name of first author)

The Role of Headwater Wetlands for Water Quality along the Northern Gulf of Mexico.
Christopher J. Anderson[1], Latif Kalin[1] and Charlene LeBleu[2]; [1]Auburn University School of Forestry and Wildlife Sciences and [2]Auburn University School of Architecture, Planning, and Landscape Architecture

Growth of coastal communities in the northern Gulf of Mexico is expected to expand urbanization and land use change. Drainage from urban lands has the potential to change hydrologic patterns and lead to increased loading of nutrients and other pollutants to local estuaries. Along the gulf coast, an extensive network of headwater wetlands and low-order streams drain coastal lands. Wetlands are known to provide important environmental functions including the maintenance of good water quality. The capacity for these wetlands to provide this function may be compromised however depending on urban intensity and drainage design. To investigate the role of headwater wetlands for sustaining urban water quality, we closely monitored three headwater wetland reaches in Baldwin County, Alabama (two in Foley, AL and one in Bay Minette, AL) representing varied degrees of surrounding urban drainage and alteration. Each wetland had a discernable surface inflow and outflow which was instrumented with a water level recorder and monitored for over two years. Periodic flow measurements at each wetland inflow and outflow were related to depths and used to develop individual rating curves for estimating hydrologic loading and fluctuation patterns. A combination of grab samples and automatic water samplers (ISCOs) were used to sample water during baseflow and stormflow conditions, respectively. Water quality (N, P, TSS and other measures) coming into and out of the wetland were analyzed and used to estimate pollutant loadings and retention during stormwater and baseflow conditions. Initial results show that there was a range of water quality conditions in surface waters entering the wetlands and wetland capacity to retain pollutants. Further, water quality improvement capabilities appear to be severely compromised at the Bay Minette wetland where urban infrastructure has resulted in rapid surface water drainage and reduced wetland hydroperiod. Using the results from this study, we report on a modified watershed model designed to account for headwater wetlands for better prediction of water quality from coastal lands. We discuss the relative importance of sustaining wetlands on the landscape for coastal water quality and provide some guidance for urban land planners on how to retain and enhance headwater wetland capabilities.

Fitting Mobile-Tensaw Delta Bass into the Black Bass Puzzle: New Molecular Tools and New Insights.
Ammu Anil, Spencer Gowan, Wilawan Thongda, Huseyin Kucuktas, Chao Li, Dennis R. DeVries, Russell A. Wright and Eric Peatman; Auburn University, School of Fisheries, Aquaculture and Aquatic Sciences

Hybridization of Florida bass (*Micropterus floridanus*) with largemouth bass (*Micropterus salmoides*) has dramatically expanded beyond a naturally-occurring intergrade zone in the Southeast U.S due to widespread stocking of *M. floridanus* outside its native range of peninsular Florida. In recent years there has been growing interest in protecting the genetic integrity of native black basses and assessing the impact and nature of *M. salmoides*/*M. floridanus* introgression relative to the goals of hatchery managers, fish biologists, ecologists, evolutionary biologists, and sport-fishery managers. Populations of coastal black bass have long been of interest due to apparent minimal stocking disturbance, habitat constraints and distinct morphology and life history. Applying two new multiplex panels of SNP

markers to bass collected from across the Mobile Delta revealed genotypes shared with both the *M. floridanus* and *M. salmoides* genomes, rather than pure *M. salmoides* ancestry as had been suggested by previous allozyme and microsatellite analyses. However, genotype patterns fell well outside expectations for a simple hybrid between the two species. Further analysis of additional individuals (n~1000) suggested shared ancestry of the Mobile-Tensaw Delta bass with black bass populations throughout the Mobile River basin (MRB), particularly with populations with minimal anthropogenic impacts (e.g., Sipsey River Wilderness). Our findings have clear and important implications for the evolutionary history, management, and conservation of black basses in the MRB.

Integrated Ecosystem Assessment for an Ecosystem Based Approach to Management in the Northern Gulf of Mexico. *Steve Ashby[1], Cristina Carollo[2], Just Cebrian[3,4], Richard Fulford[5], William McAnally[6], Scott Milroy[7] and Erick Swenson[8];* [1]Mississippi State University Science and Technology Center, [2]Harte Research Institute for Gulf of Mexico Studies at Texas A&M University-Corpus Christi, [3]Dauphin Island Sea Lab, [4]University of South Alabama, [5]U.S. Environmental Protection Agency, [6]Mississippi State University, [7]University of Southern Mississippi and [8]Louisiana State University

An Integrated Ecosystem Assessment (IEA) was implemented as part of an overall Ecosystem Approach to Management (EAM) effort by the National Oceanic and Atmospheric Administration. Ongoing studies are being conducted at 4 sites in the Northern Gulf of Mexico, Perdido Bay, Florida; Mississippi Sound, Mississippi; Barataria Basin, Louisiana; and Galveston Bay, Texas. IEA employs a Drivers-Pressures-States-Impacts-Responses (DPSIR) framework for scoping the ecosystem assessment process and setting management goals. Some practitioners replace "Impacts" in the DPSIR framework with "Ecosystem Services", producing the acronym DPSER. Three major drivers were identified, Hydrologic Alterations, Climate, and Human-Related Processes. The Sulis Community Ecosystem Models and Informatics Services were used for performing Integrated Ecosystem Assessments as well as providing the framework for evaluation of management responses including risk assessment. Specifically, an ecosystem model (TroSim) was used to simulate ecological processes resulting from various stressors. This work exemplifies how interfacing Sulis and Trosim provides a management assessment tool for the Mississippi Sound applicable to varying scenarios of climate and human-induced change.

The Gulf of Mexico offers an appropriate domain in which to develop, evaluate and validate strategies for environmentally and economically-sustainable development and utilization in the decision-making process. This is of particular importance since many restoration projects have been and will continue to be implemented in the Gulf of Mexico. Some of these projects will likely involve gains in goods and benefits provided by coastal ecosystems, and with input from stakeholders, could be of significant value for the decision-making process. The next step in our research is to more fully explore the ecosystem services at these 4 sites and "translate" them into measurements of human well-being based on scenario analyses and management needs. Proposed efforts that focus on interactions of oyster reefs and associated social and economic benefits under various scenarios that can inform the decision-making process will be presented.

Categorization of Annual West Indian Manatee Movements Informs Understanding of Species Response to Environmental Changes. *Allen Aven[1,2] and Ruth Carmichael[2,1];* [1]University of South Alabama and [2]Dauphin Island Sea Lab

The study of annual scale animal movements and migration by quantifying migratory destinations and phenology can provide valuable insights into the life history of a species. Those data may in turn be particularly useful to evaluate and contextualize individual and population level responses to threats such as climate change and habitat loss. West Indian manatees (*Trichechus manatus*) in the U.S. exhibit seasonal migration patterns between essential wintertime habitat and poorly-defined summertime ranges. To better characterize intra-annual movements in terms of migratory destinations and phenology for manatees on the northern Gulf of Mexico coast, we fitted a suite of animal movement models to data collected from satellite-tracked manatees, each model corresponding to an animal movement pattern common in nature. We found that, in all cases, the best fitting movement model was a multiple-stage migratory model with three discrete migratory endpoints (one wintertime and two warm-season). Manatee movements among migratory endpoints were typically short and well defined, although timing and duration of movements varied among individuals and years, potentially due to annual environmental variation. These results are an important first step to defining warm-season manatee habitat use patterns in the northern Gulf of Mexico and are immediately useful as a baseline for examining potential effects of natural or anthropogenic perturbations on manatee distributions.

REACH: Monitoring the efficacy of agricultural Best Management Practices to Reduce Nutrient Loading to the Gulf of Mexico. *Beth Baker[1], Dan Prevost[2], Troy Pierce[3] and Joby Prince-Czarnecki[1];* [1]Mississippi State University, [2]Delta F.A.R.M. and [3]U.S. Environmental Protection Agency

There is increasing societal awareness of natural resource concerns in both agricultural systems and the downstream receiving water bodies. These concerns are reflected in current policy discussions at both Federal and State levels, where there is a desire for 1) increased accountability with regard to agriculture's impact on the environment, and 2) documentation of how well on-the-ground programs and conservation practices are doing to improve our natural resources. REACH (Research and Education to Advance Conservation and Habitat) is a program within Mississippi that is producer led that will address these two points. REACH provides landowners within Mississippi coordination and support for documenting the benefits of conservation efforts to natural resources and importantly to agriculture on specific farms throughout the state. REACH then utilizes those outcomes and demonstrates the successes of conservation and agriculture integration. The successes are documented using innovative outreach, but grounded in defensible science. Currently the program is investigating the impacts of best management practices including, but not limited to, controlled drainage, tailwater recovery systems, on-farm storage reservoirs, and cover crops. REACH has three philosophical tenets that ensures its success: 1) it will encourage profitable and sustainable agriculture by coordinating interdisciplinary collaborations on specific farms, to address specific interests, from which outcomes can be shared with other producers; 2) it will illustrate the willingness and resolve of Mississippi producers to proactively address natural resource concerns; and 3) REACH will provide scientifically defensible data, and highly visible outreach materials to document resource improvements being made toward water resource conservation and landscape stewardship.

Case Study: A recent REACH project aimed to quantify the effects of low-grade weir frequency on nutrient reduction efficiencies of agriculture runoff using field-based experiments in the Mississippi

Alluvial Valley. Temporal trends of load reductions of total inorganic nitrogen, total inorganic phosphorus, and total suspended sediment indicate that reference and treatment ditches may show potential to meet pre-determined goals of 45% annual nitrogen and phosphorus reductions under certain conditions. High nutrient and sediment concentrations during storm flows highlight the capacity limitations of these systems. Capture capacity of best management practices must be tailored to retain runoff capacities during intense storm events, which speaks to specific engineering of the channel (slope, weir height, and channel outflow capacity). Adaptive management of systems for nitrogen removal should also be a major priority, such as the addition of carbon amendments or the use of cover crops. To fully understand the impacts of low-grade weir implementation, continued investigation is warranted to see the ecosystem changes through to full recovery of biogeochemical characteristics of wetlands.

Resilient Coasts Need Environmental Flows: A Lesson from the Lower Pascagoula River. *Jeff Ballweber[1] and Jonathan Pote[2];* [1]Pickering Firm and [2]Mississippi State University, Department of Agricultural and Biological Engineering

The Pascagoula River and its tributaries flow 265 miles and drain about 6,144,000 acres before discharging in the Mississippi Sound. The Basin proves that sustainable ecological and economic health needs quality water, living resources, habitats, and resilient communities. However, severe droughts on the Lower Pascagoula River threaten the region's ecosystems and economy. The Port of Pascagoula (e.g., Chevron's Pascagoula Refinery), Mississippi Power Company (Plant Daniel) and the Jackson County Utility Authority (public water supply) all depend water withdrawn from the Pascagoula River under MS Dept. of Environmental Quality (MDEQ) permits. On the Lower Pascagoula, MDEQ has set minimum stream flows of 917 and 1030 cubic feet per second (cfs) at the US Geological Survey's Merrill and Cumbest Bluff stream gages respectively. MDEQ must revoke withdrawal permits if flows fall below these values. In 2000, the Merrell gage hovered at 917 cfs for months before dropping to 707 cfs on October 2 when MDEQ asked the Pat Harrison Waterway District (PHWD) to release water from Okatibbee Reservoir 251 miles upstream to augment the Lower Pascagoula River's flows. PHWD released water until November 7. Later the PHWD and the Port signed a water purchase contract as insurance against future droughts such as in 2011. Okatibbee is not an ideal long-term drought solution; it was designed for flood control, the released water takes five days to reach Merrill, and 50% of that water is lost.

Efforts to conserve, preserve or restore land including floodplains and wetlands can enhance habitat and improve water quality. These activities are also touted as rainwater banks and groundwater recharge areas to capture flood peaks and naturally release water during droughts. In 2005, almost 17% of the Pascagoula Basin was protected or under conservation management. These lands run from the headwaters to coastal marshes and include large tracts of the Lower Pascagoula's riparian zone. The Basin also has many preserves and conservation easements and large wetland mitigation banks. Major land conservation did not prevent the 2000 or 2011 drought. Recent climate variability studies project more frequent, longer and severe droughts in the area through 2065. So, it is important to recognize that; 1) environmental flows are inextricably related to coastal resiliency; and, 2) land conservation must be expanded to include water resources water development to achieve habitat and water quality objectives.

A Novel Approach for Evaluation of Water Quality Trends in Gulf Coast Estuaries. *Marcus W. Beck[1], James D. Hagy III[2] and Michael C. Murrell[2];* [1]Oak Ridge Institute for Science and Education Research Participation Program and [2]U.S. Environmental Protection Agency

Water quality data form the backbone of management programs aimed at protecting environmental resources. The increasing availability of long-term monitoring data for estuaries can improve resolution of temporal and spatial changes in water quality. However, the relatively simple methods that are commonly used to evaluate trends are often insufficient to disaggregate the complex effects of multiple environmental drivers, limiting the potential to relate changes to possible causes. Continuous monitoring data reflect variation from both natural and human-induced factors, such that observed data may provide misleading information on system response to management actions. For example, chlorophyll and dissolved oxygen are common water quality endpoints that are used to support decision-making, yet observed data can reflect variation in pollutant loads, freshwater inputs, and tidal advection. Recent advances for trend evaluation of water quality in streams and rivers have shown that statistical models using a weighted regression approach can improve our ability to discriminate among multiple environmental drivers. These techniques are useful for quantifying system response that is independent of natural variation related to freshwater discharge or other confounding factors. Weighted regression techniques have not been extensively applied in Gulf of Mexico estuaries, despite the availability of many long-term datasets.

To improve our ability to resolve long-term changes in water quality, we adapted a weighted regression approach developed for streams and rivers to analyze long-term water quality datasets from several Gulf Coast estuaries. The weighted regression approach allows for changes in the relationships between water quality and explanatory variables by using dynamic model parameters and can more clearly resolve the effects of both natural and anthropogenic drivers of ecosystem response. The model was applied in two unique contexts that illustrate the flexibility of the approach, namely characterizing monthly chlorophyll trends in Tampa Bay, Florida and to remove variation from tidal advection from continuous dissolved oxygen records from several Gulf Coast estuaries. For Tampa Bay, the model resolved changes in chlorophyll-a from 1974 to 2012 at seasonal and multi-annual time scales while considering variation associated with changes in freshwater influence. Observed trends coincided with the well-known long term decrease in nitrogen loading to Tampa Bay, however the model also resolved more subtle seasonal variability. For the Gulf Coast estuaries, the model was able to remove variation from tidal advection in dissolved oxygen data, allowing for more accurate estimates of daily net metabolism. Overall, adaptation of this novel modelling technique has improved our resolution of water quality changes on a variety of time scales. The model is highly flexible allowing for application to additional datasets or extension to other water quality endpoints.

Analysis of Historic Rainfall and Flooding Events in the North-Central Gulf Coast. *Alex Beebe, Chad Shafer, Sytske Kimball and Wesley Terwey;* University of South Alabama, Department of Earth Sciences

On April 29th 2014, a slow moving cold front associated with a powerful low pressure system produced historical rainfall over the Mobile and Pensacola regions. The National Weather Service reported 11.24 inches of rain for Mobile Regional Airport and an estimated 15.55 inches of rain for Pensacola Regional Airport. Severe flash flooding associated with the historical rainfall event resulted in flooded streets and buildings, destroyed houses, sinkhole formation, bridge washouts, and a single fatality. Many residents in the area have compared the recent historical flooding event with Hurricane Danny which stalled near the mouth of Mobile Bay in July of 1997, dumping more than 36 inches of

rain on Dauphin Island. Because flash flooding associated with high-impact rainfall events results in repeated damage to coastal ecosystems in the form of polluted stormwater runoff, severe stream bank erosion, sedimentation, and sanitary sewer overflow, a fundamental understanding of the meteorological, hydrologic, and anthropogenic factors linked to flooding is of great interest. Therefore, a statistical analysis of historical rainfall events in the Mobile Bay area and underlying factors that may exacerbate the effects and severity of flash flooding including seasonality, urban development, soil moisture, and land use/land cover changes was conducted in order to elucidate predictors for flooding severity. Historical meteorological and river gauge data and observations were compiled and analyzed to identify high-impact precipitation events over the past 20 years in the north-central Gulf Coast region. Relationships between flash flooding and meteorological, hydrologic, and anthropogenic factors were determined using a series of statistical analyses. Data sources include the South Alabama Mesonet, National Data Buoy Center (NDBC), Dauphin Island Sea Lab (DISL), National Estuarine Research Reserve (NERRS), Physical Oceanographic Real-Time System (PORTS), and Automated Surface Observing System (ASOS), National Weather Service (NWS) as well as WSR-88D Doppler radar derived rainfall data from the Mobile radar. The results from this study provide useful linkages between anthropogenic effects (e.g., land use/land cover changes) and flooding severity.

Mass-Specific Respiration of *Streblospio gynobranchiata* in Response to Multiple Combined Levels of Dissolved Oxygen and Temperature. *Alyssa Bennett, Kelsey Burns and Chet Rakocinski;* University of Southern Mississippi, Gulf Coast Research Laboratory

Higher sea surface temperatures associated with climate change exacerbate the threat of hypoxia within coastal ecosystems. Hypoxia and elevated temperatures may elicit different physiological responses from marine organisms. For example, respiration can decrease under hypoxia, whereas respiration increases with increasing temperature due to higher metabolic demands. Thus, physiological effects of both stressors together may be nonlinear and synergistic. Due to threat of increasing hypoxic zones and elevated temperatures, the dearth of information about combined effects of multiple stressors must be addressed.

The objective of this presentation will be to characterize size-scaling trends in aerobic respiration of an opportunistic polychaete, *Streblospio gynobranchiata*, relative to combined levels of dissolved oxygen and temperature. Further, results from this common GoM species will be compared to other data for the model tolerant northeastern polychaete, *Capitella telata*, obtained in our laboratory. This comparison will provide insights into adaptive and geographic differences between these species.

Mass-specific respiration rates (VO2) were determined for individual acclimated specimens using a fiber optic, closed system respirometer, the FireSting oxygen meter. Cultured *S. gynobranchiata* originating from specimens collected from tidal creeks in Davis and Simmons Bayou, MS were used. Respiration rates were measured across the full range of body sizes at three dissolved oxygen levels (20%, 60%, and 100% oxygen saturation) and three temperatures (15°C, 25°C, and 35°C).

Non-linear curves were fitted to the allometric aerobic responses relative to dissolved oxygen and temperature. In addition to interpreting these relationships, planned anaerobic respiration and oxygen debt measurements that should provide deeper insights into the overall respiratory response of this opportunistic polychaete relative to multiple abiotic stressors will be discussed.

Determining Localized Risk Perception and Impacts of Predicted Sea-Level Rise (SLR) to Enhance Stakeholder Mitigation Planning through Visualization Tools. *Matthew Bethel[1], Wei Wu[2] and Patrick Biber[1];* [1]Louisiana Sea Grant College Program and [2]University of Southern Mississippi-Gulf Coast Research Laboratory

Marshes are essential buffer zones between land and water in estuaries and coastal zones, they are disappearing rapidly, and those that remain are often in poor health. The most dramatic coastal marsh losses in the U.S. are in the northern Gulf of Mexico. These disappearing marshes serve as a vital habitat for a diverse and unique range of flora and fauna, a cushion between coastal waterfront-dependent communities and the open waters of the Gulf, and an integral resource for the economic and social viability of these communities. Therefore, coastal community leaders, government officials, and natural resource managers must be able to accurately assess and predict a given coastal landscape's sustainability and/or vulnerability, especially as this coastal habitat continues to undergo rapid and dramatic changes associated with natural and anthropogenic activities such as accelerated relative Sea Level Rise (SLR).

A multi-disciplinary research team has been conducting a NOAA Sea Grant funded project to use a regional approach to refine the NOAA SLR Visualization Tool for local implementation in areas experiencing two different driving mechanisms of coastal wetland habitat change (subsidence versus erosion). This collaborative research aims to determine the different ways in which two different stakeholder groups (traditional ecosystem users and resource managers) evaluate risk and plan mitigation strategies associated with coastal habitat change due to predicted SLR resulting from climate change.

To achieve this goal, the research team is determining: (1) a method for producing localized vulnerability/sustainability maps based on predicted inundation and redistribution of coastal wetlands under accelerated SLR for two regionally representative systems; the first is an ecosystem-dependent coastal Louisiana indigenous Native American community, and the second is a Mississippi natural coastal preserve. Results from physical information derived from data and modeling of subsidence, erosion, engineered restoration and coastal protection features, historical land loss, and future land prediction under SLR that are complemented with traditional ecological knowledge (TEK) offered by the collaborating local ecosystem users will be integrated for these assessments; and (2) how and whether the results of such an approach can provide more useful information for assessing localized impacts of SLR and associated risk that may later be applied across the Gulf Coast by Sea Grant and the NOAA Coastal Services Center among others. We are currently finalizing work for this research project, and intend to present the results in achieving the project objectives that includes: analyses of scientific field data collected related to marsh vegetation biomass characteristics, analyses of TEK data collected, and examples of mapping products developed.

Shoalgrass Patch Mapping On Horn Island to Assess Landscape Structure. *Patrick Biber and Linh Thuy Pham;* University of Southern Mississippi

Seagrasses provide key ecosystem services via carbon and nutrient cycling and sediment stabilization, as well as nursery habitat and as a food source. Seagrasses are subjected to numerous stressors such as direct physical damage to seagrass habitats, nutrient and sediment pollution, the introduction of exotic species, and global climate change. A six year study of seagrass patch dynamics on Horn Island, MS was completed to determine structural changes of shoalgrass landscape structure at the patch –level in this region. At two locations (West end and Big Lagoon) three transects running in a north-south

direction perpendicular to the shoreline were established. Within a transect, 10 seagrass patches that are greater than 3m in diameter were remapped annually. The field estimated midpoint (centroid) of each patch was mapped using a Trimble GPS to sub-meter resolution. Additionally, the perimeter of the patch was recorded to obtain a polygon outline of the patch for overlay and manipulation in ArcGIS. This hierarchical monitoring scheme provided information on the spatial changes to patch area and centroid location over time. On the average patches on West end migrated to the N and W, while patches at Big Lagoon migrated to the S and E. Average annual change in the centroid location was 3.1 meters. Numerous sources of error introduced in the mapping process could affect the accuracy of field-derived results, including: difficulty in relocating the same patch, indistinct patch edges, geospatial inaccuracy inherent in GPS technology. Previous investigations during the 1970's suggest that shoalgrass patches may extend as much as 3.5 meters in one year with permanent stakes marking the locations. Additional research will use these field data to evaluate the accuracy of aerial photography used in seagrass assessment and monitoring since the 2010 oil spill.

Beyond Within-Host Proliferation and Environmental Control: Development of a Theoretical Basis for Modeling Disease Processes in Marine Invertebrates. *Gorka Bidegain[1], Eileen E. Hofmann[2], John M. Klinck[2], Eric N. Powell[1], David Bushek[3], Tal Ben-Horin[3], Ximing Guo[3], Dafne Munroe[3], Susan Ford[3], Dale Haidvogel[3], John Wilkin[3], Julia Levin[3] and Ming Liu[3];* [1]Gulf Coast Research Laboratory, University of Southern Mississippi, [2]Center for Coastal Physical Oceanography, Old Dominion University and [3]Haskin Shellfish Research Laboratory, Institute of Marine and Coastal Sciences, Rutgers University

Specific physical and biological characteristics make oceans a much more favorable medium than land for the spread of infectious disease and the support of widespread disease outbreaks. However, the dynamics that underlie the generation of epizootics in marine ecosystems still lack the equivalent level of description, conceptual understanding, and epizootiological modeling framework routinely present in the terrestrial environment. The general question of how epizootics are initiated and terminated in marine invertebrate populations and how this process is supported by transmission provides a basis for expanding evaluation of marine epizootics, and generating mechanisms beyond studies of within-host proliferation and environmental control. Addressing this question requires development of a theoretical framework for disease transmission among invertebrates in marine systems. The project combines experimental and modeling efforts that will provide a general theory for marine invertebrate diseases. The model is informed using Dermo disease, caused by *Perkinsus marinus*, in Eastern oysters (*Crassostrea virginica*), as an experimental system. Extensive data sets are available for the pathogen and host, and experimental protocols are well described. However, the model will be applicable to all sessile or nearly sessile species whose movement is restricted to the small scale (e.g., bivalves, gastropods, sea urchins, corals) and to a range of hydrodynamic regimes from estuaries to lagoons to coral reef tracts. The proposed model will provide for the marine realm the analogous opportunity for study as the Kermack-McKendrick (SIS/SIR/SIRS) formulation does for motile terrestrial species. The framework that underpins the proposed model recognizes two alternate stable states: transmission from 1) point-sources and 2) non-point sources. Both maintain disease in the host population and are determined by the balance between particle production, loss, accumulation, and dilution processes. The stability of the two states and the mechanisms that trigger shifts between them are hypothesized to be determined by the interaction of the flux of infective particles, the dose required to initiate an infection, and the host population density. The first objective of this proposed study is to investigate experimentally and theoretically the infective dose-particle flux-population density hypothesis so that a marine equivalent of the basic reproduction number R0 can be specified. Developing a population with high prevalence capable of sustaining an epizootic from a population of

lower prevalence, requires that some portion of the population retain the infection and be able to locally proliferate abundant infective particles. These individuals may be the most susceptible ones in the population. Thus, the second objective is to investigate the hypothesis that genetically based, within-population susceptibility is an important factor in generating epizootics of marine diseases, and can be evaluated relative to the transmission process. The project results will provide an important advancement in the understanding of the ecology of marine infectious diseases, particularly, the theoretical basis for modeling diseases and disease transmission.

Developing a Resilience Index for the Fisheries and Tourism Industries. *Colette Boehm[1] and LaDon Swann[2];* [1]Gulf Shores & Orange Beach Tourism and [2]Mississippi-Alabama Sea Grant Consortium

Mississippi-Alabama Sea Grant Consortium (MASGC), in coordination with Gulf Shores & Orange Beach Tourism (CVB) and several other agencies, is expanding the work it began with the development of the Coastal Community Resilience Index, which has been implemented by 45 communities along the Gulf Coast. This new project creates a framework for assessing resilience across critical industries, or systems, of the coastal region. Initial industries identified for detailed analysis were tourism and fisheries.

Alabama and Mississippi's commercial fishing and tourism industries account for millions in state and local revenues, thousands of jobs and payrolls of billions of dollars. It is clear that these industries' success and sustainability are critical to the northern Gulf Coast economy as well as its lifestyle. For this reason, developing a tool to help ensure the sustainability of these critical industries is an ideal way to begin the multi-system program MASGC is undertaking. Partnering with a successful tourism organization like the CVB, which represents an area of Alabama's Gulf Coast experiencing record-breaking revenues, lends industry expertise as well as credibility among industry leaders and potential user groups.

The Tourism and Fisheries Resilience Indices will be used by individual businesses to identify economic, natural, technological, environmental and social strengths and vulnerabilities. The assessments will assist in framing specific resilience plans and implementation strategies. The result is an innovative and cost-effective tool to engage and educate businesses. The result will be stronger, more sustainable industries which will support a more resilient Gulf Coast region.

The project coordinators used focus groups to develop a draft index for each industry and to provide various types of feedback through the testing and implementation process. The groups consist of a regional mix of business people representing various sectors of the coastal tourism and fisheries industries.

Project Overview:

1. Index Development: The project team identifies key areas of operation and indicators of resilience in those areas.
2. Index Testing: The project team reviews the index with selected industry professionals to garner input on its completeness, usability and overall value to the user. Additionally, follow up discussions are held to determine best next steps to improving areas the index identifies as being vulnerable.
3. Pilot Testing: The project coordinators identify test subjects (businesses) to implement the draft index.

4. Index Revision and Development of Resource Document: Reports from testing are brought back to the project team for consideration and index revisions. Suggested next steps identified in testing are developed into a resource document which will be developed as a follow-up for entities using the resiliency index.
5. Final Revisions: Responses and results from the pilot project are reviewed by the project team and any necessary changes to the index, the process or the resource document are incorporated.
6. Launch: Presentations are made by the project coordinators to tourism and fisheries organizations throughout the region announcing the availability and value of the index.

Mississippi Habitat Stewards. *Peggy Stowers;* Mississippi Wildlife Federation

The Mississippi Habitat Stewards is a program of the Mississippi Wildlife Federation on our Gulf Coast. The program is a one-of-a-kind volunteer group trained to provide habitat management services to natural land managers, especially those related to public use, access and interpretation. Some of the many activities include: treatment or removal of invasive plants, native plant restoration, trail building and monitoring, bird monitoring and beneficial use of dredge material monitoring.

After volunteers complete a training course, mentors match volunteers with certain interests and skills to partners with corresponding needs. The success rate of the program depends on the continued mentoring and landowner needs assessments provided by Mississippi Wildlife Federation, as well as keeping our volunteers happy! Within the past 3 years 47 volunteers have completed the 24 hour training program and have reported over 7000 hours of volunteer service.

Connecting the Dots in Whole System Conservation Planning. *Mary Kate Brown;* The Nature Conservancy

Two years ago, the Alabama Chapter of The Nature Conservancy (TNC) adopted a new Strategic Plan that embraces the whole systems approach. The Plan showcases four major priority landscapes throughout the state with each landscape involving at least two of the state programs: freshwater, marine and terrestrial. Since the whole systems approach is still a relatively new way to link the comprehensive conservation of critical lands and waters statewide, TNC has been engaged in various workgroups focused on regional projects and tools development that will help our chapter and partners better understand the real-life interconnections between our marine, freshwater and terrestrial programs and priorities. These regional projects and tools include, but are not limited to, the Coastal Resilience 2.0 Tool, Southeast Resilience Project, Southeast Aquatic Connectivity Assessment Project (SEACAP), and Appalachian LCC Stream Classification Project. All of these projects will provide essential information to guide our decisions when planning for land acquisitions, stream/fish passage restoration activities, and coastal resilience projects.

Since this preliminary compilation is new to Alabama, the challenge is figuring out the best way to incorporate the results and tools from each of these projects into future planning and strategies for conservation and restoration. In addition, it is essential to ensure that results from this approach are easily interpreted and understood by funders, partners, and policy makers who can provide the support to implement future projects along coastal Alabama. By sharing potential strategies and applications with the larger audience, it will be helpful to receive feedback as to how TNC and our partners can move forward with better integration with whole systems conservation planning in coastal Alabama.

Green Building Case Studies. *Rebecca Dunn Bryant;* WATERSHED

These posters illustrate completed green building projects on the Gulf Coast. Each poster includes performance metrics covering energy use reduction, water use reduction, habitat creation, etc. These are illustrated with images from the projects and a narrative giving the story behind each work. Up to 9 posters are available for display. If space is limited, we can reduce that number as needed.

The Living Building Challenge. *Rebecca Dunn Bryant;* WATERSHED

Over the last twenty years, green building has grown to become the most important and progressive trend in the building industry. There have been huge steps forward in the design, construction and operation of buildings, and yet when compared with the rate of change that is required to avoid the worst effects of climate change and other global environmental challenges, our progress has been minute and barely recordable.

The Living Building Challenge is an attempt to dramatically raise the bar from a paradigm of doing less harm to one in which we view our role as steward and co-creator of a true Living Future.

INSTEAD OF A WORLD THAT IS MERELY A LESS BAD VERSION OF THE ONE WE CURRENTLY HAVE—WE ASK A SIMPLE AND PROFOUND QUESTION—WHAT DOES GOOD LOOK LIKE?

What if every single act of design and construction made the world a better place? What if every intervention resulted in greater biodiversity; increased soil health; additional outlets for beauty and personal expression; a deeper understanding of climate, culture and place; a realignment of our food and transportation systems; and a more profound sense of what it means to be a citizen of a planet where resources and opportunities are provided fairly and equitably? A tall order to be sure

This presentation provides an introduction to The Living Building Challenge™ -the built environment's most rigorous performance standard. It calls for the creation of building projects at all scales that operate as cleanly, beautifully and efficiently as nature's architecture. To be certified under the Challenge, projects must meet a series of ambitious performance requirements over a minimum of 12 months of continuous occupancy.

The Challenge defines the most advanced measure of sustainability in the built environment possible today and acts to rapidly diminish the gap between current limits and the end-game positive solutions we seek. The Challenge aims to transform how we think about every single act of design and construction as an opportunity to positively impact the greater community of life and the cultural fabric of our human communities. The program is a bit of a Trojan horse—a philosophical worldview cloaked within the frame of a certification program.

Parasites Can Cause Lesions on Gulf of Mexico Fishes. *Stephen A. Bullard, Margaret Maynard, Matthew Womble and Raphael Orelis-Ribeiro;* Auburn University, School of Fisheries, Aquaculture and Aquatic Sciences

Fish parasite species vastly outnumber fish species worldwide, and under apparently normal conditions many infected fish hosts are grossly asymptomatic, i.e., "normal" and indistinguishable from non-infected conspecifics. However, depending on the physical environment, parasite species, parasite life history stage, host species, host immunological status, and season, some parasitic infections indeed can be associated with lesions ranging from seemingly benign to potentially pathogenic. In other instances, a particular parasite life history stage may itself superficially resemble a skin abnormality. The 2010 BP Deepwater Horizon (DHOS) oil spill focused much more attention on Gulf of Mexico aquatic animal health, especially regarding the outward appearance of commercially- and recreationally-valued aquatic organisms such as red snapper (*Lutjanus campechanus*) and shrimps (Penaeidae). Media reports asserted that the DHOS was causally linked with several non-infectious disease processes in fishes but seemingly lacked specific details and supporting scientific evidence from parasitology, microbiology, pathology, and environmental chemistry. Information on the infectious and non-infectious diseases of fishes, or the lack thereof, can demonstrably impact ecosystem science (micro- & macro-evolutionary processes), industry (tourism, fisheries), human health (zoonoses, seafood safety), and community resilience (bequest value, perception of environmental quality). We argue that a deeper understanding of parasitism, parasitology, and marine disease (broadly) can help citizens, stakeholders, and researchers better interpret how, when, where, and why Gulf of Mexico fish are infected, lesioned, or debilitated. Herein, we provide some curious examples of parasites that cause abnormalities or skin lesions on their fish hosts: red snapper (*Lutjanus campechanus*) infected with a skin-dwelling parasitic nematode (*Huffmanela oleumimica*) and electric stingray (*Narcine bancroftii*) infected by a leech (*Branchellion torpedinis*) as well as yellowfin tuna (*Thunnus albacares*) and blacktip shark (*Carcharhinus limbatus*) infected by ectoparasitic flatworms (*Capsala cf. biparasiticum* and *Dermophthirius penneri*, respectively). We suspect that these host-parasite relationships have resulted from ecological and phylogenetic interactions between and among parasites and their hosts over a geological timescale, including parasite life history specializations and host-parasite coevolution. We also emphasize the value of infectious and non-infectious disease studies that characterize interactive effects of anthropogenic disturbances, fish health, and parasite pathogenicity.

Design and Construction of a Step Pool Storm Conveyance (SPSC) System on an Unnamed Tributary to Joe's Branch, D'Olive Bay Watershed, Baldwin County, Alabama. *Wade Burcham;* Thompson Engineering

A Step Pool Storm Conveyance (SPSC) system has been constructed to restore a severely eroded ephemeral drainage on a tributary to Joe's Branch within the D'Olive Creek watershed in Baldwin County, Alabama. The project represents implementation of one of the management measures recommended in a comprehensive watershed management plan (WMP) developed for the area. The SPSC project was primarily funded through a Section 319 (nonpoint source) grant from the Alabama Department of Environmental Management (ADEM) to the Mobile Bay National Estuary Program (MBNEP). Additional funding for the project was provided by the Alabama Department of Transportation (ALDOT), with the cooperation and support of many others.

The objective of an SPSC system is to convert and dissipate, through storage pools and sand seepage filters, surface storm flow to shallow groundwater flow. SPSC systems typically are comprised of a

series of shallow aquatic pools, riffle grade control, native vegetation, and an underlying sand/organic filter bed media. An SPSC system is intended not only to provide a stable drainage pathway for higher flows, but to attenuate and/or retain lesser flows and facilitate water quality treatment. SPSC systems have been used in other parts of the country. Notably, in Anne Arundel County, Maryland, there have been several applications spanning over a decade, and the County has developed specific design guidelines for their construction. However, to our knowledge, an SPSC or similar system has not been evaluated for the conditions found in the north Gulf coastal region of south Alabama.

This presentation will discuss the engineering design and construction of the SPSC demonstration project in Spanish Fort, Alabama. Participants will be presented with information to identify when and why a SPSC may be an effective measure to stabilize and enhance hydrologic systems. Post-construction stormwater monitoring as performed by the Geological Survey of Alabama (GSA) will be discussed, along with "lessons learned". In addition, participants will be presented with future projects where these measures are currently being planned using different constraints.

Specific Growth Rates and Complimentary Egestion Rates of the Model Tolerant Polychaete, *Capitella teleta*, Vary with Time under Varying, Combined Levels of Dissolved Oxygen and Temperature. *Kelsey Burns, Alyssa Bennett and Chet F. Rakocinski;* Gulf Coast Research Lab

In the current Anthropocene period, marine ecosystems are faced with an increasing frequency and magnitude of hypoxic conditions, along with the aggravating effects of higher temperatures. Higher metabolic costs associated with increasing temperature require greater food consumption; whereas, depressed feeding and metabolism have been observed under hypoxia. Thus, physiological trade-offs for organisms faced with multiple stressors may not engender simple, linear, additive responses to those stressors. This presentation will elucidate an experiment designed to quantify allometric growth and egestion responses of the model tolerant deposit-feeding polychaete, *Capitella teleta*, across multiple combined levels of dissolved oxygen and temperature.

The experiment comprised four dissolved oxygen levels (20%, 50%, 70%, and 100% oxygen saturation), crossed with three temperatures (15°C, 20°C, and 25°C). To achieve a balance, polychaete sizes were initially selected from one of three categories: small (< 2 mg), medium (2 - 4 mg), and large (> 5mg), but indexed by their actual sizes for statistical analysis. The experimental flow-through system followed a split-plot layout for which each of four sections was assigned to a specific DO level, and each DO level was split into three temperature levels, each of which were further split into nine chambers for housing individual worms (108 individuals). Three replicates of each of the three body-size categories were randomly allocated to each block of nine chambers. Worms were allowed to feed ad libitum and their enriched sediment was changed daily. Individual worms were weighed and their feces collected daily for 4 days. Fecal pellets were counted and their volumes estimated using photograph software.

Specific growth rates ranged widely from -60% to 60%; and varied across DO and temperature levels over time. Overall, the 70% oxygen saturation treatment exhibited the highest specific growth rates. This DO treatment likely best represents normoxia for this species. Although there was no apparent relationship between fecal pellet production and size, egestion rates generally corresponded with specific growth rates.

Size-Scaling Trends in Aerobic and Anaerobic Respiration of the Model Tolerant Polychaete, *Capitella teleta*, Change under Varying Combined Levels of Dissolved Oxygen and Temperature.
Kelsey Burns, Chet F. Rakocinski and Alyssa Bennett; Gulf Coast Research Lab

Current research on abiotic stress tends to focus on single abiotic factors; only 2.2% of all climate change studies examine more than one environmental variable. Moreover, many studies that examine multiple stressors consider only high versus low treatment levels, which precludes the detection of nonlinear and potentially synergistic responses. In this presentation we characterize potential synergistic effects of two primary abiotic variables (dissolved oxygen and temperature) on size-scaling trends in aerobic and anaerobic respiration for the model tolerant polychaete, *Capitella teleta*.

Aerobic and anaerobic respiration was measured across the full range of body sizes at four dissolved oxygen levels (20%, 50%, 70%, and 100% oxygen saturation), and at three temperatures (15°C, 20°C, and 25°C). Aerobic respiration (VO_2) was determined for individual specimens using a closed-system, polargraphic respirometer. In order to resolve potential anaerobic pathways and assess the activity of pyruvate reductase, the specific activities of lactate dehydrogenase (LDH), opine dehydrogenase (ODH), alanopine dehydrogenase (ADH), and strombine dehydrogenase (SDH) were assayed. Non-linear curves were fitted to the aerobic and anaerobic responses relative to body size. To identify nonlinear effects in respiration capacity, size classes were examined for visual breaks in VO2 In addition, we looked for complementarities between allometric relationships in aerobic and anaerobic respiration.

