



**Coastal Waccamaw**  
Stormwater Education Consortium

*Helping local governments meet requirements for stormwater education and public involvement*

# ANNUAL REPORT

January 1, 2020 – December 31, 2020

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## 2020 ACTIVITY TOTALS SUMMARY

### Minimum Control Measure #1: Public Education and Outreach

Outreach Strategy	# Distributed / Reached	Outreach Strategy	# Distributed / Reached
Brochures/Informational Cards/Booklets	111	Newsletters	2592
Websites	95,076	Online Coverage	56,000
Newspaper Articles	100,000	Television (PSAs & News Coverage)	140,000
Posters/Exhibits/Displays	600	Presentations	347
Billboards	1,532,280	Conference Hosting	390
Workshops/Seminars	365	Technical Assistance via Meeting Participation	178
Field Workshop/Field Trip	108	Social Media	2566
Good Housekeeping Video Viewing	33	Television / Online Coverage (Promoting tools, resources, positive behaviors)	361,200
LID Manual	87		

### Minimum Control Measure #2: Public Involvement/Participation

Activity	# of Activities	# of Participants	Activity	# of Activities	# of Participants
River, Marsh and Beach Cleanups	7	191	Volunteer Water Quality Monitoring in Surfside Beach	46	68
Pet Waste Stations in Murrells Inlet	2 sites	10,000	Volunteer Water Quality Monitoring in Murrells Inlet	184	163
Storm Drain Marking	1	35	Volunteer Water Quality Monitoring on Waccamaw River	396	234
Volunteer Involvement/Recruiting Event	1	30	Volunteer Water Quality Monitoring at CCU	144	34
Secchi Dip-In Turbidity Monitoring on Waccamaw River and CCU	1	50	Volunteer Water Quality Monitoring in Briarcliffe Acres	46	45

## EXECUTIVE SUMMARY

### History

From its conception in May 2004, the Coastal Waccamaw Stormwater Education Consortium (CWSEC) set out to fulfill the federal Clean Water Act requirements associated with the National Pollutant Discharge Elimination System (NPDES) Phase II Stormwater Program. Six small municipal separate storm sewer systems (SMS4s) located within the Myrtle Beach Urbanized Area (MBUA) unanimously endorsed a coordinated approach to regional stormwater education. They charged the educational service providers with developing a Regional Stormwater Education Strategy and a Phased Education Work Plan based on a formal needs assessment. This can be found at [http://cwsec-sc.org/wp-content/uploads/business/guidance/11-04\\_phased\\_education\\_work\\_plan.pdf](http://cwsec-sc.org/wp-content/uploads/business/guidance/11-04_phased_education_work_plan.pdf).

The Consortium's first staff member, Karen Fuss, began work in October 2005 and became the first CWSEC Coordinator in summer 2006 which serves as a central point of contact to better coordinate communication amongst the SMS4s and education providers. In November 2014, Lisa Swanger assumed the Coordinator role. In Summer 2020, Dr. Monica Gray assumed the role of Director. Ahmed Bakr assumed the Coordinator role in November 2020.

Based on guidance from South Carolina Department of Health and Environmental Control (SCDHEC) staff in March 2007, CWSEC members and educators chose to focus educational messages on those pollutants contributing to 303(d) impaired waters listings. Late in 2007, the Towns of Atlantic Beach and Briarcliffe Acres signed resolutions to join CWSEC. A second needs assessment in December 2009 aimed to guide future educational programming during the second 5-year NPDES Phase II permit cycle. The findings stressed the unique needs and priorities that vary among SMS4s and their target audiences. The education providers then participated in strategic planning sessions and updated the goals and

strategies. CWSEC members approved the changes in June 2011 (refer to page 3). The education providers continue to coordinate, communicate and involve each SMS4 to serve each of their needs for Minimum Control Measures (MCM) #1 and #2 for public education, outreach, participation and involvement.

