



SCIENTIFIC LITERACY AND WORKFORCE DEVELOPMENT

IMPACTS

S.C. Sea Grant Consortium's Beach Sweep/River Sweep Litter Cleanup Saves Taxpayers \$93,427 in 2017 **Susan Ferris-Hill, S.C. Sea Grant Consortium**

Relevance: South Carolina has 2,876 miles of tidal shoreline, 504,450 acres of salt marsh, 165 linear miles of beaches, and more than 40 barrier islands. Natural resources account for approximately \$33.4 billion in annual economic output for the state (S.C. Department of Natural Resources' Economic Impact Report, 2016). And according to the S.C. Department of Parks, Recreation, and Tourism, tourism spending reached \$21.2 billion in 2016. Clean beaches, marshes, and waterways are critical to support commercial and recreational boating and fishing, wildlife viewing, tourism, and other industries. A litter-free environment also contributes positively to quality of life.

Response: The S.C. Sea Grant Consortium initiated the annual Beach Sweep litter cleanup program in 1988. In 1989, Hurricane Hugo devastated coastal and inland areas. To increase the effectiveness of the cleanup, the Consortium partnered with S.C. Department of Natural Resources in 1990 to extend the program statewide; the cleanup was then named Beach Sweep/River Sweep. Through the use of volunteers and private sector funds, the cleanup contributes to the economic, environmental, and societal well-being of the state. By participating in Beach Sweep/River Sweep, the public is more informed about natural resource issues, such as litter's detrimental effects on the landscape and wildlife, and people are empowered to take action and become environmental stewards.

Results: In 2017, the coastal portion of Beach Sweep/River Sweep was rescheduled to October due to the potential impact of Hurricane Irma; the inland counties remained with the previously scheduled date in September. Statewide 1,632 volunteers collected nearly 10 tons of litter, covered 135 miles of South Carolina's beaches, marshes, and waterways, and recycled as much debris as possible. There were 65 site captains at 75 cleanup locations across the state. The dollar value of Beach Sweep/River Sweep volunteers' time in 2017 was \$93,427 (Independent Sector, 2017). The number of volunteer hours was 3,784. Volunteers contributed time to improve their communities and natural areas and gained an increased awareness of the fragility of natural resources and the importance of keeping them litter-free.

Re-cap: Beach Sweep/River Sweep has economic, environmental, and societal benefits. While numbers were reduced due to the effects of Hurricane Irma, 1,632 volunteers statewide collected nearly 10 tons of litter along 135 miles of South Carolina's beaches, marshes, and waterways in 2017. There were 65 site captains at 75 cleanup locations across the state. The dollar value of volunteers' time equals \$93,427. The number of volunteer hours was 3,784. The state's natural resources are cleaner, safer, and more beautiful for all to enjoy.

From Seeds to Shoreline® Salt Marsh Restoration Program Expands to Include Hydroponic Growing Technique

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

Relevance: The From Seeds to Shoreline® (S2S) program, coordinated by the S.C. Sea Grant Consortium (Consortium) in partnership with the South Carolina Department of Natural Resources, ACE (Ashepoo-Combahee-Edisto) Basin National Estuarine Research Reserve, and Clemson University Cooperative Extension Service, serves as the state's only student-based salt marsh restoration program. During the school year, students and teachers cultivate *Spartina*



alterniflora from seed and transplant young seedlings to areas along the coastline. During the 2017-2018 school year, 36 teachers representing eight coastal counties are participating in the S2S program. Since its inception in 2011, the S2S program has expanded programmatically and geographically in the following manner:

- Participating teachers and students rose 338% and 149%, respectively.
- Average yearly number of *S.alterniflora* seedlings transplanted increased from 8,800 to more than 22,000.
- S2S expanded to Georgia and North Carolina through their respective Sea Grant and National Estuarine Research Reserve programs.
- Nine S2S specific educational products were published.

Response: In an effort to keep expanding the S2S program in 2017, a \$44,998 National Estuarine Research Reserve (NERR) System Science Transfer Grant was awarded to the Guana Tolomato Mantanzas NERR, in partnership with the Consortium, ACE Basin NERR, North Inlet-Winyah Bay NERR, and North Carolina NERR to pilot a hydroponics approach for cultivating *S. alterniflora*.