Overall, smaller individuals maintained higher VO2 levels than larger ones relative to both DO and temperature. The Q5 (rate of change at 5°C difference) coefficients ranged from 1.05-2.62 with body size across the dissolved oxygen levels. The allometric exponent b was similar across temperatures at 50% and 70% oxygen saturation, while at 20% and 100% saturation, allometric responses varied depending upon temperature. Examination of the respiration capacity ratio shows a fairly consistent regulating trend for all size classes at 20°C up to the 20% DO saturation is reached. At 25°C, larger individuals appeared to oxyregulate while smaller worms displayed classic oxyconformation. The most active anaerobic pathway for *Capitella teleta* was strombine dehydrogenase. Anaerobic enzymatic activity was highest for small organisms at 20% oxygen saturation, implying complementarity between aerobic and anaerobic respiration.

Calibrating a Bio-Optical Model for Submerged Aquatic Vegetation Habitat Suitability in the Lower Mobile-Tensaw Delta and Lower Perdido Bay Systems.
Dorothy Byron[1], Kenneth L. Heck, Jr.[1,2] and Mary Kennedy[2]; [1]Dauphin Island Sea Lab and [2]University of South Alabama

In the recent past we have learned a great deal about the critical importance of adequate light quantity and quality for ensuring the health of submerged aquatic vegetation (SAV). Significant progress has been made in developing simple optical models that can predict where SAV will prosper. Light requirement models have been developed for Chesapeake Bay, MD, Albemarle-Pamlico Sound, NC, Indian River Lagoon, FL and Tampa Bay, FL. Unfortunately, these models are not generally transferrable, owing to local variability in the factors that influence water clarity; thus, a specific northern Gulf of Mexico model is needed to set accurate targets for improving water quality that will maintain healthy SAV habitats. We will present and discuss water quality data collected during a 1.5 year study in two different coastal habitats used to calibrate optical models that can aid coastal managers in identifying those factors most responsible for light attenuation and thus light availability for SAV.

Protecting the health of coastal Alabama's SAV beds and restoring those that have been lost will enhance the many ecosystem services provided by SAV habitats. These include supplying nursery habitat for juvenile finfish and shellfish, improving water quality and reducing shoreline erosion by dampening wave energy and stabilizing sediments. Understanding the conditions required to sustain healthy SAV meadows is important for coastal resource managers and prior efforts in other regions have shown that developing these models can facilitate conservation and restoration of this ecologically and economically important habitat.

Response of Benthic Microalgae to Phosphorus Inputs in Grand Bay National Estuarine Research Reserve. *Jane Caffrey[1], Tashana Jones[1], Kaleb Price[1], Kimberly Cressman[2], Lorenzo Modestini[1], Cheyene Hunt-Alderson[1] and Mark Woodrey[2,3];* [1]University of West Florida and [2]Grand Bay National Estuarine Research Reserve and [3]Mississippi State University

Benthic microalgae are an important, but often understudied component of shallow, photic estuaries in the Gulf of Mexico. Grand Bay National Estuarine Research Reserve is located in a small and relatively pristine estuary in the northern Gulf of Mexico. Freshwater input into the estuary is primarily local runoff from bayous and tidal creeks, including Bayou Cumbest, Bayou Heron, and Bangs Lake. Nutrient loading to Grand Bay is relatively small, with ambient nutrient concentrations often below detection. However, several events in 2005, 2012 and 2013 due to breaches in a containment levee from a gypsum stack have led to high phosphate levels near Bangs Lake. In marine ecosystems, nitrogen availability normally limits growth of phytoplankton and previous research has shown this to be the case in Grand Bay. However, little is known about benthic microalgae in Grand Bay and what their response is to these phosphorus inputs. We hypothesized that cyanobacteria could be stimulated in Grand Bay as a result of these phosphorus spills, particularly cyanobacteria that fix atmospheric nitrogen. Surface sediment samples from multiple locations in Grand Bay were collected for analysis of chlorophyll a, extractable phosphorus, and ammonium. Samples were also collected for measurement of nitrogen fixation using the acetylene reduction method which has been a standard technique for measuring nitrogen fixation since the 1970s. In 2013 and 2014, sediment chlorophyll a concentrations, a measure of microalgal biomass, were higher in and near Bangs Lake which is near the gypsum stack compared to Bayou Heron or Bayou Cumbest. Sediment chlorophyll a was significantly correlated with extractable phosphate concentration in sediments ($r = 0.88$), but not extractable ammonium concentrations. Sediment nitrogen fixation rates were very low compared to literature values. However, nitrogen fixation was also significantly positively correlated with extractable phosphate concentrations ($r = 0.92$) and negatively correlated with extractable ammonium concentrations ($r = -0.69$). In addition, grow out experiments with amendments of phosphorus to water and sediment samples stimulated the growth of cyanobacteria which were capable of fixing nitrogen. These data suggest that phosphorus inputs stimulate the growth of benthic microalgae including cyanobacteria in Grand Bay.

Planning the Future with an Eye to the Past: Land Use and Water Quality on the Mississippi-Alabama Coast. *R. H. Carmichael[1,2], E. Darrow[1,2], W. Wu[3,4] and H. Huang[3,4], K. R. Calci[5], W. Burkhardt II[5], W. Walton[6], A. Pasch[7], M .S. Woodrey[7,8] and M. Hanisko[9];* [1]Dauphin Island Sea Lab, [2]University of South Alabama, [3]Gulf Coast Research Laboratory, [4]University of Southern Mississippi, [5]Gulf Coast Seafood Laboratory/US Food and Drug Administration, [6]Auburn University Shellfish Laboratory, [7]Grand Bay National Estuarine Research Reserve, [8]Mississippi State University and [9]NOAA Ocean & Coastal Resource Management, Coastal Services Center

On August 1, more than 40 researchers, managers, and members of the public met for a one-day workshop at the Grand Bay National Estuarine Research Reserve to discuss local water quality concerns and recommend data products to guide water quality improvements on the Mississippi-Alabama coast. This workshop was the culmination of a 4-year study conducted to measure land use related nutrient source and pathogen indicator changes through time using Grand Bay, on the Mississippi-Alabama coast, as a benchmark system. The study determined how land use changes in the past have affected water quality, natural resources, and potentially human health to provide data for local land use planning and decision-making. Data showed that historical and present-day land use, particularly increased wastewater input to coastal areas, has affected water quality and potential for shellfish harvest. Of the five sites tested in the Grand Bay area, Bayou Chico in Mississippi was identified as having particularly poor water quality, while wastewater treatment was demonstrated as a method to increase water quality throughout the area. To sustain water quality and shellfisheries safe for harvest, communities will need to balance land use, particularly area of impervious surface, with suitably designed wastewater treatment alternatives (e.g.; for runoff or combined sewage overflows) and water quality outcomes appropriate for natural resource and public health protection. From these findings, stakeholders identified two products as most useful to promote water quality protection: a quantitative tool to predict how future land use change will affect water quality (nutrients and pathogen indicators) and educational materials to raise awareness among local citizen groups, from eco-tourists to municipal officials. While full implementation of these products will take time, this workshop demonstrates that communication with stakeholders can be useful to guide application of scientific data.

Living Shoreline Demonstration Project – Analysis of Performance of Oyster Reef Concepts. *Josh Carter[1] and Arpit Agarwal[2];* [1]Coast & Harbor Engineering, a Division of Hatch Mott MacDonald, New Orleans LA and [2]Coast & Harbor Engineering, a Division of Hatch Mott MacDonald, Austin TX

This presentation discusses a project with the goal to establish a living shoreline that will help prevent erosion along the coastal fringe marsh of Bayou La Loutre in St. Bernard Parish, Louisiana by using the living shoreline products to attenuate the wave energy that reaches the shore. The secondary goal is to stimulate oyster growth and thereby increase the biodiversity in the immediate vicinity of the project site. To meet the project goals, living shoreline products are planned to be installed along the shoreline to reduce wave energy and stimulate oyster growth. The project is also intended to provide the Louisiana Coastal Protection and Restoration Authority (CPRA) experience and data on living shoreline products and their performance in order to design more effective living shoreline projects in the future.

To reduce marsh edge erosion, the marsh erosion tolerance to wave energy impacting the shoreline must be established to determine the conditions during which erosion will occur. Modeling and analysis was conducted to determine coastal processes at the site. An analysis of the geotechnical

properties of the soil along with wave climate and shoreline morphology was used to develop the marsh erosion tolerance for the site.

The living shoreline products must reduce wave energy transmitted past the designed structure to levels below the marsh erosion tolerance limit to successfully control shoreline erosion. However, known performance characteristics of available living shoreline products are generally limited due to the experimental nature of the products. Therefore, the ability of each product to reduce wave energy transmitted past the designed structure was evaluated along with the hydraulic loading on the structures using 2D-V and 3D computational fluid dynamics modeling tools.

This presentation will discuss results of the marsh erosion tolerance analysis and the wave energy reduction performance of different living shoreline (artificial oyster reef) products.

Effects of Upstream Disturbances on Sediment Yield Downstream Where Best Management Practices are Present. *Ilkim Cavus, Latif Kalin and Ferhat Kara;* Auburn University, School of Forestry and Wildlife Sciences

Although higher quality of water is usually provided by forested watersheds, intensive forestry practices are known to negatively affect water quality if best management practices (BMPs) such as streamside buffer zones and well-designed logging roads are not used. BMPs are designed and have been successfully used to protect water quality, aquatic ecosystem, and wildlife habitat from the silvicultural management practices near or adjacent to those water sources. However, any upstream urban and agricultural activities where BMPs are not present or are inadequate can negatively impact downstream water quality regardless of the presence of downstream BMPs. Two small adjacent watersheds located on the Marry Olive Thomas Demonstration Forest near Auburn, Alabama were previously monitored for streamflow and sediment yield in 2009 and 2010 to assess the effectiveness of streamside management zones (SMZ) in trapping sediment yield from a clearcut area. Due to the recent urban activities upstream of the study watersheds and poorly designed/implemented BMPs around these activities, excessive amount of sediment is carried to downstream locations. This study has been designed to monitor the impacts of those upstream disturbances on downstream stream health and morphology. Six sites were selected to monitor flow and sediment yield. Sediment data collection started in January 2014, and will continue until June 2015. In addition to sediment concentration measurements, cross-sections of the channels are also being surveyed after each significant storm event at several locations in order to assess the effects of the upstream activities on downstream channel morphology. Preliminary data shows significantly elevated sediment levels. Sediment concentrations are almost 2 orders of magnitude higher than the concentrations observed after the forest clearcut during the previous study. Further, significant changes are observed in channel morphology after every significant rain event (>1”). Preliminary results suggest that while SMZs and other forest BMPs are effective in sediment control, there is a need to assess watersheds in a holistic fashion in order to properly identify sources of problems and mitigate them more efficiently and economically.

Isolation and Characterization of Triclosan and Carbamazepine Degrading Bacteria from Coastal Alabama Environments. *Sinéad M. Ní Chadhain, Trenton Kaine O'Neal, Leah Hixon and Meaghan Russell;* University of South Alabama

Pharmaceuticals, plasticizers, steroids and trace organics, both natural and anthropogenic, are a growing concern in aquatic ecosystems. Collectively these compounds are referred to as "pharmaceuticals and personal care products" (PPCPs). Some PPCPs have been shown to have detrimental effects such as endocrine disruption. As such they pose risks to human populations when present in finished drinking water and to aquatic biota when released into the natural environment. Many PPCPs, including widely used cholesterol fighters, tranquilizers and anti-epileptic medications, resist modern drinking water and wastewater treatment processes. Indeed, there are currently no sewage treatment systems specifically engineered to remove PPCPs. Biodegradation by both aerobic and anaerobic bacteria represents one pathway for the removal of PPCPs from the environment. In order to better understand the fate of these compounds in aquatic environments we isolated bacteria capable of degrading either triclosan, a commonly used antimicrobial or carbamazepine, an anticonvulsant and mood-stabilizing drug frequently prescribed in the treatment of epilepsy and bipolar disorder. Enrichment cultures were established using sediments from the Weeks Bay National Estuarine Research Reserve or water collected at the Dauphin Island beach or on the University of South Alabama campus. The enrichments were incubated with either triclosan or carbamazepine as the sole source of carbon and energy and serially diluted onto agar plates in order to obtain pure cultures of PPCP degrading bacteria. Genomic DNA was purified from each isolate and the 16S rRNA gene amplified. Amplified ribosomal DNA restriction analysis (ARDRA) and ribosomal intergenic spacer analysis (RISA) of the culture collection was then performed to separate the bacteria into different operational taxonomic units (OTU). Thirty-one carbamazepine and twenty-four triclosan degrading bacterial isolates were obtained and grouped into OTUs. Representatives of each phylotype were then selected for 16S rRNA gene sequencing. Our results indicate that coastal Alabama environments host a wide diversity of pharmaceutical degrading microorganisms and suggest that these microorganisms may play an important role in the degradation of PPCPs in marine systems.

Implementing the SLEUTH Urban Growth Model to Predict Urbanization within the Big Creek Lake Watershed. *Walt Clark[1], Marlena Giattina[1], Rachael Isphording[2], Shikher Mishra[1] and James Pickett[1] (Presenter, Christopher Castillo[1]);* [1]University of South Alabama and [2]Embry Aeronautical University

The reconstruction of Highway 98 in Mobile, Alabama was expected to usher in new development within the watershed that feeds Big Creek Lake, Mobile County's primary source of drinking water. Concerns were raised about the affects construction and the successive urban growth of the area would have on the quality of water supplying an estimated 600,000 residents. In order to predict the magnitude of development within the watershed and how it could consequently impact the water processing expenditures, the urban growth model SLEUTH (slope, land use, exclusion, urban extent, transportation, hillshade) was implemented with input from remotely sensed data products derived from NASA Earth Observing Systems (EOS), primarily the Landsat and Aqua/Terra platforms. The final outputs, a series of maps estimating change in land use and urban extent, predicted that by 2050 approximately 30% of the study area will be urbanized. By constructing the new highway, an additional 2,000 acres were predicted to become urbanized. This information supports concerns of increased sedimentation, non-point source pollution, carbon amounts, and deforestation that are known to reduce drinking water quality and subsequently increase water treatment costs due to urbanization. Local officials utilized the future urban development outputs to advocate responsible and low-impact development within the watershed.

Reproductive Ecology of the Mississippi Diamond-Backed Terrapin (*Malaclemys terrapin pileata*). *Andrew Coleman and Jonathan L. Pitchford;* Institute for Marine Mammal Studies

Diamond-backed terrapins are obligate estuarine turtles that inhabit coastal salt marshes, bays, and mangrove forests. The species is an effective bioindicator of these critical ecosystems, but faces a number of anthropogenic threats throughout its range. For instance, the BP Deepwater Horizon (DWH) oil spill adversely affected terrapins in the northern Gulf of Mexico, but long-term studies are needed to identify which populations were impacted. This study was initiated in 2012 in central and western Mississippi salt marshes to monitor certain aspects of terrapin reproductive ecology. Depredated nest surveys were conducted from early May to early August to characterize the importance of potential nesting beaches to terrapin populations. Our results suggest that Bayou Caddy in Hancock County, MS, supports one of the largest terrapin populations in Mississippi. Additionally, in 2014, 12 nesting females from Bayou Caddy were captured, and a suite of morphological measurements and radiographs were collected. Clutch sizes were assessed, and radio transmitters were attached to a subset of females to investigate their habitat use. These data will be critical in evaluating potential long-term influences from the DWH oil spill as well as future restoration activity, such as the large-scale living shoreline project slated for Bayou Caddy.

Net Ecosystem Metabolism Trends in the Mobile Bay Delta. *Renee Collini[1], Michael Dardeau[1] and Behzad Mortazavi[2,1];* [1]Dauphin Island Sea Lab and [2]University of Alabama

Gross primary production (GPP), ecosystem respiration (ER), and net ecosystem metabolism (NEM) provide ecosystem status, characterization, and quantify subtle changes in ecosystem metabolism temporally and spatially. Estimates of these parameters can be calculated from high-frequency oxygen sampling combined with additional hydrographic and meteorological data. Along coastal Alabama, seven real-time monitoring stations sample hydrographic and meteorological parameters at half-hourly intervals. Analyses of GPP, ER, and NEM were performed based on changes in half hour samples of dissolved oxygen, adjusted using calculated air-sea exchange rates, over nine years at one station in Mobile Bay located at the southern end of the Mobile-Tensaw River Delta. GPP, ER, and NEM were analyzed on daily, monthly, seasonal, and annual scales and against a variety of parameters sampled concurrently. Results were also compared to studies conducted in adjacent estuaries (Weeks Bay and Grand Bay). Daily NEM values oscillated seasonally, displaying slight autotrophy in the winters and strong heterotrophy in the summers. Monthly climatological means of GPP, ER, and NEM ranged from 45 mmol O_2 m^{-2} d^{-1} to 115 mmol O_2 m^{-2} d^{-1}, -80 mmol O_2 m^{-2} d^{-1} to -297 mmol O_2 m^{-2} d^{-1}, and -30 mmol O_2 m^{-2} d^{-1} to -185 mmol O_2 m^{-2} d^{-1} respectively. Annual averages of NEM indicated a trend of increasing heterotrophy through time, which when broken down seasonally appeared to be driven by increasing heterotrophy in both winter and summer. Further analysis was conducted to determine factors potentially driving changes in metabolism. If the increased heterotrophy displayed over this relatively short time-series continues it could indicate functional shifts in Mobile Bay's response to stressors such as anthropogenic influences in the watershed, climate change, or natural oscillations. Determining NEM for multiple areas of Mobile Bay will assist managers in better understanding the ecosystem functions and services of the estuary, changes that might be occurring, and track restoration and management efforts. Further analysis covering the same time period will be conducted at two other stations in the bay to increase the spatial resolution of this study.

Water Quality in Mobile Bay Tributaries: Conditions, Causes, and Corrections. *Marlon Cook;* Geological Survey of Alabama

Parts of Baldwin and Mobile Counties are undergoing widespread transitions in land use from forest and agriculture to commercial and residential. The region also experiences severe climatic impacts ranging from periodic drought to high intensity rainfall and flooding. Land-use change can have tremendous deleterious impacts on water quality and biological habitat of streams. This is true in a number of Mobile Bay tributaries, where complex geology has influenced topography, highly erodible soils, and surface-water runoff that are profoundly impacted by disturbances related to residential and commercial development.

Is There a Relationship Between In-Stream Total Suspended Solids and Turbidity in a Marine-Dominated Estuary? *Kimberly Cressman[1], Brenna Ehmen[1] and Mark Woodrey[1,2];* [1]Grand Bay National Estuarine Research Reserve and [2]Mississippi State University, Coastal Research and Extension Center

Knowledge of sediment dynamics is critical to understanding the resiliency of tidal marshes to predicted future sea level rise. For many of the current models for evaluating marsh response to increasing inundation, some measure of total suspended solids (TSS) is a key parameter. However, in most tidal marsh ecosystems, we lack these data and thus are limited in our ability to predict future marsh response to increasing sea level. Some researchers have suggested that turbidity, a parameter commonly collected in many abiotic monitoring programs, could serve as a surrogate for estimating TSS concentrations in water bodies. While both of these parameters are useful indicators of water clarity, and often used for regulatory purposes, turbidity readings are much easier to obtain than TSS data. However, sediment characteristics such as particle size and shape affect light scatter, which is the basis of turbidity readings; so relationships between turbidity and TSS may be highly site-specific and potentially season-specific within a site. Data loggers deployed at four sites in the Grand Bay National Estuarine Research Reserve measure turbidity, along with a variety of other water quality parameters, every 15 minutes as part of the National Estuarine Research Reserves' System-Wide Monitoring Program. For an 18-month period, we added TSS to our routine monthly nutrient sampling to see if, in this marine-dominated system, there is a significant relationship between TSS and turbidity. We found a significant positive correlation ($p<0.001$) across the Reserve, although the r^2 value was low (0.25). When analyzed by site, this relationship is strongest at the more marine sites of Point aux Chenes Bay ($p = 0.008$, $r^2 = 0.386$) and Bangs Lake ($p = 0.003$, $r^2 = 0.423$), and weak to non-significant at the more runoff-influenced sites of Bayou Cumbest ($p = 0.033$, $r^2 = 0.220$) and Bayou Heron ($p = 0.060$, $r^2 = 0.176$). We will also investigate whether there are relationships between our other routinely measured indicators of water clarity, Secchi depth and chlorophyll a, and TSS/turbidity; as well as effects of wind events and rainfall on all of these parameters. Our preliminary analysis of these data provide insights into the spatial variability of TSS, which will improve our ability to model how the Grand Bay marshes may respond in the face of increasing sea levels as well as allow us to better understand how suspended solids fit into the overall water quality of the Reserve.

Seagrass-Associated Mollusk Assemblages along a Nutrient Gradient in in the Big Bend Region of Florida, Gulf of Mexico. *Katherine Cummings[1], Savanna Barry[2], Thomas Frazer[3] and Michal Kowalewski[1];* [1]Florida Museum of Natural History, University of Florida, [2]Fisheries Department, University of Florida, [3]School of Natural Resources and the Environment, University of Florida

Using the paleontological records for modern management decisions is an increasingly popular strategy for aiding conservation efforts. Understanding how and when organisms and ecosystems changed in response to past environmental changes can help in predicting how they will respond to future changes. In this study, we aim to assess how seagrass beds have changed through time. Because seagrasses do not fossilize well, it is difficult to examine their long-term responses to past environmental changes and develop informed forecasting models for how they might respond to future global and regional environmental change. Herein, we describe preliminary results for developing a proxy for seagrass being affected by different environmental conditions using a mollusk death assemblage unique to seagrass beds along the Florida Gulf Coast. Sediment samples were collected from a series of sites along the central Gulf Coast of peninsular Florida that have been monitored for water quality for 15 years and, more recently, for seagrass health parameters. Sites were chosen to capture a steep environmental gradient in nutrient concentrations, phosphorus in particular, with N:P ratios decreasing markedly in the northward direction. All sites are vulnerable to degradation caused by the human-mediated influx of nutrients into adjacent watersheds, but sites in the south are more likely affected by excess P and those in the north by excess N. Modern mollusks, echinoderms, and other organisms were separated by species and all identifiable unique specimens were counted. A preliminary multivariate analysis (a non-metric multidimensional scaling using Bray-Curtis distances) indicates that samples from five sampled river systems (1) separate into clearly delineated groups with distinct faunal compositions and (2) align in the ordination space from north to south tracking the change in nutrient ratios along the study sites. Over 60 species of mollusks have been found in the samples, with the three most common species being *Transenella stimpsoni*, Cerithium spp., and *Lucinisca nassula* (the woven lucine). Our long term goal is to evaluate the utility of mollusk assemblages as a proxy for seagrass beds in the Big Bend region of the Gulf of Mexico to assess how seagrass beds have responded to historical environmental conditions. By documenting the long-term dynamics of seagrass ecosystems, we hope to improve our understanding of how they may respond to future climate, environmental, and anthropogenic changes and, thus, help managers develop efficient conservation plans for seagrass ecosystems.

Analysis of Manatee Periotic Bone Microchemistry as a Tool to Retrospectively Track Manatee Migrations in the Northern Gulf of Mexico. *Kayla P. DaCosta[2,1], Justin Lewis[2,1], Ruth H. Carmichael[1,2], William F. Patterson[2,1];* [1]Dauphin Island Sea Lab and [2]University of South Alabama

Understanding migrations and habitat use of the West Indian manatee in the northern Gulf of Mexico (nGOM) is critical for determining their conservation needs. Satellite tags have been deployed on manatees to monitor movement patterns and habitat utilization, but these samples are limited in time, number and duration. Furthermore, estimates of lifetime migration are limited to sightings of known manatees throughout their range. Chemical analysis of hardparts (i.e., statoliths, shells, otoliths, and bone) of marine taxa ranging from molluscs to mammals has enabled inference about migration pathways, population connectivity, and habitat utilization. A similar approach has the potential to aid in determining manatee migrations retrospectively via analysis of chemical constituents in their periotic bone. For example, strontium and barium concentrations vary with salinity, making them useful for determining transitions between marine and freshwater, while magnesium concentrations in hardparts has been used to reconstruct environmental temperature. Manatee periotic bones display

annual growth layers, similar to those found on fish otoliths or mollusc shells, thus chemical analysis of transects across these structures may reveal age-specific migration pathways. To examine this potential, manatee periotic bones were collected from necropsied animals along the nGOM from Mississippi to the western Florida Panhandle. A laser ablation-inductively coupled plasma-mass spectrometer (LA-ICP-MS) was used to analyze the growth layers of the periotic bones to determine if variations in chemical signatures occurred among growth layers. Preliminary analysis of Sr:Ca ratios across these structures indicate they may useful as an indicator of saltwater versus freshwater residency, hence a tool to trace migration pathways. Use of this technique has the possibility of increasing our understanding of manatee habitat use in the nGOM and has the potential to be coupled with stable isotope ratios to determine diet throughout migrations. Results to date will be presented along with future directions of this promising research.

Density and Diet of Invasive Red Lionfish on North Central Gulf of Mexico Natural and Artificial Reefs. *Kristen A. Dahl[1,2] and Will Patterson[1,2];* [1]University of South Alabama and [2]Dauphin Island Sea Lab

Indo-Pacific lionfish (*Pterois volitans*/miles complex) were introduced in the western Atlantic Ocean off southeastern Florida in the 1980s. Since then, they have become the most success marine invasive fish species on the planet, with lionfish populations expanding throughout the US South Atlantic Bight and the Caribbean Sea. Lionfish were first observed in the northern Gulf of Mexico in summer 2010, which is when we began seeing them during remotely operated vehicle sampling of natural (n = 16) and artificial (n = 22) reef sites located across the shelf between longitudes 86W and 88.25W. Sampling reported here occurred at these reefs between summer 2010 and winter 2014. Over this time period, lionfish density increased exponentially at both natural and artificial reefs, and by fall 2013, mean lionfish density at artificial reefs (14.7 fish per 100 m^2) was among the highest reported in the western Atlantic. Lionfish were sampled with spears to obtain biological samples to assess diet, trophic position, and growth. Their diet was significantly different among habitats, seasons, and size classes. Smaller (<200 mm TL) fish consumed more benthic invertebrates, while larger fish became more piscivorous. However, invertebrates tended to contribute a greater proportion of the diet of lionfish sampled from artificial reefs, and their fish prey tended to be non-reef associated species. Overall, diet results indicate lionfish are generalist mesopredators in the nGOM that become more piscivorous at larger size. However, lionfish diet was much more varied at artificial reef sites where they clearly were foraging on open substrates away from reef structure. These results have important implications for tracking the lionfish invasion in the nGOM, as well as estimating potential direct and indirect impacts on native reef fish communities in this region. Lastly, ongoing DNA barcoding analysis of unidentifiable prey found in lionfish stomach samples should add greater resolution to diet estimates and further elucidate lionfish trophic ecology in the northern Gulf of Mexico.

Regulating Oyster Aquaculture in the Gulf of Mexico and Beyond. *Melissa Daigle[1] and Niki Pace[2];* [1]Louisiana Sea Grant Law & Policy Program and [2]Mississippi-Alabama Sea Grant Legal Program

Oyster reefs provide a number of ecosystem services, including supporting fish populations, denitrification, water filtration, and shoreline protection. Many of these benefits are also provided by alternative oyster aquaculture facilities, which are gaining popularity in areas along the Gulf coast. In Louisiana, a regulatory system has been developed that allows for alternative oyster culture in areas that have been mapped for suitability for such projects. In Alabama, newly developed rules provide

for the granting of easements specifically for shellfish aquaculture, greatly reducing the initial waterbottom leasing fees. The Louisiana Sea Grant Law & Policy Program and the Mississippi-Alabama Sea Grant Legal Program have examined the legal issues related to oyster aquaculture through a two-year research project, specifically those issues related to leasing state-owned submerged lands for aquaculture projects and the availability of new fee structures. This presentation will provide a short summary of submerged lands leasing for oyster aquaculture across the Gulf States and will cover several case studies exploring oyster aquaculture regulation in different contexts, including an update on Alabama's new fee structure. Other case studies include efforts in the Chesapeake Bay area to use oyster reef restoration as a way to meet nitrogen TMDL (Total Maximum Daily Load) standards; once a value can be placed on the removal of nitrogen, a potential market can be built around that service, leading to the potential for additional funding for oyster restoration.

Communicating Science: Sharing GoMRI Research. *N. M. Dannreuther, Stephanie C. Ellis, and Jarryl B. Ritchie;* Northern Gulf Institute, Mississippi State University

A common challenge facing many large and small research programs is communicating the results of their scientific activities. The default outlet used by the science community for this information is peer-reviewed journals. The road less traveled is the translation of this science into language for a broader audience and the sharing that information with the program's target audiences.

The Northern Gulf Institute as part of the Gulf of Mexico Research Initiative (GoMRI) Administrative Unit leads the program's effort to develop stories and highlights that translate the scientific finding to the needs of a broader audience. The program's website uses this content to highlight activities and share discoveries with those who visit and is also shared through a variety of social media channels. Additionally, the team is leveraging relationships with other programs funding similar science (NSF and others) to share articles about co-funded research activities through the partner agency's channels.

The team develops and shares over sixty stories a year. Following established NSF and NAS guidelines for the discussion of in-progress science and published science, the team manages the processes used to identify, manage, develop, review, approve, and disseminate the information. Lessons learned and approaches for leveraging and extending the use of the developed content are important components to the team's activities.

The GoMRI is a 10-year independent research program established to study the effect, and the potential associated impact, of hydrocarbon releases on the environment and public health, as well as to develop improved spill mitigation, oil detection, characterization and remediation technologies. An independent and academic 20-member Research Board makes the funding and research direction decisions to ensure the intellectual quality, effectiveness and academic independence of the GoMRI research. All research data, findings and publications will be made publicly available. The program was established through a $500 million financial commitment from BP.

The system developed and the approaches taken can provide a framework for others seeking to establish a similar program to share the results of their research beyond the standard channels and broaden the potential impacts of their program.

A Primer on Coastal Engineering for "Living Shorelines". *Scott Douglass[1,2], Bret M. Webb[2] and Kari Servold [2];* [1]University of South Alabama and [2]South Coast Engineers

Living shorelines are being developed throughout coastal Alabama-Mississippi and the nation with the general goal of developing alternatives to bulkheads on bay shorelines which better preserve and create habitat value. Many of these projects use some form of breakwater or other coastal reef-like structure of some type. Most of the recent evolution in this field has been through significant and valuable contributions from the applied coastal ecology and management fields. Successful living shoreline projects typically include input from at least three areas of expertise: coastal ecology, coastal physical processes (waves, tides, and sediments), and coastal engineering (structures and nourishment). This presentation will summarize knowledge and concepts from the field of coastal engineering that can be used in the planning and design of "living shorelines" and related alternatives to bulkheads and revetments. This includes tools for estimating wave energy at a specific location, determining whether or not a breakwater or other structure is needed for wave energy reduction, principles of sediment additions, tools for estimating wave energy reduction through breakwaters and other structures, the potential for sediment trapping by breakwaters, and wave setup and circulation induced by new structures. Projects built in coastal Alabama, including some new projects, will be highlighted.

The Ecological Impact and Pedal Ultrastructure of *Rangia cuneata* in Johnson Bayou, MS. *Brandon Drescher and Jennifer Walker;* University of Southern Mississippi, Department of Biological Sciences

Rangia cuneata, the wedge clam, is an estuarine infaunal siphonate bivalve capable of burrowing until only the siphon (~1.5 cm in length) is exposed. Johnson Bayou, an understudied system in Pass Christian, MS is a site in which *R. cuneata* is the most common burrowing bivalve. Within Johnson Bayou, canals constructed in the 1950's to facilitate development, are often bulkheaded to prevent erosion of personal property. These structures have altered the ecology of the system by removing the tidal flats, and as a result greater mixing and shear velocity occurs at these locations. Few clams have been found near bulkheads in this system. In addition, submerged vegetation is also rare near bulkheads. Presumably, larvae are unable to settle as well as they would on tidal flats protected by grasses and less turbulent mixing. Sediment type also appears to influence population distribution. Sand, silt, and clay are the three main sediment types that exist throughout the system, but *R. cuneata* is not common in all types. Silt appears to be the more desirable substrate (up to 37 clams m-2) while few clams are found in sand or clay. Burrowing effectively turns over the top benthos layer by pushing nutrients onto the surface or resuspending them in the water column. The nutrients may then be used by micro- and meiofauna and subsequently recycled through the trophic levels. This sediment and nutrient turnover can facilitate formation of algal mats and bacterial films among bivalve beds. In addition, suitable habitats for polychaetes and other infaunal or epifaunal invertebrates are formed. Vegetation also affects the burrowing patterns and distribution of *R. cuneata*. Emergent grasses (e.g., *Spartina cynosuroides*) and their root systems can prevent burrowing. Cover by perennial submerged grasses (e.g., *Ruppia maritima*) forces the clams out of the sediment, likely as a result of hypoxic conditions. Field research aims to link population densities and localities of this clam in Johnson Bayou to histological examinations of the foot. Preliminary evidence indicates that muscle fibers are oriented in multiple arrangements, presumably giving the foot its flexibility for probing and burrowing into the sediment. Histological observations reveal that the structure of the epithelium differs on either side (i.e., distal versus proximal; and anterior versus posterior). In addition, polysaccharide-rich granules are abundant along the epithelium. Continuing research will analyze the pedal neural ganglion and cytoskeletal framework of the pedal musculature. In the field, future work will focus on

nutrient and trace metal analyses from the water column and the sediment and will include samples from areas where clams are present and where they are absent. These data should provide information on why clams are located in specific areas, and address questions regarding the ecology and health of the system.

Dynamic Habitat Use of Young Bull Sharks (*Carcharhinus leucas*) in a Northern Gulf of Mexico Estuary. *J. Marcus Drymon[1], Matthew J. Ajemian[2] and Sean P. Powers[1];* [1]University of South Alabama and [2]Texas A&M Corpus Christi

Understanding how animals alter habitat use in response to changing abiotic conditions is important for effective conservation management. For bull sharks (*Carcharhinus leucas*), habitat use has been widely examined in the eastern and western Gulf of Mexico; however, knowledge of their movements and the factors influencing them is lacking for populations in the more temperate north-central Gulf of Mexico. To examine how changes in hydrographic conditions affected the presence of young bull sharks in Mobile Bay, Alabama, thirty five sharks were fitted with internal acoustic transmitters and monitored through an acoustic telemetry array consisting of thirty four receivers between June 2009 and December 2010. Tagged sharks ranged in size from 60 to 114 cm fork length and were detected between the upper and lower portions of Mobile Bay. Our findings suggest a combination of hydrographic factors interact to influence the distribution of young bull sharks in Mobile Bay. The factors affecting the probability of detecting at least one bull shark varied both temporally (2009 vs 2010) and spatially (upper vs lower bay). Electivity analysis demonstrated that bull sharks showed highest affinity for warm water (29-32 °C), moderate salinities (10-11 psu) and normoxic waters (5-7 mg/l), although these patterns were not consistent between regions or across years. We suggest future studies coupling telemetry and hydrographic variables should, when possible, consider the interactions of multiple environmental parameters when defining the dynamic variables explaining the spatial distribution of the bull shark.

Site Suitability Modeling for Mobile Bay, AL: A GIS & Remote Sensing Based Approach *Saranee Dutta[1], Stephen Jones[2], Mark Woodrey,[3,4] Chris Boyd[5] and Scott Rush[1];* [1]Mississippi State University, [2]Geological Survey of Alabama, [3]Mississippi State University Coastal Research & Extension Center, [4]Grand Bay National Estuarine Research Reserve, [5]Troy University

Coastal wetlands play a significant role in buffering land from storm impacts and serve as essential habitat. Shoreline recession can be accelerated by human activity such as dredging, boating wakes, and shoreline armoring. Efforts to reduce the loss of these wetlands are frequently undertaken and natural shoreline protection techniques referred to as soft and hybrid structures (living shorelines), are encouraged over the use of hard structure. However, through this process, it is important to understand that not all coastal landscapes are suitable for living shoreline installation. Thus understanding the site-specific conditions are critical for an effective design, based on surrounding ecology, geomorphology and other near shore hydrodynamic process. This research will focus on to identify the most suitable type of erosion control structure based on the site-specific criteria. The objective is to create a living shoreline site suitability model by using Geospatial technology (GIS & Remote Sensing) for Mobile Bay and connected inlets. Deliverables will include a descriptive map of areas where living shorelines would be the preferable erosion control option over hard structures. This research will help extension specialists advise various stakeholders on the best ways to protect, preserve, and use their land resources. Conservation and restoration practitioners will also be able to use this information for habitat restoration.

Evolution and Fate of a Mobile Bay Discharge Plume. *Brian Dzwonkowski[1], Kyeong Park[2] and Stephan Howden[3];* [1]University of South Alabama, [2]Texas A&M University at Galveston and [3]University of Southern Mississippi

Coastal regions of Alabama and Mississippi are significantly impacted by discharge from Mobile Bay as this is a major source of suspended sediment, nutrients, and buoyancy; all of which effect water quality. Consequently, the transport and fate of materials associate with Mobile Bay discharge plumes have significant consequences on the local marine ecosystems. As such, the goal of this study is to provide a detailed description of the structure and fate of a Mobile Bay plume event using a multi-sensor approach. During March 2011, a major flood event (peak discharge exceed 6000 m3 s-1) was observed with in-situ water column velocity data from multiple mooring locations, surface velocity data from a regional high frequency (hf) radar system, and a CTD survey during the peak discharge period. These measurements were supplemented with a series of high resolution ocean color satellite images (i.e., MERIS and MODIS images) as this period had unusual clear atmospheric conditions. The plume event lasted approximately 2 weeks, during which the surface advected plume was exposed to a range of wind conditions which strongly modulated the surface structure: downwelling winds narrowed and elongated the plume structure and upwelling winds reversed and widened the plume. At the plumes peak size, it extended well beyond the 30 m isobath, reaching approximately 50-60 km offshore. Mapping the transport pathways of Mobile Bay plumes during a range of environmental conditions provides improved insight on the temporal and spatial variability of key parameters that contributing to regional water quality.

Swim Guide in Coastal Alabama. *Renée Edwards and Laura Byrne (Erin Rockwell, Presentor);* Mobile Baykeeper

Hundreds of thousands of Americans suffer from negative health impacts after swimming in polluted waters every year. Lack of understanding and access to local water quality data are at the root of many of these alarming encounters. To address this issue in our own community, Mobile Baykeeper decided to incorporate Alabama's beaches to the Swim Guide app — an app for iPhone®, iPad®, iPod touch®, and Android (2.1) or higher that provides the public with easily accessible information regarding water quality and swimming locations. The Swim Guide is an effective model to follow, because it connects the general public to hard scientific data.

Mobile Baykeeper, a member of the Waterkeeper Alliance, became a Swim Guide affiliate in 2012 and began tracking, compiling water quality information from Alabama Department of Environmental Management (ADEM) and Alabama Department of Public Health (ADPH). These agencies, as part of the Coastal Alabama Beach Monitoring Program, collect water samples from high-use or potentially high-risk public recreational sites and analyze them for the indicator bacteria enterococci with an EPA established threshold. Mobile Baykeeper regularly updates the water quality status for the Alabama beaches based on the most recent data from state agencies to make the information easier for the public to understand and access. In order to assess viewing trends and evaluate the success of Mobile Baykeeper's outreach methods, we looked at viewing numbers for 22 beaches in Mobile and Baldwin Counties.

As expected, from May 2012- August 2014, a majority (48%) of Swim Guide users viewed the app via Apple devices. Surprisingly, however, 34% of people viewed Swim Guide from the web versus smart phones. It was also predicted that viewing of the app would increase during swimming seasons

(defined as June 1-Sep. 30 by ADEM). Viewing did decrease during the non-swimming season in 2012 and 2013 by 65.7% and 31.6% respectively.

It was anticipated that viewing would increase in areas possessing a history of worrisome water quality and Mobile Baykeeper's public endorsement of the app. First, out of the beaches with the three highest closure percentages from April 2012-August 2014 (Mary Ann Nelson Beach, Mobile Bay; Volanta Avenue; Fairhope Municipal Park), Mary Ann Nelson Beach and Fairhope Municipal Park had the highest total views in that same time period. Next, Mobile Baykeeper heavily endorsed Swim Guide during our large annual fundraiser and total views increased dramatically in the weeks following the event compared to the week of the event.

Overall, Swim Guide has made Coastal Alabama water quality information more accessible and easier to understand through Swim Guide. The viewing trends indicate varied methods of access, heightened interest in water quality status during the swimming season and in areas with water quality issues, and increased viewing in response to public endorsement. Swim Guide is ever-changing as we continue to add more beaches and additional features to the app.