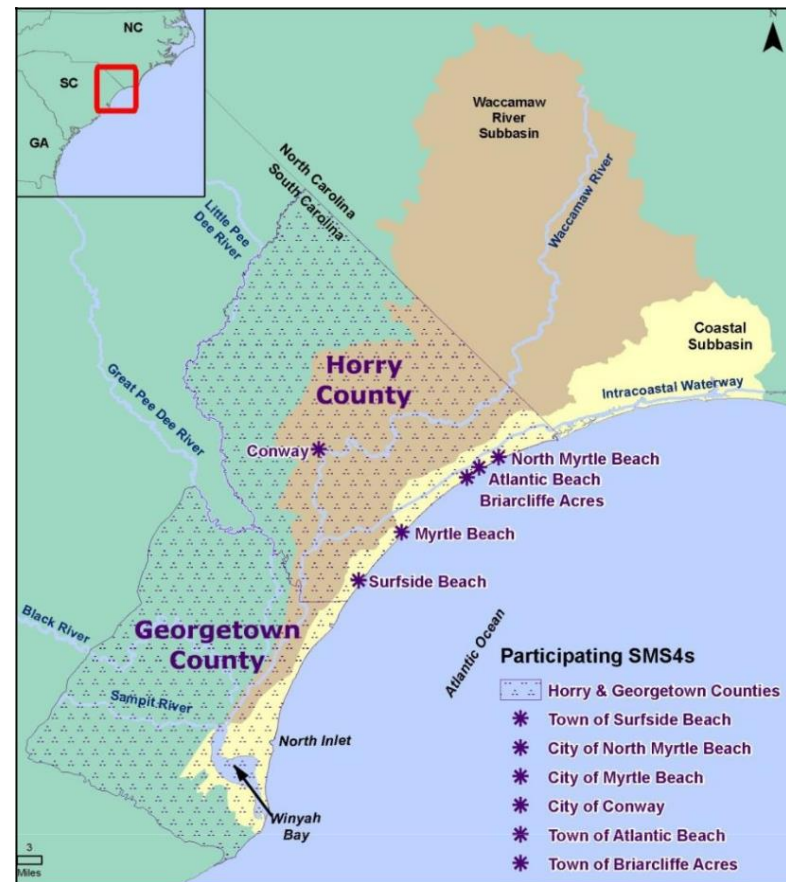


Figure 1 – Map of CWSEC SMS4s

## Goals and Strategies (Approved June 2011)

- 1.) Maximize efficiency and effectiveness through coordinated and collaborative stormwater education activities.
  - Efforts are collaborative, synergistic and non-duplicative
  - Work, plan and report together as an entity – member SMS4s and education providers
  - Adaptive management in which assessment results are used to guide improved implementation
  - Identify and maximize use of individual organizational strengths
  - Be a cost-effective deliverer of educational services
  - Support the needs and goals of core education providers
- 2.) Using a regional watershed approach, help member SMS4s meet NPDES Phase II stormwater permit requirements for public education and outreach and public involvement and participation.
  - Deliver public education and involvement activities that address water quality information
  - Work, plan and report together as an entity – member SMS4s and education providers
  - Tailor support activities to individual member SMS4s needs
  - Recognize the changing needs of member SMS4s and evolving regulatory requirements within the region
- 3.) Provide and exchange technical information and expertise on innovative stormwater best management practices and supporting funding opportunities.
  - Serve as an information provider on technical and current innovations and associated environmental conditions
- 4.) Improve watershed and stormwater awareness in target audiences that informs decision-making and promotes behavior change to address water quality impairments.
  - Keep current on educational theory/behavior change/social research/effective communication techniques
  - Make local educational resources and service providers readily accessible
  - Support identification of external funding opportunities, proposal development, and project delivery
- 4.) Improve watershed and stormwater awareness in target audiences that informs decision-making and promotes behavior change to address water quality impairments.
  - Define target audiences to address water quality threats and impairments
  - Use programming in which increased awareness and/or behavior change is measurable
  - Stormwater education efforts by public/municipalities are shifted to a watershed focus
  - Empower population to serve as stewards of their watersheds through delivery of messages and taking action
- 5.) Continue to serve as a model for collaborative stormwater education and involvement throughout the state of SC and beyond.
  - Communicate outreach efforts and success stories beyond the Consortium and target audiences
  - Build upon Consortium collaboration and successes to secure future grants

