



**SOUTH CAROLINA SEA GRANT CONSORTIUM**  
**~ 2015-2016 IMPACTS AND ACCOMPLISHMENTS ~**

**SCIENTIFIC LITERACY AND WORKFORCE DEVELOPMENT**

**IMPACTS**

*S.C. Sea Grant Consortium's "From Seeds to Shoreline" adopted in Georgia and North Carolina after EPA-funded pilot year*

**E.V. Bell, S.C. Sea Grant Consortium**

**Relevance:** The S.C. Sea Grant Consortium's "From Seeds to Shoreline" (S2S) serves as the state's only student-based salt marsh restoration program and has consistently shown an increase in participating schools, partners, and educational resources since its inception in 2011. During the 2014-2015 school year, 42 teachers and 956 students representing seven inland and coastal counties participated in the program. In addition, 15 partnering institutions from inland and coastal locations provided support through educational programs and resources, scientific expertise, and staff assistance. New educational products such as the *Spartina* poster and teacher-vetted classroom lessons have been developed to supplement the educational context of the program. To meet the growing demand, the Consortium, in partnership with the S.C. Department of Natural Resources, was awarded \$78,564 in 2014 from the U.S. Environmental Protection Agency (EPA) to expand the program throughout South Carolina and pilot/replicate the model in North Carolina and Georgia.

**Response:** As part of the EPA grant, eight hubs have been established in South Carolina to serve as a local layer of support for teachers participating in S2S in their area. The level and type of support provided by each hub varies from assistance with the cultivation and restoration process (collection of seeds, cultivation of seedlings, etc.) to providing programs during Restoration Days, when students transplant *Spartina alterniflora* seedlings. The S2S program model was replicated in North Carolina and Georgia in partnership with the Sea Grant and National Estuarine Research Reserve programs in both states.

**Results:**

- 1) Fourteen teachers representing 13 schools in Georgia and North Carolina were trained during workshops in August and September 2015. These workshops were modeled after South Carolina S2S training held annually and incorporated resources and tools currently used in South Carolina.
- 2) Approximately 625 students in Georgia and North Carolina participated in the S2S program during the 2015-2016 school year.
- 3) Both Georgia and North Carolina plan to continue the S2S program beyond the scope of the EPA grant. The N.C. NERR, in partnership with N.C. Sea Grant, has adopted the S2S program into its long-term educational programming. The Georgia Sea Grant and Sapelo Island NERR are currently establishing methods to continue the S2S program for the long-term.

**Recap:** After five years of increased growth and demand, the S.C. Sea Grant Consortium's "From Seeds to Shoreline" program has expanded into North Carolina and Georgia with support from a



\$78,564 grant from the U.S. Environmental Protection Agency. Fourteen teachers representing 13 schools in Georgia and North Carolina were trained during workshops in August and September 2015. The National Estuarine Research Reserve and Sea Grant programs in both states are adopting the program as part of their long-term educational programming.

***Local business develops second phase of sensor for the S.C. Sea Grant Consortium's weather buoy STEM elementary education program***

**E.V. Bell, S.C. Sea Grant Consortium**

**Relevance:** The S.C. Department of Education reported that 40% of 3<sup>rd</sup> graders failed the science section of the Palmetto Assessment of State Standards test in 2012. The educational pipeline for science begins at the elementary level, but resources are lacking for teachers and students in upper elementary grade levels (grades 3-5). In addition, as South Carolina continues to recruit large industries (e.g. Boeing and Volvo) and serves as a leader in marine science research and education, students are presented with great potential to enter STEM (science-technology-engineering-math) careers. Because of low achievement, however, they may lack the skills to be competitive.

**Response:** The S.C. Sea Grant Consortium, in response to the need for robust STEM programming, has designed several student-based programs, curricula, and professional development opportunities. One example is the eBOB (elementary basic observation buoy) program developed in 2011. The eBOB program challenges students to work in teams to design and create a working weather buoy that uses instrumentation to collect data such as wind speed, air and water temperature, wind direction, and precipitation. Since its development, the eBOB program has been modified and adapted by the Consortium's Marine Education Specialist to suit the educational needs of elementary, middle, and high school teachers. As this program continues to evolve, new partnerships with local businesses have encouraged the development of innovative technologies to be used in the eBOB design. The Brockman Apprentice Foundation, a small technology business, initiated the development of sensors that attached to the buoy to collect real-time, continuous data (light, air temperature, and pressure). A representative from Brockman Apprentice Foundation presented the sensors, called BOBino, during a 2014 professional development workshop. Based on the response from the participating teachers, the foundation worked to expand and revise the sensor capabilities to meet additional educational needs.