Results: In August 2017, a S2S teacher hydroponics training workshop was hosted at the North Inlet-Winyah Bay NERR for 19 educators. Currently, 10 South Carolina coastal schools are piloting the hydroponics method with modifications from this school year implemented during the 2018-2019 school year as an additional method for cultivating *S. alterniflora* as part of the S2S program.

Recap: S2S expands restoration techniques through incorporation of hydroponic methodology for cultivating *Spartina alterniflora* through a NERR system science transfer grant to the GTM NERR, the training of 19 educators in South Carolina (?), and piloting of the techniques in ten S.C. coastal schools.

Local South Carolina Software Company Develops Third Version of Data Sensor Unit for S.C. Sea Grant Consortium Education Program

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

Relevance: South Carolina has recruited several industrial giants over the last 10 years, including Boeing, Volvo, and Google. As high-caliber companies continue to move to the state, the demand for employees skilled in STEM (science-technology-engineering-math) is increasing. This demand reflects a nationwide trend: STEM employment rose faster than non-STEM occupations over the past 10 years (24.4% vs. 4.0%) and is projected to grow by 8.9% from 2014 to 2024, compared to 6.4% for non-STEM occupations. However, South Carolina's students continually rank below average in STEM-based disciplines potentially placing them at a competitive disadvantage in the workforce. In response, the S.C. Sea Grant Consortium (Consortium) developed the eBOB (elementary basic observation buoy) project in 2010 to hone student STEM skills through the design and construction of a working weather buoy complete with student-constructed anemometer, weather vane, rain gauge, and water and air thermometers.

In 2014, Brockman Technologies, a Charleston-based business, partnered with the Consortium and developed a data sensor unit, BOBino, that helped to scale up the eBOB project through the collection of continuous weather data including: temperature, barometric pressure, and light fluctuations. This unit was developed at no cost (value \$100/unit) and was used in eight teacher workshops for approximately 90 teachers.



Response: Brockman Technologies have annually revised the BOBino sensor unit, at no cost to the Consortium, in an effort to provide the most relevant and useful tool data collection tool for the eBOB project. Through trouble-shooting and modifications to the BOBino, educators of all grade levels and abilities have access to a data collection tool that is affordable and reflects the type of instrumentation scientists might use to collect and analyze weather data.

Results: In 2017, Brain Power Software (formerly Brockman Technologies) developed a third version of the BOBino at no cost to the Consortium (value \$120/unit). This version includes a digital display, improved water tight container, refined data configuration code, and enhanced data probes. The BOBino will be piloted during the Consortium’s June 2018 Data on the Estuary Workshop with 15 teachers. This BOBino unit will be available for school use starting at the beginning of the 2018 – 2019 school year.

Recap: A third version of the BOBino data sensor unit is developed for the eBOB project which includes a digital display for data, refined configuration code, and water-tight control box.

S.C. Sea Grant Consortium Website Continues to be Significant Source of Science-Based 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 the 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), 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. The website received 1,980,836 hits, 394,424 unique visits, and 1,365,956 downloads during the reporting period.

Results: The website received 1,980,836 hits (a 31.5% increase from FY16-17), 394,424 unique visits (a 42.6% increase from FY16-17), and 1,365,956 downloads (a 38.5% increase from FY16-17) during the reporting period. The top 10 PDF downloads, and the number of times each was downloaded, are:

- *Low Impact Development in Coastal South Carolina: A Planning and Design Guide* – 45,029 (a 74.7% increase from FY16-17)
- *Guide to the Salt Marshes and Tidal Creeks of the Southeastern United States* – 21,592
- *Physical and Chemical Properties of the Ocean (Ch. 2 Of Sand and Sea)* – 15,413
- *Chemical and Biological Contamination of Stormwater Detention Pond Sediments in Coastal South Carolina* – 9,829
- *Sea Level Rise Adaptation Report: Beaufort County, South Carolina* (full report) – 8,398
- *2014 International Conference on Shellfish Restoration program* – 4,277
- *South Carolina Coastal Wetland Impoundments* – 3,701
- *Tidal Creek Habitats: Sentinels of Coastal Health* – 3,341
- *Salt Marsh Activity Book* – 3,075
- *Handbook of Relative Acute Toxicity Values for Crayfish* – 2,904

Re-cap: 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 1,980,836 hits (a 31.5% increase from FY16-17), 394,424 unique visits (a 42.6% increase from FY16-17), and 1,365,956 downloads (a 38.5% increase from FY16-17) during the reporting period.