## Core Education Providers



### Coastal Waccamaw Stormwater Education Consortium

Dr. Monica Gray, CWSEC Director, Associate Professor & Engineering Program Director  
Ahmed Bakr, CWSEC Coordinator



### Coastal Carolina University's Waccamaw Watershed Academy

Dr. Susan Libes, Founding Director and Professor Emeritus  
Victoria Green, Program Manager  
Kelly Hall, Volunteer Monitoring Coordinator



### Clemson Extension's Carolina Clear Program

Kim Morganello, Carolina Clear Program Coordinator, Water Resources Associate  
Guinn Wallover, Clemson Extension's Carolina Clear Water Resources Extension Agent



### Murrells Inlet 2020

Meredith Harrison, Executive Director



### North Inlet - Winyah Bay National Estuarine Research Reserve

Beth Thomas, Education Coordinator  
Hayley Fournier, Education Specialist  
Maeve Snyder, Coastal Training Program Coordinator



### South Carolina Sea Grant Consortium



April Turner, Coastal Communities Specialist  
Brooke Saari, Coastal Water Quality Specialist



### Winyah Rivers Alliance Waccamaw RIVERKEEPER® Program

Cara Schildtknecht, Waccamaw Riverkeeper

## Member SMS4s

SMS4 Contacts	SMS4 Annual Priorities and Projects
 <p><b>Benjamin Quattlebaum, Town Manager</b></p> <p><a href="http://townofatlanticbeachsc.com">http://townofatlanticbeachsc.com</a></p>	<p>The Town of Atlantic Beach is focused on reducing litter entering their stormwater system, particularly during Town events. Atlantic Beach is also undertaking an effort to identify locations of septic systems within the Town to determine whether any systems are failing and could connect to sewers.</p>
 <p><b>Brian Palliser, Town Councilman and Stormwater/Lake Committee Member</b></p> <p><a href="http://www.townofbriarcliffe.us/">http://www.townofbriarcliffe.us/</a></p>	<p>Briarcliffe Acres' stormwater focus is on their recently established (February 2019) water quality testing program coordinated by CCU and Town Council, as well as making improvements to stormwater runoff throughout the town. The Town is also continuing to work with neighboring municipalities to keep White Point Swash at its natural location while maintaining adequate tidal flushing of the tidal estuary. An ongoing focus will continue to be directed towards the water quality testing program to observe changes and trends within White Point Swash. The Town continues to educate their residents by raising awareness on how to properly maintain septic systems.</p>
 <p><b>Brandon Harrelson, Director of Public Works</b></p> <p><a href="http://www.cityofconway.com/departments/public_works/">http://www.cityofconway.com/departments/public_works/</a></p>	<p>Conway's Water Quality and Drainage Commission includes 4 members, with the City actively looking to fill 3 open positions, serving for 3-year terms. The City seeks to add businesses into the River-Friendly Business Program, implemented to help reduce the environmental impact on the Waccamaw River and the community, and to recognize each business for their commitment and participation. Program materials are at: <a href="http://www.cityofconway.com/departments/public_works/river-friendly_business_program_overview.php">http://www.cityofconway.com/departments/public_works/river-friendly_business_program_overview.php</a>. The City has also continued to support the Waccamaw Riverkeeper's River Sweeps, the Waccamaw River Volunteer Water Quality Monitoring Program, restoration of the Crabtree Canal, and has instituted a stormwater inspection program.</p>