**Results:**

1. Brockman Apprentice Foundation developed, at no cost to the Consortium, a second edition of the original BOBino unit. This new unit uses the Arduino™ platform and incorporates probes and sensors that can collect real-time and continuous water, air, light, and pressure data. The 20 units are valued at \$2,000.
2. The second edition of the BOBino was piloted at a 2015 workshop and will be used in upcoming STEM workshops during the 2016-2017 school year.

**Recap:** A S.C. Sea Grant Consortium STEM-based elementary education program that challenges students to design and engineer a working weather buoy benefited from an industry partnership. The partner developed at no cost a second edition of sensors (valued at \$100/unit) that collect continuous water and air data. More than 20 units have been created and used during Consortium led STEM-based professional development workshops.



### ***S.C. Sea Grant Consortium and partners collect 78 tons of gear and abandoned boats from Charleston County***

**E.V. Bell, S.C. Sea Grant Consortium, and Dan Burger, SCDHEC-Ocean and Coastal Resource Management**

**Relevance:** Abandoned and derelict vessels (ADVs) and fishing- and aquaculture-related debris contribute to the amount of unwanted material found in the waterways along South Carolina's 2,876 miles of coastal and estuarine shoreline. The presence of ADVs within South Carolina's coastal waterways is a persistent problem that has the potential to cause negative impacts on ecosystems, wildlife, and navigational safety. Vessels that have been abandoned, either floating or submerged, have been attributed to the scarring of salt marsh and oyster habitat, both of which are recognized as essential fish habitat (EFH) by the South Atlantic Fisheries Management Council. Leaking engine oil, gas, and other fluids from ADVs can compromise water quality and in some cases can facilitate hypoxic or anoxic conditions lethal to fish and other aquatic species. Reasons for vessel abandonment range from damage due to natural hazards (e.g., coastal storms and hurricanes) to the increasing costs of upkeep and maintenance. Jurisdiction over ADVs in South Carolina is a coordinated effort among federal and state agencies. Despite this complex multi-agency approach, ADVs remain a common occurrence in South Carolina's coastal waterways. Since 2004, the S.C. Sea Grant Consortium's partner agency, S.C. Department of Health and Environmental Control-Ocean and Coastal Resource Management (SCDHEC-OCRM), has worked with federal and state collaborators to leverage the removal of more than 100 derelict vessels from South Carolina's coastal waters; however, currently there are 151 ADVs present along coastal waterways. Recreational and commercial fishing- and boating-related marine debris also pose threats to coastal wildlife and ecosystems. Items such as fishing nets and crab traps, once present in the water, can affect wildlife by entanglement or trapping, which can lead to starvation, disease, drowning, or predation.

**Response:** The Consortium, in partnership with the SCDHEC-OCRM, received \$144,344 from the NOAA Marine Debris Program to address the issue of ADVs and unwanted boating and fishing gear in Charleston County. The funding allowed for the removal and salvaging of ADVs located in the Charleston Harbor and facilitated a county-wide stewardship effort, Clean Marine, which encouraged the public to dispose of unwanted boating and fishing gear.

**Results:**

- 1) Ten ADVs totaling 68 tons have been removed and salvaged from Charleston Harbor.
- 2) The three-day Clean Marine Disposal Event, held April 24-26, 2015, collected 9.4 tons of boating and fishing related gear. Gear collected was disposed of properly or recycled.

**Recap:** With funding from the NOAA Marine Debris Program, the S.C. Sea Grant Consortium and partners collected 77.4 tons of abandoned or derelict vessels and boating and fishing gear.

### ***S.C. Sea Grant Consortium's Coastal Heritage magazine wins three prestigious awards*** **Susan Ferris-Hill, S.C. Sea Grant Consortium**

**Relevance:** *Coastal Heritage* magazine, a free quarterly publication produced by the S.C. Sea Grant Consortium, brings readers the most up-to-date information available on South Carolina's rapidly developing coast. Over the last few decades, the S.C. coast has experienced its most sweeping changes since the end of the Civil War. Population growth and rapid economic development transformed the



state's coastal resources, historic cities, and culture. Globalization continues to drive major changes in commercial fisheries, ports, and economy. And South Carolina's dynamic coastal environment is in a constant state of flux.