Communicating Oil Spill Science: A Social Network Analysis of the Gulf of Mexico Resilience Initiative. *Chris Ellis[1], Stephen Sempier[2] and LaDon Swann[2];* [1]NOAA, National Ocean Service and [2]Mississippi-Alabama Sea Grant Consortium

Social network analysis (SNA) is a tool for measuring and visualizing relationships and communication. Commonly, by means of survey data, it maps the connections among individuals to show how information flows, and illustrates which actors within a communication network are most essential for connectivity and information flow. A graphic representation of these social links (sociogram) reveals important attributes of the network, such as the leaders and connectors, cliques or subgroups of communication, those who may be on the periphery of the communication network, or isolated and disconnected from the network. This analytic tool was used by a new oil spill outreach program that is being implemented by the four Gulf of Mexico Sea Grant programs through the support of the Gulf of Mexico Research Initiative (GoMRI). The SNA was used to understand the extent of communication across states, within specific areas of expertise and between agencies and organizations. This SNA was conducted in the spring of 2014 through a partnership between the Mississippi-Alabama Sea Grant Consortium and the NOAA Coastal Services Center. Study findings are being used to help the GoMRI-supported Sea Grant oil spill outreach team understand how oil spill science is being shared and assist in developing a strategy to improve approaches to sharing oil spill science. Findings will also be used in the future to evaluate the effectiveness of the outreach program.

Assessing the State of Gulf Coast Habitats in the Gulf Coastal Plains and Ozarks LCC. *Kristine O. Evans[1], John Tirpak[2], Todd Jones-Farrand[3,4] and Yvonne Allen[4];* [1]Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative/Mississippi State University, [2]Gulf Restoration/U.S. Fish and Wildlife Service, [3]Central Hardwoods Joint Venture and [4]U.S. Fish and Wildlife Service

The Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative (GCPO LCC) is a consortium of agencies and institutions with a collective mission to define a shared vision for sustainable natural and cultural resources in the face of a changing climate and other threats; design strategies to achieve that vision; and deliver results on the ground through leadership, partnerships, contributed resources, evaluation and refinement over time. The GCPO LCC covers 180 million acres

and intersects 12 southeastern states, including coastal portions of Mississippi, Alabama, the western Florida panhandle, and eastern Louisiana. Implementing strategic conservation across such a broad landscape has prompted the LCC to prioritize science needs to enhance ecological integrity within an initial set of priority ecosystems. Estuarine tidal marsh and beach/ dune habitats along the coastal GCPO LCC geography have been identified as two of the nine priority habitat systems on which to focus conservation design and delivery. However, strategic design and delivery of effective conservation is predicated on the assumption that desired ecological states for these systems are well-defined and characterized. In response to this need, the GCPO LCC chartered an Adaptation Science Management Team (ASMT) comprised of both research and management expertise from across the diversity of partners in the GCPO. The ASMT drafted an Integrated Science Agenda that outlines species-habitat relationship hypotheses defining desired ecological states within each of the priority aquatic and terrestrial ecosystems. Along the Gulf Coast, the ASMT defined the desired state of estuarine tidal marsh to consist of large blocks (>250 acres) of stable marsh systems containing ample native cover, adequate submerged vegetation, with limited open water and hydrology resembling a natural system. The ASMT also described a desired ecological state for Gulf coast beach/dune habitats as stable systems with wide intact beaches, limited human disturbance, and intermediate cover and adequate dune height and slope on primary, secondary and tertiary dunes. In 2014 the GCPO LCC commenced an effort to assess the state of each Gulf Coast priority system using the best available landscape-scale geospatial data to clearly define the amount, configuration, composition, and structure of estuarine tidal marsh and beach/dune habitats relative to the desired ecological for each system. This includes assessment and summary of existing comprehensive datasets like the Coastal Change Analysis Program and/or National Wetlands Inventory data, and also includes identification of key data gaps that could be addressed with future data development. The assessments of desired ecological states within each system will culminate in the first installment of the "State of the GCPO" report, which summarizes current system character relative to the desired ecological state of the system. The final outcome will be a data-driven product that will provide clear linkages among habitats and species in Gulf Coast priority system, identify and prioritize LCC data development needs, and lay the necessary groundwork for strategic conservation design in the Gulf Coast portion of the LCC.

Developing an Individual-Based Model for Assessment and Management of Restored Oyster Reefs. *Virginia Fleer and Chet Rakocinski;* University of Southern Mississippi, Gulf Coast Research Lab

Over recent years, natural and anthropogenic changes due to altered hydrology, hurricanes, variable precipitation, and the BP oil spill have taken their toll on existing oyster reefs in Mississippi. In response, considerable oyster reef restoration efforts have ensued within this region. Oyster reef restoration purports the overall goal of enhancing the production of commercially and recreationally important oysters and fishes, but assessments of restoration success are typically lacking. This poster presentation documents the first steps of a dissertation project intended to develop an individual-based model framework tailored to this region for assisting resource managers to identify suitable areas for oyster reef restoration along the Mississippi Gulf coast. A pilot study was conducted to make an initial geographically extensive assessment of ten artificial reefs along the Mississippi coast. Historic reef sites as well as limestone/concrete and oyster shell artificial reef sites were selected to represent various depths, water flow conditions, and distances from shore. Substrate condition at reef sites was characterized on a scale of one to five, with one being mud and five representing hard reef substrate. GIS maps were created to depict the coverage and type of substrate at each reef.

Sampling trays were deployed at half of these reefs to document species occurrences and obtain specimens of key members of the trophic web for interaction experiments used for parameterization of the model. Preliminary small-scale mesocosm experiments: (1) quantified predator/prey interactions among mud crabs, various stages of oysters, oyster drills, and toadfish, (2) determined what stages of oysters are most vulnerable to each type of predator, and (3) examined direct and indirect trophic effects on oysters and their predators. Information gleaned from this pilot study will be instrumental to the overall project goal to create a user-friendly model framework for identifying suitable areas for oyster reef restoration. The model will be calibrated using data from mesocosm experiments and tested using field data to ensure it is performing accurately. Model output will facilitate selection of the most promising locations for allocating efforts and funding for oyster reef restoration.

Investigating Potential Domoic Acid Exposure in West Indian Manatees Stranded in Coastal Alabama. *Jessica J. Frank[1], Alison Robertson[1] and Ruth Carmichael [2,1];* [1]University of South Alabama and [2]Dauphin Island Sea Lab

Domoic acid (DA) is a marine neurotoxin that can be produced by diatoms of the genus Pseudo-nitzschia, which are known to bloom in coastal regions of the northern Gulf of Mexico (nGOM). DA exposure can be characterized by gastric distress, permanent or transient memory loss and confusion, seizures, atrophy of brain tissue, and even death. Despite the potential threat of DA exposure to migratory marine animals in the nGOM, such as the endangered West Indian manatee, there has been no documented investigation into possible DA exposure by manatees. To determine if stranded manatees from the nGOM were exposed to DA, samples collected from stranded and captured manatees by the Alabama Marine Mammal Stranding Network from 2008 to 2014 were chemically extracted and analyzed for the presence of DA. To determine possible routes of DA exposure in manatees, sediment, water, and submerged aquatic vegetation (SAV) were collected monthly during Spring and Summer, from three sites where manatees have been known to visit. These included Rabbit Creek (a tributary of Dog River), along the Mobile Bay causeway, and in the intercoastal waterway at Orange Beach, Alabama. The top 15 cm (150 ml) of sediment was collected using a syringe corer. SAV was collected by hand and identified to species. Surface water samples were collected in 1 L bottles. Prior to storage, 100 ml of the water sample was preserved with Lugol's solution to preserve diatom species for later identification, and the remaining 900 ml were prefiltered through 1.2 µm Whatman filters for assessment of particulate DA. To isolate potential DA from the sample matrices, each sample was extracted in 50% aqueous methanol at a ratio 4ml/g, homogenized on ice using a saw-tooth probe homogenizer, and centrifuged to remove particulate matter. Water samples were sonicated using a probe sonicator (50Hz; 20% amplitude) to disrupt any cells in the sample. The supernatant of all extracts were filtered (0.22µM, PTFE) and analyzed for the presence of domoic acid using liquid chromatography, tandem mass spectrometry. These data will provide a domoic acid exposure assessment for manatees and their surrounding environment when in Alabama coastal waters for conservation and management of this important and charismatic species.

Community Hazard Recovery: Achieving Financial Resiliency. *Carol Franze[1,2], J. Mathew Fannin[2], Jody Thompson[3] and Don Ator[2];* [1]Louisiana Sea Grant College Program, [2]LSU AgCenter, and [3]Mississippi-Alabama Sea Grant Consortium

Many local governments are financially unprepared for the costs associated with a natural disaster. A research and outreach program was developed, in 2009, to help communities identify optimal policies to achieve financial solvency during disaster recovery. This decision making tool was originally

applied to help local governments along the Gulf coast to prepare for the financial burden of cleanup, recovery, and reconstruction costs from future tropical storm events. The pilot program was conducted with the Tangipahoa Parish, Louisiana government utilizing a participatory research methodology to analyze and estimate the optimal level of financial reserves needed to address recovery costs associated with debris removal after Hurricanes Katrina, Rita and Gustav. In 2010, the Calcasieu Parish, Louisiana Police Jury participated in the program, followed in 2013 by the City of Foley, Alabama.

The program has evolved into a training opportunity for a range of governmental entities (municipalities, parishes/counties, and school districts) to facilitate policy development locally, as well as regionally. In 2013, two webinars were developed and financed for national distribution through the National Association of Development Organizations (NADO), the U.S. Department of Housing and Urban Development (HUD), the Rural Policy Research Institute (RUPRI), the National Institutes of Food and Agriculture (NIFA), and MS-AL and LA Sea Grant programs. A series of Train the Trainer workshops was developed, in 2014, to introduce the program to finance and emergency preparedness officials, and others in local government, and extension agents coast-wide. Two of the workshops have been conducted. The first was in Orange Beach, Alabama (April 9th) in conjunction with the Climate Community of Practice Workshop, and the second was conducted in Lake Charles, Louisiana (May 13th). The success of the program has inspired collaboration by the Louisiana Governor's Office of Homeland Security and Emergency Preparedness.

Throughout the implementation of this program successes and failures have been realized. One of the successes is the flexibility of the program to serve a wide variety of audiences and stakeholders. From our experiences as facilitators for three governmental bodies, we have developed the strategies to share experiences during our facilitator trainings and eliminate or adapt any areas that were not as successful. A detailed summary of our experiences and strategies during workshops and trainings will be presented. A description of the future program direction and expectations will also be outlined.

Community Structure and Secondary Production of Benthic Biota Associated with Artificial Reefs with Differences between Oyster Shell and Rubble Substrata and between High and Low Profile Reef Structures in the Mississippi Sound. *Patrick D. Gillam and Chet F. Rakocinski;* Gulf Coast Research Lab

In recent years, the Mississippi (MS) Department of Marine Resources (DMR) has created and maintained 67 nearshore reefs across the MS coast. These nearshore reefs model two basic reef architecture types (high profile breakwater and low profile submerged structures) and include various substrate types such as oyster shell, cement rubble, and limestone rubble. In addition to providing shoreline protection, the primary rationale for constructing artificial reefs is to enhance biological production and fishing opportunities by providing more hard substrate within the predominantly mud bottomed topography of the MS Sound. However, the success of these different substrates and profiles to serve as a trophic base to support artificial reefs is poorly known, particularly the ability to promote secondary production and diversity of associated benthic organisms.

In this presentation we will compare the benthic biota associated with oyster shell and cement rubble substrates among four artificial reefs representing both high and low profile reef structures within the eastern and western portions of the Mississippi coast in the late summer/early fall of 2011. Four pairs of substrate baskets containing oyster shell or cement rubble were deployed at each reef for six weeks and subsequently processed to recover the colonized benthic biota. Several functional and community

structure metrics characterized the benthic fauna including estimates of production potential and biomass, community turnover rate (i.e., Production:Biomass (P:B) ratio), community turnover time, and normalized biomass size spectra (NBSS). Substrate and reef types were compared using Split Plot ANOVA for functional metrics and PERMANOVA for Non Metric Multidimensional Scaling output[CR1].

Preliminary results suggest that shell displayed higher daily production rates than rock substrate. High profile reefs appeared to be comparable, with daily production rates ranging from 30,000 to 60,000 ug DW /m2 /d-1. Further, rock substrate had slower turnover rates compared to shell substrate; however, turnover rates were comparable for both high profile reefs with values ranging from 40-70 d. Cumulative number of organisms varied greatly among replicates. A common trend among both eastern reefs suggested higher numbers of organisms in shell baskets; however, this trend was not obvious among western reefs. Further, low profile reefs appeared to maintain a higher number of organisms compared to high profile reefs.

Evaluating the Benefits of Intertidal Structure in Coastal Restoration Using Assessments of Sediment Dynamics and Vegetation. *Joshua Goff [1], Shailesh Sharma[2,1] and Just Cebrian[1,2];* [1]Dauphin Island Sea Lab and [2]University of South Alabama

In coastal Alabama, natural and artificial wave-attenuating structures are used to restore reef habitats and protect vulnerable shorelines. While natural reef designs catalyze a number of biological systems upon implementation, evidence suggests that these structures are less adept at mitigating coastal erosion in high energy systems. A three year monitoring project in Little Bay, a fully restored marshland site, illustrates how larger complexes of wave-attenuation devices (WADs) are better suited to mitigate erosion. Surveys conducted using real-time kinematic GPS (RTK GPS) show marked changes in elevation due to sediment accrual shoreward of the WAD complexes. This high retention of sediments results in a more stable shoreline which, in turn, positively affects other components of the ecosystem such as the marsh vegetation. Observations of fixed plots of transplanted Spartina alterniflora indicate a healthy population comparative to naturally occurring stands, and RTK GPS shoreline surveys document the seaward expansion of emergent marsh vegetation. While these results can be attributed to the use of WAD complexes to armor the shoreline, more effort will be needed to expound upon the sediment transport mechanisms and vegetation dynamics. Additionally, a closer examination of additional services (fisheries, water quality, etc.) provided by intertidal reef structure would be integral in guiding future restorations where shoreline protection is paramount.

Delivering Oil Spill Science to our Coastal Audiences. *Larissa Graham, Stephen Sempier and LaDon Swann;* Mississippi-Alabama Sea Grant

The April 2010 Deepwater Horizon oil spill was the largest spill in US history, with an estimated 4.9 million barrels of Louisiana crude oil being released into Gulf of Mexico waters. In response to the spill, the largest application of dispersant occurred and, for the first time, dispersant was used in subsurface waters. An estimated 1.2 million gallons of dispersant was applied to oiled surface waters and injected into the wellhead, 5100 feet below the water's surface.

Many questions and concerns have been raised about the short and long-term impacts of oil, dispersed oil, and dispersant on the Gulf of Mexico and its communities. The Gulf of Mexico Research Initiative (GoMRI) was established to answer these questions. This 10-year research program received a $500

million financial commitment from the BP oil company to conduct independent research to improve society's ability to understand and mitigate the impacts of hydrocarbon pollution and stressors on the marine environment and public health.

In 2014, GoMRI and the Gulf of Mexico Sea Grant College Programs partnered to implement a Gulf-wide extension and outreach program to share oil spill science with those whose livelihoods depend on a healthy Gulf of Mexico. Input from target audience will be used to inform the outreach program and assist the GoMRI Research Board in identifying oil spill science gaps. Since May 2014, four oil spill research extension specialists were hired, a social network analysis survey was implemented and outreach publications were produced, including ones that focus on dispersants.

During this presentation, we will provide an overview of the outreach project, present initial findings from the social network analysis and share some of the initial products developed by this program.

Activity Patterns of Gulf Sturgeon (*Acipenser oxyrinchus desotoi*) in the Staging Area of the Pascagoula River during Fall Outmigration. *Paul Grammar[1], Mark Peterson[1], Todd Slack[2] and Robert Leaf[1];* [1]University of Southern Mississippi and [2]U.S. Army Corps of Engineers

Environmental cues that are associated with individual movement of threatened Gulf Sturgeon from upriver areas to nearshore and offshore winter feeding areas have been described throughout much of their range in the Gulf of Mexico. In this study, we focus on small-scale movement of Gulf Sturgeon between summer 'holding' areas and the fall staging area in the Pascagoula River system (Mississippi, USA). We evaluated a set of logistic regression models using Akaike's Information Criterion and found that relative changes in barometric pressure, time of day, and water temperature were cues for small-scale Gulf Sturgeon movements during fall outmigration. Numerous environmental cues appear to drive the activity of Gulf Sturgeon in staging areas, indicating the complexity of abiotic factors affecting the observed staging patterns during emigration. The identification of the environmental drivers that are associated with Gulf Sturgeon movement is particularly important if these known saline transition zones change spatially annually with variable rainfall or due to water withdrawals and are used by Gulf Sturgeon making osmotic adjustments while moving downriver.

Coastal Dune Lakes of Northwest Florida: Multivariate Analysis of Water Quality Data to Establish Lake Classification and Ecosystem Specific Nutrient Criteria. *Catherine Gross;* University of West Florida

The coastal dune lakes of northwest Florida are globally unique ecosystems with intermittent connections to the Gulf of Mexico that result in mix of characteristics typical of both freshwater and estuarine systems. Despite their distinctive character, the coastal dune lakes are grouped with Florida's freshwater lakes for monitoring and management, a classification that does not consider their estuarine properties. This study proposes a classification framework and ecosystem specific nutrient criteria for the 15 coastal dune lakes in Walton County, Florida through complementary multivariate analyses of water quality data. The objectives of this study were threefold: to determine if all of Walton County's coastal dune lakes were statistically similar; to determine if the character of the lakes changed over time; and to determine if the lakes were appropriately grouped with freshwater lakes for management purposes. A qualitative assessment of existing physicochemical and biodiversity data indicated that the coastal dune lakes likely fall into three classes: fresh, mixed, and estuarine. The complementary multivariate methods of principal component analysis (PCA), cluster analysis (CA), and analysis of similarities (ANOSIM) were conducted on water quality data recorded from 2003-2013. The data sets

consisted of 15 variables from monthly physicochemical measurements and nutrient data collected through a regional monitoring program, and similar seasonal data from a short term Florida Department of Environmental Protection (FDEP) study. A classification analysis examined the 10-year median of all data for the coastal dune lakes, with results of all methods in agreement with the fresh, mixed, and estuarine classes defined in the qualitative assessment. A temporal analysis, using the annual averages of the same data, revealed that the lakes do not change class over time, with two exceptions. One lake shifted class from fresh to mixed for a period of six years, and then back to fresh, while the other shifted from fresh to estuarine. These shifts in both lakes are likely the result of flood control and debris removal activities following the impacts of Hurricanes Ivan in 2004 and hurricane Dennis in 2005. A comparative analysis was conducted with data from the coastal dune lakes, from sections of the regional estuary, Choctawhatchee Bay, and from a regional freshwater lake for which comparable data was available for at least one year. This analysis shows that the coastal dune lakes are more similar to the bayous and bay segments of the Choctawhatchee Bay, for which site-specific numeric nutrient criteria are defined, than they are to Florida's fresh water lakes, which are managed according to a single set of state-wide numeric nutrient criteria. The results of these analyses are tools for local managers to adopt more appropriate nutrient criteria for the protection of the coastal dune lakes; but more broadly, this combination of complementary multivariate analysis methods may be employed by other coastal resource managers to assess the applicability of current management criteria, or to guide the selection of site specific nutrient criteria in other coastal systems.

Hydrodynamic and Sediment Transport Modeling of an Alabama Coastal Lagoon to Assist with Sediment Bypassing and Maintenance of Water Quality. *Bryan A. Groza and Bret M. Webb;* University of South Alabama

A model of local hydrodynamics, including currents, waves, and sediment transport, is being constructed using the U.S. Army Corps of Engineer's Coastal Modeling System. The purpose of the model is to help inform management decisions regarding modifications to an existing channel and jetties linking Little Lagoon with the Gulf of Mexico. Located in Gulf Shores, Alabama, Little Lagoon is a roughly 2,500-acre brackish lagoon fed by groundwater with a constricted tidal connection to the Gulf. Historically, natural coastal dynamics allowed for multiple, transient channels connecting to the Gulf waters. In recent decades, however, due to the development of a coastal community and highway, surface flow between the lagoon and Gulf has been restricted to a single bridged channel, flanked by jetties. A local interest in preserving sandy beaches, and a need to reduce costly channel maintenance, serves as the impetus for this project. Development of the hydrodynamic model is occurring simultaneously with routine monitoring of beach profiles, flood and ebb tidal shoal volumes, channel depths, and lagoon water quality parameters. These data are being used to develop a sediment budget for management of the inlet system and will also serve as validation and calibration data sets for the model. Targeted surveys of water levels and currents will also be performed and used for model validation in the future.

How Do Stressors Associated with Stock Enhancement Processes affect Stress Response and Post-Release Success of Spotted Seatrout? *Taylor Guest, Andrew Evans, Chet Rakocinski and Reginald Blaylock;* Gulf Coast Research Laboratory, University of Southern Mississippi

Alteration of habitat associated with coastal development and increased demand for food and recreation can result in the depletion of fisheries resources such as the spotted seatrout (*Cynoscion nebulosus*), the Gulf of Mexico's most popular recreational fish. Stock enhancement, or the release of

cultured fish to supplement wild populations, is one potential tool for managing important fisheries resources. Although large economic and human efforts have been allocated to enhancement of some marine species, the effectiveness of stocking is not well established and techniques for ensuring success have not been well developed. The ecology and life history of the spotted seatrout have been studied extensively, but comparatively little is known about its physiology, including how it responds to physical stressors in aquaculture settings. Hatchery environments can affect many learned behaviors; however, the role of stress associated with handling, transport, and release processes in the success or failure of spotted seatrout stock enhancement is unknown. My research is focused on the impacts of physical stressors and the subsequent stress response on growth and survival of fish upon release. I have assessed cortisol production during real time hatchery-release processes in which I have examined the effect of a high magnitude stressor (i.e., release procedures) and subsequent increase in cortisol to post-release survival and growth in both 48 and 80 days post-hatch (dph) fish. Cortisol concentration for both 48 and 80 dph fish was seen to increase throughout the release process. No difference was seen in survival between 48 dph control and experimental treatments, both exhibiting 93% survival. 80 dph fish; however, exhibited substantial differences in survival. 80 dph control fish exhibited 87% survival while experimental fish exhibited 26% survival.

A Regional Impact Model of Tourism in the Mississippi and Alabama Gulf Coast Region.
Zhimei Guo, Terry Hanson, Derrick Robinson and Diane Hite; Auburn University

We develop an IMPLAN input-output model for the impacts of tourism on the Coastal region economy, which measures three types of impacts: Direct, Indirect, and Induced. Direct impacts are those realized by the expenditures made directly to the tourism industry, while indirect impacts are those that impact supplying industries to tourism, and induced impacts are those that arise from the expenditures made by tourism and supplying industry employees spending their income on goods and services in the region. Based on IMPLAN data which are gathered from the US Bureau of Economic Analysis, the Bureau of Labor Statistics and other sources and provide a complete set of balanced social accounting matrices, economic multipliers are computed for various sectors of the industry. They are calculated as the total effects divided by the direct effect. In other words, the multipliers estimate the additional economic benefit per dollar of direct expenditure of the tourism industry.

Our preliminary model uses the data collected in a nationally representative survey of Gulf Coast Visitors within a 700 mile radius of the Grand Bay National Wildlife Sanctuary on the MS-AL border. Thus, we have a wide range of expenditures from a large geographic area. To use the data in the IMPLAN model, expenditures were projected to state-level populations to more accurately estimate actual expenditures on tourism in the coast.

We group the survey expenditure data into the following industry categories: Retail Stores; Scenic and Sightseeing Transportation; Independent Artists, Writers and Performers; Amusement Parks, Arcades and Gambling Industries; Other Amusement and Recreation Industries; Hotels and Motels, including Casino Hotels; Other Accommodations (includes condos); and Food Services and Drinking Places. We estimate two preliminary models, one that does not allow for government impacts and one that does. In the case of the first model, we find that the multiplier for Scenic Sightseeing Transportation yields the highest multiplier of 1.687, meaning that for every dollar spent in this industry results in an additional economic benefit of $0.69. Independent Artists, Writers and Performers is the industry with the lowest multiplier in the model of 1.364.

When examining multipliers for the second model, the lowest and highest multipliers are the same as for the first model, but their magnitudes increase to 1.462 and 1.884. Given that the simple average of multipliers from the two models, we conclude that the impact of every dollar spent on Scenic Sightseeing Transportation is likely an additional of $0.79, and an additional of $0.41 for Independent Artists, Writers and Performers. Based on preliminary total estimated expenditures and the multipliers, we predict that the total economic impact of tourism is approximately $20 billion. Future modeling will include the additional impacts of tourism for the Black Belt region and for the entire state.

Modeling Remediation of Aquatic Life Impacts of Episodic and Diel Cycling Hypoxia via Nutrient Loading Rate Reductions. *James D. Hagy III[1], Brandon M. Jarvis[1], Michael C. Murrell[1] and Marcus W. Beck[2];* [1]U.S. Environmental Protection Agency, Office of Research and Development and [2]Oak Ridge Institute for Science and Education

Theoretical linkages between excess nutrient loading, nutrient-enhanced community metabolism (i.e., production and respiration), and hypoxia in estuaries are well-understood. In seasonally-stratified estuaries and coastal systems (e.g., Chesapeake Bay, northern Gulf of Mexico), hypoxia is predominantly an annual event in which the spatial scale of hypoxic characterizes potential aquatic life impacts. However, in relatively small and shallow Gulf of Mexico bays and bayous, hypoxia frequently occurs on a diel basis or episodically. We hypothesized that nutrient-enhanced community metabolism increases the risk of such hypoxic events through both increased amplitude of diel DO variations and periods of persistently negative net ecosystem metabolism. The observed extent of hypoxia reflects the interaction between the risk imposed by nutrient enrichment and other processes that impact productivity and oxygen dynamics, including physical processes. Using a 10-year continuous O2 record from Weeks Bay, we applied empirical relationships and simple scaling arguments to predict how reducing nutrients may affect the frequency, severity and duration of hypoxia. We used species sensitivity data to evaluate how the existing DO status may impact aquatic life and how nutrient reductions would benefit aquatic life. Initial results showed that although diel DO fluctuations could be large (>5 mg/L), hypoxia (i.e., DO<2.0 mg/L) was commonly associated with periods of sustained heterotrophy. Hypoxia occurred for 2 to 8 hr/day during late summer, with a peak in September. The analysis could be used as a screening tool to inform development of numeric nutrient criteria and to guide restoration of shallow coastal systems subject to eutrophication and hypoxia. The complex interactions between DO status, population dynamics, and trophic interactions highlight the ongoing need for direct monitoring of hypoxia effects to strengthen the scientific basis for management.

Sedimentary Records of Recurrent Phosphate Spills to a Gulf of Mexico Coastal Estuary. *Jacob G. Hall[1], Pavel Dimens[1], Elizabeth D. Condon[2], Ruth H. Carmichael[1,2] and Kimberly Cressman[3];* [1]Dauphin Island Sea Lab, [2]University of South Alabama and [3]Grand Bay National Estuarine Research Reserve

Two large phosphate spills have occurred from Mississippi Phosphate Corporation to Grand Bay National Estuarine Research Reserve's Bangs Lake since 2005. Following these spills, there was a spike in phosphate concentrations (as high as 7 mg L-1), a significant drop in pH (from 7.5 to as low as 3.7), and on one occasion, fish and shellfish kills. To help determine the fate of phosphorus within the estuary, we measured the concentration of phosphorus retained in sediments relative to distance from the spill site. To do this, two sediment cores were collected from each of four sites in Bangs Lake, and

two cores were collected from each of two sites in Bayou Heron, a site more remote from the spill area. The cores were collected using an 8 cm diameter x 50 cm long PVC corer. The sediment cores were sectioned using clean methods at 1cm intervals down to approximately 24 cm. Each section was homogenized, dried, weighed for bulk density and subsequent analyses. Each core section was analyzed for grain size, particulate organic phosphorus concentration, and porewater phosphate concentration. Core sections also will be dated using Lead-210 to trace historical phosphorus inputs to each site. The average bulk densities of the sections from Bangs Lake were greater than those from Bayou Heron. Results of downcore sediment phosphorus analyses will be discussed. These data will provide a spatial and temporal record of phosphorus additions and retention within Bangs Lake to inform companion studies on water quality and primary production as well as future studies of effects on biota.

A Discussion of Multiple Techniques Used in Alabama for Living Shorelines and Oyster Reef Breakwaters. *Judy Haner;* The Nature Conservancy

Mobile Bay, Alabama, the fourth largest estuary in the US, plays an important role in nurturing the finfish, shrimp, crabs and oysters that are vital to Gulf of Mexico communities. It has experienced significant loss of critical coastal habitats that shelter these species through dredge-and-fill activities, seawalls, erosion, storm events, and other causes. With funding received from the National Oceanic and Atmospheric Administration, The American Recovery and Reinvestment Act of 2009, the National Fish and Wildlife Foundation, the US Fish and Wildlife Service, The Gulf of Mexico Foundation, the National Wildlife Federation and many other organizations, TNC and our partners have implemented six different techniques for oyster reef restoration and living shorelines in coastal Alabama. Traditional shoreline armoring techniques, such as bulkheads and seawalls, reflect wave energy, causing sediment to remain in suspension and adding to the loss of shallow-water fisheries habitat. Low-crested, submerged breakwaters and living shorelines offer an alternative to armoring that helps to slow erosion, create habitat for fish, crabs, oysters and other animals, and protect marsh habitat that proves vital for coastal resiliency in the face of flooding, storms, and sea-level rise. This presentation will focus on a discussion of the individual techniques, their application in restoration, methods for deployment, and the monitoring parameters that are being used to track performance.

Assessing Exposure to Coastal Flood Hazards: A Planning Tool for Gulf Coast Communities. *Marian Hanisko and Lauren Long;* NOAA Office of Ocean and Coastal Resource Management and Coastal Services Center

Flood events are among the more frequent and costly coastal hazards that impact coastal communities. Planning for current and future flood hazards can be a challenge, and the first step is to understand a community's exposure. The Coastal Flood Exposure Mapper is a new tool developed by NOAA's Office of Ocean and Coastal Resource Management and Coastal Services Center. This tool supports community conversations about flood hazard vulnerabilities by providing maps and information showing where people, places, and natural resources are exposed to flooding.

The goal of this presentation will be to provide a demonstration of the Mapper. Features of the tool include maps of shallow coastal flooding, flood zones, storm surge, sea level rise, and a composite view of flood hazards along with societal, infrastructure, and ecosystem information. Maps can be downloaded or shared online with stakeholders to assist with planning for flood impacts. The Mapper will be available for the Gulf of Mexico region (excluding Louisiana) in the fall of 2014. For more information on this resource, please visit the following website: www.csc.noaa.gov/digitalcoast/tools/flood-exposure.

NOAA Sentinel Site Program: Activities and Recent Accomplishments of the Northern Gulf of Mexico Sentinel Site Cooperative. *Marian Hanisko[1], Mark S. Woodrey[2], John Tirpak[3] and Michael Osland[4];* [1]NOAA Office of Ocean and Coastal Resource Management/Coastal Services Center, [2]Grand Bay National Estuarine Research Reserve/Mississippi State University Coastal Research and Extension Center, [3]U.S. Fish and Wildlife Service and [4]U.S. Geological Survey

The National Oceanic and Atmospheric Administration (NOAA) Sentinel Site Program leverages existing assets, programs, and resources to address coastal resource management questions of local, regional, and national significance that affect both NOAA Trust Resources (e.g., Sanctuaries, National Estuarine Research Reserves (NERRs)) and surrounding communities. The program currently focuses on the impacts of sea level rise and is envisioned to incorporate all aspects of the science, service, and stewardship continuum. Through this approach, the program is designed to increase innovations of science-based solutions and transition their application for improved management of coastal regions.

The Gulf of Mexico Cooperative leverages the capabilities of three NERRs (Grand Bay, Weeks Bay, and Apalachicola) and builds from the on-going work of the University of Central Florida-led project titled, Ecological Effects of Sea Level Rise in the Northern Gulf of Mexico. The Cooperative was established in 2013 and includes three primary goals: 1) enhance and expand SLR partnerships to maximize effectiveness of data collection, modeling, and response to this information through increased coordination and collaboration; 2) improve science based capabilities for understanding SLR and its impacts; and, 3) foster science-based decisions to support SLR and coastal inundation planning and adaptation efforts.

Over the last year the Gulf of Mexico Cooperative has made progress towards its goals in a number of ways, and partnerships have been essential. The composition of the Management Team for the Cooperative was expanded to include staff from diverse agencies at the federal and state level so that shared sea level rise research and management priorities can be identified and addressed. These new partnerships have fostered a collaborative research agenda and leveraged research dollars and capacities to support shared priorities. For example, the Cooperative participates in shaping research (currently funded by U.S. Fish and Wildlife Service and U.S. Geological Survey) to identify barriers to landward marsh migration from urbanization under a variety of sea level rise and urbanization scenarios. Also within the last year, a surface elevation table (SET) inventory for the Cooperative was completed with assistance from NOAA's National Centers for Coastal Ocean Science (NCCOS). The Management Team is currently working with U.S. Geological Survey, the Gulf of Mexico Alliance, and other partners to expand this inventory Gulf-wide. Finally, through a partnership with the Mississippi-Alabama Sea Grant Consortium, the Cooperative plans to welcome a new Coordinator during the Fall 2014. The Coordinator will help identify new partners for the Cooperative and improve the transfer of relevant sea level rise information across the Cooperative network.

Health Disparities in the Deep South: A Public Health Policy Study of the Effect of Disasters on Vulnerable Communities. *Roma Stovall Hanks[1], Candace Forbes Bright[2], David Butler[2] and Michelle Martin[3];* [1]University of South Alabama, [2]University of Southern Mississippi and [3]University of Alabama at Birmingham

Background and Objective: Natural and Man-made disasters can have a profound negative impact on communities. Increasing the resiliency of communities to respond to such disasters is a public health priority. Our understanding of the factors associated with community resilience however, is limited.

To address this gap in knowledge, we initiated an innovative mixed-method research study, under the NIH-funded, Gulf States Collaborative Center for Health Policy Research.

Methods: We will conduct a multiphase study with economically vulnerable families in communities affected by the 2010 BP Deepwater Horizon oil spill, the 2011 Mississippi River flooding, and 2011 Tuscaloosa tornado. In phase I, we successfully completed 600 surveys of families affected by disaster. Survey domains included pre-disaster, during disaster, post-disaster, and demographics questions. Next (Phase II), the team will conduct interviews with the head of household of 120 families from the survey to study recovery at the family level. Interviews will be conducted with both families that were and were not negatively affected by the disasters. Of those families who reported experiencing psychological and/or physical illness at the time of interview, in Phase III, 16 individuals will be randomly selected for enhanced surveys. These families will be asked the same disaster and health related questions as those who participated in the standard interview, but with the addition of social network questions. Each interviewee will be asked to refer the researcher to five individuals that he/she goes to for health advice. The interview process will then be repeated with the five individuals that have been referred to the researcher (Phase IV). The 16 enhanced interviews will result in 480 follow-up interviews with referrals, which the researchers will use to develop a social network analysis of the communities of interest. In the final Phase, focus groups will be conducted to gather information of the perceived availability and accessibility of health resources in the community following a disaster

Results: In this poster, we will highlight the novel approach to our research question and preliminary findings of the first phase of the study. The survey data will be modeled to make predictions about the socio-economic related factors that are associated with community resilience.

Conclusions: In gaining an understanding of personal and community aspects of resiliency across forms of disaster, the researchers will be able to make policy suggestions for preparing communities for future disasters. This research will identify not only the existing channels of resources for recovery, but also identify the gaps in reaching community members with resources, as well as indicate marginalized groups that expressed the least access to much needed resources following a disaster. The mixed-methods approach will yield "lessons learned" in community resilience research that will also be applicable to other areas of study, such as health policy research.

REACH: Research and Education to Advance Conservation and Habitat. *Jared Harris[1] and Jerry Boos[2];* [1] Mississippi State University and [2] EPA Gulf of Mexico Program

The goal of REACH is to use scientific data and outreach in support of conservation best management practices that reduce downstream nutrient inputs into the Gulf of Mexico. REACH provides empirical water quality data at a local scale that informs producers and landowners of the benefits of conservation practices. The data is then used for outreach and educational purposes to increase adoption of best management practices. The scientifically defensible data can also be used to justify state and federal investments in conservation practices that affect water quality and quantity issues.

The REACH program has been very successful in documenting the benefits of agricultural conservation practices in the Mississippi Delta, an agriculturally intense region in the state. REACH is currently making an effort to expand the program into the southern portion of the state, while also broadening the scope of participants enrolled in REACH. Agricultural producers are still the main candidates for the REACH program; however, REACH is also trying to enroll other entities that can

make an impact on the water quality of the Gulf of Mexico (i.e., nurseries, golf courses, municipalities, etc.).

Currently, REACH is collecting water quality samples at a golf course and a nursery that have installed best management practices to reduce nutrient run-off. REACH is also involved in a collaboration that is in the process of working with a community college to implement and monitor storm water best management practices on campus. The green infrastructure projects that result from this collaboration will be used to engage and educate the student body as well as the community and to serve as an example for other campuses and municipalities.

Resilient Coastline Protection – Living Shorelines and the MBNEP. *Tom Herder;* Mobile Bay National Estuary Program

The Mobile Bay National Estuary Program and its Management Conference partners have directed increasing time, attention, and money to protecting ecosystem services provided along the critical edges of our estuarine waters. With rising sea levels, the constant threat of tropical weather events, and the persistent impacts of wakes from ship and recreational boat traffic, erosion along coastal Alabama's estuarine shorelines is a priority issue. With the rate of habitat-degrading shoreline armoring corresponding to that of coastal population growth, protecting essential nearshore habitats and the services they provide to fishery resources through living shorelines technologies is a priority reflected in MBNEP project implementation, outreach efforts, and its new Comprehensive Conservation Management Plan.

Since 2010, MBNEP has implemented three very different living shorelines projects, participated in the development of policy and homeowner manuals, and prescribed increased use of living shorelines technologies in its CCMP. Shoreline stabilization projects at Dog River Park in Mobile, Mon Louis Island in Mobile County, and Steele Creek Lodge in Satsuma demonstrate different engineering technologies to address very different problems with different solutions that preserve the habitat value of each shoreline.

Constant recreational boat traffic had left Dog River Park's 400-foot, popcorn tree- and taro-infested shoreline steep and incised to underlying clay layers that clouded the water with turbidity with each scouring wake. Installation of seven pile-supported timber structures and clean sand fill to form headland breakwaters, grading of intermittent pocket beaches, removal of invasive plant species and replacement with native marsh and riparian vegetation transformed the shoreline into a productive, habitat-rich ecotone.

The challenge along Mon Louis Island was to encourage several waterfront property owners along a receding shoreline impacted by ship wakes, day-to-day wave energy, and tropical weather events to develop a strategy that would slow erosion while protecting intertidal habitats. Together with coastal engineers, contiguous property owners developed a plan to install rock headland breakwaters and clean sand fill to create intermittent pocket beaches to pin their 700-foot shoreline in place with only positive impacts conveyed to downstream properties.

At Steele Creek Lodge in Satsuma, recreational boat wakes left a 150-foot shoreline in an embayment off Bayou Sara incised and retreating. With very steep bathymetry, construction of a rock sill and placement of clean sand fill to create a perched terrace planted with diverse native marsh vegetation protected the shoreline from boat wakes and provided productive wetlands habitat.

Collaboration on a policy manual and development of a property owner's manual, both funded by NOAA and the State, have been part of MBNEP's outreach efforts towards promoting use of living shorelines as alternatives to armoring. Today, following years of research, the issues of establishing more natural shorelines on bays, backwaters, and rivers has become as important as protecting our Gulf-fronting beaches in an effort to restore and protect healthier, resilient, and habitat-rich shorelines. With a goal to improve ecosystem function and resilience, installation of living shorelines on publically- and privately-owned bays, backwaters, and intertidal waterways is prescribed in two different objectives of the revised CCMP.

A Comprehensive Watershed Management Plan for Three Mile Creek, Mobile, AL. *Jerri Daniels[1] and Tom Herder[2];* [1]Dewberry and [2]Mobile Bay National Estuary Program

Mobile Bay National Estuary Program (MBNEP) worked closely with Dewberry as environmental planning and engineering consultants to develop a comprehensive Watershed Management Plan (WMP) for the Three Mile Creek Watershed which runs through the cities of Mobile and Pritchard, Alabama. This plan is necessary to document existing environmental challenges and provide a vision and strategy for achieving a transformation from what is currently a community liability, due to its degraded condition, to an asset celebrated by residents. An essential piece of plan development is the engagement of city, county, state and federal agencies; nongovernmental organizations focused on community and environmental health; community resources such as hospitals, schools and businesses; and the congressional delegation. Engaging the entire community was necessary for project success and to demonstrate how both private and public objectives can be achieved for community environmental and economic development benefits. The WMP definitively identifies and categorizes watershed/water quality issues and problems, identifies climate change vulnerabilities, reasonably ascertains the magnitude of restoration and adaptation potential, identifies human and financial capital needed to implement best management practices and engineering or other actions, institutes reasonable implementation timelines, and provides a framework for documenting and measuring success and adaptively managing project outcomes.