ACCOMPLISHMENTS

S.C. Sea Grant Consortium Pilots First Environmental Education Certification Program in South Carolina **E.V. Bell, S.C. Sea Grant Consortium**

The S.C. Sea Grant Consortium (Consortium) initiated efforts to develop South Carolina’s first environmental education certification program after a state-wide survey and focus groups supported the need for this type of professional training. Approximately 150 educators completed the survey, stating the following as benefits for a certification program in the state:

- Improved skills (90%)
- Networking with others in the field (84%)
- Enhanced status as a Certified Professional Environmental Educator (EE) (79%)
- Greater understanding of environmental issues (75%)
- Advanced learning (72%)
- Increased professionalism in your business (83%)
- Standard criteria for job applicants (57%)
- Marketing advantage from hiring certified EE professionals (43%)

Since 2014, the Consortium, in partnership with 14 formal and informal educators, developed the ***Palmetto Environmental Education Certification (PEEC)*** program with the vision of advancing professional environmental education in South Carolina and mission to foster and empower a professional environmental education network to promote environmental literacy in South Carolina. The framework for PEEC is a two-year process involving four workshops, eight online modules, electives, and a culminating capstone project. With funding received from the Spaulding-Paolozzi Foundation in 2017, the PEEC pilot launched in August 2017 with 14 formal and nonformal educators and will wrap up in March 2018. Evaluations from the pilot period will be used to make modifications in preparation to launch the first official PEEC class starting in January 2019 with 15 – 20 educators.

S.C. Sea Grant Consortium Facilitates U.S. Department of State’s TV Cooperative Climate News Series with Ecuadorian Channel 10 Crew **Susan Ferris-Hill, S.C. Sea Grant Consortium**

The Consortium’s director of communications organized a day of interviews in Charleston in partnership with the U.S. Department of State Bureau of Public Affairs-Office of Broadcast Services for a TC Television Channel 10 crew from Guayaquil, Ecuador. Interviewees were Elizabeth Fly, Ph.D., the Consortium’s coastal climate specialist; Dan Burger, director, Coastal Services Division, Ocean and Coastal Resource Management, S.C. Department of Health and Environmental Control; and Danny Kassis, vice president of Customer Relations and Renewables, South Carolina Electric and Gas Company. TC Television Channel 10’s *El Noticiero* is one of Ecuador’s leading news programs with nationwide coverage. TC Television is a leading broadcaster in Guayaquil, with over 20 percent of the national market share and a viewership of over 4 million. This TV Cooperative program series titled “Amenaza Climatica,” or “Climate Threat,” aired in June 2017. The series covered climate change, sea-level rise, climate adaptation, and renewable energy in the U.S. Other cities on the two-week itinerary were Miami



and Fort Lauderdale, FL; the New York City area; Annapolis, MD; Washington, D.C.; Beaufort, S.C. area; and Savannah, Tybee Island, and Darien, GA.

New Citizen Science Bio-Fouling Project Piloted by S.C. Sea Grant Consortium and Charleston County Parks with Funding from Bosch

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

Funding from Bosch in the amount of \$18,000 was awarded to the Charleston County Park and Recreation Commission in partnership with the S.C. Sea Grant Consortium to support the pilot of a K-12 citizen-science biofouling initiative called the BioDiscovery Project. The project is based upon Maryland Sea Grant's Biofilms and Biodiversity program, in which bioracks (consisting of 10 acrylic discs) are spaced 3 feet apart along a 10-foot rope and submerged in the water column. As organisms colonize the plates, the bioracks can be retrieved periodically to be analyzed for relative abundance, species richness, species diversity, and other parameters. The funding from Bosch supports 10 K-12 educators to attend a one-day training in June 2018, incorporate the project with their students during the 2018-2019 school year, and participate in a field study at one of the local Charleston County parks. In addition, funding will be used to develop a data portal that will connect participating teachers and facilitate the sharing of data along and across watersheds, as well as the publication of a species identification guide. Teacher feedback in the form of reflections and assessments will provide ways in which the program can be modified before a full program is offered across the state.