**Response:** *Coastal Heritage* offers readers an in-depth look into environmental, technological, historical, and cultural patterns of change along the S.C. coast and how they affect residents and visitors. The magazine describes how people in the region – from the colonial era to modern times – have depended upon and used coastal and marine resources, and how those resources have shaped the state's history, culture, and quality-of-life. Hard copies are distributed nationally and internationally to 5,500 subscribers. About 500 more issues are distributed as requested to targeted audiences, and each issue is available on the SCSGC website. In FY 15-16, PDF files of the 10 most popular issues were downloaded 23,508 times.

**Results:** The *Coastal Heritage* team was recognized with three prestigious awards during FY15-16. *Coastal Heritage* won an Award of Excellence in the Magazine category from the National Association of Government Communicators 2015 Blue Pencil and Gold Screen Awards. The Association for Communication Excellence bestowed a Gold Award for Writing in the 2015 Critique and Awards competition. *Coastal Heritage* also won a 2015 Award of Excellence from APEX in the Magazines and Journals category.

**Recap:** *Coastal Heritage*, a quarterly magazine of the S.C. Sea Grant Consortium providing information about important drivers of change along the South Carolina coast, won three prestigious awards during FY15-16. Communications professionals from throughout the U.S. recognized the value of the magazine and its team. Website visitors seeking out particular issues of the magazine downloaded PDF files of 10 different issues 23,508 times during the reporting period.

### ***S.C. Sea Grant Consortium website continues to serve as significant source of science-based coastal information***


**Susan Ferris-Hill, S.C. Sea Grant Consortium**

**Relevance:** Decision-makers and the public should be informed about coastal resource issues, and the S.C. Sea Grant Consortium website continues to be a significant source of information. The website also gives users a better understanding of Consortium organization, as well as funded research, education, and outreach programs.

**Response:** CIS staff maintains the Consortium's website, ([www.scseagrant.org](http://www.scseagrant.org)), holds monthly web meetings with staff, and ensures the content is updated regularly with new information. CIS monitors website usage on a monthly basis with the web statistics software Sawmill version 8.

**Results:** The website received 1,343,550 hits, 239,204 unique visits, and 896,453 downloads during the reporting period. The top downloads, and the number of times each was downloaded, are:

- *Low Impact Development in Coastal South Carolina: A Planning and Design Guide* – 25,664
- *Chemical and Biological Contamination of Stormwater Detention Pond Sediments in Coastal South Carolina* – 16,072
- *Community Associations and Stormwater Management: A Coastal South Carolina Perspective* – 13,838
- *Of Sand and Sea: Teachings From the Southeastern Shoreline, Chapter 2* – 12,688
- *South Carolina Coastal Wetland Impoundments* – 10,994

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- *2014 International Conference on Shellfish Restoration program* – 8,415
  - *Tidal Creek Habitats: Sentinels of Coastal Health* – 6,493
  - *Coastal Heritage, Summer-Fall 2010, “Celebrating 30 Years” issue* – 6,353
  - *Coastal Heritage, Fall 2014, “Water Cities: Can We Climate-Proof the Coast?” issue* – 4,250
  - *Sea Level Rise Adaptation Report: Beaufort County, South Carolina (full report)*– 3,918

**Recap:** The S.C. Sea Grant Consortium website is a source of science-based information for decision-makers and the public to help them make wise choices regarding natural resource conservation and sustainability. The website also provides users with information about Consortium organization and processes. The website received 1,343,550 hits, 239,204 unique visits, and 896,453 downloads during the most recent annual reporting period.