**Ray Funnye, Director of Public Services;  
Tracy Jones, Stormwater Division Manager;  
Christina J. Fisher, Billing Coordinator;  
Christopher Hancock, Stormwater Compliance  
Inspector**

<http://www.georgetowncountycleanwater.com/>

Georgetown County Stormwater Division's mission is to protect and improve the quality of life of all citizens of Georgetown County and surrounding communities, and provide for the collection and conveyance of stormwater runoff in accordance with all federal, state, and local regulations in the safest, most efficient, and cost-effective manner possible. The Stormwater Management Plan is designed to reduce the discharge of pollutants from Georgetown County's SMS4 to the maximum extent practicable, protect water quality, and satisfy the appropriate requirements of the Clean Water Act. They also engage in promoting equitable, acceptable, and legal measures for stormwater management. Major storm events have impacted the Grand Strand Area and coastline over the past 6 years. Severe flooding has impacted communities across Georgetown County. As such, Georgetown County has embarked on Watershed Master Planning for the entire County, starting with the Murrell's Inlet and Pawley's Island Regions. The objectives of this project are, but not limited to; having a detailed inventory of the drainage system to the major outfalls, a hydraulic model of these drainage basins and sub basins, identify problem areas that need new or upgraded infrastructure, review ordinance or policy changes to enhance the areas that are prone to flooding, and more.



**Tom Garigen, Stormwater Manager;  
Thom Roth, Stormwater Manager; Chelsea  
Cogliano, Watershed Planner**

<http://stormwater.horrycounty.org>

Horry County Stormwater Management is continuously working to implement the provisions of the SMS4 stormwater permit. Horry County's program is advised by its Stormwater Advisory Board. The Department participates in providing training for HOA's as well as other educational opportunities to raise awareness regarding stormwater runoff. Horry County Stormwater aided in the planning and execution of the 2020 Grand Strand Stormwater Pond Conference in Feb 2020. Horry County is a partner in the implementation of the Hog Inlet Watershed Plan and the Murrells Inlet Watershed Plan. The County continues to be a major contributor to several water quality monitoring programs throughout the region.



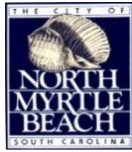
**Janet Curry, Director of Public Works;  
Eric Norris, Street Division Superintendent;  
Samantha Taylor, Stormwater Program Supervisor**

The priorities of the Myrtle Beach stormwater management program are to: protect, maintain, and enhance the health, safety and general welfare of the citizens of the City; decrease the degradation of the beaches; prevent damage to properties from improper drainage and flooding; and protect drinking water supplies. The City has accomplished the initial Withers Watershed Pilot Study and is moving towards its second phase of the watershed-based masterplan. This past year, each of the four deep ocean outfalls were cleaned and will remain on a routine inspection and maintenance program. The Stormwater Management Program looks forward to a bright future with the addition of the Yaupon Drainage Project which will alleviate local flooding issues, the design of a



[http://www.cityofmyrtlebeach.com/departments/public\\_works\\_department/index.php](http://www.cityofmyrtlebeach.com/departments/public_works_department/index.php)

header pipe, as well as the addition of 24th Avenue North deep ocean outfall. The City desires to continue mitigating flood hazards and enhancing local water quality with focus being placed on watershed-based planning efforts. Continued emphasis on our Fats, Oils and Grease public outreach initiative, non-point source pollution education, and intradepartmental coordination of stormwater best management practices will occur during the current permit cycle.



