

SUSTAINABLE COASTAL DEVELOPMENT AND ECONOMY

IMPACTS

S.C. Sea Grant Consortium Assists McClellanville Community with Sustainable Working Waterfront Planning

April Turner and Graham Gaines, S.C. Sea Grant Consortium

Recap: The S.C. Sea Grant Consortium continued to collaborate with McClellanville, its citizens, industry Partners, the watermen, and local nonprofits to implement a much-needed comprehensive master plan and viable business model to protect and sustain the cultural and economic values of the town's working waterfronts.

Relevance: As many traditional working waterfronts become vulnerable to high-end residential development and commercial activity, much of the South Carolina commercial seafood industry has been affected by changes in waterfront property use. The changes make it increasingly difficult for commercial fishermen to secure dependable and affordable docking space, fuel, and ice. This is cause for concern among the McClellanville watermen and the community, as the town's largest seafood business owner is approaching retirement and the future of the working waterfront is uncertain.

Response: Recognizing that the seafood industry is a core economic and cultural asset, the town reached out to S.C. Sea Grant Consortium for assistance with the "Preserving McClellanville's Working Waterfront Initiative." The Consortium and Partners collaborated to implement a much-needed comprehensive master plan and viable business model, ensuring that the cultural and economic values of the town's working waterfronts are not lost. Funding from municipal economic development grants were leveraged with the Consortium's S.C. Coastal Communities Initiative mini-grants. Input from community visioning sessions and recommendations from the waterfront master plan were used to further initiative goals.

Results: Efforts are underway to develop a marketing campaign centered around the watermen, local seafood businesses, and community history, as well as capacity building through the establishment of a nonprofit, the McClellanville Community Foundation, to assist with working waterfront ownership and protection. The Watermen's Association has been formed and a business model selected for cooperative ownership and operation of wholesale and retail seafood distribution. The Consortium will continue to work with the town, industry experts, the newly established nonprofit, and the watermen to implement the actions outlined in the master plan.

Partners: East Cooper Land Trust; Robin Payne Consulting; Carolina Common Enterprise; McClellanville Community Foundation; McClellanville Watermen's Association; McClellanville, S.C.

S.C. Sea Grant Consortium and Partners Train Real Estate Agents through "Calling the Coast Home" Continuing Education Series

April Turner, Sarah Watson, and Susan Lovelace, S.C. Sea Grant Consortium

Recap: The S.C. Sea Grant Consortium and Partners created and taught a series of accredited continuing education courses for 347 real estate professionals. Fifteen virtual trainings were conducted, providing information and

resources about important coastal issues for agents to share with clientele. Further offerings have been requested and scheduled in 2021.

Relevance: South Carolina's coastal population is rapidly growing. In recent years, it has become clear that real estate professionals (REPs) are a key audience for new information and resource sharing because they are often the primary contact for newcomers to the coast. In addition to their connection to new residents and business owners, REPs can influence natural resource policy and decisions since their industry relies on healthy coastal resources and resilient communities.

Response: As part of a S.C. Coastal Information Network (SCCIN) project to provide science-based information on important issues, the Consortium collaborated with several Partners to develop continuing education electives for coastal real estate professionals (REPs). Key REPs were engaged to identify course topics and provide guidance throughout curriculum development. "Calling the Coast Home" was developed as a series of four courses addressing the topics of coastal ecosystem/biodiversity, water quality, flooding and flood maps, and rebuilding regulations.

Result: Courses were piloted in January 2020. Due to COVID-19, courses then were presented virtually. 347 REPs participated in one of 15 two-hour trainings and received licensing credit. The SCCIN website offers resources for REPs to reference as they help prospective clients. The Consortium's effort for these trainings is estimated to have provided an economic benefit of \$10,848 based on the provision of continuing education credits at a discounted rate and opportunity costs of time.