## ACCOMPLISHMENTS

### *S.C. Sea Grant Consortium develops science curriculum for afterschool program in inland Pickens County*

**Dr. Stephen Klaine, Clemson University, and Dr. John Weinstein, The Citadel**

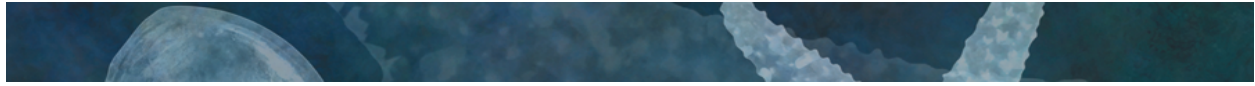
S.C. Sea Grant Consortium-funded research at Clemson University and The Citadel in microplastics resulted in the development of an afterschool science curriculum taught by six students in the Environmental Toxicology Graduate Program at Clemson University. The *What’s in Our Water (WOW) Junior Program* was presented twice a week for two hours during an eight-week period to approximately 30 students in the third through fifth grades at Central Elementary School in Pickens County, S.C. Each week, a new theme was designed to teach students environmental toxicological concepts with demonstrations, art activities, and games. The first day usually involved an interactive lecture, where students were presented with an explanation of a term (i.e. pollution, fate, transport, various contaminant properties). The second day involved an experiment that applied what was taught on the first day, and a game if time allowed. For example, the students made masks of marine organisms during the week of Halloween, while learning about the dangers those organisms face due to different pollutants. Microplastics fate and transport was a large component of the program. The program provided the graduate students with the opportunity to work with a younger age group of students than usual, which required them to think about the activities and related terminology in new ways. It also presented the students with interactive opportunities to understand climate change and pollution as problems on a larger scale, while allowing them to learn creative methods of addressing these issues.

### *S.C. Sea Grant Consortium coordinating development of South Carolina’s first environmental education certification program*

**E.V. Bell, S.C. Sea Grant Consortium**

The S.C. Sea Grant Consortium is coordinating efforts to develop the state’s first environmental education certification program. Beginning in 2013, the Consortium disseminated a state-wide survey and conducted focus groups with educators to gauge the interest in and purpose of an environmental education certification program in South Carolina. Based on this feedback, in 2015, a steering committee was formed with 17 educators representing informal, formal, college, and nature-based tourism. As of November 2015, this committee had completed the development of an official title (Palmetto Environmental Education Certification), vision, mission, and framework for a pilot program to be launched in 2017.





### ***S.C. Sea Grant Consortium's Science Café model fuels support for additional education events***

**E.V. Bell, S.C. Sea Grant Consortium**

The Center for Ocean Sciences Education Excellence SouthEast (COSEE SE), which was administered by the Consortium from 2001-2015, coordinated the Researcher Educator Exchange Forum (REEF) program to foster best practices in enabling scientists to extend their research to diverse audiences (public, students, media, etc.). Between 2011 and 2015, COSEE SE coordinated five REEF events in Georgia, North Carolina, and South Carolina for approximately 48 scientists. As part of the REEF model, participating scientists were required to coordinate an outreach event in partnership with an informal education institution to share their scientific research. The format for the outreach event included: student programs, lecture series, teacher workshops, cart programs, traveling trunks, and other platforms. One outreach event, and educator science café, “Horsin’ Around on the Yorktown” was coordinated by a REEF participant in partnership with the Patriots Point Naval and Maritime Museum. During this café, participating teachers learned about horseshoe crab biology, current research efforts, and resources to use in the classroom. An exit survey indicated that 100% of registrants would attend additional educator science café’s, and 100% of the registrants responded that the café met expectation. Because of this response, the Patriots Point Naval and Maritime Museum provided facility space and staff support to for three additional educator science cafés during 2016.

### ***New educational products developed through S.C. Sea Grant Consortium's “From Seeds to Shoreline” program***

**E.V. Bell, S.C. Sea Grant Consortium**

In 2014, funding was awarded to the S.C. Sea Grant Consortium from the U.S. Environmental Protection Agency to extend the “From Seeds to Shoreline” (S2S) salt marsh restoration program into North Carolina and Georgia and develop several education products to supplement the program. The *Spartina alterniflora* educational poster was produced in 2015 and disseminated during teacher trainings. A Tidal Creek-Salt Marsh guide, lessons plans, a mobile website, and additional companion products are in development and will be completed by November 2016 for use in the S2S program.

### ***S.C. Sea Grant Consortium develops new monitoring protocol and site profile for its “From Seeds to Shoreline” program***

**E.V. Bell, S.C. Sea Grant Consortium**

In 2015, a site profile and monitoring protocol for the “From Seeds to Shoreline” (S2S) program was developed through a graduate student-focused project. The site profile prioritized eight criteria coordinators of the S2S should consider when identifying new restoration sites. These criteria included: safe access to the site for students, natural or man-made barrier protecting the marsh (e.g. oyster reef), and soil and salinity parameters. Based on this site profile, new restoration sites are being explored for inclusion in the S2S program. In addition, a monitoring protocol was developed to track the restoration sites on a long-term basis. The protocol is designed such that students and teachers can monitor the success of transplanted *Spartina alterniflora* seedlings and measure the footprint of restored salt marsh.