S.C. Sea Grant Consortium's Coastal Heritage Magazine Wins Four Prestigious Awards

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

Communications professionals from around the U.S. acknowledged *Coastal Heritage* magazine in national awards competitions. The *Coastal Heritage* team was recognized with four prestigious awards during FY17-18. *Coastal Heritage* won a Distinguished Award and Best in Show Award for Informational Materials from the Society for Technical Communication-Carolina Chapter for the Summer 2016 issue, "S.C.'s Working Waterfronts: Fishing Villages Evolve." *Coastal Heritage* won an APEX Award of Excellence in the Magazines and Journals category for the Winter 2017 issue, "Trailblazers of the Reconstruction Era." *Coastal Heritage* won an Award of Excellence in the Magazine category from the National Association of Government Communicators Blue Pencil and Gold Screen Awards for three consecutive issues, Winter 2017, Spring 2017, "New Technology: Driving Advances in Coastal Sciences," and Summer/Fall 2017, "Love for Natural Places: How It Shapes Our Coast and Affects Us All."

From Seeds to Shoreline® Program Receives First Place Community Education Award

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

During the 2017 Charleston Community Pride Award Ceremony, the S.C. Sea Grant Consortium received the First Place Johnny Dodds Education Award for the From Seeds to Shoreline® (S2S) program. S2S is South Carolina's only student-focused salt marsh restoration program that engages K-12 students in cultivating and transplanting *Spartina alterniflora* to areas of coastal marsh. The Community Pride Award event was established in 1966 and is financially supported by members of the Greater Charleston business community as a way to recognize people, programs, and organizations that strive to protect and enhance the local environment.



S.C. Sea Grant Consortium’s Educator Science Café Program Receives Support from Regional STEM Organization

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

In 2014, the S.C. Sea Grant Consortium, in partnership with Patriots Point Naval and Maritime Museum, and the S.C. Department of Natural Resources, piloted an Educator Science Café aboard the *USS Yorktown* called “Horsin’ Around on the Yorktown.” Formal and nonformal educators attended to learn from scientific experts about the biology and ecology of horseshoe crabs (*Limulus polyphemus*) as well as ideas for linking the information learned to the classroom. Of the 33 attendees, nearly 100% indicated through an exit survey that the café format was engaging, informative, and unique and that they would be likely to attend future events. Since 2014, the Consortium and Patriots Point have continued to organize Educator Science Cafés while modifying the format from a lecture style to a more informal roundtable discussion at local venues in an effort to foster dialogue between educators and science experts. Six cafes have been hosted for a total of 60 educators and have covered topics ranging from sea-level rise to the physics of swimming. In 2017, the Lowcountry STEM (science-technology-engineering-math) Collaborative entered into partnership with the Consortium and Patriots Point by providing funding for each café to support supplies and speaker stipends, allowing educators to attend the events for free.

South Carolina Students Develop Plastic and Microplastics Outreach Media

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

Students at a local Charleston school, Buist Academy, partnered with the S.C. Sea Grant Consortium to conduct a plastics and marine debris-related community service project during the 2017-2018 school year. Consortium staff meet several times with the students to outline a plan of action, provide educational resources, and recommend local researchers to assist the students in conducting the necessary research for their project. Education resources provided to the students include the Consortium’s “Microplastics in Estuaries” poster as well as the Consortium’s *Coastal Heritage* issue, *The Global Plastics Breakdown: How Microplastics are Shredding Ocean Health*. In addition, the Consortium assisted in connecting the students with two microplastics researchers at the College of Charleston and The Citadel to further their research. Ultimately, the students developed a project that consisted of two phases: 1) a bi-weekly litter clean-up and data analysis of the amount and type of plastics collected between November 2017 and March 2018 and 2) the creation of one-minute educational video designed to share the impacts of plastics and microplastics and promote ways in which to mitigate the problem. The video is currently in the final stages of development and will feature the “Microplastics in Estuaries” poster. Once complete, the video will be available on the Consortium’s website for download and incorporated into education and outreach efforts of the Consortium and its partners.

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.

18 Young Scientists Envision S.C. Sea Grant Consortium's Future in Focus Groups

Susan Lovelace, S.C. Sea Grant Consortium

The S.C. Sea Grant Consortium, as part of its FY2015-2016 visioning process, conducted focus groups to engage users in thinking about the Consortium's education, communication, extension, and research priorities for the future. Eighteen graduate-level students from four different universities discussed the need for adaptable and resilient coastal living, continuing need for education, both for residents and decision-makers, and vigilance in protecting coastal and ocean waters from emerging contaminants such as microplastics and pharmaceuticals. The sessions provided an opportunity for participants to consider the challenges and opportunities South Carolina will face over the next 25-30 years. Two focus group sessions were held at two different schools and included students from the University of South Carolina, The Citadel, the Medical University of South Carolina, and the College of Charleston. The input from each session was helpful in structuring the Consortium's 2018-2021 strategic plan.