Partners: South Carolina Coastal Information Network; South Carolina Department of Natural Resources (SC DNR); ACE Basin National Estuarine Research Reserve (US DOC, NOAA, NOS, NERRS); North Inlet-Winyah Bay National Estuarine Research Reserve (US DOC, NOAA, NOS, NERRS); South Carolina Department of Health and Environmental Control (SC DHEC); Clemson University

S.C. Sea Grant Consortium Builds Capacity Within Gullah Geechee Chamber of Commerce and Helps Obtain Federal Funds Eligibility

Matt Gorstein, S.C. Sea Grant Consortium

Recap: S.C. Sea Grant Consortium develops Partnership with the Gullah Geechee Chamber of Commerce and helps them apply for federal funding.

Relevance: Identifying strategies to promote equity in sustainable economic opportunity is necessary for maintaining the well-being of coastal communities. In an era of climate change, it is also critical to address environmental justice issues and to understand the experiences of historically marginalized communities. With lucrative coastal industries like tourism, fishing and harvesting, and seafood dining continuing to grow in South Carolina, it's important to ensure that economic benefits are realized across the social and demographic spectrum.

Response: S.C. Sea Grant Consortium (Consortium) developed a Partnership with the Gullah Geechee Chamber of Commerce (Chamber), an organization that promotes businesses owned by Gullah Geechee members in S.C. and enhance economic opportunity for this community. The Consortium assisted the Chamber to develop project ideas that further both organization's goals, and developed a proposal for a Gullah Geechee Seafood Trail to promote seafood businesses owned by community members, and to share stories of maritime cultural heritage.

Results: The Consortium built capacity within the Chamber by walking them through System Awards Management

and grants.gov registration processes, making the Chamber eligible to apply for federal funds. The Consortium identified NOAA Saltonstall-Kennedy funds and played an essential role in obtaining eligibility for the Chamber, writing the grant proposal, organizing planning meetings, meeting grant proposal requirements, and submitting the grant on-time. A Consortium staff member devoted 60 hours to assist, which conservatively was worth \$2,817.

Partners: Gullah Geechee Chamber of Commerce

ACCOMPLISHMENTS

S.C. Sea Grant Consortium Develops Rapid Response RFP

April Turner and Graham Gaines, S.C. Sea Grant Consortium

Recap: The Consortium developed and was awarded a \$99,500 Direct Marketing Support project for the shellfish aquaculture and nature-based tourism industry, aimed at providing both immediate and long-term solutions to the impacts of COVID-19, all of which will begin in 2021. The “Rapid Response” activities address a vulnerable supply chain using a three-tiered approach: understanding consumer preferences, identifying regulatory obstacles, and direct support of online marketing efforts by S.C. seafood producers.

Relevance: COVID-19 caused many challenges for seafood businesses in South Carolina. Farmed shellfish is reliant on restaurants as an outlet for their product, with more than 65% of growers’ inventory going directly to restaurants. Soft-shell crab producers, the other major mariculture industry in S.C., suffered an 80% loss in 2020 sales. The pandemic has highlighted a major vulnerability in the local seafood supply chain, and presented an opportunity to learn how to improve that supply chain. To keep businesses open, prevent job losses, and boost the supply of sustainable seafood, determining best practices for alternative sales were needed.

Response: The Consortium worked with industry members to develop “Rapid Response” opportunities that would address the problems identified above. These solutions included: (a) understanding the potential for direct marketing of S.C. seafood products through a Study Group Partnership with the Clemson Marketing MBA Program; (b) developing a regulatory guide for retail or direct-to-consumer sales for seafood producers; (c) an aquaculture literacy campaign to promote the science behind year-round oyster sales; and (d) social media training courses for aquaculture producers. Included in this Rapid Response package were funds to support nature-based tourism.