The plan charts a conceptual course for transforming this degraded urban creek into a watershed that supports improved community assets that improves water quality and fish and wildlife health resulting in enhanced community health and civic pride, increases property values, and provides economic development opportunities as a unique urban ecotourism destination as well as a cultural destination that celebrates local history.
Implementation projects currently in the plan out for comment range in cost from $90,000 to $72 million. These projects include:

- Reducing the amount of trash in the watershed,
- Removing excess sediment,
- Removing sanitary system leaks and illicit discharges,
- Removing nuisance and/or exotic species,
- Constructing greenways, blueways, stormwater parks, fitness circuits,
- Establishing a tidal monitoring system,
- Sea level rise and storm surge flood risk education, and
- Tidal marsh restoration.

Variable Response of Natural Mesozooplankton and Ichthyoplankton Assemblages to the Deepwater Horizon Oil Spill. *Frank Hernandez[1], Laure Carassou[2], Jesse Filbrun[3], John Ransom[1], William Graham [4], Carla Culpepper[1] and Jeffery Fang[5];* [1]Department of Coastal Sciences, University of Southern Mississippi, [2]Department of Marine Science and Fisheries, Sultan Qaboos University, [3]Department of Biology, Southern Arkansas University, [4]Department of Marine Science, University of Southern Mississippi and [5]Department of Biology, University of Portland

Mesozooplankton provide a critical link between primary production and many secondary consumers, including the early life history stages of most marine fishes, yet the impacts of the Deepwater Horizon oil spill (DWHOS) on planktonic food webs remain largely unknown. Biological and oceanographic data from a long-term plankton survey in the northern Gulf of Mexico (2005-2011) were used to investigate 1) annual environmental variability; 2) mesozooplankton abundance and community structure; and 3) larval abundance, diet, and condition of three representative marine fish species (Spanish Mackerel, Atlantic Bumper, and Red Snapper) among summer sampling periods prior to the spill (pre-impact), during the spill (impact) and after the spill (post-impact). Principal Component Analysis of environmental variables (SOI, NAO, water temperature, wind speed, wind direction, atmospheric pressure and river discharge) suggest May-August periods during previous years (2005-2009) were similar to those encountered during the oil spill (2010). Significant variations were detected in mesozooplankton assemblage structure in May and June 2010, but these changes were no longer significant by July of the same year. The density of Ostracods, Cladocerans and Echinoderm larvae were responsible for most of the differences observed, but patterns differed depending on taxon and month. When differences in abundances were observed between pre-impact and impact periods, most mesozooplankton taxa had higher densities during the oil spill year. Overall, these results suggest that although changes in mesozooplankton community composition were observed during the DWHOS, variations were weak and recovery was rapid. Seasonal patterns were observed in larval fish condition, with fish spawned later in the summer being deeper bodied and generally heavier (values adjusted for size). However, condition relative to pre-impact, impact, and post-impact periods varied by taxon. The results from our mesozooplankton and ichthyoplankton analyses to date suggest planktonic responses to the DWHOS were complex and taxon-specific. Further investigations are needed before final conclusions can be drawn about the long-term effect of the DWHOS on fisheries production in the northern Gulf of Mexico.

Sighting Demographics of the West Indian Manatee (*Trichechus manatus*) in Alabama and Mississippi Waters. *Elizabeth E. Hieb[1], Ruth H. Carmichael[1,2], Allen Aven[2] and Kayla DaCosta[2];* [1]Dauphin Island Sea Lab and [2]University of South Alabama

Founded in 2007, the Dauphin Island Sea Lab's Manatee Sighting Network (DISL/MSN) is the first and only formal manatee sighting network in the U.S. DISL/MSN has recorded 1400 opportunistic sightings of the endangered West Indian manatee (*Trichechus manatus*) in Alabama (AL) and Mississippi (MS), including historical data (documented prior to inception of the network) and opportunistic sighting reports made to the network by the public. DISL/MSN maintains a 24-hour toll-free telephone hotline, website with online sighting report form, and email address to receive manatee sightings. Historical data (1912-2006) include 181 manatee sightings in AL and 26 in MS. Sightings reported since DISL/MSN inception (2007-2013) increased six-fold in AL and four-fold in MS, demonstrating the benefit of a dedicated sighting network to data collection. Manatees have been sighted year-round in AL and MS, but sightings typically occurred Apr-Nov in AL with peak sightings in Aug and Sep. In MS sightings typically occurred May-Nov with peak sightings in Jul. Manatee carcasses were most often reported Dec-Feb; however, in one year (2013) three strandings were

reported in Jun/Jul, marking the highest number of warm-weather strandings recorded on the MS-AL coast in a single year. Sightings of single manatees were most common, but group sizes of up to 17 have been reported. The number of animals per group increased beginning in Apr in both states with the largest groups typically reported in Aug/Sep in AL and Sep/Oct in MS. In recent years, the temporal distribution of sightings and group size data suggest that the greatest number of manatees occurred in AL and MS during late summer (Aug/Sep). Opportunistic sighting records have established West Indian manatees as regular seasonal visitors to AL and MS waters and suggest that the AL-MS coast may be important seasonal habitat for some manatees. These data complement direct observation studies (such as by telemetry) by allowing corroboration of manatee habitat use through time for more animals and over a larger area than would be possible from direct observation alone.

Evaluating the Current Status of Red Drum (*Sciaenops ocellatus*) in Offshore Waters of the North Central Gulf of Mexico: An Update on Abundance, Age Composition, and Mortality.
Crystal L. Hightower, Sean P. Powers, J. Marcus Drymon; University of South Alabama

Red Drum (*Sciaenops ocellatus*) in the Gulf of Mexico (GOM) have been overfished since the late 1980s. In an effort to stop overfishing, a recreational and commercial harvest moratorium was established in 1987 for GOM federal waters (Gulf of Mexico Fishery Management Council, 1987). This species continues to be one of the most popular sportfish in state waters. Due to the apparent return of large spawning aggregations in the northern GOM over the past decade, managers are being urged by fishermen to open federal waters to recreational fishing (Powers and Burns, 2010). The official status of the stock was characterized as undefined in the latest assessment in the early 2000s (Porch, 2000). Over a decade later, the status of the stock remains unknown (Hogarth, 2004). To evaluate the potential of a recreational fishery in federal waters, the current status of the stock must be assessed. We focused on addressing several issues relevant to evaluating the current status of GOM Red Drum. Specifically, we: 1) developed a current index of relative abundance for Red Drum in the north central GOM with fishery-independent catch data from 2006-2013 and 2) examined updated age composition, growth, and mortality in adult Red Drum in offshore waters of the north central GOM from 2010-2013 using otoliths from fishery-independent and -dependent sources. Fishery-independent Red Drum were collected by bottom longline and gillnet. Fishery-dependent Red Drum were collected at the annual Alabama Deep Sea Fishing Rodeo. Age composition was determined using otoliths. Age composition and growth rates showed an increase in average age during the current moratorium, but an absence of 5-10 year old fish. The abundance index showed a declining trend. Age and length distributions and abundance of fishery-independent longline Red Drum were also examined spatially to look at any differences between state and federal waters. Spatial analysis of the fishery-independent longline data showed that the age ($D = 0.484$, $p<0.0001$) and length distributions ($D = 0.507$, $p<0.0001$) were significantly different for Red Drum caught in state versus federal waters. Fish were older and larger in state waters. Total mortality (Z) calculated using catch curve analysis was estimated at 0.25 for fishery-independent catch and 0.08 for fishery-dependent catch. Fishing mortality was estimated between 0.14 to 0.18 for fishery-independent catch and 0 to 0.01 for fishery-dependent catch when using the Hoenig (1983) and Hewitt and Hoenig (2005) estimates for M, respectively. Our results provide a clear indication of success immediately following the moratorium, but also point out the effects of increased fishing pressure in state waters likely due to older age classes that are susceptible to state recreational fishing mortality.

Assessing the Impact of Exotic Asian Tiger Shrimp (*Penaeus monodon*) on Native Shrimps and Other Estuarine Species in the Gulf of Mexico. *Jennifer M. Hill and Kenneth L. Heck, Jr.;* Dauphin Island Sea Lab

Anthropogenic habitat modification and globalization have increased the number of invasive species that disrupt community structure, reduce biodiversity, and cause billions of dollars in damage to the US economy. In 2011, Asian tiger shrimp, *Penaeus monodon*, were identified as a new potential invasive species when shrimpers from North Carolina to Texas began to recover them in their catches. Although reporting of this species has declined, most likely because they are no longer uncommon, tiger shrimp continue to be caught in bays, estuaries, and offshore waters of the Atlantic and Gulf coasts. The presence of tiger shrimp in US waters is ecologically concerning because their broad diet, aggressive omnivory, large body size, and overlapping distribution with native shrimp suggest this species may compete with or consume native shrimp species or other economically important crustaceans and be highly disruptive to community structure. In particular, competitive or predatory interactions of tiger shrimp may cause declines in native, commercially important brown and white shrimp populations. Here, we discuss the results of several preliminary investigations into the predatory and/or competitive interactions of tiger shrimp on native Gulf of Mexico estuarine species. In laboratory mesocosms, we offered tiger shrimp obtained from Gulf Coast waters several different estuarine species as prey. Tiger shrimp regularly consumed small gastropods and juvenile blue crabs (<15mm carapace width) but did not attack or consume grass shrimp, hermit crabs, or fish. We also used laboratory mesocosm experiments to investigate if tiger shrimp consumed or competed with native brown and white shrimp. The results of these experiments suggest that the impact of Asian tiger shrimp will be species specific.

Hypoxia in Mississippi Coastal Waters: Insights from δ18O and Trace Element Distributions. *Peng Ho, Melissa Gilbert and Alan Shiller;* University of Southern Mississippi

The Northern Gulf of Mexico is known for its hypoxic regions, especially on the Louisiana Shelf. However, hypoxia has been observed east of the Mississippi River (MR) delta, too. Specifically, we examined Mississippi coastal waters extending offshore from St. Louis Bay (SLB) to the Mississippi Bight (MB). This is a complex region, receiving riverine inputs from the MR, Pearl River (PR) and SLB. This complexity makes it challenging to study the causes of hypoxia in this area. This study focused on a monthly, 8-station transect in 2011, examining the relevant water masses and causes of hypoxia along the Mississippi coast.

Strong coastal freshwater signals were observed in May (hypoxia) and September (no hypoxia). The freshwater plume extended further seaward in May than in September, due to the Bonnet Carre Spillway opening (May 9-Jun 10). In September, the lowest salinity was observed offshore (Stn 3, near Cat Island) which indicated the freshwater signal was not from SLB.

The δ18O of the water revealed mixing of different freshwater sources during hypoxic periods. The δ18O values at SLB were -3 - -4‰. Extrapolation of the trend of δ18O in MB surface and bottom waters found the δ18O value was -6 ‰ which is close to the δ18O of MR water. In September, the lightest δ18O was found at Stn 3, corresponding to the lowest salinity and suggesting the freshwater source was from the PR or MR and not SLB.

There was no difference in trace element distributions between May and September, although slightly elevated Mn, Cs, Ba and CDOM were observed offshore in September. Trace elements were not an effective indicator of freshwater sources for the MR and PR. However, the difference in the distributions of Mn, V and Ba in the water column between hypoxic and non-hypoxic periods revealed the impact of stratification on the exchange of surface and bottom waters, and reflected Mn and V dissolved/particulate phase conversion in reducing environments.

Enriched Ba was observed in hypoxic waters, which might be due to barite dissolution, submarine groundwater discharge (SGD) input, or sediment diffusion. Low V concentrations were observed in hypoxic water due to V removal to the sediments, although there was no significant relationship between dissolved oxygen and V. High Mn concentrations were found in hypoxic water (except August) and were likely caused by input of reduced Mn from sediments and/or SGD. In August, the absence of enriched dissolved Mn in hypoxic water might be a result of increased seawater advection.

Based on the 2011 data, the major contributor to hypoxia formation in coastal bottom water was MR and/or SGD. However, the source of freshwater source (MR/PR) signal in September could not be determined. The distributions of Ba, Mn and V were controlled by the water stratification, redox process, the advection of water masses and the diffusion at the sediment water interface.

Rapid Damage Assessment: Post-Hurricane Response at the Community Level. *Henry B. Hodde III[1], Kathleen A. Garland[2] and Deanna Schmidt[2];* [1]NOAA National Ocean Services and [2]University of Houston Clear Lake

Each year, the first of June heralds the official beginning of the Atlantic Basin Hurricane Season. This season, which continues until December 1, covers the six months when hurricanes are most likely to develop in the Atlantic Basin, including the Gulf of Mexico. Ideally, it also highlights the period of maximum storm preparedness for coastal residents and their communities in this region.

In the days immediately following a storm, coastal communities conduct initial assessments of the physical damages to the built environment, both public and private, within the community. Cost estimates based on this information supply critical information for recovery programs at the state and federal levels. These assessments are a prerequisite for Federal Emergency Management Agency (FEMA) disaster declarations and aid, as well as for reimbursement under the National Flood Insurance Program (NFIP), and are also required as part of many state and regional emergency response plans. These assessments are termed "Rapid Damage Assessments" for the purposes of this study, and will be abbreviated as RDAs.

The RDA is a critical element of disaster response and recovery. It describes where the damage has occurred, how many structures have been affected, the extent of damage to those structures, and where first responders are needed. Following the RDA, or sometimes as a part of it, a Preliminary Damage Assessment (PDA) is conducted in conjunction with state and federal officials. PDAs include estimates of the cost of damages and justify a Presidential declaration of a disaster (FEMA, 2010a), thus opening the doors to multiple levels of federal funding and assistance.

The Upper Texas Gulf Coast experienced the 3rd costliest storm event in United States' history when Hurricane Ike made landfall in Galveston in September 2008. This study describes the RDA process in several communities on Galveston Bay in Texas that sustained significant damage from flood, surge, and wind during this storm. This study illustrates how the RDA process varied from

community to community depending on the level of damage, the community's capacity to carry out RDAs, and the persons and organizations carrying out the assessments. It also demonstrates how differently communities followed up on and used this information in the months following the storm, and provides some recommendations on ways communities can take advantage of these datasets for better community and emergency management planning.

Using Mitigation to Create a Resilient Community. *Jody Hodge;* Jefferson County Emergency Management Agency

Environmental changes will result in significant changes in weather patterns. Not only will these changes result in more powerful tornadoes and windstorms, we will also see stronger hurricanes and tropical storms along our coastline. In addition, more and more people are moving to America's coasts. Thus, we will continue to see weather impacts on a greater number of residents.

To address weather changes and their impacts, it is necessary to look at mitigation. Mitigation is the first step in creating a resilient community. Thus, it is important to look at mitigation strategies as ways to affect and improve the resiliency of coastal areas and cities. Mitigation can include reclamation of wetlands and natural areas, which act as natural buffers to winds and tide surge. It can also include the creation of water barriers and retaining walls to capture storm surge and dissipate the effects of waves on coastal areas.

Another mitigation strategy is improved building codes that call for structures to handle greater wind forces. Additionally, land use ordinances can also improve resiliency. An example of this is to change the orientation of buildings along the coast, with green space facing toward the water. This creates a natural retainer for water surge, reducing damage from flooding.

In discussing mitigation strategies, it is important that they be put into action. This requires all stakeholders of resiliency to work with local lawmakers to construct ordinances and building codes to deal with weather issues and events. Stakeholders should work with local city and urban planners to identify areas that are sensitive to damage from disaster events. It also allows stakeholders to look at redrawing streets and highways, as well as looking at planning for future growth and development.

It is important to note that stakeholders should also include with local emergency management practitioners. If they are not part of the stakeholders group, it is important that stakeholders reach out to emergency management practitioners. Practitioners can help identify sensitive areas, as well as local industries and factories, such as chemical plants, that could create secondary damage because of a disaster event.

Engaging stakeholders with different aspects of the community will allow the community to build back safer, stronger and smarter.

Uptake of Excess Phosphate by Estuarine Sediments in Bangs Lake. *Sarah Holcomb[1], Chris Griffin[1], Joshua Allen[1], Kevin S. Dillon[1], Kim Cressmam[2] and Mark Woodrey[3];* [1]University of Southern Mississippi, Department of Coastal Sciences, [2]Grand Bay National Estuarine Research Reserve and [3]Coastal Research and Extension Center, Mississippi State University

Bangs Lake, an estuarine water body in the Grand Bay NERR, has been the site of three industrial phosphate spills from a nearby fertilizer plant since 2005. Due to restricted tidal exchange in Bangs Lake, these events have had long lasting effects on water column phosphate concentrations which may stimulate biological activity and alter the biogeochemical cycling of essential elements within the water column and the sediments. Previous experiments have shown that sediments in the Mississippi Sound can rapidly adsorb dissolved phosphate, removing it from solution. To determine the fate of excess phosphate from the industrial spills, we measured soluble reactive phosphate concentrations in sediment pore water and total particulate phosphorous concentrations from sediment cores (0-25 cm depth) from three locations: North Bangs Lake (closest to spill locations), Bangs Lake, and Bayou Cumbest (low impact site). Phosphate adsorption experiments with sediment core sections were also conducted to examine the phosphate adsorption capacity for sediments from these locations. Pore water phosphate concentrations were highest (21 uM) from 10 to 20 cm depths in North Bangs Lake cores however pore water from the surface sections of these cores had much lower phosphate concentrations (<0.5 uM). Pore water from the Bangs Lake cores consistently had elevated phosphate concentrations (2 to 5 uM) throughout the core length while pore water phosphate concentrations from Bayou Cumbest were much lower (<0.7 uM) down core, likely reflecting background levels. Analysis of particulate phosphorus concentrations in the cores is ongoing and results will also be presented. Phosphate adsorption experiments show that surface sediments from North Bangs Lake and Bayou Cumbest rapidly stripped phosphate from solution to final concentrations of <3 uM while surface sediments from Bangs Lake had greatly reduced phosphate adsorption capacity with much higher final concentrations (24 to 32 uM) indicating these sediments are near saturation. These results show that sediments in Bangs Lake are a major sink for excess phosphate introduced to Bang Lake from industrial spills. The potential release of sediment-bound phosphate back into the water column due to sediment resuspension and/or changes in ionic strength with salinity is currently under investigation.

Linking Structural and Process-Based Attributes of Salt Marshes and Mangroves to Ecosystem Service Provision. *Lauren Hutchison[1], David Yoskowitz[1] and Just Cebrian[2,3];* [1]Harte Research Institute, Texas A&M University-Corpus Christi, [2]Dauphin Island Sea Lab and [3]University of South Alabama

Globally, mangroves are expanding into salt marshes. In the northern Gulf of Mexico, mangroves are projected to expand their range northward due to increasing temperatures and decreases in the frequency and duration of freezes. Globally, minimum temperatures are increasing at twice the rate of maximum temperatures. With a 2°C to 4°C increase in mean annual minimum temperature, 95-100% of salt marshes in Texas and Louisiana will be vulnerable to displacement by mangroves. This projected transition of habitat types could have cascading ecosystem effects, thus affecting the supply and resiliency of ecosystem services and, consequently, coastal communities that depend upon these habitats.

Here we present the results of a meta-analysis of existing studies conducted to link structural and process-based attributes of salt marshes and mangroves to the provision of ecosystem services. Structural (e.g., density, biomass, spatial complexity) and process-based (i.e., rates of carbon and nitrogen cycling, productivity, trophic connectivity) measurements reflective of ecosystem function

were compiled for marshes and mangroves. The variability in these attributes in relation to geographical area (e.g., latitude and temperature), type of dominant plant, biodiversity, colonization stage (age of the stand), and level of anthropogenic pressure was analyzed using several statistical techniques including structural equations and hierarchical modeling. The most important sources of variability for system attributes were identified and, based on this, salient environmental and biological controls of ecosystem services (e.g., carbon sequestration and nutrient filtration) are suggested.

The results of this study help our understanding of the mechanisms that regulate ecosystem service provision and contribute important information to inform policies of coastal management as human occupation of coastal watersheds increases. These results also provide information to models of future changes in coastal communities that may occur with climate change, in particular regarding what shifts in ecosystem service provision could ensue.

Climate Resiliency on Dauphin Island. *Catherine Janasie;* Mississippi-Alabama Sea Grant Legal Program

The Southeast region of the United States is projected to face many climate change impacts that are thought to result in higher temperatures, more droughts, rising sea levels, scarce water supplies and severe weather events. As a low-lying barrier island approximately 15 miles long and a mile wide at its widest, Dauphin Island will be highly susceptible to these impacts.

Dauphin Island has been impacted by erosion, and like the rest of the Gulf Coast region, is particularly vulnerable to sea level rise. Sea level rise will make barrier islands like Dauphin Island more susceptible to coastal storms and related storm surges, including weaker, seasonal storms. These factors could have a strong impact on barrier islands by increasing erosion, permanently inundating some areas and leading to higher salinity levels in estuaries and freshwater aquifers. These climate stressors will likely impact Dauphin Island's natural resources, as well as access to and transportation on the Island. These stressors could also have a potential economic impact on the island.

The Mississippi-Alabama Sea Grant Consortium (MASGC) has been working on a two-year climate resiliency study for Dauphin Island. In the first year of this study, the Mississippi-Alabama Sea Grant Legal Program (MASGLP) prepared a scoping document on the anticipated regional changes in climate variables and how these changes can impact Dauphin Island's natural and built resources. MASGLP also organized a Vulnerability-Consequence Adaptation Planning Scenarios (VCAPS) workshop for the Town. As part of a larger climate resiliency study, MASGLP has also been working on a climate change vulnerability and risk assessment process. Through meetings with the Town of Dauphin Island and the Dauphin Island Park and Beach Board, MASGLP has been focusing on sea level rise and flooding, as well as the island's ecologic and economic health.

This talk will discuss the results of the project so far, including the scoping document, the VCAPS process generally, the VCAPS workshop on Dauphin Island and possible solutions for the climate impacts facing Dauphin Island.

Temporal and Spatial Dynamics of Diel-Cycling Hypoxia in Four Northern Gulf of Mexico Estuaries. *Brandon Jarvis, James Hagy, John Lehrter and Michael Murrell;* U.S. Environmental Protection Agency, Office of Research and Development, National Health and Environmental Effects Laboratory, Gulf Ecology Division

Eutrophication of coastal ecosystems is a longstanding environmental concern, exacerbated by population growth and associated nutrient pollution, and ultimately resulting in increased incidence of hypoxia. Shallow and highly productive estuaries and embayments are particularly susceptible to diel-cycling hypoxia, associated with day-night cycles of production and respiration, which can cause extreme excursions in dissolved oxygen (DO) concentrations from anoxia to super-saturation within a single day. Diel oxygen dynamics in these systems are complex, and may be influenced by wind forcing, vertical and horizontal mixing, variation in freshwater inflow, cloud cover and temperature. To better understand the environmental drivers of periodic hypoxia, this study examined four northern Gulf of Mexico Estuaries (Weeks Bay, AL; Wolf Bay, AL; Fowl River, AL; and St. Louis Bay, MS). Dissolved oxygen varied strongly on a diel basis in all four systems. Periods of sustained low oxygen (>24 h) were observed in both Weeks Bay and Wolf Bay. The duration and persistence of diel-hypoxia further varied in response to changing salinity regimes and regional weather. These results underscore the importance of combining fixed site continuous monitoring data with spatial hydrographic surveys to accurately resolve DO dynamics in shallow estuarine systems.

Some Effects of Global Climate Variations on Red Snapper and Other Important Fisheries in The Gulf of Mexico. *Donald R. Johnson, Harriet M. Perry and Guillermo Sanchez;* Center for Fisheries Research and Development, University of Southern Mississippi

Red snapper (*Lutjanus campechanus*) have a life history that includes habitat on continental shelves from shallow waters (~15 m as juveniles) to the shelf edge (~150 m as older adults). Although adult migration appears to be small, high fecundity over an extended spawning season (May-October) and a month long larval planktonic stage assures relatively broad dispersion and sensitivity to alterations in seasonal current patterns. Changes in atmospheric and oceanic conditions that affect water properties and currents on the continental shelves from inshore to the deep basin can affect red snapper at various stages of their life history and, hence, have an impact on fishery populations. This study examines important oceanographic variables of the Gulf of Mexico as seen in data-assimilative (phase-locked to satellite data) ocean models over the past decade. These variables are associated with Atlantic basin and Atlantic/Pacific equatorial atmospheric/oceanic changes as indicated by climate indices.

Population dynamics of coastal organisms are influenced by global climate factors that affect local meteorology and hydrology and structure habitat. Enhanced productivity and decreased predation associated with annual and decadal wet climate regimes in Gulf of Mexico watersheds have been linked to population variations of Gulf menhaden and blue crabs, respectively. Scientists working in coastal ecosystems may need to look beyond locally changing conditions in order to understand the role of climate variation in structuring nearshore habitats.

Improving Water Quality through Watershed Planning, Design and Innovative Outreach Activities. *Kelsey Johnson[1] and Judy Steckler;* [1]Mississippi State University's Gulf Coast Community Design Studio and [2]Land Trust for the Mississippi Coastal Plain

Mississippi State University's Gulf Coast Community Design Studio (GCCDS), in partnership with the Land Trust for the Mississippi Coastal Plain (LTMCP) and with input from community leaders and residents, is developing a Watershed Implementation Plan for Rotten Bayou Watershed in Hancock and Harrison Counties, Mississippi. In addition to developing a written plan, the work includes extensive education, community outreach, and demonstration projects of best management practices.

Meaningful engagement is critical both to address conditions that cause nonpoint source pollution and to develop a plan that has good community buy-in to ensure implementation. Innovative engagement approaches are necessary in Rotten Bayou Watershed for two main reasons. First, there is currently very limited public access to the Bayou so few residents in the watershed have a direct connection to or an appreciation of the waterways they impact. Second, there are essentially two "communities" that make up the watershed: Fenton/Dedeaux and Diamondhead. Fenton/Dedeaux is a rural community with many residents that have deep roots in the area. Diamondhead is a planned retirement community that recently became Mississippi's newest city and is made up of many transplants to the area Effectively communicating with residents in these two communities; appealing to their different interests and values; and uniting them in the cause of improving water quality in Rotten Bayou requires multiple and creative approaches to outreach.

The presentation will introduce conference attendees to the unique planning and outreach methods being utilized in developing the Rotten Bayou Watershed Implementation Plan. Strategies include working with non-traditional partners such as a churches, summer library reading programs, golf courses and an educational puppet show; utilizing social media and raffles to make participation appealing and accessible; and leveraging funding from NOAA's Gulf of Mexico B-WET Program to connect students at a local elementary school to the watershed planning work.

The Watershed Implementation Plan for Rotten Bayou Watershed is funded in part by a grant from the EPA to the Mississippi Department of Environmental Quality under the provisions of Section 319(h) of the Clean Water Act along with State and local match.

Restoring Wet Pine Savannah Impacted by Ditch Construction in Hancock County, Mississippi, USA. *Jim Kelly;* President, Society for Ecological Restoration Southeast Chapter

Wet pine savannahs in coastal Mississippi are under constant pressure by developers due to their proximity to the Gulf of Mexico and its associated commercial and recreational amenities. A developer acquired a large parcel of land in Hancock County, Mississippi to construct a business and residential community. Wet pine savannah ecosystems occupied a significant portion of this land. In an effort to modify site hydrology to make it suitable for such development, the owners excavated several miles of large ditches through the wetlands without appropriate permission. A member of the Gulf Restoration Network living adjacent to the intended development began to experience severe flooding never before seen on their property. Following complaints, the US Army Corps of Engineers Mobile District and the Environmental Protection Agency Region 4 became involved. A lawsuit was filed by the Gulf Restoration Network on behalf of their member to halt the illegal activities and seek compensation for damages incurred. As a result, the developer was ordered to restore the impacted

wetlands and to donate a portion of their land to the Land Trust for the Mississippi Coastal Plain to hold as conservation.

Approximately 37 acres of land were directly impacted by the ditch excavations. More than 26,000 cubic yards of dirt were moved to fill the ditches and bring these areas back to the appropriate elevation. The site was then allowed to naturally recruit plant species characteristic of native wet pine savannahs in coastal Mississippi. Bare-root nursery trees were planted to insure canopy diversity. Monitoring and maintenance to control exotic species are ongoing. The site is in its first year since completion of the earthwork. The history of the site, restoration activities and methods, and current site condition are discussed.

Defining Fish Communities: Factors Affecting the Organization of Fish Communities in the Mobile Bay Estuary. *Christopher M. Kemp, Dennis R. DeVries and Russell A. Wright;* Auburn University, School of Fisheries and Allied Aquaculture

Estuaries are important ecosystems at the interface between marine and freshwater systems. They provide many critical ecosystem services, such as water filtration, habitat protection, and nursery habitat for numerous commercially and ecologically important fishes and invertebrates. The Mobile Bay Estuary, Alabama is a river-dominated estuary in the northern Gulf of Mexico. Patterns of freshwater input from the Mobile River drive both the upstream-downstream spatial gradient and seasonal fluctuation of salinity in the greater Mobile Estuary. Changes in river discharge as well as wind and storm-driven water movements can produce rapid changes not only in salinity but other physical-chemical conditions in the estuary. Because of the variable nature of these abiotic conditions in the estuary and the overlap of marine and freshwater organisms that occurs in estuaries, the aquatic community structure can vary dramatically both spatially and temporally.

We quantified the fish and invertebrate communities at 7 sites along an upstream-downstream oligohaline gradient within the Mobile Bay Estuary over a twelve year period (Jan. 2002-June 2014) to quantify trends in community structure. Sites were sampled using electrofishing methods and standardized seine hauls, and measured abiotic variables conductivity (µm/m), salinity (ppt), water temperature (ºC) and dissolved oxygen (mg/l). Principal component analysis was used to characterize patterns in fish communities and canonical correspondence analysis was used to determine relationships of the principal components with the abiotic variables.

Upstream sites were dominated by centrarchids (e.g., *Lepomis microlophus*, *Lepomis miniatus*, *Lepomis macrochirus*), while downstream sites were dominated by species such as spot (*Leiostomus xanthrus*), clupeids (e.g., *Anchoa mitchilli*), pinfish (*Lagodon rhomboides*) and estuarine fundulids (e.g., *Fundulus grandis*, *Fundulus similis*). Based on the canonical correspondence results, dissolved oxygen and temperature surprisingly played the most significant roles in defining upstream fish assemblages. Salinity was not found to play an important role in organizing the communities within the gradient of salinity values in our study area.

Impacts of Wintering Redhead Ducks on Seagrasses of the Northern Gulf of Mexico. *Maddie Kennedy[1,2], Kenneth Heck[1,2], John Valentine[1,2] and Thomas Michot[3];* [1]University of South Alabama, [2]Dauphin Island Sea Lab and [3]Institute for Coastal Ecology and Engineering, University of Louisiana at Lafayette

While it has been well established that waterfowl can control the distribution and abundance of seagrasses in other regions, less is known about their effects in the northern Gulf of Mexico. This is likely because herbivorous waterfowl are only present during winter when typically less fieldwork has been done. We are evaluating the effects of waterfowl (specifically redhead duck (*Athya americana*)) feeding on mixed shoalgrass (*Halodule wrightii*) and widgeon grass (*Ruppia maritima*) beds using caging experiments at several locations along the northern Gulf coast. Time-lapse photography is providing estimates of the abundance and feeding activities of the birds. Additionally, samples of seagrass biomass have been taken at time zero (before waterfowl presence), and one month post bird presence; samples will be taken two additional times: once the birds migrate northward in spring and once during peak seagrass biomass during summer. Waterfowl gut contents will also be examined to determine the amount of seagrass consumed. Results to date show that ducks feed in the study areas and that seagrass biomass may be reduced in uncaged areas. Based on year one results, the experiment will be repeated during the following year with the focus on those locations with the greatest grazing activities.

Wind Characteristics around Mobile Bay: Sea Breezes, Tropical Storms, and Wind Energy. *Sytske Kimball;* University of South Alabama

Using wind speed and direction observation from the South Alabama Mesonet and various other surface data providers, a climatology of wind speed and direction in the Mobile Bay area is established. Data providers include the National Data Buoy Center (NDBC), Dauphin Island Sea Lab (DISL), National Estuarine Research Reserve (NERRS), Physical Oceanographic Real-Time System (PORTS), Automated Surface Observing System (ASOS), South Alabama Mesonet (SAM), and Remote Automated Weather Stations (RAWS).

Seasonal and diurnal variations of wind speed and direction will be investigated using wind roses and time series charts. Wind roses in the Mobile Bay region show patterns of strong northerlies, fewer north-westerlies, and very frequent and strong south-easterlies. This can be explained by the annual evolution of the Bermuda High pressure center. Diurnal variations can be explained by local phenomena such as the sea breeze circulation. Sea breezes are prevalent in the area during the warm season and responsible for forcing most of our summer rainfall.

In November 2009, Hurricane Ida made landfall on the south-east Alabama coast. While wind speed impacts from the storm were minimal, observations display an interesting evolution of the wind direction over Baldwin County where a miniature warm front formed.

The wind speed distribution can be modeled with a Weibull distribution which is widely used by the wind energy community. Weibull distributions from a variety of stations in the area will be shown. The windiest stations are the sites in “maritime” locations with good exposure. These sites have the highest mean and median wind speeds and would be most suitable to wind energy production. As expected, stations with lower anemometer mounting height and/or more obstructions have smaller median and maximum wind speeds. The shape of the Weibull distribution changes. The spread of the distribution decreases, the right-skewness increases, and the peaks get sharper. All of the above means that low winds speeds are more common.

Denitrification Rates are Comparable in a Natural and a Restored Marsh in the Northern Gulf of Mexico. *Alice Kleinhuizen and Behzad Mortazavi;* University of Alabama, Dauphin Island Sea Lab

Salt marshes act as coastal filters, permanently removing nitrate through the process of denitrification and preventing large quantities of reactive nitrogen (N) from entering nearby coastal systems. Recent marsh restoration efforts aim to compensate for the structural and functional losses of ecosystem services due to widespread decline in these coastal habitats. While these construction projects have been successful at reestablishing macrophyte biomass, the development of biogeochemical processes is still poorly quantified. This study aims to determine denitrification rates in a typical northern Gulf of Mexico (GOM) salt marsh and define the factors that influence these rates. These rates were compared to those within a tidal creek to determine the impact of vegetation on denitrification and to rates at a nearby reconstructed salt marsh in order to evaluate the extent restored habitats can contribute to N removal 21 years post construction. Located on Dauphin Island, AL, study sites include a naturally occurring salt marsh primarily inhabited by *Juncus romarianus* (M), a non-vegetated tidal creek located within this marsh (Cr) and a reconstructed salt marsh comprised of a mixture of Spartina alterniflora and *Juncus romarianus* (RM). Rates of denitrification were measured with the isotope pairing technique on a membrane inlet mass spectrometer.

The highest rates of denitrification were measured in the vegetated sites in the spring (M: 31±9 μmol m-2 hr-1 and RM: 19±3 μmol m-2 hr-1) and summer (M: 45±4 μmol m-2 hr-1 and RM: 63±11 μmol m-2 hr-1) with lower rates found in the unvegetated sites during both seasons (Cr spring: 10±1 μmol m-2 hr-1 and Cr summer: 35±3 μmol m-2 hr-1). Denitrification rates followed a temporal pattern with rates increasing as temperature increased. The presence of vegetation likely enhanced denitrification due to root oxygen leakage into the rhizosphere allowing for increased coupled nitrification-denitrificaiton. Porewater hydrogen sulfide concentrations remained low at the M (0-38 μmol dm-3 H2S) and RM (below detection levels) sites, but were greater at the Cr site (68-591 μmol dm-3 H2S) potentially indicating the oxidation of hydrogen sulfide through root oxygen leakage in the rhizosphere. Overall, the presence of vegetation appears to enhance nitrogen removal processes in marsh sediments. In addition, similar nitrate removal rates at the restored and natural marsh sites suggest that marsh reconstruction can be an effective strategy for removing N.

Lessons for Collaborative Governance of Coastal Restoration from the Carnarvon river diversion in Louisiana. *Jae-Young Ko[1] and John W. Day[2];* [1]Jackson State University and [2]Louisiana State University

The State of Louisiana has been recording an alarming rate of coastal land losses, due to complex interactions among physical and biological coastal ecosystem components, mainly driven by diverse human impacts, due to economic incentives and poor remediation efforts surrounding oil and gas production in its coastal zone. In an effort to restore deteriorating coastal ecosystems in Breton Sound, Louisiana, a facility of river diversion for freshwater inflow into the estuarine ecosystem has been operated in Caernarvon, Louisiana, south of New Orleans, since 1991.

The plan was an output of a relatively long collaborative planning process starting in the 1950s. After building the facility, the operational plan of the facility has been developed by the Caernarvon Interagency Advisory Committee, a collaborative stakeholder advisory group, consisting of representatives from federal, state, and local government agencies, local private stakeholders including land owners, fishers, and others. The mission of the collaborative governing committee was expected to consider scientific aspects of operating the facility, including physical reactions inside the estuarine

ecosystem such as freshwater inflow pattern and salinity changes, and biological reactions, including marsh habitat changes, occurred by the freshwater inflow through the facility. It is also required to accommodate diverse stakeholders' interests in the decision-making process.

One of the expected benefits from operating the committee is to internalize conflicts among stakeholders, while accomplishing the goals of restoring coastal ecosystem. However, even though representatives for the fishery interests have been members of the committee, local oyster fishers developed class action lawsuits through federal and state legal circuits for their claimed damages to their oyster beds by the diversion project from 1994 through 2005, until the US Supreme Court denied hearing the case. Their lawsuits against the diversion project were unsuccessful in the Federal Courts. However, their lawsuits were successful in the trial and Appeals Courts in Louisiana, until the State Supreme Court reversed the lower courts' decisions. People in Louisiana amended their State Constitution to protect coastal restoration projects against lawsuits in 2003.

Even though most literature of collaborative governance ask for consensus-based decision-making, a majority rule would be inevitable after trade-off relationships among diverse stakeholders are revealed. A group action from marginalized stakeholder can halt coastal restoration efforts. We believe that efforts to increase common understanding among diverse stakeholders should be increased, and a process to compensate interests of marginalized stakeholders from impacts of restoration projects at an earlier stage should be institutionalized using non-litigation processes.

Using Acoustic and Satellite Telemetry to Track Movements of Alabama's State Saltwater Fish, Atlantic Tarpon (*Megalops atlanticus*). *Andrea M. Kroetz, J. Marcus Drymon and Sean P. Powers;* University of South Alabama, Dauphin Island Sea Lab

The recent collapse of many estuarine and marine fisheries has been widely recognized and is particularly acute for fishes that are long lived, slow growing, and reach sexual maturity at a late age. Several of these fishes have life histories that include ontogenetic movements across estuarine habitats and knowing how much area an individual uses during their residency in a marine habitat is vital to understanding the life history of a species. Atlantic tarpon (*Megalops atlanticus*) are a highly migratory and highly prized sport fish throughout the Gulf of Mexico. Tarpon make extensive seasonal and regional migrations along the Gulf of Mexico as part of their complex life history and exemplify the life history traits that exacerbate population declines. Although this fish is a highly prized sport fish, little is known about the ecology of this species. Given the paucity of information on tarpon ecology, there is a clear need to investigate and understand the movement patterns and habitat utilization of this large fish. Telemetry is a valuable tool used to collect data from mobile marine organisms as acoustic telemetry allows for examination of fine scale movement patterns and habitat usage of marine fishes while satellite telemetry can be used to assess large scale movement patterns. We applied satellite and acoustic telemetry to adult tarpon in Mobile Bay and surrounding coastal waters of Alabama to investigate fine- and large-scale movement patterns of this species. From July-September 2014, 5 adult tarpon (mean size = 1771 mm total length, mean weight = 40 kg) were tagged with an acoustic and a pop-off archival tag (PAT). Each tag type was attached via a dart anchor into the musculature of the fish just below the first dorsal fin. An acoustic array consisting of 22 Lotek Wireless Inc. hydrophones were placed at the mouths of rivers and bays surrounding Mobile Bay and Mississippi Sound, AL to ensure that major corridors to the estuaries are monitored. Data from the hydrophones were downloaded every 3 months to monitor the fine-scale movements of this large fish. The PAT tags are programmed to pop-off and transmit data after 320 days on the fish and thus data will be transmitted in the spring/summer of 2015. Data from this study will provide valuable insight into the movements of Alabama's state saltwater fish in Mobile Bay and surrounding coastal waters, which are previously unknown.