S.C. Sea Grant Consortium Leverages Climate Change Education Support for Additional Professional Development Opportunities

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

In 2016, the S.C. Sea Grant Consortium (Consortium) received a \$5,000 grant from the National Oceanic and Atmospheric Administration (NOAA) Planet Stewards Education Project (PSEP) (formerly "Climate Stewards"). The grant was used for a climate-related educator workshop hosted in partnership with the South Carolina Aquarium and the National Park Service (Fort Sumter). Eighteen educators attended this two-day workshop, "Rising Tides and Changing Times," in which information and educator resources were presented on the historical, present, and future impacts of sea-level rise. External evaluation data showed participants self-rating themselves significantly more knowledgeable in all content areas of the workshop, with 90% of the participants confident in using what they learned in their own places of employment. Based on these data, the Consortium hosted second version of the workshop in 2017 for 12 educators. The content of these workshops, as well as the partnerships formalized, have provided the basis for a new program initiative recently proposed in response to the NOAA Environmental Literacy Program funding opportunity to work directly with teachers and students at six Title I schools located in the most flood-prone areas of Charleston to develop place-based flood-resiliency curriculum units to ultimately be adopted by the Charleston County School District.

South Carolina Sea Grant Consortium's Education Specialist Receives Marine Educator of the Year Award

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



The S.C. Sea Grant Consortium (Consortium) Marine Education Specialist, Elizabeth Vernon Bell, was selected as 2017 Marine Educator of the Year by the South Carolina Marine Educators Association (SCMEA). This annual award recognizes one individual for outstanding efforts in marine science education based on programs, services, activities, and curricula developed, grant funding awarded, and skills at fostering marine science education in a way that stimulates an interest and awareness of marine and aquatic environments. Specifically, Bell was recognized for her overall leadership in the marine science education community, skill in developing and implementing several new marine education programs (e.g. From Seeds to Shoreline[®]), and coordination of professional development opportunities. SCMEA was founded in 1988 as a local chapter of the National Marine Educators Association with the goal of promoting and expanding marine and aquatic education throughout the state. Members include classroom teachers, nonformal educators, scientists, government officials, and other supporters of ocean education.

S.C. Sea Grant Consortium's Director of Communications Wins 2017 Community Pride Award
Susan Ferris-Hill, S.C. Sea Grant Consortium

Community Pride, Inc. of Charleston County, a non-profit organization that promotes environmental stewardship among all citizens of Charleston County, selected Director of Communications Susan Ferris Hill for the 2017 Captain Pride Award. The award was given for her 16-year history of “demonstrating excellent environmental stewardship practices” through coordination of the annual Beach Sweep/River Sweep litter cleanup. The Community Pride Award was established in 1966 and is financially supported by members of the Greater Charleston business community as a way to recognize people, programs, and organizations that strive to protect and enhance the local environment.

S.C. Sea Grant Consortium's Coastal Heritage Magazine Adds to Public Knowledge on Stormwater Ponds and the Impact of Outdoor Recreation
Susan Ferris-Hill, S.C. Sea Grant Consortium

The influence of *Coastal Heritage* reaches beyond its 5,000 subscribers. Clemson University Extension Service requested 150 copies of the Fall/Winter 2017-18 issue (“Stormwater Ponds: The Coast Re-Plumbed”) and distributed them to participants at the Healthy Pond Series. Representatives from 40 homeowners’ associations attended the series. Also, a member of the Hunt Club Homeowners’ Association in Charleston County requested 15 copies to distribute to the HOA’s full board to help them understand the need for taking care of their ponds. Lee Brockington, senior interpreter at Hobcaw Barony in Georgetown County, said the exploration in the Summer/Fall 2017 issue (“Love for Natural Places: How It Shapes Our Coast and Affects Us All”) about the impact of spending time in nature “was the impetus for my planning ‘Hikes at Hobcaw.’ The first was a Hike to Tar Kiln Swamp Boardwalk and was so successful, we’ve offered Hike Down King’s Highway, Hike Hobcaw Beach, Hike to Fraser’s Point, Hike to the Rice Mill Ruins, etc.” She also complimented the diversity of people in the photographs – white and black, old and young, men and women.