Results: A total of \$99,500 was awarded to the Consortium for a Direct Marketing Support project for the shellfish aquaculture and nature-based tourism industries, aimed at providing both immediate and long-term solutions to the impacts of COVID-19

S.C. Sea Grant Consortium Scientists Examine Socioeconomic Aspects of Stormwater Control Measures to Guide Decision-Making in Coastal South Carolina

Marzieh Motallebi, Clemson University Baruch Institute of Coastal Ecology and Forest Science
Erik Smith, North Inlet-Winyah Bay National Estuarine Research Reserve
Daniel Hitchcock, Clemson University Baruch Institute of Coastal Ecology and Forest Science

Recap: S.C. Sea Grant Consortium research results in stormwater managers using cost-benefit methodologies to implement BMPs and related cost-benefit information being incorporated into a Realtor continuing education course “Calling the Coast Home.”

Relevance: Effectively managing stormwater has been an ongoing challenge in coastal South Carolina. Coastal development dramatically increases rates of stormwater runoff and impacts coastal resources. Stormwater management is thus a vital and required component of coastal zone development in the state. A great deal of research has been conducted in South Carolina on stormwater management practices, and a wealth of information exists on the design, management, and maintenance of a variety of stormwater best management practices (BMPs). In 2014, the Consortium and several of its Partners published *Low Impact Development in Coastal South Carolina: a Planning and Design Guide* (Guide), describing a variety of stormwater BMPs. While the Guide provided an initial economic analysis of the cost of implementing various BMPs, the limited analysis focused primarily on installation costs. Stormwater management research has been lacking in informing a full socioeconomic understanding regarding the various options for BMP implementation decisions.

Response: S.C. Sea Grant Consortium researchers at Clemson University and the University of South Carolina Baruch Institute built from the foundation provided in the Guide by adding necessary socioeconomic knowledge to better inform stormwater decision-making in coastal South Carolina. The effort examined detailed operation and maintenance costs, cost effectiveness, and benefit valuation of BMPs.

Results: Researchers designed a participatory story map for stormwater managers to include type and costs of their installed BMPs in the eight coastal counties, as well as a survey to select the most common BMPs in different coastal counties. Several economic analyses were performed to determine costs of installing and maintaining BMPs, and residential willingness-to-pay for related measures. As a result, the South Carolina Association of Stormwater Managers (SCASM), City of Mt Pleasant, City of Charleston, and City of Bluffton are using this methodology for cost benefit analyses of implementing BMPs in their areas. Additionally, cost-benefit information was incorporated into a Realtor continuing education course "Calling the Coast Home."

Partners: Coastal Waccamaw Stormwater Education Consortium; S.C. Association of Stormwater Managers; Clemson University Cooperative Extension; North Inlet-Winyah Bay National Estuarine Research Reserve (US DOC, NOAA, NOS, NERRS); North Carolina Department of Environment and Natural Resources (NC DENR); North Carolina State University (NCSU); South Carolina Department of Natural Resources (SC DNR); Bluffton, S.C.; Charleston, S.C.; Mount Pleasant, S.C.

S.C. Sea Grant Consortium and Partners Organize Virtual Workshop on Low Impact Development

April Turner, S.C. Sea Grant Consortium

Recap: S.C. Sea Grant Consortium co-organized a virtual workshop for 150 engineers, landscape architects, stormwater and plan-review staff, planners, and other design professionals, providing training focused on how to correctly use the compliance calculator tool for the *Low Impact Development in Coastal South Carolina: A Planning and Design Guide* to increase implementation of better site design practices in coastal South Carolina.

Relevance: Many coastal decision-makers, stormwater management professionals, and design engineers find it challenging to implement low impact development (LID) techniques for mitigating stormwater impacts. They need expertise, guidance, and resources to remove barriers to implementing LID practices on the community level, neighborhood scale, and site scale. The *Low Impact Development in Coastal South Carolina: A Planning and Design Guide* was published in 2014; however, a 2019 informal assessment revealed training was needed to introduce new users to the guide, demonstrate its utility, and dispel lingering perception issues surrounding the use of LID.