**Kevin Blayton, City Engineer/Public Works Director; Jay Beeson, Stormwater Compliance Manager, Dana Hamilton, Engineering Division Manager**

<http://www.nmb.us/Page.aspx?id=33>

North Myrtle Beach conducts continuous water quality monitoring within the coastal waters, including: ocean water quality at Cherry Grove pier and weekly beach water quality sampling. This monitoring work allows us to identify and target problem areas with specific water quality improvement methods, and assess the effectiveness of those management practices. In addition, the city is working jointly with Horry County and the Waccamaw Regional Council of Governments to implement a watershed improvement plan for Hog Inlet / Cherry Grove Marsh. We also fund a joint project with Horry County and Town of Briarcliffe Acres for WQ monitoring at White Point Marsh, which includes a camera for swash monitoring (<https://video-monitoring.com/beachcams/coastalcarolina/whitepointswash/slideshow.htm>). The city's Manual of Design, Installation, and Maintenance Requirements for Stormwater Management Plans is available at: [http://cwsec-sc.org/wp-content/uploads/commdocs/Manual for Storm Water Management Plans.pdf](http://cwsec-sc.org/wp-content/uploads/commdocs/Manual%20for%20Storm%20Water%20Management%20Plans.pdf)



**John Adair, Public Works Director**

<http://www.surfsidebeach.org/publicworks.html>

The Town of Surfside Beach's stormwater focus is on flood prevention, water quality, and public education of coastal issues. Surfside Beach has a Stormwater Committee comprised of 5 members, each serving four-year terms. The town recently approved a Stormwater Utility Fee, to fund various large infrastructure improvements, operational expenses, as well as pursuing various grant opportunities. This fee will provide a dedicated source of funding for these projects. The 2019 focus was on public education, with information given out on websites and street festivals. This is in addition to the Town's volunteer monitoring effort and public education component.

## CWSEC Role with NPDES Phase II Permit

Authorized by the Clean Water Act of 1972, the NPDES permit program controls water pollution by regulating the discharge of pollutants into waters of the United States. In South Carolina, the SCDHEC administers the NPDES program. EPA's NPDES Stormwater Phase II Rule establishes a stormwater management program that is intended to improve the nation's waterways by reducing the quantity of pollutants that stormwater picks up and carries into storm sewer systems during storm events. The Phase II Rule defines a stormwater management program for a small MS4 as a program composed of six elements or minimum control measures (MCMs), including: 1) Public Education and Outreach on Stormwater Impacts; 2) Public Participation / Involvement; 3) Illicit Discharge Detection and Elimination; 4) Construction Site Runoff Control; 5) Post-Construction Stormwater Management in New Development and Redevelopment; and 6) Pollution Prevention / Good Housekeeping for Municipal Operations. The Consortium specifically addresses MCMs #1 and 2.

The NPDES General Permit for Storm Water Discharges from Regulated SMS4 went into effect on January 1, 2014 and can be found at [https://www.scdhec.gov/sites/default/files/docs/Environment/docs/Final\\_SMS4\\_Permit.pdf](https://www.scdhec.gov/sites/default/files/docs/Environment/docs/Final_SMS4_Permit.pdf). For MCM #1, this permit requires identification of pollutants of concerns, target audiences, outreach goals and assessment. CWSEC had previously established a program that complies with these requirements, which is demonstrated through the procedural flowchart on the following page (Figure 2) and the formalized annual activity plan. Each year, the activity plan is formulated, discussed, and approved during biannual core education provider meetings (spring and fall) and biannual CWSEC meetings (summer and winter). The status on achieving the current and former year's planned activities is also discussed during these biannual meetings. The approved activity plan is compiled and presented in a Microsoft Excel spreadsheet containing the following information: pollutant of concern; target audience; activity description; MCMs addressed; lead service provider; and geographic target. The partnership between the member SMS4s and educators often continues from the planning stage into activity implementation. Once the activity is completed, this information is compiled into a database (<http://bccmws.coastal.edu/cwsec/>) containing the above information from the activity plan and type of assessment utilized.