The Exposed Surface Area to Volume Ratio: Is Shell More Efficient than Limestone in Promoting Oyster Recruitment? *Kelsey Kuykendall[1], Paula Moreno[1], Eric N. Powell[1], Thomas Soniat[2], Susan Colley[2], Roger Mann Roger Mann[3] and Daphne M. Munroe[4];* [1]Gulf Coast Research Laboratory, University of Southern Mississippi, [2]Department of Biological Sciences, University of New Orleans, [3]Virginia Institute of Marine Science, College of William and Mary, [4]Haskin Shellfish Research Laboratory, Rutgers University

Planting oyster cultch is a common management approach used to enhance recruitment. The two most popular cultch materials are shell and limestone. Both are sold by volume or weight with planting costs expressed in these terms; however, once deposited on oyster grounds, only a small portion of the total surface area of each particle is available for recruitment. Shell and limestone have different surface area to volume properties, and thus provide differential settlement opportunities. An evaluation of the cost-to-benefit ratio of using shell versus limestone for enhancement should be expressed in terms of the surface area available for settlement. We compared exposed surface area to volume (expSA/V) ratios of oyster shell and limestone fragments, as an indicator of their recruitment- and cost-efficiency for cultch planting. Samples were collected from the Primary Public Oyster Seed Grounds in Louisiana by vibracore, and from the Pass Christian Tong Grounds in Mississippi by dredge. We classified shell (n=608 including both whole and fragments) and limestone (n=241) particles ≥8 mm by geometric shape and calculated their expSA/V. Mean expSA/V ratios of shell were approximately 3 to 9 times larger than limestone. For limestone to provide an equivalent recruitment benefit would require that the cost of purchase, transport, and planting be 3 to 9 times lower than shell. These findings suggest that shell is likely to be a more cost efficient material than limestone for recruitment enhancement. However, the higher variability in expSA/V of shell and other factors such as the material's expected lifetime should also be considered in applications where restoration goals involve more than simply enhanced oyster recruitment.

Atlantic Stingrays: Ideal Model Organisms for Elasmobranch Conservation Research. *Faith N. Lambert and Andrew N. Evans;* University of Southern Mississippi, Gulf Coast Research Laboratory

Populations of elasmobranch fishes have been on the decline over the past several decades largely as a result of anthropogenic activity. These top predators have a pivotal role in the environmental health of the oceans, while also holding significant economic importance in the tourism industry. With the number of threatened elasmobranch species on the rise, interest in conservation efforts and improved methods for examining the effects of anthropogenic stressors has increased. We investigated the use of Atlantic stingrays (*Dasyatis sabina*) as model organisms for studies in stress physiology using a common stressor, air exposure, and a novel serial sampling method that greatly minimizes handling effects. Eleven mature male *D. sabina* were exposed to air for 30 minutes, during which time blood samples were taken at 0 (basal), 15, and 30 minutes, as well as a recovery sample at 48 hours. Blood was collected using a dorsal wing draw method that greatly reduces animal handling over the course of the stressor. Analysis of blood lactate, PCO2, and acidosis indicated that all three parameters increased with high statistical significance, indicating a strong secondary stress response. Blood parameters from the recovery time point were completely recovered to basal levels. Additionally, despite the poor condition of stingrays at 30 minutes, only a single mortality was observed during the week following air exposure demonstrating the resiliency of this species. This model will be useful in future endeavors to elucidate the mechanisms coordinating the physiological stress response in elasmobranchs, leading to more effective conservation efforts.

Service Learning on Deer Island. *Aaron Lamey and Jessica Kastler;* University of Southern Mississippi, Gulf Coast Research Lab

Deer Island, Mississippi has lost 300 acres of its area since 1850. The storm surge from Hurricane Katrina (2005) flooded the island with saltwater, causing the slow death of many trees and contributed to erosion. State and federal agencies have conducted several restoration projects using dredged material and oyster shells both to build land and to reduce erosion rates on the island.

Service learning is a pedagogical method that offers effective learning while addressing a community need by providing a balance between student learning goals and community service outcomes, while requiring students to reflect on their experience. The Mississippi Tidelands Trust Fund Program, administered by the Department of Marine Resources, sponsored a service learning project to conduct environmental monitoring on Deer Island after the recent restoration projects. Groups of 15 undergraduates from four different universities traveled to GCRL to conduct the service learning monitoring project during 2013-2014.

During each four-day visit, student groups spent one day in the classroom learning the natural and human history of Deer Island, two days collecting field measurements that will contribute to a long-term database to monitor changes on the island, and a final day entering data into the computer and presenting their results. The data included elevation profiles and habitat descriptions along transects across the island. In the littoral zone, water samples were analyzed and organisms were sampled, identified and counted. Students completed reflections at the beginning and end to document their experiences in environmental science and community service and changes in their career attitudes.

Students who participated in this service learning opportunity piloted the long term monitoring project by establishing a baseline of data to show the condition of the island. Their reflections illustrate enhanced awareness of environmental science careers and understanding of why monitoring is necessary, as well as increased feelings of environmental stewardship. Monitoring will continue in the future with data collection by students in GCRL's undergraduate, summer field program.

Oyster Restoration in Coastal Alabama. *Brooke Lannie, Stacie Woodard, Andy Antill and Bryant Teasley (Lynn Stewart, Presentor);* Alma Bryant High School

Bryant High School, located in southwest coastal Alabama, is surrounded by fishing communities. In recent years, the oyster reefs have suffered tremendous damage due to natural and man-made disasters (Hurricane Katrina and the Deepwater Horizon Oil Disaster).

The Aquaculture teacher has operated the aquaculture program for the past 15 years and his students have successfully cultured a number of species, including oysters. The Marine Biology teacher has been involved with oyster research and restoration projects for the past six years. Bryant HS is equipped with the culture facilities and equipment needed to carry out oyster culture activities. The essence of the project has involved producing seed oysters, growing them out for a period of time, and then deploying the oysters at a preserve site in an effort to restore the oyster reefs to pre-disaster levels.

The project has resulted in expanded curriculum for aquaculture and marine biology students. Students are monitoring the survival, growth and water quality conditions at the sites which is providing new opportunities for science fair projects. Students are also giving presentations on the project to elementary and middle school students and other members of the community. Although the project term is two years, the overall restoration efforts are planned to continue for years to come.

An Examination of Inter-Annual Variability of Gulf Menhaden Condition. *Robert Leaf;* University of Southern Mississippi

Gulf Menhaden (*Brevoortia patronus*) is an economically and ecologically important harvested species in the northern Gulf of Mexico (NGOM). Recent interest in the trophic role of this stock as "forage" for predators has resulted in an increased focus on its population and fishery dynamics. In this study I describe and investigate the inter-annual variation in condition of the *B. patronus* stock in the NGOM (estimated as oil density, liters/kg). Similar to other estuarine-dependent primary consumers in the NGOM, such as blue crab, Gulf Menhaden's population dynamics are correlated to environmental conditions including the magnitude of rainfall and the relative size of the Mississippi River and Atchafalaya River discharge plume. I hypothesize that the contrasts in inter-annual condition are controlled by similar abiotic conditions. I examined the relationship of potential predictor variables: chlorophyll a phenology and magnitude, the temporal and spatial patterns of sea surface temperature, the magnitude of river discharge, the strength and direction of wind and the spatial characteristics of freshwater intrusion in the NGOM. I show that there exists, in the NGOM, an ecoregion that exhibits coherent productivity dynamics, that the time-series of observed and modeled condition is characterized by marked inter-annual variability, and that environmental conditions in the NGOM have explanatory power to predict annual oil content in the stock. This work is relevant to managers, industry, and other stakeholders because if Gulf Menhaden are a critical link to the productivity of higher trophic levels and their condition is indicative of large-scale changes in ecosystem productivity, then the continued monitoring of menhaden oil content can provide information about the expected status of other trophically related stocks.

Just Six Feet: Rethinking the City of Mobile's Waterfront Infrastructure to Acknowledge and Improve Local Ecology in an Age of Climate Change. *Charlene M. LeBleu and Kenneth Dale Speetjens;* Auburn University Landscape Architecture

Headwater wetlands are located in the upper reaches of watersheds. These intertwining streams and wetlands collect and amend runoff and shallow groundwater entering streams that flow into larger receiving streams. Acting as a crossing point between uplands and surface water networks, these small headwater entities have been compared to capillaries in a human blood circulatory system (Hupp 2000, EPA 2003, Spingarn 2003, Havens et. al 2004).

Headwater wetlands are directly influenced by adjacent riparian zones, and are known for their high contribution to water quality management. Headwater wetlands protect downstream aquatic resources by acting as a natural filtering system for water quality. They are the first step in treating water moving from uplands to streams. Peterson et al. (2001) suggested that small headwater streams can process more than 50% of inorganic nitrogen from the contribution drainage area. Disturbance of headwater wetlands affects water quality proportionately more than disturbance of wetlands further downstream (Perterjohn and Correll 1984, Cooper et al. 1987, Brison 1993).

Headwater wetlands also serve important roles in moderating stormwater runoff and providing wildlife habitat. Many gray infrastructure prototypes for stormwater runoff end with an outfall pipe in an adjacent stream. These "pipe in stream" structures may result in the over saturation of receiving headwater wetlands and scour the sides of these small receiving stream reducing base flow, and depleting them of their pollutant removing ability and ecosystem functions (Bledsoe and Watson 2001, Forman and Alexander 1998).

This presentation uses a case study approach to suggest low impact development (LID) best management practices (BMPs) can be sued to protect headwater wetlands from urban stormwater scouring and saturation (Dylewski et al 2013). LID tools such as buffers, spreaders, bioretention and other best management practices are evaluated for design value and pollutant removal efficiency. Attendees to this presentation will be able to: define a headwater wetland and describe its qualities; choose appropriate BMPs for urban head water wetlands and compare and contrast their value for water quality; and evaluate the use of LID as a tool in protecting headwater wetlands.

Low Impact Development Strategies for Protecting Headwater Wetlands. *Charlene M. LeBleu and Kenneth Dale Speetjens;* Auburn University Landscape Architecture

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Variation in Soil Bacterial Communities along a Natural Land Gradient in Weeks Bay, AL. *Philip Lee[1], Cory Shoemaker[2] and Julie B. Olson[1];* [1]Department of Biological Sciences, University of Alabama and [2]Department of Biological Sciences, Mississippi State University

Each year, efforts are made to restore wetland habitats that are critical for maintaining healthy coasts. One of the most important ecosystem services provided by wetlands is the ability to remove excess nutrients from waters before they enter the ocean. Because sediment microorganisms carry out much of the nutrient removal, understanding the complexity and composition of these communities is necessary. Currently, limited information on the composition of the resident soil microbiota, both

prior to and after restoration efforts, is available. To evaluate the composition of microbial communities in a natural wetland, soil samples were collected at Weeks Bay National Estuarine Research Reserve (WBNERR) across an elevation gradient in which marsh transitioned into shrub and forest wetlands. At each sampling location, abiotic factors (pH, salinity, redox potential, soil organic matter) were measured. Across the elevation gradient, clear shifts in edaphic characteristics were identified. Percent organic matter, redox potentials, and pH were found to increase with higher elevation, while salinity decreased. Analyses of the resident bacterial communities showed distinct shifts in composition between the six sampling locations that likely correspond with changing edaphic properties. These data demonstrate that alterations in environmental conditions have dramatic effects on the composition of the resident soil microbiota, which influences the functionality of the ecosystem. In the future, data from this study could be used as a baseline for making management decisions and support restoration projects that are focused on restoring ecosystem function to degraded wetlands.

Predicted Climate Change Effects on Northern Gulf of Mexico Hypoxia. *John Lehrter[1], Dong Ko[2], Lisa Lowe[3] and Brandon Jarvis[1];* [1]Environmental Protection Agency, Gulf Ecology Division, [2]Naval Research Lab, [3]EPA/Lockheed Martin

U.S. state and federal partners are working cooperatively to develop nutrient management strategies to reduce hypoxia (O_2 < 63 mmol m^{-3}) in the northern Gulf of Mexico. Numerical models that represent eutrophication and hypoxia development processes have been an important tool for estimating the reduction of nutrient loads required to achieve management goals. The models, however, have not examined the potential role of climate change in altering how northern Gulf ecosystems respond to nutrient loads. In this study, we used a coastal ocean ecosystem model to assess a potential future climate of + 3°C air temperature and + 10% river discharge to inspect how future climate could impact hypoxia in the northern Gulf. We applied the model to the Louisiana shelf hypoxic area as influenced by the runoff from the Mississippi River basin. The net effect of increased temperature and freshwater discharge was an increase in the strength of water-column stratification at the pycnocline and a shallowing of the depth of the pycnocline. This change in the physical regime allowed a larger drawdown of O_2 in the water-column beneath the pycnocline compared to the present climate mainly due to less mixing of O_2 to depth. The implications from this future climate scenario are that stricter nutrient management practices may be required to offset climate impacts and that without these practices northern Gulf estuarine and coastal systems may experience more frequent and longer duration hypoxia than in the present.

Distinguishing Blacktip Shark, *Carcharhinus limbatus*, Nursery Areas in the Northern Gulf of Mexico with Vertebral Chemical Signatures. *Justin Lewis[1,2], Will Patterson[1,2] and John Carlson[3];* [1]University of South Alabama, [2]Dauphin Island Sea Lab and [3]National Marine Fisheries Service

Understanding connectivity between juvenile and adult populations is critical for the conservation of exploited and non-exploited species. The analysis of trace metals incorporated into calcified structures of bony fishes (e.g., otoliths) has emerged as a powerful method for estimating the proportion of adults derived from specific nursery areas. For elasmobranch species that occupy coastal nurseries, it may be possible to infer natal origin based on nursery specific biogeochemical signatures in their vertebrae. To assess the efficacy of this approach, we collected neonate and young of the year blacktip sharks, *Carcharhinus limbatus*, (n = 41) from three regions (Florida, Alabama/Mississippi, and Texas) in the fall 2012 and analyzed their vertebral centra with laser ablation-inductively coupled plasma-mass spectrometry (LA-ICP-MS). We ran three parallel ablation transects across the corpus calcareum of

each centrum which allowed us to construct trace metal maps, as well as to integrate nursery chemical signatures across that portion of the centra. Of the ten elements assayed, Ba, Ca, Cu, Mg, Mn, and Sr were consistently above detection limits. Maps of trace metal concentrations indicate Mn concentrations peaked and Sr concentrations dropped following birth. Biogeochemical signatures were significantly different among regions (MANOVA, Pillai's Trace = 0.848; $p < 0.001$), and discriminant function analysis yielded a mean classification accuracy of 81% among the three regions. This preliminary analysis provides positive support for the efficacy of distinguishing blacktip shark nurseries with elemental signatures in vertebrae, and this novel approach may be useful for estimating population connectivity and nursery contribution in other coastal elasmobranchs. Ongoing analysis of 2013 samples will allow us to test for interannual differences in vertebral chemical signatures. Furthermore, optimizing laser settings and ablation spot sizes has permitted higher precision in LA-ICP-MS analysis of shark vertebrae, which in turn should yield increasingly robust nursery signatures.

Influence of *Avicennia germinans* on Ecosystem Dynamics at the Edge of Their Northern Limit.

Aaron Macy, Just Cebrian, Shailesh Sharma and Whitney Scheffel; Dauphin Island Sea Lab, University of South Alabama

With milder winter temperatures as a result of climate change, the black mangrove *Avicennia germinans* has been extending its range northward in the Gulf of Mexico (GoM) and supplanting *Spartina alterniflora* salt marsh. We have noticed increasing mangrove colonization of GoM barrier islands, and use a space-for-time substitution by comparing islands at different stages of mangrove colonization. Several metrics were measured to indicate functional variation between systems, including plant diversity and abundance, growth rates, herbivory preference, decomposition rates, soil organic matter content, grain size, and nutrient compositions. We found preliminary evidence suggesting marsh plants encounter little inhibition at early colonization stages where trees are small and scarce, but with larger trees in greater abundance, marsh plants are excluded. There were similar levels of herbivory for each vegetation species. Decomposition rates were consistently faster in senesced *S. alterniflora* leaf tissue than in senesced *A. germinans* leaf tissue, despite higher nutrient levels in mangrove tissue. Combined, these differences suggest significant changes in energy transfer through our local wetland ecosystems, with implications for carbon storage, erosion, and community structure.

Identifying Ecological Protection Zones in Floodplain Areas Used for Agricultural Activities.

Alexander Maestre[1], G. Milton Ward[2], David Burkhalter[1] and Cheryl Clifton[1]; [1]Civil, Construction, and Environmental Engineering Department, University of Alabama and [2]Biological Sciences Department, University of Alabama

A significant percentage of U.S. grain production is concentrated in few states of the upper Midwest and Great Plains States. In the event of water scarcity due to climate change, it will be necessary to identify other regions of the country adequate to supply the grain demand. One alternative is to increase the current row crop agriculture in the Southeast using excess water from rivers in piedmont and coastal areas. The University of Alabama is evaluating the potential impacts that agricultural withdrawals can cause in the aquatic ecology of floodplains and in the river hydrology. The analysis involved the development of hydraulic and hydrological models that simulate the extent and duration of flooding events. The models were used to estimate the volume of water that could be stored during the winter storms to be used during the dry summer months.

In addition, we were able to identify patterns of inundation and how they could be affected with the agricultural withdrawals. Aquatic scientists have found that flooding cycles are important because encourage benthic macro invertebrates communities to rebound to its original biodiversity. We explore the possibility of develop maximum operation withdrawal rules that cause the minimum impact on the flooding cycles needed by aquatic communities. Four hydraulic models were created in small sections of major rivers located in Alabama, Florida, Georgia, and South Carolina. The results of these analyses were combined with similar studies conducted by agricultural, economics, and policy members of the project. This research has been funded by NSF and the USDA Forest Service Climate Change program.

A Simulation Model Evaluating the Efficiency of Adaptive Cluster Sampling. *Jesse Aaron Marks[1] and Robert Thomas Leaf[2];* [1]Central Methodist University and [2]Department of Coastal Sciences, University of Southern Mississippi

In this work we describe an alternative sampling design to the commonly used sampling methods stratified and simple random sampling: adaptive cluster analysis (ACS). Through simulation and application to long-term spatial distribution data we show that ACS designs can be an efficient alternative to traditional sampling schemes. ACS methods are generally employed for estimating population sizes of organisms that are rare and display clustered or contagious distributions on some scale. We show that such designs have utility for organisms that exhibit a range of distribution types. The objectives of this study were to determine if, and under what circumstances, ACS designs were more efficient than traditional sampling procedures. The Hansen-Hurwitz estimator was used to calculate the population total and the population variation. A simulation model was developed to understand the strengths and biases of ACS methods relative to standard simple random sampling approach. We investigated how changing 1.) the total number of samples and 2.) the relative size of sampling frame altered absolute population density estimates in simulated landscapes with different levels of clustering (aggregation) and population size. Three factors were used as a measure of efficiency; the total population estimate, the variance of the population estimate, and the total number of cells searched. Adaptive cluster sampling outperformed the simple random sampling in nearly every case on efficiency. An optimum range of efficiency was found for each parameter tested on adaptive cluster sampling. We use the results of the simulation model to understand how ACS designs can be used to understand the spatial and temporal dynamics of eastern oyster populations in the Chesapeake Bay.

Short Term Monitoring After Restoration of Highly Stressed Intertidal Marsh in Mobile, AL Indicates Ecosystem Enhancement. *Ashley McDonald[1], Tom Herder[2] and Just Cebrian[1];* [1]Dauphin Island Sea Lab and [2]Mobile Bay National Estuary Program

The shorelines of Mobile County, AL are currently subjected to multiple stressors, both natural and anthropogenic in origin. One way to combat these stressors is with active intertidal shoreline restoration of native vegetation to a pre-disturbance condition. Although an entirely natural, pre-disturbance condition is often impossible to attain for many restorations, it is vital to attempt as natural a state as possible, in order to attain many of the important ecosystem functions, resources, and services. Monitoring of these projects is necessary to help scientists and managers determine not only the immediate success of the restored area, but also to what timeframe and degree the intended resources and services are occurring. One such intertidal restoration was conducted at Helen Wood Park in the middle of the Mobile Bay on the western shore in Mobile County, AL. This restoration

project was initiated with the deposition of 1000 meters of reef block parallel to the shoreline in order to attenuate wave action and encourage oyster growth. Secondly, the degraded marsh area was re-leveled, graded, and replanted with native marsh vegetation with periodic removal of Phragmites occurring after the restoration concluded. Two years of seasonal monitoring were conducted post-restoration with measurements focused on: marsh vegetation abundance, species distribution, and species diversity; submerged aquatic vegetation abundance; associated nekton species abundance and diversity; and intertidal benthic infaunal community abundance. These measurements were also conducted at a nearby unrestored intertidal shoreline that is similar to pre-restoration conditions of the Helen Wood Park area for comparison. Seasonal measurements comparing the restored Helen Wood Park with an unrestored area indicates the large differences in ecosystem function, services, and resources including primary and secondary production, nekton habitat utilization, benthic community abundance, shoreline expansion, and evidence suggesting enhanced storm debris protection in the restored marsh. These results suggest that this type of restoration is useful for enhancing the ecosystem production and resources within Mobile Bay. Although the similarity to pre-disturbance era marshes cannot be determined, comparison with a nearby unaltered shoreline ecosystem provides evidence that disturbances have altered these intertidal communities to a substantial degree.

Betting on a Sustainable Future: Algae Systems Demonstrates Game-Changing Progress in Algae Wastewater Treatment. *Rob McElroy, Lucie Novoveska and Eric Sunstrom;* Algae Systems

Algae Systems' pilot plant demonstration project on Mobile Bay is demonstrating that sustainability is not only the "right" thing to do but is, in fact, the smartest bet going.

The Rules of the Game Are Changing - Treating wastewater has traditionally been viewed as a "fixed cost" that is simply passed onto the customer. Other industries, like Las Vegas casinos, used to think of garbage in this way, too and, solved the problem of garbage from their operation by sending it all to a landfill. As long as customers are willing to bear the cost of this wastefulness, all is seemingly okay. Unfortunately, as the economy tightens, casinos cannot simply continue to raise prices with impunity. For a casino to remain profitable, "garbage" had to be seen for what it really is: a collection of resources waiting to be harvested – from shampoo bottles to bars of soap, and plastic room keys to empty beer bottles. Every casino in Las Vegas today has instituted large-scale recycling programs in order to maintain profitability.

Throwaway Bets - As long as the utilities industry thinks of their mission as "receive wastewater, treat wastewater, dispose of wastewater", then we are no different than the inefficient casinos of yesteryear. Our utility waste streams are filled with valuable resources, too: water, nutrients and biosolids to just name a few. Can we stay profitable simply throwing these resources away? Digging more holes to bury more garbage is not an answer. Likewise, throwing away water, discharging nutrients into the environment and sending biosolids to landfills is not an answer, either.

A Smarter Game, Better Odds, a Bigger Pot
Algae Systems is betting on a completely new game. We use locally found algae strains to treat disinfected wastewater in large "bags" floating in Mobile Bay. Natural wave action provides mixing to keep the algae suspended and exposed to sunlight. We harvest CO2 from the air for our algae to "breathe" (as plants, algae breathe in CO2 and exhale oxygen). The mass of the water provides excellent temperature control. In only 4-6 days, we harvest the algae, dewater it and are left with clean water fit for either reuse or further filtering to drinking water standards. The algae are converted in a

proprietary process into crude oil that can be further refined to any fuel desired. We have also developed ways to convert treatment plant sludge into raw crude oil in much the same manner.

Collecting Your Winnings - We stand at the cutting edge of the "water / energy nexus" in wastewater treatment, and are moving now to establish full commercial scale plants in the US and abroad. If this process moves forward as expected, we have the ability to show utility companies across the country that betting on a sustainable future is far from "risky". It is, in fact, the safest bet in the house!

Balloon Mapping at Grand Bay National Estuarine Research Reserve: A Low Cost Aerial Imagery Acquisition Alternative. *Julius B. McIlwain Jr., William V. Underwood and Lindsay T. Spurrier*; Grand Bay National Estuarine Research Reserve

Aerial imagery has played an important role in mapping terrain since the first one was taken by Felix Tournachon in 1858. However, as technology changes, this imagery can be acquired in many different ways ranging from the use of satellites, planes and balloons. Each of these methods has their pros and cons such as cost, resolution, legalities and weather during acquisition. In the summer of 2014, Grand Bay NERR purchased a Balloon and Kite Mapping Kit from Public Lab NOLA, a Canon Powershot Elph 110HS and a Canon Powershot Elph 110HS with a NDVI filter installed to map vegetation health. A camera cage was constructed using a two liter plastic soda bottle cut 2/3 down from the top. The cameras were mounted inside the cage using heavy duty rubber bands and zip ties. Using the bottom portion of the two liter bottles, two sets of two tails were cut out and mounted to the camera cage. This keeps the cage relatively steady once in flight. After the cage was constructed and the camera mounted, the chloroprene mapping balloon was filled with helium and attached, using zip ties, to 1000 feet of 110lbs test of Dacro Line. If the winds are high, one can consider using the kite instead of the balloon to cut cost. The balloon, or kite, is now set for flight. Once an altitude of +/-200 ft is reached the camera cage was mounted to the Dacro Line using a stainless steel swivel and clasp. The camera is powered on and set to a one second shooting interval and the focused to the horizon (∞). If the camera does not have interval shooting, one can keep the shutter button depressed by placing a small rock held in place by a rubber band on the shutter button. The camera is now ready for flight. Once the camera was at the desired altitude, we walked and boated the balloon mapper along pre-determined transects using the wind to our advantage. After mapping transects with the regular camera, we reeled in the balloon, placed the NDVI camera in the cage and repeated the flight process. In order to geo-reference the imagery, 3-5 five gallon bucket lids were attached to stakes and placed in the marsh. Points were then taken at the center of the lids using Trimble R8 RTK/RTN (high precision GPS). After acquiring the imagery; the cameras were brought in from the field and are loaded on the computer. They were opened in Mapknitter, an image stitching software that creates a mosaic of all the photos taken. This application has a variety of uses ranging from mapping natural and man-made disasters to invasive species mapping. Some other advantages of using this system are one can experiment with different elevations and filters, there is no need for a licensed pilot to fly imagery, and imagery can be flown at the drop of a hat.

Striped Bass Project Update on the Mississippi Gulf Coast. *Paul Mickle[1], Jennifer L Green[2], Mark S. Peterson[2] and Larry Nicholson[2];* [1]Mississippi Division of Marine Resources and [2]University of Southern Mississippi

Native gulf strain striped bass have seen dramatic declines over the last 50 years with hatchery efforts sustaining the population. Decreased water qualities in relation to industry and residential septic systems have been suggested as the driving factors toward the declines. Presently, no natural reproduction has been documented and all collections have given evidence to only hatchery fish being

present within their historical distribution. Telemetry projects using Principal Components Analyses (PCA) have suggested a habitat specific strategy for striped bass during summer months as well as evidence of possible spawning migrations. Deeper than average depth along with increased salinity values were selected among striped bass during summer months which are consistent with other studies conducted in Florida as well as New England. With evidence of habitat refugia during physiochemical stress along with documented spawning migrations, natural reproduction may be present. The final phase of the striped bass project in Mississippi will be to sample for wild hatched striped bass to confirm natural reproduction.

Facilitating Thermal Acclimation: Heat Shock Protein 70 mRNA Expression in Red Blood Cells of the Eurythermal Atlantic Stingray. *Alexis B. Miller[1], Danielle E. Bailey[2] and Andrew N. Evans[2];* [1]Ocean Springs High School, [2] University of Southern Mississippi, Gulf Coast Research Laboratory

Aquatic coastal habitats are characterized by large spatial and temporal variations in multiple environmental parameters including oxygen, salinity and temperature. Physiological systems of many species inhabiting these environments are therefore well adapted to function over a wide range of such parameters. High temperatures affect cellular function through the denaturation of proteins, with these effects partially mitigated by molecular chaperones such as the heat shock proteins (HSPs). The functional temperature range for a given species is therefore largely mediated by the relative stability of proteins as well as the expression and function of HSPs. The Atlantic stingray, *Dasyatis sabina*, is highly adapted to the coastal environment and can acclimate to temperatures ranging from <5 to 40 °C. We therefore used *D. sabina* as a eurythermal elasmobranch model to examine the potential temperature regulation of heat shock protein 70 (hsp70) mRNA expression. A fragment of hsp70 was isolated from *D. sabina* using degenerate PCR, and rapid amplification of cDNA ends (RACE) was then used to isolate the full mRNA sequence including the 5' and 3' untranslated regions. To examine the potential induction of hsp70 mRNA by increased temperature, whole blood was collected from Atlantic stingrays and incubated for two hours at either 24 (control) or 32 °C, with hsp70 mRNA subsequently measured in red blood cells using quantitative PCR. hsp70 mRNA levels increased within two hours of heat shock, demonstrating induction of this gene within a range of temperatures encountered by Atlantic stingrays in coastal regions of the Gulf of Mexico. These results also provide additional support for the utility of red blood cells, which are nucleated in fish and therefore capable of regulated gene expression, as non-lethal markers for studies examining environmental stress.

Identifying Failing Septic Systems in the Eight Mile Creek Watershed. *Christian Miller;* Auburn University, Marine Extension and Research Center

The Eight Mile Creek Watershed is located in Mobile County, with a majority of its 37 square mile watershed located within the cities of Mobile, Prichard, and Chickasaw. The watershed contains five miles of impaired streams comprising components of the semi-braided, perennial Eight Mile Creek and larger Chickasaw Creek tributary system which flow into the Mobile River and eventually into Mobile Bay and the Gulf of Mexico.

In 1998, Eight Mile Creek and Gum Tree Branch were added to the State of Alabama's 303(d) list of impaired waters due to high levels of pathogen pollution (fecal coli form) from urban runoff and/or storm sewers and septic system failure. The Eight Mile Creek Watershed is subject to the impacts generally associated with urbanization: sewage and pathogenic bacteria from aging and overloaded infrastructure, trash and litter carried into the creek by stormwater runoff, and loss of natural shoreline

triggered by increases in impervious surface. The Alabama Department of Environmental Management's (ADEM) monitoring efforts have indicated severe problems with low concentrations of dissolved oxygen downstream of the confluence of Eight Mile and Chickasaw creeks.

The Eight Mile Creek Watershed has been identified by ADEM as one of the top-five watersheds for septic systems in Mobile County, with 3,800 systems in the Watershed. The current project creates a comprehensive GIS database of failing septic systems within the Watershed which would enable community decision makers, residents, and state and federal agencies to better allocate limited resources in an effort to remediate compromised systems.

Color Infrared (CIR) photography has proven to be a successful method for identifying failing septic systems. This technique for locating failing septic tanks has been in use for decades, and is described in detail by the EPA report "Evaluation of Color Infrared Aerial Surveys of Wastewater Soil Absorption Systems." Gwinnett County, Georgia, performed such an investigation in 2006 and documented the study in the report titled, "Fecal Coliform TMDL Implementation – Analysis of Color Infrared Aerial Photographs to Detect Failing Septic Systems." These studies indicate that the CIR process can identify failing septic tank sites with an accuracy of approximately 80%.

As one of the stated goals of the watershed management plan for the Eight Mile Creek Watershed, the Mobile Bay National Estuary Program (MBNEP) contracted with Southern Resources Mapping Corporation (SRMC) to identify failing septic systems in the Eight Mile Creek Watershed. As part of this project, approximately 50-square miles were photographed in February, 2014 using CIR. The photos were then processed, orthorectified and examined to locate likely failing systems. Subsets of 16 sample sites of possible failing systems were identified for field confirmation which took place on June 25th, 2014 by members of the Mobile County Health Department, SRMC, and MBNEP. The final report and GIS database will allow for a targeted approach to remediating failing systems within the watershed through education/outreach efforts, cost-share programs (i.e., septic tank vouchers) and installation of new technologies for managing wastewater such as decentralized treatment systems.

Storm Surge: An Interactive Visualization Tool. *Tina Miller-Way[1], Carrie Riley[1], Thomas Richardson[2] and Carsten Neumann[3];* [1]Dauphin Island Sea Lab, [2]Jackson State University and [3]University of Louisiana Lafayette

Storm surge is one of the most deadly aspects of hurricanes in the Gulf coast region, but one that is not well understood and whose significance is under-appreciated. We have developed an interactive tool that allows users to examine storm surge or inundation levels as they vary with hurricane severity and landfall location. Visualizing the Surge is a Web application built on top of the popular Google Maps platform and employs standard click and drag techniques for ease-of-use. The user selects a landfall location along the Gulf coast (currently only Mississippi-Alabama) and storm severity (currently only category 2 or category 4), and allows the simulation to run. As the storm approaches and makes landfall, the user sees variation, depicted using color contours, in inundation levels at the selected location. The Google Maps platform allows the user to zoom in at a neighborhood scale or zoom out to see the entire coastline of both states. The user may also select a specific gage station location (indicated using water drop icons) and a pop-up window appears showing hydrographs depicting water levels before, during and after a storm's passage.

This tool is based on a library of ADCIRC model runs. When a user selects storm severity and landfall location, the simulation is not calculating water levels in real time: the program selects a specific

ADCIRC model run from the library that most closely matches the selected parameters. Inundation levels are solely determined from differences in land and water elevations. It should be cautioned that this tool is for heuristic value only: it is not intended for the prediction of storm surge during an actual storm.

Visualizing the Surge was developed for student audiences and as such includes accompanying content lectures, lesson plans, assessment tools and a Google Earth tutorial. Formative assessments indicated that this curriculum unit significantly increased student understanding of storm surge. However, the tool could also be used as an engagement and exploratory tool for general audiences in public settings. Visualizing the Surge can be accessed at http://stormsurge.disl.org.

First Documented Predation of Adult Mississippi Diamondback Terrapins (*Malaclemys terrapin pileata*) by Raccoons (*Procyon lotor*). *Christina F. Mohrman[1,2] and Jason D. Tappa[3];* [1]NOAA Environmental Cooperative Science Center, [2]Grand Bay National Estuarine Research Reserve and [3]Gulf Islands National Seashore

Diamondback terrapins (*Malaclemys terrapin*) are the only species of turtle that solely inhabits brackish water and are endemic to salt marshes and mangrove habitats along the US Atlantic and Gulf coasts. Mississippi diamondback terrapins (*Malaclemys terrapin pileata*) are found along the northern Gulf Coast from the Florida panhandle to western Louisiana. While populations of some terrapin subspecies are well studied, little is known about Gulf Coast terrapin populations. In Mississippi, terrapins are listed as "imperiled because of rarity or factor(s) making it vulnerable to extirpation." Habitat loss, bycatch mortality, and drowning in derelict traps have been repeatedly ranked by scientists and resource managers as the top threats to terrapins in Mississippi (and other states throughout their range).

We are currently employing several methods, including nesting beach surveys, to estimate current terrapin population status and to assess changes that may have occurred in Mississippi terrapin populations. This year, we documented 12 adult female terrapins killed by raccoons (*Proyon lotor*); 10 terrapins were found at the Grand Battures (Grand Bay National Estuarine Research Reserve) and two terrapins were found at Marsh Point (Gulf Islands National Seashore). The adult female terrapins were killed on the beach after emerging from the marsh to nest. This is the first documented predation of adult *M. t. pileata* by raccoons and the first documented predation in the northern Gulf of Mexico. Raccoons commonly depredate terrapin nests to consume terrapin eggs, however, predation of adult terrapins is rare. Predation of adult female terrapins has only previously been documented in New York (*M. t. terrapin*) and at several sites in Florida (*M. t. centrata*, *M. t. tequesta*, and *M. t. ornata*).

All 12 terrapins were found with injuries to the rear limbs and broken necks; this is consistent with the description of injuries from previously documented raccoon attacks in New York and Florida. However, unlike previously documented terrapin attacks, the terrapins that we found in Mississippi were not eviscerated and consumed. The average midline carapace length of these terrapins was 19.3 cm and the average plastron length was 17.6 cm. While the sample size is small (n=12), it is worth noting that the average carapace length of these terrapins is larger than documented by Mann in his study of Mississippi terrapins during the early 1990s (average carapace length 16.8 cm; n=34).

If predation of adult female terrapins at these sites continues, it may become a serious threat to the survival of local terrapin populations. Local extirpation of a terrapin population in east-central Florida was attributed, in large part, to raccoon predation on adult terrapins. The life history traits of terrapins

(and all turtles), including high mortality at the egg and juvenile stages, delayed age to maturity, and long adult life spans make them vulnerable to adult mortality and very slow to recover from population declines. Mortality of adult terrapins is of serious concern, especially considering the pressure terrapins are already experiencing from crab trap mortality and other threats.

Involving Teachers and Students in Habitat Restoration. *JoAnn Moody, Tina Miller-Way, Greg Graeber and Hazel Wilson;* Dauphin Island Sea Lab

Habitat restoration will continue to be an increasingly frequent activity in the northern Gulf of Mexico. It is therefore critical to educate individuals of the need for, the value of and the process of habitat restoration. The education and outreach group at the Dauphin Island Sea Lab Discovery Hall Programs (DHP), has implemented a series of education and service-learning programs focused on oyster reefs and their restoration.

MASGC funding supported the development and implementation of professional development for educators on the science of and practice of habitat restoration. A multi-day workshop, titled Reefs, Rhizomes and Restoration, was offered from 2010-2013 and provided more than 60 teachers with an introduction to restoration science, familiarity with the physical and biological requirements of three coastal habitats (seagrass beds, oyster reefs, salt marshes), age-appropriate relevant classroom activities, site visits to restoration projects and ideas for restoration-themed student service activities.

An USEPA grant (Gulf Alliance Partnership) has allowed DHP to involve science teachers and students from a Mobile Co. Title I school in field trips to local and coastal watersheds coupled with a service-learning activity. In 2 years, more than 120 students participated in the program, learning about watersheds, water quality and oyster reefs. While at DISL, students bagged and deployed oyster shell to create a living shoreline. Assessments and qualitative interviews indicated that students learned about water quality and of the role oyster reefs play, and felt they were contributing to improving the bay.

A NOAA BWET grant has allowed DHP to expand this educational effort to a wider group of teachers and students from across Alabama and the panhandle of Florida. For 2 years, we have hosted a multi-day teacher workshop focused on watersheds, water quality, oysters, as well as oyster reefs, their value and restoration. Teachers return to DISL with their students to study Mobile Bay and its oyster reefs. As part of their visit, these middle school students have bagged and deployed oyster shell adding to the living shoreline started by the GAP project. To date, more than 150 students have participated in this ongoing project and the living shoreline currently measures approximately 600 cubic ft.

Community Adaptation to Sea Level Rise on Georgia's Coast. *Katherine Moore and Johanna McCrehan;* Georgia Conservancy

Georgia Conservancy has been a regional nonprofit leader in advancing sustainable growth since launching our Blueprints for Successful Communities program in 1995. The Blueprints technical assistance program helps Georgia communities make informed development decisions through more robust and comprehensive planning.

Since 2011, Georgia Conservancy has been involved in research, community planning and education and outreach around the issue of sea level rise and its impacts to Georgia's natural and built

environments. With over half of the world's population living less than 100 miles from the ocean, and with coastal cities having a population density that is three times higher than the global city average, it is imperative that focus on sea level rise become a consideration in every shore community's planning exercises.

Though sea level rise is incremental, communities must plan well in advance in order to develop adequate adaptation strategies that will help mitigate future social, economic and environmental losses. Georgia Conservancy has partnered with three academic graduate courses to develop community-specific understanding of likely sea level rise impacts to vulnerable populations and to develop community-specific adaptation design scenarios for the built environment.

Georgia Conservancy's presentation will give an overview of how vulnerable communities (both physical infrastructure and human populations) were defined and studied in three Georgia counties as well as an overview of two of the five communities for whom design adaptation concepts were developed.

Georgia Conservancy's primary goals with this multi-year focus on sea level rise are to ensure awareness of sea level rise threats in the minds of local community leadership and to aid Georgia's coastal communities in planning future infrastructure and development and redevelopment in a sustainable and fiscally responsible manner. It is the Georgia Conservancy's position that coastal communities must learn to live with water versus ignoring or battling it, allowing these communities to continue to thrive through adaptation.