Response: Building on the “LID Hot Topics” workshop series in 2019, the Consortium and Partners organized a virtual training workshop, “Using the S.C. Coastal LID Guide,” on August 19, 2020. This two-hour training was based on user needs with a combination of presentations addressing better site design, LID best management practices and maintenance, local case studies, and demonstration design exercises using the compliance calculator tool and guide updates for runoff reduction credits, tree credits for volume control, and conservation credits.

Results: The workshop provided demonstration for site-design application and a Q&A session with the intent of increasing the guide’s use. More than 150 people attended, including engineers, landscape architects, stormwater and plan-review staff, planners, and other design professionals. To supplement the guide, a FAQ was created. In 2020, the LID guide resource webpage was accessed 121 times and the guide was downloaded 92 times. Evaluations indicated 96% of attendees thought participating was a good use of their time, while 92% indicated the workshop increased their knowledge of using the guide.

Partners: Center for Watershed Protection; Clemson University; ACE Basin National Estuarine Research Reserve (US DOC, NOAA, NOS, NERRS); North Inlet-Winyah Bay National Estuarine Research Reserve (US DOC, NOAA, NOS, NERRS)

S.C. Sea Grant Consortium Provides Leadership to South Carolina Nature-Based Tourism Association

April Turner, S.C. Sea Grant Consortium

Recap: Through the activities of the Coastal Communities specialist, the S.C. Sea Grant Consortium has continued to support the South Carolina Nature-Based Tourism Association, providing technical assistance, conference planning, and small business promotion to help ensure the economic viability and resource sustainability of the South Carolina nature-based tourism industry.

Relevance: Tourism is an important economic driver for South Carolina, bringing in an estimated \$23.8 billion in 2019. While this was significantly curtailed by COVID-19 and the subsequent shutdowns, demand for nature-based tourism and outdoor recreation steadily increased in 2020. People are drawn to the South Carolina-both residents and tourists take advantage of the opportunities the state’s natural and cultural resources provide. In light of this increased demand, it is important to help ensure an economically viable and resource sustainable nature-based tourism industry in South Carolina.

Response: The S.C. Sea Grant Consortium (Consortium) supports sustainable statewide, nature-based tourism and outdoor recreation through its involvement with the South Carolina Nature-Based Tourism Association (SCNBTA). The Consortium’s Coastal Communities specialist continues to serve on the SCNBTA Board of Directors, providing technical guidance and leadership service, including Program planning for the quarterly board meetings, annual conferences and workshops, as well as coordinating and developing marketing and membership strategies.

Results: As the conference co-chair, the Coastal Communities specialist organized the virtual 2020 annual conference and coordinated the redevelopment of the SCNBTA website which was launched in March. The website overhaul promotes each of the state tourism regions and supports nature-based tourism and recreation businesses, providing increased exposure to potential clientele and the continued sustainability and viability of the SCNBTA.

Partners: S.C. Association of Tourism Regions; Charleston County Parks and Recreation Commission; South

Carolina Department of Parks, Recreation and Tourism (SC DPRT); South Carolina Department of Natural Resources (SC DNR)

S.C. Sea Grant Consortium Provides Rapid Response to Nature-Based Tourism Industries to Address COVID-19 Impacts

April Turner, S.C. Sea Grant Consortium

Recap: As a result of a Direct Marketing Support grant (\$22,500), the Consortium is engaged in activities to provide immediate and long-term solutions to mitigate the impacts of COVID-19 for the nature-based tourism industry. Rapid response activities underway include developing and implementing marketing strategies to strengthen the South Carolina Nature-Based Tourism Association and its small business members.

Relevance: Nature-based tourism businesses rely heavily on visitors to South Carolina's communities to increase sales. Many small businesses from this sector incurred financial burdens and disruption in service as a result of the shutdowns caused by the pandemic. As the tourism market begins to recover, it is important that this industry is visible in the marketplace so that locals and visitors are aware of sustainable nature-based and outdoor recreation opportunities.