### ***S.C. Sea Grant Consortium's Marine Education Specialist receives President's Choice Award***

**E.V. Bell, S.C. Sea Grant Consortium**

The S.C. Sea Grant Consortium's Marine Education Specialist was nominated for the 2015 President's Choice Award and Marine Educator of the Year Award by members of the South Carolina Marine



Educators Association (SCMEA). The Education Specialist received the President's Choice Award in recognition of work in support of marine education. This award was presented at the annual 2015 conference in Greenville, S.C.

***South Carolina Student Selected for Knauss Fellowship***

**Susannah Sheldon and M. Richard (Rick) DeVoe, S.C. Sea Grant Consortium**

The National Sea Grant College Program's Dean John A. Knauss Marine Policy Fellowship, established in 1979, provides a unique educational experience to students who have an interest in ocean, coastal and Great Lakes resources and in the national policy decisions affecting those resources. The program matches highly qualified graduate students with hosts in the legislative and executive branches of government located in the Washington, D.C. area for a one-year paid fellowship. The students learn about federal policy regarding marine and Great Lakes natural resources and lend their scientific expertise to federal agencies and congressional staff offices. The S.C. Sea Grant Consortium received eight formal applications for the Knauss fellowship program this year. After interviewing the applicants, the S.C. Sea Grant Consortium submitted two application packages to the National Sea Grant Office for consideration by the Knauss Fellowship review panel. One of the Consortium's two fellowship candidates was selected as a Knauss fellow in the 2015 class, a graduate student from the College of Charleston. This student was among 52 selected from a nationwide pool of over 100 candidates. The Consortium's Knauss fellow is Ms. Courtney Gerstenmaier, who completed a M.S. in marine biology at the College of Charleston, and served as an ocean science educator with NOAA Fisheries. The Consortium interviewed eight candidates for the National Sea Grant College Program's Dean John A. Knauss Marine Policy Fellowship, submitted two candidates to the National Sea Grant Office for consideration, and had one of the two selected to serve as a Knauss fellow.

***S.C. Sea Grant Consortium fosters student support through internships, fellowships, and research Opportunities***

**Susannah Sheldon and M. Richard (Rick) DeVoe, S.C. Sea Grant Consortium**

Supporting undergraduate and graduate students and early career professionals leads to an informed, engaged, and well-trained workforce. The S.C. Sea Grant Consortium is involved in several initiatives that support education and professional development for these individuals. Forty-six Knauss fellows have been selected from South Carolina since 1984, and 17 Coastal Management fellows from South Carolina have been placed with various state agencies nationally since 1997. In addition, Sea Grant partners with the S.C. Space Grant Consortium annually to support the Kathryn D. Sullivan Earth and Marine Science Fellowship, designed to increase the number of highly trained earth and marine scientists and to enable graduate students to conduct NASA- and NOAA-related Earth/marine science research. In 2015, S.C. Sea Grant supported 19 undergraduates, 37 master's-level students, and nine Ph.D. students in conjunction with Consortium-funded research, projects, and fellowships. Of these, 31 were new to Sea Grant support and 34 were continuing to receive support. Ten of the graduate students were Sea Grant extension and administration interns for the Consortium. One Sea Grant-nominated student was selected for the Knauss fellowship, two for the Coastal Management fellowship, and one for the Sullivan award. Sea Grant student support has improved ocean and coastal literacy among university students and early professionals and encouraged their success in securing coastal and marine-related employment.



*S.C. Sea Grant Consortium provides social science support for Consortium members*

**Dr. Susan Lovelace, S.C. Sea Grant Consortium**

The S.C. Sea Grant Consortium provides social science support for Consortium members and partners through supervising graduate students in thesis and internship projects for their Masters of Science degrees from the College of Charleston. The Consortium provides supervision in study design, survey or questionnaire development, data acquisition, and institutional review board approval as well as overall mentoring, thesis supervision and degree completion. Recent projects include evaluating fish consumption patterns of people residing near a contaminated Superfund site, comparing exposure and consumption of contaminants by alligator hunters and their families, method development and evaluation of collaborative research projects, exploration of sustainable seafood knowledge of restaurant servers, offshore energy policy development, and comparison of biodiversity and social values of ecosystem services in a large estuary.