Independent Advisory Team for Marine Mammal Assessments. *Paula Moreno;* Gulf Coast Research Laboratory, University of Southern Mississippi

In the U.S. Atlantic 23 fisheries are classified as having frequent (Category I) or occasional (Cat. II) interactions with marine mammals (MMs). Basic knowledge to classify fisheries interactions and determine whether fishing restrictions are required includes metrics such as the Potential Biological Removal (PBR) and annual mortality caused by each fishery. Yet, 39% of the MM stocks in this region lack PBR and 19% are in review. Of the reviewed stocks, 34% are reported as subject to a non-zero Annual Fisheries Serious Injury and Mortality and for about 27% stocks this metric is unknown. Likewise, in the Gulf of Mexico, for a large fraction of MM stocks, PBR is undetermined. For example, of the 32 bay, sound and estuary bottlenose dolphin stocks in the Gulf of Mexico, only 4 stocks have estimated PBRs. The independent advisory team (IAT) is a think-tank dedicated to identifying research to help reduce uncertainty associated with MM stock assessments in U.S. waters. Refinement of the stock assessment process can optimize regulatory responses and benefit both MM conservation and fisheries. The IAT will review the scientific basis of assessment and management efforts of MMs and identify priority areas for research. To this end, the IAT will promote networking with MM stock assessments researchers and managers. The IAT project was recently launched at the Science Center for Marine Fisheries, or SCeMFiS, which is sponsored by the Industry & University Cooperative Research Program (I/UCRC) of the National Science Foundation (NSF). The University of Southern Mississippi is the lead academic institution in SCeMFiS with the Virginia Institute of Marine Science as the partner institution.

Shrimp Boat or Dolphin Delicatessen? Dolphin Interactions with the Shrimp Fishery in the Galveston Bay. *Paula Moreno and Michael Mathews;* Gulf Coast Research Laboratory, University of Southern Mississippi

Studies of the interactions between marine mammals (MM) and commercial fisheries tend to focus on the detrimental effects of depredation and bycatch. Hence, despite the prevalence of these interactions, limited knowledge is available on the role that commercial fisheries may play as an integral component of the marine ecosystem in providing a predictable source of food for MMs, potentially contributing to an increase of their foraging success. The MM-commercial fishery foraging association is likely intensified in the case of social species such as the bottlenose dolphin (BD), which are highly mobile, opportunistic foragers, capable of learning multiple foraging behaviors that can propagate across generations. Worldwide, BDs forage in association with the shrimp bottom-trawl fishery. This fishery is among the top five most valuable U.S. commercial fisheries with most landings originating from the Gulf of Mexico, where dolphin-shrimper interactions occur in estuaries, coastal and offshore waters. This BD-shrimp trawling association is not surprising, considering the substantial amount of bycatch generated (bycatch:shrimp ratios range from 1.5 to 11.8 in Texas bays) that is usually discarded. The main goal of our study was to characterize the foraging behavior of BDs associated with the shrimp bottom-trawl fishery in a Gulf of Mexico estuary. Specifically, we quantified: the proportion of foraging that relies on shrimp vessels; how many dolphins on average forage with shrimpers; the proportion of adults, juveniles and calves; and how prevalent feeding on discards is compared to feeding in proximity to the nets. By conducting systematic vessel surveys across four seasons in sub-areas of the Galveston Bay that differ in level of shrimp fishing effort, we also investigated whether BDs exhibit preference for seasons and/or areas with higher shrimp fishing effort. We discuss these findings in the context of bottlenose dolphin conservation and the shrimp fishery dynamics. This study highlights the need to consider the trophic link between commercial fisheries and top-predators such as BDs in ecosystem-based models of estuaries, where both are commonly present.

Environmental Drivers of Ecosystem and Plankton Metabolism in Pensacola Bay, Florida. *Michael Murrell[1], Jim Hagy[1], Jessica Aukamp[1], Marcus Beck[1], David Beddick[1], George Craven[1], Ally Duffy[1], Brandon Jarvis[1], Mike Marcovich[1], Diane Yates[1] and Jane Caffrey[2];* U.S. [1]Environmental Protection Agency and [2]University of West Florida

Water quality time series serve a valuable role in monitoring temporal changes in aquatic systems. High frequency dissolved oxygen (DO) time series are increasingly used to derive integrated ecosystem metabolism rates using the open water method. Such process rates are valuable because they provide insight into mechanisms of water quality impairments (i.e., eutrophication, hypoxia). In shallow well-mixed environments, open water metabolism represents the sum of water column (plankton) and benthic processes, but source attribution is difficult without additional information. Therefore, we measured ecosystem and plankton process rates to resolve metabolic sources and to examine responses to environmental changes. We selected paired sites in Pensacola Bay to represent a contrast between shallow seagrass habitat and deeper bare-bottom habitat. Continuous DO time series were collected during 2013 in conjunction with a series of 40 plankton bottle experiments. Ecosystem and plankton production and respiration were highly coupled, suggesting near balanced net metabolism at both sites. At the deep site, plankton and ecosystem metabolism rates were similar, implying a minor role for benthic metabolism. In contrast, at the shoal site, ecosystem metabolism was much larger (~7X) than plankton metabolism, indicating a strong benthic contribution. At both sites, plankton metabolism increased following a freshwater inflow event that occurred mid-way through the study. At the deep site, ecosystem metabolism also increased following the inflow event, further

suggesting a predominance of plankton processes. However, at the shoal site, the inflow event depressed ecosystem metabolism and stimulated plankton metabolism, suggesting a sharp decline in benthic component of metabolism, which also coincided with a ~20% decrease in light availability. Thus, integrated process rate measurements help to understand ecosystem responses to environmental drivers in estuarine environments.

***Fundulus grandis* Otolith Microchemistry as a Metric of Estuarine Discrimination and Oil Exposure.** *T. Reid Nelson[1,2,3], Dennis R. DeVries[3], Russell A. Wright[2] and Joel E. Gagnon[4];* [1]University of South Alabama, [2]Dauphin Island Sea Lab, [3]School of Fisheries, Aquaculture, and Aquatic Sciences, Auburn University and [4]Great Lakes Institute for Environmental Research, University of Windsor

The Gulf Killifish, *Fundulus grandis* is a vital component of saltmarsh ecosystems and an indicator species for environmental impacts, because of strong site fidelity. Also, their otoliths can provide a record of environmental conditions because they are metabolically inert, grow continuously with the fish, and incorporate trace elements from the environment. We used LA-ICP-MS to determine chemical composition differences in Gulf Killifish otoliths across the N. Gulf of Mexico. Concentrations of Mn, Sr, and Ba varied among sites and allowed for discrimination of fish between estuaries in Louisiana (elevated Ba concentrations) and the west side of Mobile Bay Alabama (elevated Mn concentrations). However, elemental signatures of otoliths from Mississippi, Florida, and the east side of Alabama could not be discriminated from one another. Regional differences in otolith elemental signatures in Louisiana and west Alabama appear to provide unique chemical tags for these waters, and thus may have utility for nursery habitat determination for species with estuarine dependent juveniles. Otoliths of *F. grandis* that had been exposed to oil (either from the 2010 Deepwater Horizon oil spill (DHOS) or because of close proximity to an oil refinery) did not differ in elemental signature between paired oiled and non-oiled sites. Therefore the otoliths did not contain trace metals associated with oil. Also, relative condition of *F. grandis* did not differ between paired sites. The presence of *F. grandis* at all sites, lack of effect of oiling on relative condition, and no signal of oil related elements in the otoliths suggest minimal long-term impact of the DHOS on *F. grandis*.

Water Resources Research in Coastal and Poorly Drained Forests of the Southeastern U.S. *Jami Nettles[1], George Chescheir[2], Devendra Amatya[3] and Erik Schilling[4];* [1]Weyerhaeuser Company, [2]North Carolina State University, [3]U.S. Forest Service and [4]NCASI

Forestry is a major component of the economy in Mississippi and Alabama, and sustainably managed forests can benefit water resources as well as provide economic benefit. However, the complexity of coastal, wetland, and poorly drained ecosystems presents a research challenge. Long term research is necessary for understanding the interaction of land use, soils, and climate.

This presentation summarizes the results of forest hydrology research in poorly drained and coastal managed forests in the southeast and implications for coastal Mississippi and Alabama. Much of the information presented comes from a long term, cooperative research project in coastal North Carolina. On land owned by Weyerhaeuser Company, a controlled watershed study was installed in the mid-1980s to study water management and site productivity under typical forest practices. Scientists from North Carolina State University, the U.S. Forest Service, Weyerhaeuser, and other institutions have extended that research to water quality and quantity in silvicultural and biofuel plantings. Key finding are discussed, including projections from expansion of forest-based biofuels. Other studies have

provided important information on forests, forest management, and the effectiveness of forestry Best Management Practices.

Watershed research requires a large financial and time commitment, so there are far fewer studies than are actually needed. Gaps and future research plans will be discussed, along with technology being used to improve data collection accuracy and cost effectiveness.

Suitability of Calcein for Mass Marking Marine Bivalve Larvae (*Crassostrea virginica*) under Different Salinity and Tank Conditions. *Haley S. Nicholson[1,2], Ruth H. Carmichael[1,2] and Scott Rikard[3];* [1]Dauphin Island Sea Lab, [2]University of South Alabama and [3]Auburn University Shellfish Laboratory

The fluorescent marker, calcein, is used to inertly stain bivalve shell to measure growth. This technique has potential to be used in bivalve mark-recapture studies, but field applications have been limited. We tested the growth and survival of mass stained eastern oysters, *Crassostrea virginica*, under different ambient salinity conditions to determine the potential application of this method to trace larval dispersal patterns in Mobile Bay, AL, the 4th largest freshwater drainage system in the U.S. To do this, we stained 35 million 3-day-old *C. virginica* hatchery reared oyster larvae by immersion in 100 mg L-1 calcein solution for 48 hours at 15 and 26 ppt. During staining, oysters were housed in hatchery tanks filled to 2500 L. Oysters were given a 24 hour recovery period in hatchery tanks filled to 19,000 L. After staining, oysters at low salinity were housed in 38 L rectangular aquaria at a density of 0.5 larvae mL-1 at 23^{o}C with water changes every other day. Oysters at higher salinity were split into two sample groups. One group was maintained in 38 L rectangular tanks at the same conditions as post-staining oysters in low salinity. The second group was maintained in 1000 L hatchery tank at a density of 1 larva mL-1 at 29^{o}C with water changes every other day. In both staining experiments 22 million larvae (63%) survived the staining process. Under low salinity conditions larvae only grew 2 μm (72-74 μm) during staining, remained as D-stage larvae, and died within 2 weeks of the experiment. Under higher salinity conditions larvae grew 11 μm during staining (76-87 μm) and matured to umbo-stage larvae. Larvae in rectangular aquaria survived three weeks post-staining and did not grow past umbo-stage larvae. Oysters in hatchery tanks continued to grow to pediveliger stage and were set on concrete tiles after the staining process.

Results indicate that salinity affected growth but not survival during staining. After staining, tank volume had the greatest effect on growth and survival. Oysters in hatchery tanks had higher growth rates and 66% survived to set. All oysters in rectangular aquaria died before reaching setting stage and did not grow past the larvae stage that they achieved during staining. Salinity may have had a secondary effect, with oysters at higher salinity surviving longer. Mass staining of oyster larvae may be an effective tool for mark-recapture studies, but consideration should be given to salinity conditions both during staining and at targeted field sites after release. For lab-based studies, tank volume post-staining may be most critical to longer-term growth and survival.

Water Quality as a Nexus Between Land Use/Cover and West Nile Virus Incidence. *Navideh Noori, Latif Kalin, Graeme Lockaby*; Center for Forest Sustainability, School of Forestry and Wildlife Sciences, Auburn University

West Nile Virus (WNV) is a vector-borne infectious disease which has been transmitted to humans by mosquitoes. In the southeast United States, due to increases in population density and urbanization,

habitat for Culex mosquitoes, the southern house mosquito vector for West Nile Virus, have increased. To control mosquito-borne diseases and WNV outbreak, the potential mosquitoes breeding sites need to be identified. Land use/cover (LULC) changes and their impact on water quality are important risk factors underlying WNV incidences. To address interactions between these risk factors and mosquito populations, water quality was predicted under different LULC scenarios in watersheds located in Atlanta metropolitan area, Georgia where an extensive dataset on WNV cases is available. Also, a mesocosm experiment was designed to develop dose-response relationships between mosquitoes and different nutrient constituents. It was found that addition of phosphate to the larval habitat increased the larval development time and also nitrate favored the development of male mosquitoes and suppressed the development of female mosquitoes. Results of this study can be critical in developing tools for predicting WNV risk across rural as well as developed landscapes.

Exploratory Research of Black Yeasts: Cryptic Diversity from Coastal Habitats in the North-central Gulf of Mexico. *Raphael Orélis-Ribeiro[1], Cova R. Arias[2] and Stephen A. Bullard [1]; [1]Aquatic Parasitology Laboratory, School of Fisheries, Aquaculture, and Aquatic Sciences, Auburn University and [2]Aquatic Microbiology Laboratory, School of Fisheries, Aquaculture, and Aquatic Sciences, Auburn University*

Fungi are underappreciated as animal pathogens, and many potentially pathogenic species have only been recently described or likely remain undiscovered. "Black yeasts" (Chaetothyriales: Herpotrichiellaceae: paraphyletic Exophiala) have been isolated from environmental samples, including sites contaminated with hydrocarbons, as well as from humans, fishes, amphibians, turtles, and invertebrates. They range in marine and freshwater habitats across a wide span of latitudes. Some Exophiala spp. are commercially important: *E. cancerae* causes "Lethargic Crab Disease" in South America and a 1969 infection by *E. pisciphila* in channel catfish, *Ictalurus punctatus*, caused mortality in pond aquaculture. No record of an infected wild-caught or captive fish or invertebrate has been documented in North America since 1985, suggesting these agents largely have been ignored in routine diagnostics activities. Herein, using light microscopy, oil flotation isolation, and molecular methods, we aimed to determine prevalence, intensity, and biodiversity of Exophiala spp. associated with blue crabs (*Callinectes sapidus*) and environmental samples (i.e., decaying wood and particulate organic matter [POM]) from coastal Mississippi. Morphological identification supplemented with molecular phylogenetic analysis identified the isolate from *C. sapidus* as a strain of *Exophiala lecani-cornii*, which also has been isolated from insects, humans, and gas biofilters. In addition, despite the inconclusive morphological and molecular data obtained from decaying wood and POM isolates, molecular phylogenetic analyses identified both black yeast strains as a putative new Exophiala-like species. This is the first record of *E. lecani-cornii* and Exophiala-like species in coastal Mississippi; first report of *E. lecani-cornii* from hepatopancreas of *C. sapidus*; and first isolation of a strain of *E. lecani-cornii* from a non-human or non-environmental source in the North America. Species circumscriptions supported by physiological profiles and multi-locus sequencing are in progress for decaying wood and POM isolates. That black yeasts are associated with hydrocarbon-rich environments and mortalities of captive fishes and a wild crustacean is noteworthy, warranting further study as indicators of oil spill and as pathogens of captive and wild aquatic organisms.

The 2013 Community Rating System: Developing a Program of Public Information. *Niki L. Pace[1], Tracie Sempier[2] and Melissa Daigle[3];* [1]Mississippi-Alabama Sea Grant Legal Program, [2]Mississippi-Alabama Sea Grant Consortium and [3]Louisiana Sea Grant Law & Policy Program

Recent changes to the National Flood Insurance Program (NFIP) resulting from the Biggert-Waters Act of 2012 and the Grimm-Waters Act of 2014 coupled with the updated 2013 Community Rating System (CRS) Manual have had overwhelming impacts on coastal communities across the Gulf of Mexico. Changes to the NFIP may significantly impact flood insurance premiums by altering grandfathering and subsidy provisions for many properties. Meanwhile, the 2013 CRS Coordinator's Manual has altered the way communities receive discounts for supplemental activities. These changes pose significant challenges to coastal communities as they strive to maximize the benefits of the NFIP while seeking new opportunities to reduce flood insurance premiums for their citizens through the CRS program.

Under the 2013 CRS Coordinator's Manual, communities may no longer receive the same number of points for current activities, causing some communities to drop a class (which would raise flood insurance premiums across the community and cost residents money). However, the 2013 CRS Coordinator's Manual also creates new opportunities for coastal communities to maintain and improve their CRS rating through new mechanisms like the Program of Public Information (PPI). A PPI refers to a committee-based localized approach to community outreach under the CRS. A PPI is described as "an ongoing effort to prepare, implement, and monitor a range of public information activities. The objective of CRS credit for a PPI is to provide additional credit for information programs that are designed to meet local needs and that are monitored, evaluated, and revised to improve their effectiveness." Developing a Program of Public Information Guidance, CRS Resources p.3 (March 2013). In other words, communities that conduct their CRS outreach activities through the coordination of a PPI stand to gain more points than they would for conducting the outreach as a standalone activity. A PPI planning committee becomes a value-added mechanism for maximizing a community's CRS score.

Mississippi-Alabama Sea Grant and Louisiana Sea Grant have been working with coastal communities in Mississippi and Louisiana to adapt to recent changes to the NFIP. This presentation will discuss preliminary work with specific focus given to the formation of a PPI under the 2013 CRS Coordinators' Manual. The EPA Gulf of Mexico Program funded this project.

Estimates of Growth and Mortality for Spotted Seatrout in Alabama Coastal Waters. *Will Patterson[1,2], Brian Klimek[1,2], John Mareska[3];* [1]University of South Alabama, [2]Dauphin Island Sea Lab and [3]Alabama Department of Conservation Marine Resources Division

Inshore fishing effort is estimated to have increased 209% since 2000 in Alabama waters, with the most targeted fish being spotted seatrout, *Cynoscion nebulosus*, an iconic inshore gamefish. Despite its ecological and economic significance, little is known about spotted seatrout population dynamics in Alabama. To examine its growth and mortality, sagittal otoliths were dissected from individuals sampled during fishery-independent gillnet sampling from 2001-2012 (n = 1,936), as well as from fish landed during the July 2013 Alabama Deepsea Fishing Rodeo (n = 669). Among all samples, total length (TL) ranged from 5 to 748 mm, and body mass ranged from 0.001 to 3.15 kg. Age was estimated by counting opaque zones in transverse otolith thin sections, and ranged from 0 to 9 years. Females outnumbered males 2.64:1 in the data. Sexual dimorphism was apparent in size at age data, with estimated von Bertalanffy growth parameters $L\infty$, k, and t0 being 668 mm TL, 0.402 y-1, and -

0.56 y, respectively, for females, and 564 mm TL, 0.336 y-1, and -0.80 y for males. Sexes were pooled to estimate mortality for both the fishery-independent and tournament samples. Linear regressions were fit to scatterplots of the natural log of numbers at age versus age, with the slope equal to negative instantaneous total fishing mortality (Z). Instantaneous natural mortality (M = 0.33 y-1) was estimated based on maximum observed longevity, and instantaneous fishing mortality (F) was estimated by subtracting M from Z. Estimated Z was 0.96 y-1 from gillnet samples and 0.88 y-1 from tournament samples. Therefore, estimates of F were 0.63 and 0.55 y-1, respectively, which yielded F:M ratios of 1.91 and 1.67 for the two datasets. Given that the fishing mortality rate that would produce maximum sustainable yield (FMSY) has been shown to be less than or equal to M for species with similar life histories as spotted seatrout, it is likely that this species is undergoing overfishing (i.e., Fcurrent > FMSY) in Alabama waters. However, a more formal stock assessment should be conducted to estimate threshold values of F and spawning stock biomass to evaluate whether spotted seatrout is undergoing overfishing or is overfished in Alabama waters.

Predictive Spatial Modeling of Seasonal Bottlenose Dolphin (*Tursiops truncatus*) Distributions in the Mississippi Sound. *Jonathan Pitchford, Victoria Howard, Jamie K. Shelly and Billie J. S. Serafin;* Institute for Marine Mammal Studies

Spatial distribution models (SDMs) have been useful for improving management of species of concern in many areas. This study was designed to model the spatial distribution of bottlenose dolphins among seasons of the year in the Mississippi (MS) Sound within the northern Gulf of Mexico. Models were constructed by integrating presence locations of dolphins acquired from line-transect sampling from 2011 – 2013 with maps of environmental conditions for the region to generate a likelihood of occurrence for winter (January – March), spring (April – June), summer (July – September), and autumn (October – December) using maximum entropy. Models were successfully generated using the program MaxEnt and had high predictive capacity for all seasons (AUC > 0.8). Distinct seasonal shifts in spatial distribution of dolphins were evident including increased predicted occurrence in deepwater habitats during the winter, limited predicted occurrence in the western MS Sound in winter and spring, widespread predicted occurrence over the entire region during summer, and a distinct westward shift of predicted occurrence in the autumn. The most important environmental predictors used in SDMs were distance to shore, salinity, and nitrates, but variable importance differed considerably among seasons. Geographic shifts in predicted occurrence likely reflect both direct effects of changing environmental conditions and subsequent indirect effects associated with prey availability and foraging efficiency. Overall, seasonal models helped to identify preferred habitats for dolphins among seasons of the year that can be used to inform management for this protected species in the northern Gulf of Mexico.

Economic Sectors Targeted By Sea Grant Research, Education, and Outreach Programs. *Benedict Posadas;* Mississippi State University Coastal Research and Extension Center

Sea Grant, an organization with a history of working closely with water-dependent industries, has documented many examples where research, education, and outreach (REO) programs have increased private-sector economic activity, including the creation or expansion of businesses and jobs. Yet, there has not been a systematic survey in the Gulf region to assess the full scope of these impacts. This preliminary study provides general information about the benefits the region's industries have gained from REO efforts sponsored by the Gulf of Mexico Sea Grant Programs. The study is a critical first step in conducting a future systematic assessment of the economic benefits resulting from these programs.

The Mississippi-Alabama Sea Grant Consortium (MASGC) has four focus areas: (1) Environmental Literacy and Workforce Development, (2) Healthy Coastal Ecosystems, (3) Resilient Communities and Economies, and (4) Sustainable Fisheries and Aquaculture. The North American Industrial Classification System (NAICS) was used to identify the U.S. industries targeted by MASGC-REO efforts during the past decade.

Under "sustainable fisheries and aquaculture," the following industries were listed: (1) commercial fishing, (2) seafood processing, (3) seafood wholesaling, (4) seafood retailing, (5) marine aquaculture, and (6) live-bait dealers.

The "healthy coastal ecosystems" focus area includes (1) research and development in biotechnology; (2) research and development in the physical, engineering, and life sciences; and (3) research and development in the social sciences and humanities.

Under "resilient communities and economies," these industries were identified: (1) working waterfronts, (2) commercial marinas, (3) charter boats for hire, (4) saltwater recreational fishing, (5) wildlife watching, (6) coastal restoration, and (6) ship building and repair.

Under the focus area "environmental literacy and workforce development," five industries were identified: (1) other justice, public order, and safety activities; (2) administration of air and water resource and solid waste management programs; (3) administration of general economic programs; (4) regulation of agricultural marketing and commodities; and (5) household sector.

The long-term data on the economic contributions of the targeted industries to the regional economy of each of the five Gulf States were compiled from various secondary sources. The time-series economic indicators consist of the annual sales and employment impacts of each sector served by Sea Grant projects. In some cases, only the direct employment impacts were available for compilation. When assessing the initial economic impacts on the U.S. industry or economic sectors by Sea Grant projects, these time-series economic indicators set the upper limits to the annual impacts that these projects can generate.

There is a pressing need to adequately measure the significant contributions of Sea Grant projects to targeted U.S. industries or economic sectors. Principal investigators and project managers should consider developing robust theoretical frameworks and primary survey procedures when designing and evaluating the long-term economic impacts and economic benefits associated with each proposed project. These performance measures can be evaluated by project staff and/or outside evaluators.

MarketMaker: Tool to Promote and Search for Local Food and Seafood Products and Outdoor Tourism Services. *Benedict Posadas[1], Bethany Starr Walton[2,3], Kathryn Buchanan[1], Gabrielle Davis[1], Cassandra Jones[1], Deacue Field[4] and La Don Swann[2];* [1]Mississippi State University, Coastal Research and Extension Center, [2]Mississippi-Alabama Sea Grant Consortium, [3]Auburn University Marine Extension and Research Center, [4]Auburn University, Department of Agricultural Economics and Rural Sociology

MarketMaker is a web-based information and communication resource designed to revolutionize the food and seafood supply chain. This includes farmers, ranchers, fishermen, fish farmers, retail markets, wholesale markets, processors, agritourism, charter boat captains, wineries, farmers markets,

restaurants, buyers, food banks and consumers. In 2011, the Gulf States Marine Fisheries Commission (GSMFC) provided four-year funding to the five Gulf States to increase awareness of MarketMaker within the seafood and fisheries sectors. The goal is to assist the seafood and charter boat industries with marketing their products and services to a broader audience. In late 2013, Riverside Research, a not-for-profit company with facilities in Champaign, signed a global licensing agreement with the University of Illinois at Urbana-Champaign for the exclusive rights to MarketMaker.

Mississippi MarketMaker partners include NOAA, the Gulf States Marine Fisheries Commission, Mississippi State University Extension Service, Mississippi State University Department of Agricultural Economics, U.S. Department of Agriculture, Agricultural Marketing Resource Center, Farm Credit, Farm Bureau and the Mississippi Department of Agriculture and Commerce.

Alabama MarketMaker sponsors and partners include NOAA, the Gulf States Marine Fisheries Commission, Mississippi-Alabama Sea Grant Consortium, Auburn University, Alabama Cooperative Extension System, Alabama Department of Agriculture and Industries, and the Alabama Department of Conservation and Natural Resources - Marine Resources Division.

Mississippi MarketMaker efforts include publishing biweekly online newsletters that are distributed to the MSU Extension Service, state regulatory and marketing agencies, MarketMaker state partners nationwide and through social media networks. Emails were sent to seafood and charter fishing businesses to encourage them to improve their business profiles in MarketMaker. Regular social media networking activities were conducted with seafood and charter fishing businesses to promote their businesses and develop clienteles. Mississippi MarketMaker also regularly participates at the weeklong annual Jackson County Fair in Pascagoula, Mississippi and other seafood festivals in the Mississippi Gulf Coast.

Alabama outreach initiatives include creation of social media outlets to help promote individual businesses, and distribution of monthly e-newsletters. We have visited seafood businesses to talk with them about registering their businesses on MarketMaker and also attended seafood industry trade association meetings. We have worked closely with the Alabama Cooperative Extension System to help cross-promote seafood along with other seasonal Alabama products. We have also developed an outreach program called Seafood Savvy that highlights local seafood and using MarketMaker as a way to source it. This program also helps promote a local chef and restaurant, and a local seafood processor or fishermen.

The CIAP Environmental Stewardship Program in Coastal Schools Impacted by Hurricane Katrina. *Ruth Posadas, Jessica Rankin, Mai Dang and Jill Zednick;* Mississippi Department of Marine Resources

Environmental Stewardship is a BIG responsibility!!

Eighteen (18) schools of the Mississippi Gulf Coast three coastal counties accepted the challenge in the years 2011- 2013 through the help of the Coastal Impact Assistance Program (CIAP) funding and the help of the students, parents and community in making their contribution to the restoration of the environment. The Seafood Technology Bureau of the Marine Fisheries Office, Mississippi Department of Marine Resources (MDMR) secured funding from CIAP and established an Environmental Stewardship Program that interacted with coastal elementary schools that were heavily impacted by Hurricanes Katrina and Rita.

Grants of $5,500 were given to recipient schools that had considerable adverse economic and physical hurricane impact on the school and community. This project addressed some restoration needs of the schools, the teachers and the students. Restoration and conservation activities were encouraged through this grant so the community could come together to help build something for the children, for the school and eventually for the community.

Environmental education and environmental stewardship are the continuing goals of the projects even if the CIAP project timeline is over. Their environmental projects ranged from establishing science centers or science rooms in their schools, buying educational tools like books, microscopes, electronic pads, aquaria, equipment and supplies, to outside vegetable gardens, butterfly gardens and eco-parks. There were project needs for field trips and exposure of students to the different environmental learning zones of the coast that protect endangered animals and plants.

The aim of the whole program was to restore the sense of community ownership in building for the future, be it environmental restoration, conservation, education and stewardship. The involvement of everyone is a must. From the famous words of the Dalai Lama " Today, more than ever before, life must be characterized by a sense of Universal responsibility, not only nation to nation, human to human, but also human to other forms of life.

The USA Center for Environmental Resiliency: Developing Multidisciplinary, Research-Based Environmental Solutions. *Sean Powers, Steve Stokes, Lynne Chronister and James Connors;* University of South Alabama

As graphically demonstrated by the Deep Water Horizon oil spill, the complex sustainability and resiliency issues facing our coastal communities and ecosystems today require interdisciplinary cooperation, research, education, and solutions. The University of South Alabama, located at the heart of the economically important and environmentally sensitive northern U.S. Gulf Coast, recognizes this and has recently established the USA Center for Environmental Resiliency to explore and develop cutting-edge, yet realistic and sustainable solutions to anthropogenically-related environmental impacts. Through the funding of targeted, multidisciplinary research, education, and outreach projects, and involvement of leaders from the scientific, regulatory, and industrial communities, as well as the public, the Center equips trains leaders, resource managers, and environmental scientists and engineers in the latest quantitative, predictive, and mitigative techniques and approaches. Funding decisions made by the Center are viewed as strategic investments in the future, designed to attract community support and extramural funding, thus increasing the scope and impact of successful projects. This presentation is intended to share an overview of current and planned initiatives of the Center and to solicit input from the community.

Clean and Resilient Marinas. *Rhonda Price;* Mississippi Department of Marine Resources

Clean and Resilient Marina initiative is a Gulf of Mexico Alliance (GOMA), Coastal Community Resilience Team project. This initiative builds on the five Gulf of Mexico States' Clean Marina Programs and was established to "promote and expand resilient and environmentally responsible operations and best management practices at marinas". The Clean Marina program in the five Gulf of Mexico States is an incentive based, voluntary program promoted by cooperating state agencies. The program is designed to encourage marina operators and owners to protect coastal water quality by employing best management practices to reduce and prevent water pollution. It also addresses storm-

water, run-off management, proper waste-water and waste management. The new incentive that the Resilience Team incorporated into the revised standard was a Resilience component. Resilience is defined by the Team as the capacity of humans and natural/physical systems to adapt to and recover from change. This is vital to marinas and harbors that are directly exposed to tropical storms, hurricanes, flooding events and land loss. Being resilient means being able to prevent loss of life and personal injury reducing property damage and resume normal business actives as soon as possible.

Key marina issues are addressed in the Clean and Resilient Marina Guidebook. Useful information, tools and recommended practices are provided along with a Policy Guide and At a Glance. Resources found in the Guidebook and accompanying reference guides include Marina Design and Siting, Emergency Preparedness, Evacuation Procedures, Climate Adaptation and Sea Level Rise and Outreach and Education for marina operators and boaters. Marinas contact the cooperating state agencies to fill out the checklist, which serves as a self- assessment and engage their state agency to certify their marina. There are 11 Sections and each section must reach a score of 80% to certify as a Clean and Resilient Marina.

MS has two Clean and Resilient Marinas, July 26, 2014; Bay St. Louis (BSL) Marina became the first C&R on the MS Gulf Coast since Katrina. Pass Christian Harbor quickly followed August 4, 2014. Both marinas incorporated new resilience components into the design and siting of their marinas. BSL has a harbor office that can be trailer out in the event of a Cat 3 or higher hurricane, each marina/harbor has the capability of trailer out restrooms and power pedestals these actions started by two innovative marinas have set new building blocks of how resilience and marinas can create a more sustainable and environmentally responsible practices for marinas.

Alternative Shoreline Management Manual for Coastal Mississippi Property Owners. *Melissa Pringle[1] and Willa Brantley[2];* [1]Allen Engineering and Science and [2]Mississippi Department of Marine Resources

As in other coastal areas of the United States, coastal Mississippi faces the challenge of balancing coastal development with coastal resources protection. The MS Department of Marine Resources contracted Allen Engineering and Science to research alternative shoreline management practices and develop a guidance manual for property owners to use when selecting strategies for shoreline stabilization.

Coastal shorelines have changed and eroded as a result of natural processes governed by climate, geology, ocean currents, waterbody depths, and wind. In addition to natural factors contributing to erosion and shoreline change, coastal development and human activities have exacerbated these changes. Efforts to prevent or control erosion must be balanced with ecological impacts and costs. The overwhelming response to shoreline erosion in Mississippi has been to protect the shorelines through bulkheads or other hardening strategies. These hard structures reduce habitat by separating land from water interfaces. They also reflect waves off the shoreline to unprotected areas, causing erosion of the land below the bulkhead and increased water depth at the shore.

To balance shoreline protection and ecological preservation, the MS Department of Marine Resources has developed a guidance manual for property owners and government agencies to provide information and education regarding alternative shoreline management practices. The manual highlights alternative shoreline management strategies, including living shorelines and hybrid stabilization projects, may be the most cost-effective, attractive and ecologically sensitive. To help disseminate the information, a stakeholder engagement campaign was also developed. The presentation will provide

an overview of the engineering, planning, and scientific considerations addressed in the Coastal MS Alternative Shoreline Management Manual. In addition, the Coastal MS Stakeholder Engagement Campaign will be presented. Benefits of Living Shorelines include the following: Increased fish/wildlife habitat; Increased property value; Reduced erosion; Reduced pollution through natural buffers/filters; Created sense of place; Improved water quality; and Cost-savings.

Planning for Disaster Recovery and Resilient Communities with Faith-Based and Secular Nonprofit Organizations. *Liliya Kasatkina Quebedeaux, Deanna Schmidt and Kathleen A. Garland;* University of Houston Clear Lake

Faith-based or secular nonprofit organizations (FBSNOs) play an increasingly important role in disaster response and recovery. The purpose of this project was to gain a better understanding of the issues affecting FBSNOs in disaster response and recovery process and find answers to two main questions: What is the current role of FBSNOs in disaster response and recovery? And how can their efforts be best supported?

In the wake of a disaster, FBSNOs demonstrate compassion and flexibility, possess local knowledge, and fill the gaps in unmet needs, particularly in the area of social services. They have invaluable characteristics necessary both to mobilize an immediate and effective response and ensure long-term recovery. In recognition of the value of FBSNOs after disasters, FEMA included them when it established the National Disaster Recovery Framework, which focuses on "whole communities" and stresses the importance of involving all stakeholders in the recovery process to ensure the most effective and sustainable community recovery.

This study analyses a subset of 26,000 FBSNOs on the Upper Texas Coast. The studied organizations provided services in the aftermath of Hurricane Ike. Through analysis of survey responses and in-depth interviews, the research team identified the services provided and unmet needs fulfilled by FBSNOs, as well as key challenges FBSNOs experience in disaster response and recovery and major issues associated with integrating FBSNOs in a disaster response and recovery network. In-depth interviews focused on response and recovery in Galveston County, which was hardest hit by Hurricane Ike.

Services provided by the studied organizations included: medical and mental assistance, operation of shelters and food and ice centers, assistance with long-term housing and household supplies, transportation and communication, direct donations, and case management. In addition, they provided vital support in the areas of translation services, legal aid, document recovery, and mortgage support, particularly with more vulnerable segments of the community such as immigrant populations. The study showed that because local FBSNOs struggle with their own recovery in the aftermath of a disaster, they needed immediate and flexible funding to get back to serving people and filling gaps in disaster related services. A coalition of Galveston foundations was able to provide such funding with a simplified grant application process and a streamlined process for obtaining project-specific funding. These foundations played a major role throughout short- and long-term recovery activities after Hurricane Ike.

Key challenges identified by the studied organizations in the wake of the disaster included the perception that local and state governments largely direct recovery funds to infrastructure and businesses while people and housing tend to get lost and do not receive sufficient attention in the response and recovery efforts. Major local FBSNOs stressed that bureaucracy and federal procedures

for obtaining disaster assistance, certification, and training necessary to provide disaster related services with their multiple levels of approval and lack of consistency were the largest impediments to recovery. Additional issues included lack of consistency and coordination among various government agencies and inability to access accurate disaster related information.

The Coastal Resilience Web Mapping Decision Support Tool. *George Raber[1], Zach Ferdana[2] and Nichole Love[2];* [1]University of Southern Mississippi and [2]The Nature Conservancy

Coastal Resilience is an approach and online decision support tool that provides communities, planners, businesses and officials a step-wise process to guide decisions to reduce the ecological and socio-economic risks of coastal hazards. The approach includes 4 critical steps: (1) Assess Risk and Vulnerability to coastal hazards including current and future storms and sea level rise scenarios, (2) Identify Solutions for reducing risk across social-ecological systems, (3) Take Action to help communities develop and implement nature-based solutions where appropriate and (4) Measure Effectiveness to ensure that our efforts to reduce risk through restoration and adaptation are successful. The primary mechanism for delivering this approach to communities is through a web-based decision support tool (maps.coastalresilience.org). The Nature Conservancy and core partners including the University of Southern Mississippi have developed the Coastal Resilience tool to support restoration, adaptation and conservation decisions across different social, economic and ecological settings. This tool provides a method to quickly deploy a web map with basic functionality using data from distributed sources. Further, the tool's platform provides for the ability to create custom applications, similar to stand alone apps on a mobile device. These custom apps can be catered to specific geographies, for example the Restoration Explorer in the Gulf of Mexico. This app allows stakeholders to perform on-the-fly weighted GIS overlays to examine ecological and socioeconomic factors when determining oyster reef restoration suitability. The oyster restoration decision support app was developed in the weeks after the Deepwater Horizon spill to help with post-disaster planning and recovery. The success and deployment of the Restoration Explorer led to its replication, in another Coastal Resilience project site. Habitat Explorer was created by replicating and modifying the Restoration Explorer app in the days after Hurricane Sandy struck New York, New Jersey, and Connecticut in October of 2012. This app interactively identifies tidal marshes that potentially protect people, property and infrastructure by weighting multiple variables such as marsh size, infrastructure, critical facilities and demographic information. The flexibility of these and other apps allows them to be repurposed for many different decision support needs. This talk will highlight a few of the apps developed for Coastal Resilience as well as discuss how the tool and apps have the potential to be used to address other risk and adaptation issues.

Crafting a Mechanistic Functional Indicator: Using a Mass Balance Model to Examine the Impact of Respiration for the Model Tolerant Species, *Capitella teleta*. *Chet F. Rakocinski and Kelsey M. Burns;* University of Southern Mississippi-GCRL Department of Coastal Sciences

Resource managers need indicators with clear connections to ecosystem function, especially where critical environmental concerns like hypoxia and climate change are concerned. By taking an ecophysiological approach, we hope to better understand trade-off mechanisms underlying chronic responses by macrobenthic organisms facing these impending environmental stressors. Population responses by macrobenthic organisms to stress should reflect bioenergetic costs and benefits to individuals, including respiration and food ingestion. Body size is a fundamental ecological trait that also underpins critical vital rates. Thus body-size provides a means to link environmental stress to

changes in vital rates on the individual level, which can in turn scale up to changes in the distribution of biomass across size classes. A working mass balance model provides a framework for considering how autecological responses to hypoxia and temperature translate into shifts in biomass-size distributions. In this presentation, we apply this Hypoxia Mass Balance Model (HMBM) to examine how the shifting balance between respiration costs and ingestion deficits may be expressed through the biomass-size distribution under oxygen limitation. The subject, *Capitella telata*, is a model tolerant indicator of stressed benthic habitats. Ingestion deficits within this exercise were predicated on a hypothetical allometric relationship in the original formulation of the HMBM for which ingestion deficits are directly linked to oxygen limitation. Respiration rates were measured for individual *C. telata* of various sizes under combined levels of dissolved oxygen and temperature, and then related to body size, DO and temperature. An interesting pattern in the parameters of the allometric respiration curves relative to DO exposure levels emerged. For example, exponents decreased inversely with increasing scaling constants as exposures ranged from hypoxic to more normoxic conditions at 20° C. As expected, allometric respiration curves were more elevated at warmer temperatures. Based on actual *C. telata* aerobic respiration data, an interesting interaction with ingestion deficits in the HMBM emerged relative to oxyconforming vs. oxyregulating responses relative to body size. Very small and small size classes oxyconformed; whereas, medium and large size classes oxyregulated. HMBM simulations using hourly observations over a 32 d span represented moderate and severe hypoxia regimes obtained from two sites where sondes were deployed. Five base 2 size classes could be represented using the *C. telata* data. Based solely on the original hypothesized ingestion deficit relationship, the HMBM output reflects a relative advantage for larger organisms. This size advantage was even more accentuated under the more severe hypoxia regime. However, by implementing the aerobic respiration pattern based on *C. telata* data, the size advantage inverted to favor smaller organisms. This study illustrates the inherent complexity in considering mechanistic individual level ecophysiological trade-offs in light of environmental stress.