Response: To assist with recovery and enhance future resilience to decreases in the demand for nature-based tourism, the S.C. Sea Grant Consortium (Consortium) received a Direct Marketing Support grant (\$22,500) and is working with regional tourism experts and agencies to develop and implement marketing strategies designed to highlight the nature-based tourism industry. Project efforts are focused on identifying ways to strengthen this sustainable sector now and into the future.

Result: The rapid response activities offer direct support to develop and implement marketing strategies for the South Carolina Nature Based Tourism Association (SCNBTA). SCNBTA is a nonprofit that has been educating and promoting its members, including outdoor outfitters and guide operations, for 25 years. Project activities to improve SCNBTA small business resiliency include website enhancements, a campaign plan for expanding membership, new marketing products and tools, and funding to support professional development opportunities in the nature-based tourism industry.

Partners: S.C. Association of Tourism Regions; South Carolina Department of Parks, Recreation and Tourism (SC DPRT); South Carolina Nature-Based Tourism Association

National Sea Grant Tourism Visioning: Building Partnerships with Sea Grant, Land Grant, and National Extension Tourism

April Turner, S.C. Sea Grant Consortium

Recap: Through the leadership efforts of S.C. Sea Grant Consortium, Georgia Sea Grant, Hawaii Sea Grant, and Oregon Sea Grant, members of the National Extension Tourism (NET) Design Team, greater integration and participation with the NET Network has resulted. The tourism visioning grant funds provide opportunities for increasing Sea Grant's ability to share best practices and strengthen relationships with Land Grant and other extension professionals working in tourism.

Relevance: Tourism plays a significant role in the economies of coastal and Great Lakes states, with significant

contributions to jobs, tax revenues, and quality of life. Science-based management of tourism in coastal communities is vital. Sea Grant has the opportunity to greatly increase the well-being of coastal communities by taking on a prominent role in tourism and outdoor recreation management science and community training through its research, extension and outreach, and communication Programs.

Response: Building on the previous work of the National Sea Grant 2018-2028 Sustainable Coastal Tourism Vision Plan, the S.C. Sea Grant Consortium, in Partnership with the Georgia, Hawaii, and Oregon Sea Grant state Programs, secured grant funding from the National Sea Grant Office (\$133,828) to further vision plan goals and recommendations.

Results: With this funding support, project Partners continued to worked with the NET Design Team to reestablish and strengthen relationships with Land Grant Extension engaged in tourism-related Programming. Other projects underway include involvement in planning for the 2021 NET Conference in Savannah, Ga., a sustainable tourism conference in Hawaii, the pilot expansion of Oregon's Guides and Outfitter Certification Program (GORP), and a Sea Grant Visioning Team meeting and professional development opportunity for Sea Grant staff involved with tourism.

Partners: Georgia Sea Grant; Hawaii Sea Grant; Oregon Sea Grant; National Extension Tourism Network

S.C. Sea Grant Consortium Expands South Carolina Coastal Information Network

April Turner, S.C. Sea Grant Consortium

Recap: For the past 14 years, the S.C. Sea Grant Consortium has managed the South Carolina Coastal Information Network, which enhances coordination of outreach efforts and the strategic dissemination of information to coastal communities.

Relevance: Communication and coordination among agencies and organizations in coastal South Carolina involved with providing outreach education to coastal communities has been challenging in the past. Information providers were often unaware of other similar outreach efforts underway targeting community leaders, local government staff, and residents. There was a need to avoid duplication of efforts, leverage scarce resources, and maximize Program benefits.

Response: Recognizing a need for improved communication and coordination among coastal outreach providers, the S.C. Sea Grant Consortium (Consortium) organized the South Carolina Coastal Information Network (SCCIN) in 2006. The Network consists of representatives from federal and state agencies, regional and local governments, and private organizations. Working with network Partners over the past 14 years, the network has developed and expanded to serve its common audiences in a more organized, coordinated, and efficient manner.