Public involvement and participation activities led by CWSEC, such as volunteer water quality monitoring, storm drain marking and community cleanups, continue to expand and clearly satisfy the new permit requirements for MCM #2. Additionally, the permit states that each member SMS4 must ensure that their Stormwater Management Plan (SWMP) is easily accessible to the public. Employing the CWSEC website (<http://cwsec-sc.org/>) with links to each SMS4's SWMP provides a way to access all the CWSEC SMS4 members' plans from one central location. Several major changes were written into the new permit in other MCMs, such as Total Maximum Daily Load (TMDL) monitoring and implementation, illicit discharge detection and elimination, and construction and post-construction, which will result in SMS4s making adjustments in their stormwater programs in order to fulfill these new requirements. Some of these may warrant education and outreach, which can be addressed during activity plan creation when appropriate.

# Planning & Operations Summary for

March 2012



**Coastal Waccamaw**  
Stormwater Education Consortium

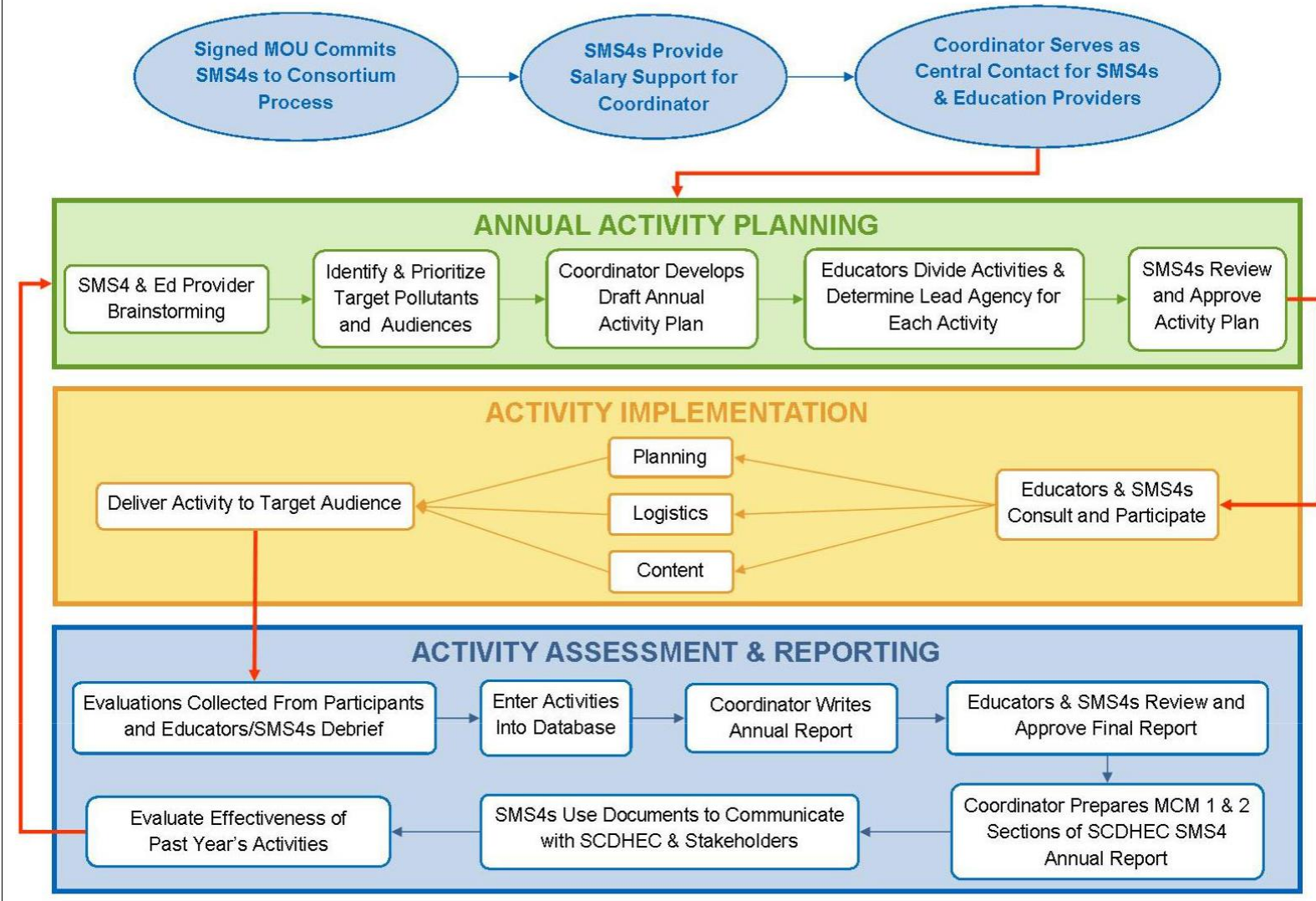


Figure 2 – Flowchart describing collaborative process between education providers and SMS4s guiding the Consortium’s annual activities

## **2020 ACTIVITY HIGHLIGHTS**

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The Coastal Waccamaw Stormwater Education Consortium's reporting cycle follows the calendar year for the purposes of matching SCDHEC's permit cycle. Therefore, this report covers the activities that occurred from January 1, 2020 – December 31, 2020. The annual activity plan, approved by CWSEC members' in December 2019, appears in Appendix A. This contains both the number of activities and impacts during 2020. Appendix B includes an abbreviated version of the activity database and depicts additional activities beyond those that were accounted for in the annual activity plan (highlighted in blue). The Consortium's activity database provides a comprehensive listing and description for all stormwater-related activities conducted throughout the year. Unlike previous years' numerous events, workshops and projects, activities of the year 2020 were significantly impacted by the COVID-19 pandemic and many events were either cancelled or became virtual. Lisa Swanger resigned from the CWSEC coordinator position. Dr. Susan Libes retired from her positions as Director of WWA and Professor of Marine Science and Chemistry and was awarded Emeritus status. Notable activities of 2020 are highlighted in the following sections.