Diet, Growth, and Condition of Larval Spanish Mackerel in the Northern Gulf of Mexico: An Assessment of Deepwater Horizon Oil Spill Impacts. *John Ransom[1], Jesse Filbrun[2], Carla Culpepper[1] and Frank Hernandez[1];* [1]University of Southern Mississippi, Gulf Coast Research Lab and [2]Southern Arkansas University

Impacts of the Deepwater Horizon oil spill (DWHOS) on fish populations in the northern Gulf of Mexico remain largely unknown. Of special concern are the fate of fish eggs and larvae present in the water column during the spill, as these are the most vulnerable life stages. Even small changes in hatching success, larval growth, and survival can drive large fluctuations in their adult populations. Early studies have shown that oil from the DWHOS entered the lower food web. Using samples from a long-term (2004-2013) ichthyoplankton survey off the coast of Alabama, we compared the condition, growth, and diet of a representative species, Spanish Mackerel (*Scomberomorus maculatus)*, during summer months in years before (2007-2009), during (2010), and after (2011-2013) the event. Initial comparisons of body condition (using morphometrics and dry weights), diet (using gut contents), and growth (using otoliths) suggest larvae where in significantly better condition during the summer of 2010 compared to larvae captured during years prior and after the DWHOS. Our results will fill critical information gaps needed by marine ecologists and fisheries managers to understand and predict the short and long-term effects of the DWHOS on important commercial and recreational fisheries in the northern Gulf of Mexico.

Comparison of Floc Growth and Stability in Four Estuarine Clay Simulations. *Allen H. Reed[1], William Gurzynski[2], Guoping Zhang[3] and Joseph P. Smith[2];* [1]Seafloor Sciences Branch, Naval Research Laboratory, [2]United States Naval Academy and [3]University of Massachusetts at Amherst

Flocculated sediments determine hydrodynamics, bed geomorphology and contaminant transport in many muddy nearshore environments which contain significant amounts of clay. In these nearshore and estuarine environments, flocs derive from aggregates of clay minerals, such as montmorillonite (2:1 expandable), illite (2:1 non-expandable) and kaolinite (1:1 non-expandable). The percentages of clay minerals vary significantly within different environments. This work addresses the importance of clay mineral percentages on floc growth rates and stability. A series of analyses used four different ratios of clay minerals to simulate sediment in four different rivers. Sediment was added to saline water within which guar, a nonionic biopolymer, had previously been dissolved. Upon addition, the mixture was shaken vigorously and then allowed to settle and aggregate into flocs. Flocs were maintained in a quiescent, no-flow environment until analyzed. Flocs were subjected to three flow rates within a flow through particle size analyzer. For each flow rate, floc sizes were quantified and stability was inferred. The flocs were analyzed during a four month period; assessments were made 1d, 2d, 7d, 14d, 1m, 2m and 4m after the initial mixing. Results indicate that while floc size increased significantly over time, total floc stability (strength and resistance to shear) changed less significantly. This work suggests that floc growth and stability may be achieved in a relatively short duration of time within quiescent environments; however, floc stability does not increase markedly over time within a quiescent environment. The significance of this work is related to floc stability; as the flocs sizes and stability determine transport and depositional rates, so too does the stability determine the transport and deposition of adsorbed ions, such as metals and organic substances. Future research will address the importance of hydrodynamic stress on floc size and stability.

Land Use and Marine Spatial Planning and Its Role in Coastal Planning and Management in the Peninsula of Mobile. *Rebecca Retzlaff[1], Charlene LeBleu[2] and Debi Foster[3];* [1]Auburn University Community Planning Program, [2]Auburn University Landscape Architecture Program and [3]The Peninsula of Mobile

Marine spatial planning (MSP) is a planning and regulatory approach to protecting ocean and coastal resources that focuses on ecosystem function and services. It allows planners, resource managers, and policymakers to locate and protect critical oceanic and coastal resources from the risks they face, while accommodating appropriate uses (whether permanent or seasonal).

Ocean zoning is a set of regulations that are used to implement marine spatial plans – similar to the idea of terrestrial zoning used to implement land use plans. Different zones along the coast and in the marine environment are specified to allow different uses, different levels of use, and accommodate seasonal fluctuations in uses. The zones are depicted on maps, with sets of use-based regulations attached to the areas of the maps. MSP can be used to protect sensitive ecosystems, working waterfronts, historic areas such as shipwrecks, recreational activities, and any other use of coastal and marine environments.

Marine spatial planning received attention along the Alabama gulf coast after the Deep Water Horizon oil spill in 2010, and during the debate surrounding President Obama's proposed National Ocean Policy and resulting executive order providing for the development of marine spatial plans in 2010. Marine Spatial Planning has been implemented with success in countries such as Australia and the Netherlands, and in the U.S. in California and Rhode Island. However, while the concept has been

discussed in recent years, there has been some comprehensive effort in the Mobile, AL, region to engage the public, resource managers, and government officials on their ideas for marine spatial planning.

This presentation will present case studies of successful Marine Spatial Plans in Australia and Rhode Island. We will also discuss a university-community partnership project in the Peninsula of Mobile involving students and faculty from Auburn University's Landscape Architecture and Community Planning programs, and community members from the Peninsula of Mobile, a moderately developed land mass bordered by an impaired urban river and a national estuary. The habitat rich area is filled with history on land in its surrounding waters and is facing imminent development with the expansion of the Brookley Aeroplex.

Water Level Prediction in Headwater-Slope Wetlands of Coastal Alabama. *Mehdi Rezaeianzadeh, Latif Kalin and Chris Anderson;* Auburn University

Coastal Wetlands are among the most important ecosystems in terms of the services they provide. The headwater wetlands of coastal plains in southeastern USA are predominantly forested wetlands at the headwaters of creeks. They are characterized by water tables at or near the surface that respond rapidly to precipitation. To assess the impact of land use/cover of the catchments draining to these headwater wetlands and their associated functions, hourly water levels (WL) of 15 wetland sites in coastal Alabama were monitored for 1 year. However, due to various reasons each site had periods of missing data, varying from one to several months. In this study, two artificial neural network (ANN) based methodologies are introduced to predict hourly WLs in wetlands whose WLs show (i) high correlation, and (ii) low to no correlation with WLs from nearby sites. Spearman's rank correlation was used to find appropriate input vectors for training and testing phases of the ANN models for two stations, namely stations number 17 and 32 at the wetland site. The most useful inputs for station 17 were hourly WL data from the nearby stations and antecedent precipitation from. The root means square error and Nash-Sutcliffe efficiency values for the best developed model of station 17 were equal to 2.92 cm and 0.98. Having no/small association among WL data from nearby stations with those from target station, the WL hydrographs of station 32 was split into quick and slow (high and low frequency) components to separately capture the WL fluctuations. A combination of ANN and baseflow separation methods proved to be an efficient methodology for WL prediction at the study site. The proposed methodologies demonstrated that WLs in wetlands dominated by both surface and groundwater can be reliably estimated by ANN based models.

Research Tracking and Management Information Systems: The GoMRI Research Information System. *Jarryl B. Ritchie and Suzanne Shean;* Northern Gulf Institute, Mississippi State University

A common challenge for research labs, universities, and large research-funding programs is the identification and tracking of the people and projects funded through its programs. Additionally, the linkage of this information with the scientific output (primarily publications and presentations) is an important additional challenge. The establishment and management of a research information system can help these programs manage their activities and personnel. An added bonus is the ability to leverage these same systems to provide research information that can be utilized to populate research web pages and generate interim and annual reports tabulating and summarizing the programs research activities.

The Northern Gulf Institute as part of the Gulf of Mexico Research Initiative (GoMRI) Administrative Unit leads the program's effort to develop, maintain, and evolve the GoMRI Research Information System (RIS). This information system provides tracking and inventory capabilities for projects, people, institutions, presentations, and publications. Using the data relationships found in the individual elements of the program, the team has developed a system that provides both administrative and management capabilities which is also the core information source driving the content for the research.gulfresearchinitiative.org web site. By aligning and adapting the GoMRI RIS to the broad needs of the program, the system is leveraged to meet a broad variety of programmatic needs.

The GoMRI is a 10-year independent research program established to study the effect, and the potential associated impact, of hydrocarbon releases on the environment and public health, as well as to develop improved spill mitigation, oil detection, characterization and remediation technologies. An independent and academic 20-member Research Board makes the funding and research direction decisions to ensure the intellectual quality, effectiveness and academic independence of the GoMRI research. All research data, findings and publications will be made publicly available. The program was established through a $500 million financial commitment from BP.

The system developed and the approaches taken can provide a framework for others seeking to establish a similar research information system to administer, manage, and share their research program's activities.

Cyanobacterial Harmful Algal Blooms (cyanoHABs) in Mobile Bay: An Emerging Threat to Ecosystem Health. *Alison Robertson[1] and Alan Wilson[2];* [1]University of South Alabama, Department of Marine Sciences and [2]Auburn University, School of Fisheries, Aquaculture and Aquatic Sciences

Mobile Bay is one of the largest estuarine systems in the US, characterized by high biodiversity and productivity, supporting freshwater and marine species, and providing a nursery habitat for commercially and recreationally important fish and shellfish. Harmful cyanobacterial blooms can thrive in nutrient-enriched estuarine waters and potentially produce a suite of cyanotoxins that can be released into the water, deposited in sediments, and bioaccumulated in marine organisms. With conditions of increased light, salinity, stratification, temperature, and nutrients, the Mobile-Tensaw delta may be a critical zone for toxin production and environmental release. We identified mixed blooms of Microcystis spp., Anabaena spp., and Planktothrix spp. in the delta in summer 2013. These genera were also identified as microcystin producers (>100 µg L-1 total) in freshwater sources in northern Alabama so this may pose a significant concern for outflow contamination into Mobile Bay. In this study sentinel solid phase adsorbent toxin tracking (SPATTs) devices were deployed at six locations within the Mobile Bay basin. Whole water, sediment, and representative shellfish were collected and environmental parameters (temperature, salinity, dissolved oxygen, turbidity, and nutrients) taken to provide a baseline of environmental conditions. SPATTs, water, sediment, and shellfish were extracted and quantitatively analyzed using enzyme-linked immunosorbent assays and liquid chromatography tandem mass spectrometry for microcystins, cyclindrospermopsins, nodularins, saxitoxins, and anatoxins. These data will be incorporated into a risk model for this and other natural toxins in our region and utilized in the management of local water quality and ecosystem sustainability.

The Working Waterfront Inventory Industry Overview. *Derrick Robinson, Filz Atasoy and Diane Hite;* Auburn University, Department of Agricultural Economics & Rural Sociology

The Working Waterfront Inventory of the coastal counties of Alabama and Mississippi was conducted to examine the socioeconomic impacts of water front dependent or related businesses. Due to population growth and subsequent land use competition among real estate and other traditional businesses and industries, land values have increased and altered land use patterns in the coastal areas. This project seeks to address the resiliency of coastal economies by performing an integrated analysis of the social and economic impacts of Hurricanes Katrina and Ivan, the Deepwater Horizon oil spill, the recent Great Recession, and other potential impacts affecting local waterfront economies.

The goal is to establish baseline economic conditions for Alabama and Mississippi water-dependent businesses in 2012-2013. The inventory establishes and tracks economic trends through an in-depth industry analysis examining the changes in multiple non/waterfront related/dependent industries in the coastal region over time, as well as developing GIS layers of business categories that can be used in planning and zoning efforts. Survey data was collected using Internet accessible surveys, mailings, and fieldwork. Statistical, econometric, and spatial analysis techniques are used to analyze these impacts. The results will lead to better policy and land-use management decisions by public administrators. Further, the investigators conducted a similar study in Mobile County, Alabama in 2008, which can be used with the new data to examine long run trends.

Preliminary survey results show that 40% of initial respondents identified being in business at the current location for 15 years or more, but most businesses were there for less than ten years. This information allows stakeholders to understand who current users of waterfront land are and how long the land has been used in for a particular purpose. This same group had 50% of respondents who identified their business to have decreased profitability over the last five years, and 40% of those respondents experienced decreases greater than half of their profitability. Combining these few statistics with GIS analysis, policy makers can understand the characteristics of struggling businesses, including location, demographic information of surrounding area, and the size of the business.

Count Data and Contingent Valuation Analysis of Coastal Recreation in the Gulf Coast of Alabama and Mississippi. *Derrick Robinson, Diane Hite and Terry Hanson;* Auburn University, Department of Agricultural Economics & Rural Sociology

This paper estimates recreational site demand to the Alabama & Mississippi Gulf Coast Region (GCR) for multiple attributes combining both revealed and stated preference data using travel cost analysis. This research is important for understanding the resiliency of areas that are frequented by tourist and experience frequent negative market shocks (i.e., Deep Water Horizon oil spill, hurricanes, recessions, etc.). Many GCR communities are heavily dependent on tourism, therefore this research is especially important to policy makers and local stakeholders dependent on the health and vitality of the coast.

The data for the study comes from 2933 household survey respondents, of which some had and some had not visited the GCR. Respondents provided demographic data, site visit frequency, and expenditures of time, for lodging and other activities. Negative binomial and zero inflated binomial modeling are used to estimate both the visitation rate and recreational values of GCR attributes (i.e., beach, boating, ecotourism, casinos, lodging, etc.). Moreover, these models are used because of data truncation resulting from the non-negative and integer nature of trip counts and the over dispersion of zeros in the data.

Preliminary analysis show the value of a single GCR visit is estimated at $137.86, which extrapolates to approx. $450 million in GCR recreational values per year. Contingent behavior modeling was used to estimate the value of potential increases in GCR beach quality. Marginal effects were assessed to show that travelers to the GCR were willing to pay $2.70 for a 1% increase in beach nourishment. The study reveals that demographic variables had a greater impact on demand than perceived environmental safety. This could be a result of those that visited the GCR have more experience with the area and have a better understanding of the environmental conditions of the area.

An Analysis of Tourists' Preferences and Perceptions for Gulf Coast Seafood. *Derrick Robinson, Zhaohua Zhang and Diane Hite;* Auburn University/Department of Agricultural Economics & Rural Sociology

This study analyzes the impacts of consumer differentiated Mississippi/Alabama Gulf Coast region (GCR) seafood products, specifically looking at consumers' perceptions of preferences and how these products impact consumer choice for seafood in the GCR. The study uses the conceptual "lens" model, which examines the impact of product differentiation on consumer preferences through attribute perception labeling. This type of labeling provides consumers with perceptions of safety for labeled products, more specifically GCR seafood products in this study.

These perceptions of product attributes are determined endogenously when looking at the choice to consume GCR seafood in the model. To control for this endogeneity, use of a stated preference discrete choice random utility model will be used to examine the consumers' preferences for perceptions (labels) on the stated preference to consume seafood when traveling to the GCR, both before and after the Deep Water Horizon oil spill. Both bivariate probit estimation, as well as a ranked order logit procedure are used to estimate the impact of these perception preferences on the likelihood to consume GCR seafood. Understanding these consumer preferences and impacts of product labeling, especially after disasters and shocks, can help to make the GCR seafood industry more resilient thereby creating a more resilient community.

Preliminary results show that consumers traveling to the GCR value safe seafood, and have an increased likelihood of consuming GCR seafood when safe seafood perception value is increased (i.e.,: industry approved safe labels). Also, higher income tourists are more likely to consume GCR seafood, while total GCR travel expenditure, increasing age, & and perceptions of GCR seafood freshness seem to be consistently not a factor. Although perceived freshness does seem to matter most for consumers of GCR seafood at festivals. GCR seafood certified safe by industry and certified sustainable increase the likelihood to consume GCR seafood most. Implications could be that local policymakers should be more involved in promoting industry, and GCR seafood industry should concentrate on label promotion.

Impact of Corexit 9500 on the Early Life Stages of the Eastern Oyster, *Crassostrea virginica*. *Rachel Rodriguez[1], Julia Edelbrock[2], Scott Rikard[3], Sean Powers[4], Andrew Whelton[5] and Anne Boettcher[6];* [1]University of South Alabama, [2]University of Findlay, [3]Auburn University Shellfish Laboratory, [4]University of South Alabama, [5]Purdue University and [6]Embry-Riddle Aeronautical University

In the aftermath of the 2010 Deepwater Horizon (DH) Oil Spill approximately 1.8 million gallons of oil dispersant was used in offshore waters in an effort to mitigate the impacts of the 200 million gallons of oil released. The most applied dispersant was Corexit 9500 which has previously demonstrated lethal and sub-lethal effects in a diversity of organisms. It is important to establish that while this dispersant was only released in offshore waters, many companies are advocating nearshore releases of dispersant in the event of future spills to disperse in near shore waters where oysters thrive. While Corexit 9500 toxicity to the Eastern Oyster, *Crassostrea virginica*, has been studied in adults, their early life stages have not been studied extensively. The focus of this study was to test the toxicity of Corexit on the larval and early spat stages of *C. virginica*. Five size classes were tested: 0.1mm, 0.2mm, 0.3mm, 0.7mm, and 2.0mm. These sizes ranged from 7-29 days old. Each size was exposed to six concentrations of Corexit: 0 ppm, 3.13ppm, 6.25ppm, 12.5ppm, 25ppm, and 50ppm for 48 hours. The results of Corexit exposure alone indicated that as oysters grew in size, their tolerance increased. High mortality was detected at and above 12.5ppm. This on-going study will include toxicity testing on Sweet Louisiana Crude Oil mixed with Corexit. This combination has been shown to have greater toxicity with other organisms. Sub-lethal effects of Corexit 9500 are currently being tested by assessing the expression of the stress biomarker, heat shock protein 70 in larvae and spat exposed to concentrations of Corexit in the 0-3.13ppm range.

Sediment Quality Assessment and Management. *Jennifer Sagan[1], Gerold Morrison[2], Ed Sherwood[3] and Pamela Bellotti[1];* [1]AMEC Environment & Infrastructure, Gainesville FL, [2]AMEC Environment & Infrastructure, Tampa FL and [3]Tampa Bay Estuary Program

Deleterious effects of contaminated sediments can show up throughout the food chain of an aquatic ecosystem. Resource managers can use the Sediment Quality Guidelines developed by the National Oceanic and Atmospheric Administration (NOAA) to provide effective guidance for identifying potential management actions involving contaminated sites. While the guidance outlines conditions where no biological effect is likely (below Threshold Effects Levels or TELs) and when biological effects are highly likely (above Probable Effects Levels or PELs), there exists a gray area between these levels where additional bioassay data can help determine real impacts to biota. This talk will discuss a case study in the Tampa Bay Estuary, where these guidelines were supplemented with additional studies to develop a management and restoration plan.

McKay Bay, located in the northern, urbanized extent of the Tampa Bay Estuary, is an area with high sediment contaminant levels and poor benthic biotic communities. The analytical results of a bay-wide sediment sampling effort in McKay Bay were used to identify areas in which contaminant levels were above TELs or PELs. These data were used to identify smaller, sediment quality management areas (SQMAs) within the embayment of high priority that would be the focus of additional studies to determine if the contaminants of concern were truly affecting resident biota. A multi-tiered study evaluated the acute toxicity of contaminated sediments and the bioaccumulation of contaminants in benthic organisms. The study also included an examination of contaminant tissue concentrations in resident macroinvertebrates and ichthyfauna. Results of the acute toxicity study indicated significant reduction in survival in organisms exposed to test sediments corresponding to areas that had greater than 5 PEL exceedances or greater than 10 TEL exceedances. Bioaccumulation studies found PAHs,

total PCBs, and chlordane in organism tissues at levels associated with potential ecological effects and/or levels known to be associated with potential human health related effects. Analysis of contaminant tissue concentrations in resident biota found metals, PCBs, PAHs, and pesticides at levels associated with potential ecological effects and levels known to be associated with potential human health related effects.

Results from this study will be used for a variety of purposes. This includes defining the areal extent and magnitude of sediment contamination; identifying probable cause(s) of localized sediment degradation; and evaluating the feasibility of controlling existing sources of contamination and conducting site remediation activities, considering costs as well as benefits.

Coastal Ecology Educational Experiences at Mobile County's Environmental Studies Center: Supported by Mississippi-Alabama Sea Grant Consortium. *Anita Salinas, Desiree Bishop and Troy Latham;* Environmental Studies Center

Anita Salinas is a resource teacher at the Environmental Studies Center. She is the lead teacher for the SEA ICE (Student Enrichment Activities in Coastal Ecology) program. She holds a bachelor's degree in Wildlife Science and a master's degree in Secondary Science Education both from Auburn University.

The SEA ICE program funded by Sea Grant began at the Environmental Studies Center in 2003. Each year the program has continued to reach as many as 1000 high school students providing a unique learning experience as students utilize a 500 acre nature center with trails through Alabama's native forest and native animal exhibits. Sea Grant funds this educational experience by covering the expense of the students' field trip; including the bus, student admission, and the substitute teacher for the participating teacher. Students complete a pre- and post-test which allows the success of the program to be evaluated. Topics covered during the all day program include habitat needs, habitat destruction, invasive species, watershed ecology, chemical contamination in the environment and environmental recovery following natural or man-made disasters.

The Environmental Studies Center also conducts teacher workshops throughout the year to assist Mobile County teachers in enhancing their ecology classes. This year the focus has been on Project WET and Climate variability.

Making Resiliency Real with Laws that Support It. *Bill Sapp;* Southern Environmental Law Center

As this conference reveals, we have made great progress in the scientific and engineering aspects of making our coasts more resilient. Unfortunately, legal and policy developments have not kept pace. Although certain more progressive jurisdictions have made progress, overall we have some ground to cover. There are serious legal impediments to putting some resiliency projects in place. In this segment, I will be discussing some of these impediments and will make suggestions on how we can adopt laws and policies to facilitate resiliency on our coasts.

Has Black Mangrove Expansion Affected Northern Gulf of Mexico Salt Marsh Nursery Function? *Whitney Scheffel[1,2], Kenneth L. Heck, Jr.[2,1], Matthew Johnson[3] and Just Cebrian[2,1];*
[1]University of South Alabama, [2]Dauphin Island Sea Lab and [3]Bureau of Ocean Energy Management

A prime example of climate-induced range shifts is the expansion of the tropically associated black mangrove (*Avicennia germinans*) into the northern Gulf of Mexico. This sub-tropically associated species has invaded temperate systems dominated by saltmarsh cordgrass (*Spartina alterniflora*) and black needlerush (*Juncus roemerianus*) in southern Louisiana and most recently on Horn Island, MS. To date, little is known about how black mangroves may function as nursery habitats for juvenile fish and shellfish. The main objective of this study is to quantify and compare fish and macrofaunal use in *Spartina*-dominated; black mangrove-dominated; and mixed *Spartina* and black mangrove habitats. Suction sample surveys were conducted every month from April to October 2012-2013 to estimate fish and shellfish abundances, biomass, and diversity among the three habitats. Preliminary results show that there were significant differences in Xanthid crab abundances with greatest numbers found in the mangrove habitat. In addition, there was a significant difference in community composition between the black mangrove and the mixed mangrove and salt marsh habitats, which was primarily driven by tanaids. Overall, however, a lack of clear negative impacts of black mangrove expansion on finfish and shellfish abundance and species composition indicates that these habitats may play a similar nursery role for associated species.

Local Habitat Use and Fishery Dynamics of an Exploited Regional Migrant, Atlantic Spanish Mackerel (*Scomberomorus maculatus*). *Meagan Schrandt[1,2], Sean Powers[1,2] and John Mareska[3];*
[1]University of South Alabama, [2]Dauphin Island Sea Lab and [3]Alabama Department of Conservation and Natural Resources, Marine Resources Division

Coastal migratory pelagic fish species make interstate migrations, which define their status for federal management; however, harvest, essential fish habitat consideration, and management are largely local (state) issues. One area of concern for local management is the scale of mixing within the population– if recruitment to the fishery is more localized, the resource may not be as readily replenished in areas of localized depletion compared to a resource with widespread recruitment. In the Gulf of Mexico (GOM), the Atlantic Spanish Mackerel (*Scomberomorus maculatus*) is considered a coastal migratory pelagic fish and it supports an important commercial and recreational fishery in the area. Here, we reviewed the history of Spanish Mackerel landings in the GOM and examined catch data from a fishery-independent gillnet survey conducted in coastal waters of Alabama. Specifically we addressed three questions of general relevance to the many species that share the trans-management boundary condition of Spanish Mackerel: (1) how do local abundance patterns respond to changes in local harvest pressure, (2) is there evidence for regional migration, and (3) do Spanish Mackerel exhibit habitat specialization or are they habitat generalists? Seasonal patterns of gillnet catch rates in Alabama's coastal waters coincide with the proposed annual migration of Spanish Mackerel. We also note the presence of adult Spanish Mackerel in the northernmost reaches of Mobile Bay (near the river mouth in salinities ranging from 0 to 10 ppt) during the fall when river discharge is relatively low. This provides new information on the extent of estuarine habitat usage by adult Spanish Mackerel and supports a habitat generalist strategy for Spanish Mackerel in estuaries. In Alabama, most of the Spanish Mackerel harvested by the state's gillnet survey appear to be between the ages of 1 and 3, well below the maximum reported in the GOM (11 yr). At the present time, recruitment to Alabama's fishery seems to be able to keep up with current harvests – as suggested by the stable standardized index of abundance within Alabama's waters over the past 10 years – despite the dramatic increase in commercial fishing harvests and heavy exploitation of years 1-3 Spanish Mackerel.

Identifying Trends in Gulf of Mexico Research Priorities over Time and Between Groups. *Stephen H. Sempier and D. LaDon Swann;* Mississippi-Alabama Sea Grant Consortium

In 2007 an effort began to identify regional research priorities in the Gulf of Mexico. One of the first activities included releasing a regional research survey to researchers, people that sponsor research, people who use Gulf of Mexico research results in their profession and others. In 2010 and 2013 follow-up surveys were released. A large number of people completed at least a portion of each survey with 1,575 respondents in 2007, 994 respondents in 2010 and 1,668 respondents in 2013. People completing the survey were asked to rate the importance of the same twenty research priorities in each of the three surveys. If a person completed the survey in multiple years their ratings from one year to another year was compared. The results from these surveys indicate that respondents rated some research priorities significantly different over time. In addition, people were asked to provide their affiliation, relationship to research and their background or areas of expertise. The results of the 2013 survey suggest that people rated the importance of some research priorities significantly different based on these demographics. The results from the 2013 survey and a comparison between the results of the 2007, 2010, and 2013 will be presented. In addition, a relative rating of the twenty research priorities will be presented based on the 2013 survey results.

10 Years Later – A Retrospective Investigation of Design Elements used to Develop Successful Living Shorelines in Alabama. *Kari P. Servold, Scott L. Douglass and Bret M. Webb;* University of South Alabama

Living shorelines are a newly developing concept in "green infrastructure" coastal management that seeks to stabilize shorelines with projects based on more natural approaches which enhance ecological and habitat functions. Most of these projects have been built in the past few years. However, a handful of very similar projects were built in coastal Alabama prior to the development of the term "living shorelines" as alternatives to bulkheads. These projects have been in place between 10 and 15 years and they include a variety of techniques spanning from homeowner scale wetlands with a wooden sill breakwater to large rock and sand fill pocket beach projects. Some of them have been successful and some of them have not. This presentation will revisit 6 projects built from 1998 to 2004 (4 successful and 2 which are no longer viable) and discuss what worked and what did not work. This retrospective analysis will focus on the design elements including original design goals/criteria, project performance, and other considerations involved in these living shoreline case studies. This research is part of an effort to consolidate information on site parameters and technologies which can be used in the application of living shoreline technology.

Do Restored Oyster Reefs Affect Seagrass Dynamics? An Experimental Study in the Northern Gulf of Mexico. *Shailesh Sharma[1], Joshua Goff[2], Kenneth L Heck, Jr.[2,1] and Just Cebrian[2,1];* [1]University of South Alabama and [2]Dauphin Island Sea Lab

Oyster reefs and seagrasses are two important components of coastal ecosystems that are declining globally at an alarming rate. Restoration is a common practice to mitigate the adverse effects that may arise from the loss of these crucial habitats. Although oyster restoration efforts have been practiced in many coastal systems, comprehensive monitoring of such efforts is not frequent. Most monitoring programs have specifically assessed the impact of restored reefs on only a few parameters. Here, we report on the effectiveness of restored oyster reefs for the enhancement of water quality and submerged

aquatic vegetation in a shallow system of the Northern Gulf of Mexico. A manipulative field experiment was conducted where we deployed four subtidal oyster reefs paired up with neighboring sediment flats as controls. No significant reef effect was detected on water quality, sediment characteristics and seagrass abundance. Live oyster density on the restored reefs remained lower than the density measured on neighboring natural reefs. Despite the lack of significant reef impacts, we detected a significant increase in seagrass abundance over the entire study area throughout the duration of the experiment. This increase appeared to be more prevalent for the seagrass *Ruppia maritima* than for *Halodule wrightii*. This suggests the deployment of reefs may have enhanced the conditions for seagrass growth over the entire study area (i.e., covering both restored reefs and control locations) rather than only within a limited zone shoreward from the reef. In turbid, high-energy systems of the Northern Gulf of Mexico oyster reef restoration may have positive effects on shallow seagrass beds, but more work on the extent and mechanisms for this interaction is needed.

Communicating Spill Science: COAST at the Gulf Coast Research Laboratory (GCRL). *Joyce Shaw and Jessie Kastler;* Gulf Coast Research Laboratory

COAST (Community Outreach for Accurate Science Translation) was a project developed by the Gulf Coast Research Laboratory's Marine Education Center to serve as the public outreach component of an Environmental Protection Agency grant "Uptake and Effects of Dispersed Oil Droplets and Emulsified Oil by Estuarine Crustaceans in the Gulf of Mexico" shared by Skidaway Institute of Oceanography, GCRL, and Institute of Marine and Environmental Technology at University of Maryland Center for Environmental Science. The mission of the COAST team was to enhance public understanding of the effects of the Deepwater Horizon 2010 oil spill and to build trust in the process of science by engaging a group of citizens to work with the researchers.

The team was drawn from the oil-affected area along the Mississippi Gulf Coast and included commercial and recreational fishers, community volunteers, college students, staff members from state and federal agencies, master naturalists, and teachers. The team included two GCRL advisors (the website developer and the head librarian) and was led by two GCRL marine educators with guidance from the grant investigators. Team members learned biological processes governing how spill and clean up products make their way into the food web while practicing the steps involved in research and reviewing early research results in the peer-reviewed literature. The volunteer citizen scientists of the COAST team developed educational materials, including fact sheets, videos and classroom activities they shared on the web and through educational presentations. Through grant sponsorship and in partnership with Mississippi-Alabama Sea Grant Consortium and the Mary C. O'Keefe Cultural Center for the Arts and Education, citizen scientists hosted an event to help the more than 300 people in attendance understand the science related to significant oil spill issues.

Evaluation of volunteer citizen scientist experiences showed increases in content knowledge, recognition of the roles science plays during an emergency, and sophistication in knowledge related to specific oil spill issues. In addition, volunteers became more adept at separating science related oil spill questions from those associated with financial, legal and political concerns.

Developing Local Clean Water Programs Through Educational Training to Leverage Funding Opportunities and Identify Emerging Issues. *B. J. Smith[1], Judy Steckler[2] and Mark Berte[3];*
[1]Shorecombers, [2]Land Trust for the Mississippi Coastal Plain and [3]Alabama Coastal Foundation

We aim to build watershed management capacity at the micro level as local community groups complete Trash Blasting Master Cleanup Plans that lead to increased funding and sponsorship and attract quality volunteers to their programs. This poster documents the process of exploring the watershed and waterbody from the perspective of the smallest organizations such as: kayakers, birdwatchers, anglers or surfers. The members of these water dependent organizations are the ones that see the trash on a regular basis. They are the most passionate about keeping our watersheds clean. It makes sense that they represent our front line of defense even though they are the ones at the end of the trash trail.

But how do we engage them? How do we bring them on board with our macro, global programs when picking up trash isn't what they love to do? We have to give them the tools and hands on guidance to quickly develop their own programs that incorporate clean up strategies organic to their lifestyles. As they investigate their organizations and their waterways, sleuthing back to the origin of the Styrofoam coffee cups, single use plastic bottles and bags, and forgotten children's toys; the members of these organizations will build their capacity and define their programs. By their sheer numbers and diversity they will bring more of the community into the service of clean water.

We coach these groups through the process of completing Trash Blasting Master Cleanup Plans™ that lead to strategic plans with action steps, communication plans, funding and sponsorship campaigns, and attracting quality volunteers; all while doing what they love to do. Because the best of our clean water intentions are lost without the resources to carry them out and if we don't have the resources or capacity to complete the intentions, then we won't carry them out to completion.

The act of creating master plans increases an organizations cohesion and capacity. First the members build their ability to function together thereby making better decisions and developing a greater respect for the other members. Trading in their complainers hats for planner hats, they develop a higher group IQ whereby they begin to understand their relationship to the community and trash while learning how to present their message of a trash free water body in terms to which others can relate. As they gather more information from the community in their planning efforts, their motives become transparent. This transparency begins to attract the required funding, sponsors and quality volunteers. The completed products of this training are Trash Blasting Master Cleanup Plans, priority lists, strategic plans with action steps, all developed with the objective of creating a measurably cleaner water body and shoreline.

The macro vision of a clean ocean will be won at the micro level of a clean waterbody and shoreline. The micro level is the best place to eyeball the litterbugs and create meaningful community connections to clean water.

Building Coastal Stewards Through Recreation & Education Tourism. *Elizabeth Smith-Incer;* National Park Service - Rivers, Trails & Conservation Assistance Program

Recreational trails, when properly planned and managed, can minimize impacts on coastal environments and serve as a driving force behind a community's resilient character, often being the motivator for building stewards for the natural world where they exist. Recreational trails can connect businesses, schools and special public places and have been known to bring high levels of tourism dollars to communities. Despite such benefits, much remains to be done in creatively fostering connections to education and tourism growth through trails and greenways while safe guarding the quality of coastal destinations.

The National Park Service's Rivers, Trails & Conservation Assistance Program (RTCA) has assisted in establishing community partnerships that are working to reconnect residents and visitors to the coastal ecosystems that surround them through recreational trails and conservation education projects.

RTCA is working with coastal partners to establish the Mississippi Coastal Heritage Trail (MCHT) from Louisiana to Alabama. While increasing public understanding and providing public access to natural resource interpretive sites, waterways, islands, and forests, this Trail will also provide an opportunity to educate community members and visitors about the effects of the Deep Water Horizon Oil Spill on Gulf Coast communities and resources. It will serve as an educational tool to teach about the interaction between humans and the marine environment as well as offer recreational access to a pedestrian/bikeway stretching across the historic and culturally rich Mississippi Gulf Coast that attracts tourists from all over the world. The MCHT will serve as the backbone of the physical network of cultural, historical and natural places where residents and visitors alike can connect with these places.

RTCA also supports local partners in promoting canoe, kayak and wading trips along the Southeast Coast Paddling Trail (SCPT) that would offer opportunities to explore the effects of water quality on aquatic life and how individuals can help protect our nation's coastal environment. The SCPT will provide unique opportunities for visitors to get a close-up look at coastal wildlife and vegetation.

The MCHT and SCPT will be not only recreational resources where folks can exercise but also educational resources where naturalists could offer insights into the complex but fascinating world of coastal and marine ecology.

RTCA would like to encourage community leaders to consider the enormous positive impact on quality of life and tourism economics of providing recreational trails, both land based and water based. RTCA plays an important role in boosting public awareness about wetlands, bays and bayous by supporting recreational opportunities and public outreach programs and hopes that through its efforts it will play a role in building enlightened stewards for our coastal world and create a space where residents can come and "re"create their bodies and minds leading to a more healthy and resilient community.

Flooding 101. *Emily H. Sommer and Landon Smith;* City of Orange Beach, Alabama

Sommer and Smith demonstrate use of an all-in-one packet of materials for a short training session for city/county councils, zoning boards, etc. on the basics of flooding and flood mitigation. Included are the 28-minute video, "But it never flooded here before!" and four handouts about flood maps, NFIP program, watersheds and possible Q&As for discussion purposes.

This presentation received rave notices at the national convention of Association of State Flood Plain Managers June, 2014. Packets available for attendees.

Application of RTK-GPS Derived Digital Elevation Models from Grand Bay National Estuarine Research Reserve. *Lindsay T. Spurrier[1,2] and William V. Underwood[1,2];* [1]Grand Bay National Estuarine Research Reserve and [2]Mississippi Department of Marine Resources

A Digital Elevation Model (DEM) is a continuous dataset that estimates surface morphology modeled from elevation data. DEMs can be generated from a variety of data sources including remote sensing, ground based GPS, photogrammetry, and topographic maps. DEMs are used for many purposes. Hydraulic modeling, determining coastal morphology, investigating rivers and floodplains, studying sea level rise dynamics, and coastal zone management are just a few of their many applications.

The Grand Bay National Estuarine Research Reserve (GNDNERR) in Moss Point, MS has been established as a Sentinel Site within the National Estuarine Research Reserve System. The Sentinel Site Program focuses on understanding marsh dynamics in the face of changing water levels and inundation patterns. Having a highly accurate and working DEM associated with each area of interest integrated into our Sentinel Site observational structure is vital to understanding marsh dynamics. In the spring of 2013, staff at GNDNERR began collecting surface elevation points and associated vegetation data using a Trimble R8 Global Navigation Satellite System (GNSS) System. This System supports Real-Time Kinematic (RTK) data collection with accuracy of 0.01m horizontally and 0.02m vertically based on static measurements. Over 3,000 surface elevation points were collected along a 10m by 20m gridded surface overlaid on our areas of interest. DEMs were created using the Topo to Raster interpolation method that aims to create a hydrologically accurate surface.

The resulting DEMs have a large amount of utility and have been applied many different ways; three specific applications will be discussed. From the associated vegetation data, the frequency distribution of dominant marsh species was graphed across the elevation gradient. Second, the DEMs were used as inputs for a GIS tool that models water movement and inundation across the marsh. This tool was developed specifically for GNDNERR to research patterns of inundation associated with dominant marsh species. Third, since DEMs created for this project are based on ground collected RTK data, they were compared to LiDAR to assess the accuracy of remotely sensed elevation data in marsh habitats.

These applications and the raw DEMs provide a large amount of invaluable information for a variety of audiences. Elevations of dominant marsh plant species can inform restoration practitioners on which grasses to plant at restoration sites. Understanding inundation characteristics can help coastal land managers determine where marshes will migrate as water levels change. Raw DEMs can be used as inputs for storm surge and floodplain maps that help the public understand the vulnerability of their home and community to hurricanes and other storm events.

The CIAP Smart Conservation: A Strategy for Incorporating Green Infrastructure into Hurricane Recovery and Renewal. *Judy Steckler[1] and Jennifer Wagner[2];* [1]The Land Trust for the Mississippi Coastal Plain and [2]Mississippi Department of Marine Resources

This CIAP Grant allowed Conservation Legacy to provide a unique opportunity for agencies and organizations in the region to come together while contributing their knowledge and data to create a database and planning reports that are beneficial to the whole coastal conservation community. The mapping of potential lands, in particular, can serve as a model for creating simple, dynamic GIS tools to aid in conservation. In addition, this project served as a model for collaborative efforts.

Conservation Legacy is a multi-part strategic project for increasing and improving conservation on the Mississippi Gulf Coast. Through this project the Land Trust for the Mississippi Coastal Plain (LTMCP) has developed an assortment of tools and reports that will assist in the strategic conservation of land.

The Conservation Mapping report discusses the creation and future use of the Map of Potential Conservation Lands, a geographic information system developed as a part of the Conservation Legacy project. The objective of creating the Map of Potential Conservation Lands was to provide a common baseline for regional conservation efforts, which can be used by local landowners, land use planners, Local and State agencies, and conservation practitioners to visualize individual projects as part of a larger whole. It lends credibility to funding requests for implementing conservation projects.

The end result was a toolkit for identifying, ranking, and mapping locations that the LTMCP can consider targeting for conservation if these lands are available for purchase or conservation easement. The conservation analysis and mapping effort produced a GIS database (geographic informational system), a prototype web-based GIS portal, static digital map files, hard copy poster maps, and an analytical report. All outputs from this project were based on an analytical model that ranked all of the land in the six- county area according to its potential for conservation priorities of the LTMCP and its strategic partners.

The Implementation Framework Report, a companion to the Map of Potential Conservation lands, explores tools, strategies and funding guidelines for conservation action in this region. It has sections on non-traditional land protection strategies, partnerships, and communications.

In conclusion, the map provides a snapshot of the great need for conservation action in South Mississippi. It focuses on the suitability of land for conservation, rather than development.