Results: The Consortium continued to facilitate and organize network meetings, which were held virtually on July 16 and December 11, 2020. The Consortium also is responsible for providing oversight and maintaining the SCCIN website, event calendar, and resource portal (www.sccoastalinfo.org), which had more than 5,463 page views in FY20-21 from visitors accessing the site's resources and events. SCCIN members have begun collaboration on the redevelopment of the S.C. LID Atlas to be launched in 2021.

Partners: Carolina Clear; Carolina's Integrated Sciences and Assessment Center; South Carolina Department of Health and Environmental Control, Office of Ocean and Coastal Resource Management; South Carolina Department of Natural Resources (SC DNR); Charleston Resilience Network; College of Charleston MES Program; Ashley-Cooper Stormwater Education Consortium; Coastal Waccamaw Stormwater Education Consortium; Town of Mount Pleasant

Stormwater Program; Clemson University Cooperative Extension; Berkeley- Charleston-Dorchester Council of Governments ; Lowcountry Council of Governments; Waccamaw Regional Council of Governments; Coastal Training Program (US DOC, NOAA, NOS, NERRS); Hollings Marine Laboratory (US DOC, NOAA, NIST, SC DNR HML); Office for Coastal Management (NOAA, NOS, OCM); SC DHEC Bureau of Water; South Carolina Department of Health and Environmental Control (SC DHEC); Clemson Baruch Institute of Coastal Ecology and Forest Science; South Carolina Forestry Commission ; U.S. Department of Agriculture Forest Service Southern Research Station Center for Forested Wetlands Research; Urban Land Institute

S.C. Sea Grant Consortium Develops First Ever Coastal Economics Extension Advisory Committee

Matt Gorstein, S.C. Sea Grant Consortium

Recap: The S.C. Sea Grant Consortium (Consortium) continues to build capacity in internal economic expertise through establishing its first ever Coastal Economics Extension Advisory Committee

Relevance: In August 2019, the Consortium hired a Coastal Economics Program Specialist for the first to address issues specifically related to coastal economics in the state: documenting economic benefits of coastal industries and marine resources, fostering sustainable economic development, and conducting socioeconomic analyses of residents and visitors to guide optimal decision making, among other efforts.

Results: Succeeding in building this Program requires inclusive and constructive collaboration with researchers, stakeholders, local officials, private industry, and other economics practitioners throughout the state.

Response: In August 2020, the Consortium convened its first ever Coastal Economics Extension Advisory Committee meeting to prioritize updates for our strategic plan. The purpose of the committee is to discuss and identify current issues impacting our coastal natural resources in South Carolina, and the communities that are dependent upon them. Several relevant stakeholder groups with an interest in coastal economics participated: economics professors; fisheries economics statistics experts; federal economists and social scientists; and stakeholders representing the Gullah Geechee Chamber of Commerce, the Gullah Geechee Sea Islands Coalition, and the S.C. Beach Advocates.

Partners: S.C. Beach Advocates; Office for Coastal Management (NOAA, NOS, OCM); Clemson University; University of South Carolina (USC); South Carolina Department of Natural Resources (SC DNR); College of Charleston; South Atlantic Fishery Management Council (SAFMC); Gullah Geechee Chamber of Commerce; Gullah Geechee Nation

S.C. Sea Grant Consortium Publishes Assessing South Carolina's Ocean Economy Report Documenting the Status and Trends of South Carolina's Ocean Economy

Matt Gorstein, S.C. Sea Grant Consortium

Recap: Consortium publishes Assessing South Carolina's Ocean Economy 2020 report to detail the status, trends, and future outlook for South Carolina's ocean economy.

Relevance: Documenting and monitoring the market and non-market economic benefits of ocean and coastal natural resources is important when evaluating policy decisions, and for understanding the level of dependence that a given coastal community may have on ocean and coastal natural resources. South Carolina's ocean and

coasts support a wide variety of industries including commercial fishing, recreational fishing, aquaculture, tourism, ports/harbors, shipbuilding, and sand mining.

Response: Datasets and relevant studies were identified, and the Assessing South Carolina's Ocean Economy 2020 report was drafted, reviewed by external experts, and published. The purpose of this report was to provide an overview of South Carolina's ocean economy based on the data available; expand upon information provided by NOAA to examine other market and non-market economic values derived from ocean resources; identify ocean economy sectors for potential future growth; and discuss how the health of natural resources provides a foundation for economic activities along the coast.

Results: The ocean economy contributed almost \$4.8 billion to South Carolina's gross domestic product (GDP) in 2017, 7.6% of total GDP in the eight coastal counties. Over 80,000 people were employed in the ocean economy in 2017, 12.2% of total employment in the eight coastal counties. Since the end of the recession (2009), ocean economy real GDP has increased by 53%, compared to 22% for the entire state economy. Assessing South Carolina's Ocean Economy was submitted as a nominee for the South Carolina State Library's Notable State Documents award.

S.C. Sea Grant Consortium Outlines Concept for Aquaculture Research and Training Study and Return on Investment Analysis

Matt Gorstein and Graham Gaines, S.C. Sea Grant Consortium

Recap: Concept is outlined to conduct shellfish aquaculture research and training Program feasibility study and return on investment (ROI) analysis.

Relevance: The growth of the shellfish aquaculture industry in the last few years has led to an increased interest in developing research and development to optimize sustainable shellfish production and survival rates and workforce training Programs to adequately train industry entrants in gear handling, shellfish science, and business planning.

Response: The Consortium identified an interested partner to conduct the ROI analysis. This assessment will utilize input-output modeling techniques to estimate the potential return on investment of constructing and operating a shellfish aquaculture research and training Program in South Carolina as measured through an economic impact analysis. Next steps include stakeholder meetings, data collection, implementation of the ROI analysis, and full feasibility study.

Results: Interested stakeholders from Consortium member institutions, technical colleges, and regulatory agencies were identified and invited to participate in a working group to define the scope and steer the assumptions of the ROI analysis.

S.C. Sea Grant Consortium Research Suggests Algal Production May Be Primary Source of Dissolved Oxygen Impairment in Stormwater Ponds

Erik Smith, University of South Carolina Belle W. Baruch Institute for Marine and Coastal Sciences

Recap: S.C. Sea Grant Consortium research on stormwater conveyances and control structures suggests that reducing particulate and algal loading from runoff could reduce oxygen demand in local receiving waters

Relevance: The presence of a sufficient minimum concentration of dissolved oxygen (DO) is a fundamental

requirement for sustaining aquatic life in coastal waters. Low DO is the number one cause of impairment to the ability of waters to support aquatic life use in South Carolina's coastal zone; however, preventing the occurrence of low DO remains a challenge for water quality management. Understanding the impacts of coastal development on water quality impairment, and specifically the prevalence of DO impairment, in coastal waters is vital to sustaining aquatic resources.

Response: S.C. Sea Grant Consortium researchers at the University of South Carolina Baruch Institute are examining how stormwater conveyances and control structures impact inputs of oxygen-demanding substances in coastal waters, measured as biochemical oxygen demand over a five-day period (BOD5). Samples were collected during rain events and dry periods from sites representing a variety of land uses and stormwater management practices.

Results: Researchers developed estimates of nonpoint source BOD5 values, as well as an empirical relationship between BOD5 and ultimate BOD, that can be used for improved oxygen TMDL modeling in coastal SC. These findings demonstrate the importance of managing episodic stormwater pollutant discharge, especially the particulate fraction in the first flush of runoff, from urbanized areas to mitigate DO impairment in downstream receiving waters.