Discard Mortality and Spatial Dynamics of Greater Amberjack (*Seriola dumerili*). *Laura Stone, Sean Powers, Marcus Drymon;* University of South Alabama

The sustainability and management of marine fish populations depends on the accuracy of their stock assessments. Greater Amberjack is a species managed by the Gulf of Mexico Management Council and has been declared as "overfished and undergoing overfishing". To improve management of this species, two continuing data deficiencies in its stock assessment, discard mortality rate and migration, need to be further investigated. Currently, discards represent a large percent of total recreational catch within the Gulf of Mexico, much of which are Greater Amberjack. To estimate discard mortality, a combination of multimode acoustic (n=36) and pop-up archival satellite transmitting tags (PSAT) (n=5) will be used. These technologies have the capability to monitor the fine-scale movement which can discern survival of the fish post-release. The acoustic array will contain four Lotek WHS 3050 acoustic hydrophones for continuous datalogging for 30 days and PSAT tag data will report to the Argos satellite data collection system after detachment on a preprogrammed date (t=365 day). Survival of released fish will then be determined from the time series depth and temperature profiles recorded by the acoustic and PSAT tags. Results from a pilot study conducted in spring 2013 indicated a discard mortality rate of 10-40%, the wide range estimated can be explained from the type of tags that were used with only five tags equipped with pressure sensors, causing uncertainties when determining survival. In the present study, the methods will be refined to include pressure and motion sensors in each of the tags to produce a more precise estimate of discard mortality.

Data from the PSAT technology will also be used for determining movement patterns and migratory routes of Greater Amberjack. Previous spatial studies have been concentrated along the southeast coast where they are managed differently and have applied traditional tag-recapture studies that cannot uncover daily/seasonal movements. With recent improvement of PSAT tags, researchers can attain continuous real-time data on fish spatial utilization and is truly fisheries-independent. A template-fit light geolocation algorithm will provide daily geolocation estimates with error estimates to give insight on horizontal movements of Greater Amberjack. Using novel applications in biotelemetry, this study aims to address current paucities in the Greater Amberjack stock assessment.

Sustaining Alabama Fishery Resources: A Risk-Based Integrated Environmental, Economic, and Social Resource Management Decision Framework. *Michael Stovall[1] and David Hale[2];* [1]Ninth Generation Consulting and [2]University of Alabama

The natural systems that make-up Mobile Bay, its watershed, and adjacent marine waters serve as critical natural infrastructure supporting water supply, transportation, power generation, recreation, commercial fishing, agriculture, forestry, and a wide variety of other valued uses for the people in the watershed. Development activities and multiple uses have placed signification stresses on the ecosystem and the sustainable use of its aquatic resources. These stresses have impacted the unique marine and freshwater biodiversity of this aquatic system.

This paper presents results of Phase 1 of a NOAA funded assessment of the freshwater and marine fisheries of the Mobile Bay watershed, the related aquatic system and the stresses placed on this system by both anthropologic and natural conditions The project is a collaborative effort among government, corporate, and private stakeholders to build the resource management decision support tools needed to assure a sustainable fisheries and coastal seafood industry for Mobile Bay and its watershed, while balancing statewide environmental, economic, and social demands.

Existing system conditions were initially characterized through review of available literature and agency documents. Two collaborative multi-stakeholder workshops were held in 2009 in order to gain their perspective on the most immediate threats to a sustainable Mobile Bay system. Challenges associated with multi-stakeholder coordination, resource allocation among potentially competing uses, and public education of how human activities potentially impact system health were ranked as higher threats for sustainable system management than more traditional environmental perturbations such as non-point source pollution or aging infrastructure.

Results from Phase 1 studies have identified tentative indicator species, sources of stresses, model boundary conditions and other major system components for Phase 2 activities to develop a preliminary decision support system, which will link riparian, stream, estuary, and near-shore marine conditions responses to various human use activities via selected indicator species monitoring. The long-term project outcome is to design and develop new tools to model and evaluate social and environmental factors that influence management of a sustainable fishery, support man-made infrastructure investment decisions, and provide a common language for expressing goals, processes, and concerns affecting responsible stewardship of Alabama's fisheries resources.

Recent developments incorporating decision impacts of near-shore drilling will also be discussed.

Ichthyoplankton Community Composition and Patterns of the Loop Current. *Stephanie M. Taylor, Robert T. Leaf, Frank J. Hernandez, Jr. and James S. Franks;* Gulf Coast Research Laboratory

The Loop Current boundary (LCB),) provides a unique habitat for ichthyoplankton in the Gulf of Mexico (GOM). The LCB is an area characterized by the transition of environmental conditions of the water mass between the GOM and Caribbean in temperature, salinity, and chlorophyll a. Ichthyoplankton are found in great abundance at the LCB because of the physical oceanographic mechanisms that aggregate them. Additionally, previous work indicates that this area provides increased feeding opportunities relative to the surrounding oligotrophic waters for ichthyoplankton in the GOM. The goals of this study were to characterize the relative density of ichthyoplankton and to describe the community composition of the LCB. Ichthyoplankton were collected using a discrete depth Tucker trawl in and around the vicinity of the LCB; attempts were made to distribute samples equally across the LCB. We identified post hoc the origin of ichthyoplankton samples from one of three water masses: GOM, LCB, or Caribbean. We took 19 samples in four transects across the LCB and caught 12,401 ichthyoplankton from 53 families. Using nonmetric multidimensional scaling, we identified three unique assemblages of ichthyoplankton at the LCB: a transition assemblage found around the LCB and two peripheral groups originating from either GOM or Caribbean water masses. The transition assemblage is characterized by relatively high densities of the families Scombridae, Carangidae, Istiophoridae, and Coryphaenidae. The transition assemblage is a heterogeneous composition and a blending of the two peripheral assemblages containing cosmopolitan species. The GOM peripheral assemblage is characterized by relatively high densities of the families Myctophidae and Exocoetidae. The Caribbean peripheral assemblage is characterized by relatively high densities of the families Tetraodontidae, Sphyraenidae, and Scorpaenidae. We found each assemblage is significantly dissimilar in their familial composition. The LCB ecotone contains a unique biotic assemblage of economically important fishes. The LCB ecotone allows for increased diversity because of its productivity and increased chances to encounter prey which in turn increase chances of survival for many species. Understanding the early life history of these fishes community structure has implications for understanding recruitment success and inter-annual population dynamics.

Updating and Improving a Spatial Database of Priority Estuarine Habitats and Calibrating a Biological Condition Gradient Model Framework for the Alabama Estuary. *Tim Thibaut[1], Roberta Swann[2], Tom Herder[2], Renee Collini[3], Michael Dardeau[3];* [1]Barry A. Vittor & Associates, Inc., [2]Mobile Bay National Estuary Program and [3]Dauphin Island Sea Lab

The Mobile Bay National Estuary Program (MBNEP) is updating and improving a spatial database of priority estuarine habitats and calibrating a biological condition gradient model (BCG) framework for the Alabama estuary. The improved database will provide greater spatial resolution of the location, interconnectedness, and condition of priority habitats across the coastal landscape. The BCG framework will describe the biological condition of wetlands and streams as it varies along a continuum of anthropogenic stress, and will be used to track management effectiveness and report on estuarine status and trends.

A tiered monitoring framework will assess stressor intensity and habitat condition at watershed and sub-watershed scales, integrating anthropogenic effects and biological patterns at different levels of spatial aggregation and analysis to inform site-specific management decisions. The framework will be used to identify problem areas and formulate restoration approaches to enhance ecosystem function and habitat quality. Restoration strategies will focus in part on those actions that result in reductions in

upstream sediment, nutrient, and pollutant inputs, to reduce loading into the estuary and remediate cumulative effects of land use disturbance.

In addition to land use intensity and stressor origin, landscape-scale analysis will include metrics such as location within the mosaic of coastal habitats, patch size, riparian buffer integrity, and the degree of hydrologic alteration. Field assessments will validate boundary locations and measure the biological condition of individual habitat patches and stream reaches. Estuarine and palustrine wetlands (emergent, shrub, forested) will be assessed using ground-level WRAP or HGM assessments, with a focus on those systems with hydrologic connectivity to tidal waters. For streams an index of biotic integrity will be developed and applied to the study area. Biological, chemical, physical, and landscape data will be collected to develop stream site classes and inform site selection for use in calibrating and testing biotic indices and associated metrics. Numeric criteria will describe the expected biological attributes of a minimally impaired aquatic community, and show an empirical and predictable change in value along a disturbance gradient.

The Science Advisory Committee of the MBNEP has developed a conceptual framework for the BCG based on the relative proportion of good, fair, and poor biological conditions for a given wetland area or stream reach of interest. The BCG also accounts for wetland acreage lost during each assessment interval. The BCG has the capacity to describe wetland and stream conditions for the overall study area, for individual watersheds, or at sub-watershed scales, as well as by wetland or stream type. Initial assessment of the BCG framework will be implemented during restoration actions in the D'Olive Bay watershed and for the East Fowl River watershed management plan. A monitoring strategy is being developed and will be implemented prior to restoration actions to establish baselines for natural spatial and temporal variability in wetland and stream biota, document biological conditions in the degraded systems to be restored, and assess existing levels of stressor intensity.

Attributes of Resilience within Coastal Systems. *Scott Thomas[1] and David Kerner[2];* [1]The Tauri Group and [2]Stetson Engineers Inc.

The concept of resilience has been developed to describe the behavior of coupled social-ecological systems. The authors have developed analytical tools to assist agencies assess and manage for system resilience. The foundation for such an assessment is a comprehensive set of resilience attributes from which metrics can be developed. Building on prior efforts, the authors developed a suite of attributes for resilient systems that explore such factors as response diversity, collaborative capacity, single points of failure, interconnection options, pathways for controlled reduction in function, situational awareness, skewing subsidies, and autonomy, among others. They also define a range of questions pertinent to assessing system status for each metric. The metrics can be directly applied to assessing the resilience of coastal systems to natural and manmade stresses, including short- versus long-term and rapid-onset versus slowly evolving challenges. Certain variables will play a more prominent role than others for any given situation, and changes that foster improvements in some areas of resilience may reduce it in others; trade-offs will likely be necessary. The entirety of the suite, however, is intended to provide a firm foundation for beginning the resilience assessment process and for developing more holistic and insightful resource management policy. This approach will be compared with the Coastal Community Resilience Index that has been used to characterize several Gulf Coast communities.

Reversing the Tide: Preserving Working Waterfronts in Alabama. *Jody Thompson[1,2] and Kristen O'Keefe[1,2];* [1]Auburn University Marine Extension Research Center, [2]Mississippi-Alabama Sea Grant Consortium

Like many coastal states, Alabama has faced threats and disturbances to its ecological, economic, social and cultural structures. Natural and technological disasters, as well as the economic recession have impacted coastal communities that rely on access to the water for their livelihoods. Water-dependent businesses along the Alabama coast are wide-ranging and include international industrial shipping, commercial and recreational fishing, nature tourism and other maritime interests. Generations of families based in traditional fishing towns operate fishing boats, seafood processing facilities, marine vessel construction and repair, and other support industries. As diverse as they may be, these working waterfronts have one thing in common: their tremendous impact upon Alabama's economy and socio-cultural heritage.

In response to these concerns, the Auburn University Marine Extension Center and the Mississippi-Alabama Sea Grant are working with stakeholders to protect and preserve this economy and heritage. By providing educational opportunities and technical support, AUMERC and MASGC are working within waterfront communities to achieve results. Facilitation of the Alabama Waterfront Access Study Committee led to recommendations to the Alabama Legislature that include management-based tools, incentives and techniques to protect and preserve working waterfronts and waterfront access in the state, and AUMERC and MASGC continue to be leaders in addressing working waterfront issues. New initiatives are planned in Alabama and Mississippi, and AUMERC and MASGC are building new partnerships to increase working waterfront efforts. This poster presentation highlights success stories and national recognition for Alabama working waterfront projects.

Evaluating the Community Resilience Index as a Hazard Resilience Tool. *Jody Thompson[1,2], Tracie Sempier[2] and La Don Swann[2];* [1]Auburn University Marine Extension Research Center and [2]Mississippi-Alabama Sea Grant Consortium

The Community Resilience Index (CRI) seeks to increase risk awareness among local communities of their susceptibility to natural hazard events. The CRI is delivered through interactive sessions with community decision-makers and facilitated by trained volunteer facilitators. Now in the evaluation phase, the CRI has been delivered to at least five communities in the five Gulf of Mexico states. The CRI is a snapshot in time, assisting communities in assessing their natural hazard preparedness and planning. The recipient audience can include floodplain managers, land-use planners, local elected officials, natural resource managers, and emergency managers, and is applicable at the city and county or parish level. The CRI can be coupled with existing training programs as an entrée to introduce other natural hazard planning topics, such as sea level rise and climate change to coastal communities. The end outcome is for communities to take actions to address the weaknesses they identify utilizing the CRI, and community decision-makers that are more informed on their community's level of risk, ultimately increasing their capability of responding to disasters. The CRI development, delivery and adaptation model can be readily transferred to all U.S. coastal communities, and is easily adapted for natural hazards more applicable to inland communities.

To date, thirty communities in five Gulf States have participated in a CRI meeting, facilitated by one of 75 trained volunteers. Partnerships have led to the CRI being facilitated in Bangladesh and Mexico, and introduced to other United States regions. This presentation will discuss the quantitative and qualitative methods by which the CRI tool is being evaluated and the results of that evaluation.

Marsh Elevation Dynamics at the Grand Bay National Estuarine Research Reserve: A Three Year Sentinel Site Retrospective. *William V. Underwood[1,2], Mark S. Woodrey[3,1] and Lindsay T. Spurrier[1,2];* [1]Grand Bay National Estuarine Research Reserve, [2]Mississippi Department of Marine Resources and [3]Mississippi State University Coastal Research and Extension Center

The loss of saltmarsh habitats has a potential to impact coastal resiliency, recreationally and commercially important fish and shellfish species, and ecotourism. Efforts to understand rates of marsh loss require localized and fine scale measurements of accretion and subsidence dynamics across the marsh platform. Unfortunately, these localized measurements are often unavailable to researchers attempting to model the response of marsh habitats to future rates of sea level change. In response to these needs for localized data, the Grand Bay National Estuarine Research Reserve (NERR) has been established as a sentinel site for monitoring marsh response to changing water levels. A network of 15 deep-rod surface elevation tables (rSET) distributed across the elevation gradient of the Reserve provides a platform for long term monitoring of sediment dynamics and marsh building processes. Quarterly measurements of surface elevation change at each rSET provide for evaluation of trends in marsh accretion. Measurement of associated feldspar marker horizons allow for the discernment of subsidence and accretion components of the measured elevation change. The presence of seasonal and episodic changes in rates of marsh accretion (i.e., shrink/swell, hurricane) requires long term data collection to elucidate relevant trends. To enhance the applicability of these data on a larger spatial scale, GPS derived orthometric heights (NAVD88) have been collected for each of the rSET locations providing ties to the National Spatial Reference System. These heights are tied to a local network of tidal and geodetic benchmarks which allows for direct transfer of tide gauge information to inundation levels at each rSET installation as well as periodic evaluation of mark stability.

While trends in marsh elevation change are best examined over an extended time frame, this presentation provides an overview of three years of quarterly data collection at the Grand Bay sentinel site. Spatial and temporal patterns of accretion will be presented as well as inundation characteristics of each site. Lessons learned and future enhancements to the sentinel site will be discussed, as well as identified research needs and opportunities. In addition, the relevance of this work in a regional context will be discussed in relation the participation in the Northern Gulf of Mexico NOAA Sentinel Site Cooperative. The results presented here provide the first spatially explicit measurements of fine scale marsh elevation dynamics across the major saltmarsh habitats for the Grand Bay NERR. These data should prove useful to coastal managers looking to protect and enhance saltmarsh habitats as well as researchers modelling future marsh response to sea level change. The sentinel site infrastructure will serve as a platform for enhancing our capabilities of understanding marsh building processes well into the future.

Living Wave Barrier. *David Walter;* Walter Marine

Walter Marine has developed a wave attenuator that solves all the problems associated with wave attenuators in the past. It solves the problem of stability both in settling or sinking into the bottom and staying put during storm events. It can attenuate both swell and chop. It can be adjusted to any water depth or any wave height.

Preliminary Results of the Effects of Culture Practices on Vibrio Spp. Abundances in Farmed Oysters. *William Walton[1], Covadonga Arias[1] and Jessica L. Jones[2];* [1]Auburn University School of Fisheries, Aquaculture & Aquatic Sciences and [2]Food & Drug Administration, Division of Seafood Science & Technology, Gulf Coast Seafood Laboratory

The increase in oyster aquaculture in the U.S., particularly in the Gulf of Mexico, has raised broad concerns about the effects of aquaculture practices on the abundances of both *Vibrio vulnificus* and *V. parahaemolyticus* in oysters and the re-immersion time required to return the vibrio levels to background levels. We began testing the following hypotheses in 2014 with additional replicates planned for 2015: 1) there is a significant effect of tested aquaculture practices (mud worm treatment, routine bio-fouling treatment, or never desiccated) and time of re-immersion (measured from 1-14 days after re-immersion) upon the abundance of *V. vulnificus* and *V. parahaemolyticus*, and 2) oysters subjected to either aquaculture practice will not significantly differ from untreated oysters in abundance of *V. vulnificus* and *V. parahaemolyticus* after a predictable amount of days of re-immersion. We are conducting a two-year experimental field study (at Auburn University's research field site in Portersville Bay, Coden, Alabama) with two- 14 day replicate runs in 2014 and three replicate runs in 2015 (between July 15th and September 1st). At the onset of any given run, six randomly selected baskets were subjected to either 1) a 3-hr freshwater dip, and then allowed to air dry for 21 hours, 2) 24 hours of desiccation at ambient air temperatures, or 3) left, untreated, in the water. After treatment, all baskets were re-immersed, adjacent to the unhandled control. Samples were collected prior to treatment, immediately post-treatment/before re-immersion, and then 1, 2, 3, 7, 10, and 14 days after re-immersion. Samples were processed following standard NSSP protocols within 24 h of collection and analyzed for Vibrio spp. using MPN followed by BAX real-time PCR confirmation. Preliminary results indicate that aquaculture practices substantially increase Vibrio spp. levels, relative to the submerged (background) control, but that the differences in levels between treated and background control samples disappear within 7 days after treatment.

Sediment Denitrification Overcomes Sulfides Inhibition under Low Salinity Environment. *Lei Wang[1,2], Behzad Mortazavi[3,2] and Alice Ortmann[1];* [1]Department of Marine Sciences, University of South Alabama, [2]Dauphin Island Sea Lab and [3]Department of Biological Sciences, University of Alabama

Anthropogenic activity is increasing nitrogen (N) inputs to coastal watersheds, which has been linked to harmful algal blooms and deteriorating water quality. A better understanding of the N cycle, especially N removal processes, in different environments can improve coastal conservation, wetland engineering and water quality. Previous studies carried out in the northern Gulf of Mexico have detected low rates of nitrification, denitrification and, hence, low N removal rates. Meanwhile, dissimilatory nitrate reduction to ammonium (DNRA), which competes with denitrification for nitrate and retains N within the system as ammonium, appeared to be more significant than previously considered. One of the reasons may be the inhibitory effects of porewater sulfide on nitrification and denitrification. The objective of this study was to identify factors limiting denitrification in coastal sediments. Mud flat sediments under different salinities were collected seasonally and potential nitrification and denitrification rates were determined. Because these processes are mediated by microbial communities, we also quantified the abundance of marker genes associated with each process. We hypothesized that in lower salinity habitats, the inhibition of HS- would be limited due to lower sulfate concentrations, and nitrification and denitrification would increase along with the associated genes.

Potential nitrification was low (0.06-0.25 nmol N g-1 h-1) at both high and low salinity sites throughout the different seasons, corresponding with low numbers of bacterial and archaeal amoA genes. Although high abundances of sulfate reducers and high sulfide concentrations were detected at both sites, potential denitrification rates were significantly higher at the low salinity site (3.35-10.11 nmol N g-1 h1) compared to the high salinity site (0.14-1.70 nmol N g-1 h-1). Denitrification increased with decreasing temperature. nirS gene abundances positively correlated with potential denitrification rates ($R= 0.70$, $P<0.0001$). The nrfA gene, a proxy for DNRA was abundant and positively correlated with the sulfate reducing gene, dsrB (Spearman's Rho= 0.64, P=0.0008). Contrary to our hypothesis, nitrification remained low in both high and low salinity environments, but potential denitrification was higher under lower salinity. Other factors and process, such as DNRA, may also play an important role regulating N removal in Mobile Bay, AL.

Oyster Reserve Establishment in Mississippi Sound (AL) - Year I. *P. J. Waters[1,2] and William Walton[3];* [1]Alabama Cooperative Extension System, [2]Mississippi-Alabama Sea Grant Consortium and [3]Auburn University School of Fisheries, Aquaculture and Aquatic Sciences

In 2011, we established the first oyster reserve (10 acres) within Alabama's coastal waters through a long-term sub-lease agreement with a private oyster riparian right holder. Situated in Portersville Bay, the project seeks to establish and maintain a productive oyster reserve that can both serve as a regional source of larvae and improve coastal habitat by establishing a new oyster reef. The site serves as an ongoing research and education platform for evaluating the spawning, recruitment, survival and growth of the American oyster.

Within the 10 acre site, oyster harvests were reduced to zero, and an area of 2,500 m2 was cultched with dried, aged oyster shell. This cultched area improves larval settlement and recruitment within the reserve and allows evaluation of spawning, recruitment, survival and growth of oysters planted within the cultched area (cultched + planted). Spawning stock 'beds' were then established (36/m2) from the advanced stocker oysters ($\bar{x}$ shell height = 55.9mm) produced by the Mobile Bay Oyster Gardening Program.

Spat recruitment was documented from significant declining $\bar{x}$ shell height ($p=0.0027$) among sampling dates (April, July and October 2013) and strongly significant $\bar{x}$ shell height ($p=0.0000067$) between samplings of both cultched only and cultched + plantings April and October 2013.

Creation of dense spawning beds was complicated by heavy predator (oyster drill) presence. Significant population decline on the cultched + planted zone was noted April to October ($p=0.008$). The cultch only zone showed significant population decline over the same time period ($p=0.013$). This predation, widely seen within the region, prompted the next phase of the investigation to include an evaluation of protective measures for dense spawning aggregates with the reserve.

A Regional Vulnerability Assessment of Gulf of Mexico Habitats and Species to Changing Environmental Conditions. *Amanda Watson;* Northern Gulf Institute, Mississippi State University

Vulnerability assessments – syntheses of ecological and climate information to better understand how resources are likely to respond to changing conditions – are commonly identified as a necessary first step in adaptation planning. With an increased focus on the potential impacts of climate change, urbanization, and sea-level rise in the Gulf Coast Region, a number of individual agencies and organizations have begun to pursue vulnerability assessments for natural systems, individual species, communities, and economies.

In an effort to unify these individual assessments and facilitate the necessary coordinated response, the Gulf Coast Landscape Conservation Cooperatives (LCCs), National Oceanic and Atmospheric Administration (NOAA), Gulf of Mexico Alliance (GOMA), USGS Climate Science Centers (CSC) are leading a network of partners in a Gulf-wide initiative, the Gulf Coast Vulnerability Assessment (GCVA). The goal of the GCVA is to enhance conservation and restoration by providing a better understanding of the effects of climate change, sea level rise and land use change on Gulf of Mexico coastal habitats and the species that they support.

The GCVA relies on the Standardized Index of Vulnerability and Value Assessment (SIVVA) to assess the vulnerability of four pilot habitats (i.e., mangroves, tidal emergent marsh, oyster reefs, and barrier islands) and the species associated with each of these habitats across the U.S. Gulf of Mexico. The Gulf was divided into six ecological subregions to evaluate if species and habitat vulnerability varies spatially. Species and habitat experts completed SIVVA for their subregion and resource of expertise. Preliminary results from the SIVVA analysis will be presented.

Results from the assessment are being developed into a report for the natural resource community to help them determine which resources are most vulnerable so they can set priorities for conservation, identify why the resources are vulnerable, and develop appropriate management and conservation adaptation strategies.

A Long-term, Stakeholder-based Strategy for Gulf of Mexico Observing and Monitoring: The GCOOS Build-out Plan V.2.0. *Stephanie Watson[1], Chris Simoniello[1], Landry Bernard[1], Barbara Kirkpatrick[1] and Stephan Howden[2];* [1]Gulf of Mexico Coastal Ocean Observing System (GCOOS) and [1]University of Southern Mississippi

The Gulf of Mexico Coastal Ocean Observing System (GCOOS) Build-out Plan V.2.0 is a long-term, stakeholder-based vision for a comprehensive, integrated ocean observing system for the Gulf of Mexico. The plan, which includes cost estimates, is firmly grounded in stakeholder-needs identified through 17 workshops with 631 participants, 10 expert writing teams and more than 50 additional individual contributors, and 32 existing regional plans. The Build-out Plan maps requirements from the Gulf of Mexico Alliance Priority Issue Teams, as well as RESTORE Act priorities. The plan includes, as examples, the development and implementation of an Integrated Water Quality Monitoring Network, Beach Quality Monitoring, Hypoxia and HABs Monitoring, as well as Ecosystem Monitoring for living marine resources, habitats, and restoration projects. This presentation will include a focus on the plan elements related to water quality monitoring and living marine resources, with the objective of initiating collaborations to implement plan elements for the benefit of the Gulf ecosystem and economy. Examples of projects already underway and regional synergies established during the past ten years of the GCOOS Regional Association enterprise will be also be discussed.

The Impact of Regional Climatic Conditions on the Distribution and Abundance of Seagrass Assemblages in the Fenholloway and Econfina River Estuaries, Apalachee Bay, Florida. *Carl M. Way[1] and Chet Thompson[2];* [1]Barry A. Vittor & Associates, Inc. and [2]Buckeye Florida, LP

The Big Bend area contains the largest seagrass beds in the northeastern GOM with coverage estimates of over 750,000 acres. Seagrasses can occur in both continuous coverage and patchy beds and provide critical and valued habitat functions. Above average rainfall and high riverine discharge over extended periods and the resulting lower salinities, increased water color and decreased light penetration can result in reduced abundance and loss of function in seagrass communities. We have monitored

seagrasses in the Fenholloway and Econfina River estuaries and Apalachee Bay from 2005 to the present in an attempt to identify the variables responsible for patterns of annual and inter-annual variation observed in seagrass abundance.

In 2005 seagrasses were absent or present with very sparse (<10%) coverage in the Fenholloway system, while coverage throughout much of the Econfina system ranged from bare to sparse (10-40%). The years, 2003-2005, had above average rainfall and riverine discharge. The years, 2006 -2011, were generally a period of below average rainfall and average discharge with dense (>70%) seagrass coverage observed in the offshore areas of both systems, with small areas of bare to moderate coverage occurring in the river mouths and nearshore areas. More recently there has been a general trend of above-average rainfall and discharge. During this time frame, changes were observed in seagrass coverage and location. In the Fenholloway system, there was a change from bare/sparse coverage nearshore and moderate/dense seagrass coverage further offshore in 2011, to more extensive sparse/moderate coverage in the nearshore areas in 2012, and in 2013, the bare/sparse coverage zones extended several miles offshore. In the Econfina system, there was dense coverage was observed near the mouth and in nearshore areas in 2011; coverages in 2012 were bare to sparse in the same region, and in 2013 the bare and sparse zones extended throughout the nearshore zone and coverage was lower for several miles into Apalachee Bay.

Data indicate that the long-term variation observed in the aerial extent of seagrass communities in the Big Bend area (Apalachee Bay) may be the correlated to long-term regional climate patterns, particularly rainfall levels and riverine discharge.

Community Based Restoration: A Living Shoreline for Mon Louis Island, Alabama. *Bret Webb[1], Scott Douglass[2] and Tom Herder[3];* [1]University of South Alabama, [2]South Coast Engineers and [3]Mobile Bay National Estuary Program

A 670-foot stretch of eroding shoreline on Mobile Bay was stabilized and enhanced with a living shoreline approach. This project was a success primarily because a site-specific conceptual design was formulated for the conditions (physical and ecological). The original goals of the project included stabilization of the sandy shoreline and creation of habitat. The project was initially envisioned as a nearshore breakwater system with marsh plantings. However, the potential for downdrift beach erosion changed the overall concept. The shoreline was stabilized with four 40-foot, low-crested, stone, headland breakwaters placed on the shoreline; clean sand beach nourishment; and two offshore submerged stone reefs for oyster habitat. An existing fallen oak tree stump, a recognizable feature of the shoreline for decades, was incorporated into the system as a natural headland in the center of the project. The offshore submerged reefs and headland breakwaters were conceived when it became clear that the site would not support the establishment of the original concept of nearshore marsh islands. Since construction in early 2013, the shorelines between each headland have equilibrated to their expected shape with no negative impacts to longshore sand transport. The offshore reefs are providing excellent fish habitat. The project was part of a community based restoration program facilitated by the Mobile Bay National Estuary Program and funded by the U.S. Fish and Wildlife Service as well as the Gulf of Mexico Foundation.

Science and Conservation as a Part of Fishing. *Ben Weldon;* University of Southern Mississippi, Gulf Coast Research Lab Marine Education Center

Recreational fishing popularity is at an all-time high in the state of Mississippi. With an estimated 650,000 plus anglers in Mississippi waters it is important to stress the importance of conservation and science in regards to fishing. The Gulf Coast Research Lab in cooperation with the Center for Fisheries Research and Development and the Coastal Conservation Association, attempt to address these points in two public outreach programs: The "Catch More Fish with Science" seminar series, and "Angler Camp".

"Catch More Fish with Science" was a four part seminar series that covered species common to the Mississippi Sound such as; Spotted sea trout, triple tail, and cobia. During the seminar guest were given a scientific perspective as well as a professional charter guides tips and tricks on how to be more effective at targeting the fish. Topics covered during the seminar included the fish's habitat, diet, spawning, migration patterns, and any ongoing research being conducted at the Gulf Coast Research Lab. Due to the popularity of the first four, future seminars have been scheduled to cover red drum and flounder. All proceeds collected from the seminars where used to scholarship underprivileged children into the second outreach program, "Angler Camp".

Angler Camp is a five day camp that centers on recreational fishing, conservation, and biology. During this five day camp students spend one day in the classroom learning the basic concepts of ichthyology, conservation, and fishing techniques. The next four days are spent in various field locations including the Pascagoula River, Ship Island, Horn Island, and local piers and beaches. While in the field students have the chance to put the conservation and fishing techniques they learn into practice as well as see first-hand the biological concepts we discussed on the first day. Students complete a pre and posttest on the first and last day respectively of the camp and all groups show marked improvement from Monday to Friday.

Assessing the Abundance, Distribution and Toxicity of Microplastics in Mobile Bay, AL. *Caitlin Wessel[1,2], Just Cebrian[2,1] and David Battiste[1];* [1]University of South Alabama and [2]Dauphin Island Sea Lab

Plastic debris has significant environmental and economic impacts in marine systems. One exponentially increasing source are microplastics (i.e., plastic pellets, plastic fragments, scrubbers, plastic flakes) which range in size from 1 µm to 5 mm. First studied in the 1970s along the east coast of North America studies on microplastics have since been conducted along both coasts of North America, the Caribbean, southern Africa, the Mediterranean, Europe, Antarctica and Asia. Microplastics have been documented to have both direct (i.e., via consumption) and indirect (i.e., persistent organic pollutant toxicity) effects on organisms. Microplastic debris originates from the degradation of packaging and resin pellet manufacturing. In marine environments they can be transported over long distances by ocean currents and eventually be deposited in coastal sediments (i.e., beaches, marsh, seagrass beds, reefs). Despite the increasing interest in microplastics, research on its abundance, distribution and impacts in the Gulf of Mexico is limited. This study aims to contribute to filling this gap in knowledge by assessing the abundance and distribution of microplastics in coastal habitats of Mobile Bay, AL.

FEMA's New Alabama Coastal Storm Surge Model. *Jason Wilson[1] and Leslie Durham[2];* [1]AMEC and [2]Alabama Office of Water Resources

As a follow up to their 5-year Map Modernization (Map Mod) Program and subsequent Map Maintenance Initiative, the Department of Homeland Security's Federal Emergency Management Agency (FEMA) is initiating the Risk Mapping, Assessment, and Planning (Risk MAP) program, of which the State of Alabama Department of Economic and Community Affairs, Office of Water Resources (OWR) is a Cooperating Technical Partner. One particular point of emphasis for Risk MAP is the completion of revised coastal inundation mapping for the entire coastal United States. Following Hurricane Ivan in September 2004, high water mark data was collected that caused FEMA to call into question the accuracy of the effective base flood elevations and coastal flood hazard area mapping for Alabama and Northwest Florida. Before a revision project could be initiated, the devastation of Hurricane Katrina in 2005 caused immediate efforts to be enacted to revise the coastal flood hazard areas in Louisiana and Mississippi. With the completion of these updates, the focus shifted to Alabama and Northwest Florida.

OWR has joined with the Northwest Florida Water Management District (NWFWMD), another FEMA Cooperating Technical Partner, in an endeavor to update the FEMA Flood Insurance Rate Maps for Baldwin and Mobile Counties in Alabama, as well as six coastal counties in Florida. As a mapping partner with OWR, AMEC Environment & Infrastructure was chosen to assist OWR in the completion of this project. The effort for such a revision is incredibly technically demanding and time consuming. Storm Surge modeling was completed earlier this year and overland wave modeling is in progress. Preliminary to this modeling and mapping effort, field reconnaissance and research was performed by AMEC and OWR for Mobile and Baldwin Counties in Alabama. The purpose of this effort was to familiarize the study team with the varying coastal conditions, identify the type and nature of the vegetation and building obstructions, and document unique coastal features that need to be considered in coastal modeling.

This presentation will provide a brief overview of the process used to revise coastal base flood elevations and flood hazard areas, details on the technical approach to new studies, the partnership with NWFWMD, and schedules for the completion of the project. In addition, this presentation will highlight the unique technologies developed for, and utilized to perform data collection and modeling.

Distribution of Stranded Bottlenose Dolphins (*Tursiops truncatus*) in Alabama Waters from 2004-2013. *Noel L. Wingers, Courtney Seely and Ruth H. Carmichael;* Dauphin Island Sea Lab

The Alabama Marine Mammal Stranding Network (ALMMSN) was established in 2011 to respond to whale, dolphin and manatee strandings along the Alabama coastline. ALMMSN responders collect stranding data and perform necropsies on carcasses to learn more about factors that influence strandings. Prior to the inception of ALMMSN, stranding data from Alabama were inconsistent due to gaps in response coverage. In this study, we analyzed stranding data for a 10-year period from 2004 to 2013. Stranding data collected from 2004 to 2007 were considered historical data and a coverage gap occurred between 2008 and 2009 when minimal stranding response occurred. Data collected from 2010 to 2013 were considered consistent with present day ALMMSN coverage and include an ongoing Unusual Mortality Event (UME) for bottlenose dolphins (*Tursiops truncatus*) throughout the northern Gulf of Mexico region. During the 4-year historical coverage period, data were collected from 60 bottlenose dolphins for a nearly equal number of males and females (sex ratio = 1.2). Carcass lengths ranged from 83 - 258 cm (perinate to adult). During the 2-year coverage gap period, data were

collected from 15 bottlenose dolphins (M:F = 0.6). Whole carcass lengths ranged from 88 - 288 cm. Between February 2010 and 2013, ALMMSN responded to 128 bottlenose dolphin strandings (M:F = 1.7), with whole carcass lengths ranging 73 - 276 cm. Throughout the study period carcasses were widely distributed throughout Alabama marine and estuarine waterways, with 5 stranding hotspots, including parts of Dauphin Island, Fort Morgan and the Perdido Pass area. Strandings were most heavily concentrated at Dauphin Island Public Beach and Fort Morgan Point. We will also show how marine mammal strandings in Alabama are seasonally correlated. These data, along with necropsy reports, increase understanding of factors that cause marine mammal strandings and benefit future stranding response and reporting efforts by helping to predict areas and seasons when strandings (including UMEs) are more likely to occur.

Putative Eye Abnormalities on Midshipman, *Porichthys plectrodon*, in the Gulf of Mexico off Louisiana. *Matthew Womble and Stephen A. Bullard;* Auburn University, School of Fisheries, Aquaculture and Aquatic Sciences

The Atlantic midshipman, *Porichthys plectrodon* Jordan and Gilbert 1882, (Batrachoidiformes: Batrachoididae) is a demersal marine fish that ranges in the northwestern Atlantic Ocean, Gulf of Mexico, and Caribbean Sea. It can comprise a large proportion of the by-catch associated with offshore shrimp trawls in the north-central Gulf of Mexico off Louisiana, Mississippi, and Alabama. In September 2013, while conducting other biological collections in the north-central Gulf of Mexico off Louisiana (N28°43’16.05”, W89°54’34.37”), we observed Atlantic midshipmen (sourced from a commercial shrimp boat as discarded by-catch) that exhibited putative eye abnormalities. These fresh-dead specimens (n=5; 7-16 g wet weight; 90-137 mm total length) were immediately preserved in 10% neutral buffered formalin in the field and subsequently photographed in the laboratory using a digital SLR camera mounted to a geared rail-and-track system, with images being assembled in Zerene Stacker, before performing whole-body clearing/staining (alizarin red dye) and routine histopathology (hematoxylin and eosin, 4 micrometer sections). Seemingly normal, conspecific specimens (n=8; 5-11 g wet weight; 83-104 mm total length) were sourced from fisheries independent trawl surveys conducted by the National Oceanic and Atmospheric Administration in the eastern Gulf of Mexico off Florida and processed in parallel for comparative purposes. Preliminary results indicate 3 combinations of abnormal features exhibited by the Louisiana specimens that were lacking in the Florida specimens (from mild to severe abnormality): (1) eye globe less telescoped relative to normal eye with accompanying thickening of the conjunctiva, irregular cornea, and indistinct lens; (2) globe seemingly absent within orbit, orbit covered by epidermis and with opaque conjunctiva, cornea absent, and lens indistinct; (3) orbit irregular, conjunctiva, globe, cornea, and lens absent. Little information is available regarding ophthalmology of marine fishes in the Gulf of Mexico, and surprisingly little information is available on eye abnormalities in aquatic vertebrates in general. Although anecdotal and based on a single collection of fish at a single time point, the results of the present study encourage additional investigations on the presence and etiology of these putative abnormalities in fishes of the continental shelf off Louisiana, Mississippi, and Alabama, where the oil and gas industry has been established for decades and where much recent attention has been cast on fish health related to that industry’s activities, e.g., the 2010 BP Deepwater Horizon oil spill.

Moving Toward a Region-wide Avian Monitoring Framework for the Northern Gulf of Mexico.

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Birds are a conspicuous and remarkable natural resource of the Gulf of Mexico. Hundreds of species and millions of individual birds are supported by barrier islands, beaches, marshes, nearshore and offshore waters and coastal forests. Although many avian monitoring projects have been implemented, scientist and conservationist lack a comprehensive and coordinated approach to monitoring avian resources across the northern Gulf of Mexico. To address this need, an ambitious plan is being developed by a small consortium of researchers, managers, coordinators, and administrators representing a subset of state and federal agencies, NGOs, universities, and partnerships across the northern Gulf of Mexico. This group has been working to define a vision and process for developing the role of bird monitoring in achieving integrated, efficient, and effective Gulf of Mexico management and recovery. To date we have identified the goals, objectives, and metrics of success for the program through a Structured Decision Making approach, and now have a mostly completed SDM decision tool by which we can judge the appropriateness of proposed monitoring packages. Specifically, this integrated monitoring program will serve multiple goals, including monitoring long term responses to anthropogenic and natural drivers, detecting unpredicted changes in status and trends, and detecting response to conservation and management actions. The monitoring plan is expected to be long term in nature, taxonomically diverse in scope, and to cover the Gulf of Mexico from freshwater to pelagic zones. The team anticipates using identified objectives to (1) facilitate communication regarding avian monitoring needs; (2) guide develop of a comprehensive, coordinated monitoring strategy; and (3) utilize the objectives and value models to develop a prioritization tool to assist funding agencies.

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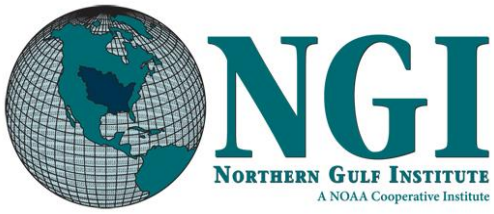

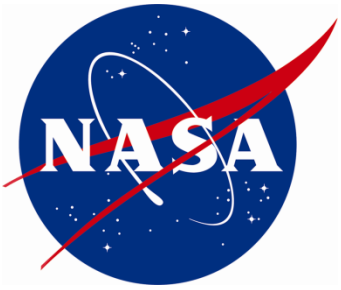

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