Partners: Georgetown County Stormwater Management; Horry County Stormwater Management Program; University of South Carolina (USC); North Carolina State University (NCSU)

South Carolina Sea Grant Consortium Researchers Investigate Water Quality Impacts of Development in Tidal Creek Watersheds to Improve Land-Use Planning

Andrew Tweel, S.C. Department of Natural Resources

Denise Sanger, S.C. Department of Natural Resources

Recap: Research supported by the South Carolina Sea Grant Consortium revealed greater salinity, fecal coliform, and enterococcus fluctuations in areas of high development intensity.

Relevance: The rate of coastal population growth and associated development has increased rapidly along the South Carolina coast and ranks among the highest nationally. Impervious cover increases proportionately with development, and these surfaces contribute to increases in stormwater runoff. This runoff can alter coastal salinity regimes, lead to shifts in biological communities, and is associated with increases in fecal coliform and other contaminants. Coastal communities are responsible for developing and implementing stormwater management plans, but significant knowledge gaps remain as to watershed characteristics that are associated with the greatest impacts, and how these impacts vary within and between tidal creek systems.

Response: S.C. Sea Grant Consortium (Consortium) researchers at the South Carolina Department of Natural Resources are quantifying watershed characteristics associated with stormwater impacts, the spatial extent of such impacts, and how they may respond to predicted changes in climate and weather patterns. To achieve this, Consortium researchers are investigating how water quality following rain events varies along the length of tidal creek systems in areas with various types and intensity of development. Spatial analysis of candidate tidal creek systems was performed using a variety of factors like impervious cover, shellfish harvesting, soil permeability, and stormwater pond coverage. Four study systems were selected: Guerin, Seaside, Toomer, and Dupont-Wappoo Creeks. Salinity and weather data were collected from each site.

Results: Analysis of data from each site suggests greater salinity fluctuations in areas of high development intensity. Fecal coliform and enterococcus also followed this gradient. The Dupont-Wappoo system exhibits several signs of water quality degradation and is also the most densely developed system. Charleston-area watershed salinity gradients are primarily driven by development metrics, while watersheds in the Port Royal region exhibit salinity sensitivities that appear to be more driven by geographical metrics such as soil type.

Partners: Berkeley County Stormwater Management; Charleston County Stormwater Management Program; City of Charleston Department of Stormwater Management; Town of Mount Pleasant Stormwater Program; Charleston Waterkeeper; Clemson University Cooperative Extension; National Oceanic and Atmospheric Administration (US DOC, NOAA)

S.C. Sea Grant Consortium Researchers Analyze Hydrological and Economic Impacts to Coastal Community Access During Nuisance Flood Events

Daniel Hitchcock, Marzieh Motallebi, Amy Scaroni; Clemson University

Recap: S.C. Sea Grant consortium researchers are examining green infrastructure interventions to mitigate impacts of nuisance flooding on access to coastal areas.

Relevance: Coastal resilience research related to infrastructure along the Southeastern US is critically needed as extreme weather (e.g. hurricanes, flooding) increasingly impact our coastal communities and economies. This regional research effort will allow for transferability of results across and among various states with a positive impact for the region.

Response: S.C. Sea Grant Consortium researchers at Clemson University are working with coastal municipalities to identify areas where access is impacted by nuisance flooding and evaluating cost-effective green infrastructure interventions like natural land conservation and restoration of coastal wetlands, oyster reefs and beach dunes for mitigating flood risks in these locales.

Results: Researchers are assimilating a variety of data (economic, transportation, elevation, etc.) to map these “hot spots” in GIS. Economic data related to how access limitations or denials impact local businesses and residents is also being collected for North Carolina, South Carolina, and Georgia.

Partners: Stetson University; University of Georgia (UGA); University of North Carolina, Wilmington (UNCW); Georgetown County, S.C.; Pawley’s Island, S.C.; Debordieu Community Association, S.C.