### **Best Management Practices (BMPs)**

#### **Low Impact Development Manual - Calculator Tool Training**

Despite the COVID-19 pandemic's impact on in-person activities, the CWSEC and education providers managed to resume major activities. On August 19, Clemson Extension, NI-WB NERR, SCDNR, SC Sea Grant Consortium, and ACE Basin NERR held a webinar focused on the LID Manual compliance calculator tool in partnership with the Center for Watershed Protection.

### **Stormwater / Watershed Outreach Programs**

#### **Plankton Palooza**

On June 30, the NI-WB NERR gave the Plankton Palooza presentation that focused on the tiny universe of phytoplankton that is the base of several aquatic food webs, providing food for a wide range of sea creatures including shrimp, snails, and jellyfish. Researchers were invited to the Reserve to tow a plankton net then observe the results under the microscope at the lab. However, the in-person segment was cancelled in light of COVID-19 restrictions on gatherings.

#### **Shorebirds at Sunset**

The NI-WB NERR organized this field workshop on March 6 for Community to meet up at Hobcaw Barony for a relaxing evening of bird watching. The event allowed participants to brush up on shorebird identification skills and enjoy the beautiful colors of the sky with a setting sun, while maintaining social distancing and COVID related precautions.



Image 1 – Photo of Grand Strand Stormwater Pond Conference (2/25/2020) attendees

### Grand Strand Stormwater Pond Management Conference

The 2020 Grand Strand Stormwater Pond Management Conference was held on February 25 at the General Robert H. Reed Recreation Center. The 2020 Grand Strand Stormwater Pond Management Conference provided a forum to give the latest information, resources and tools on pond management for the Grand Strand area.

Over 150 participants attended the 2020 Grand Strand Stormwater Pond Management Conference. Representatives of Homeowner's Associations, individual pond owners, and pond management professionals came together with speakers, exhibitors, and local governments to learn and connect. The conference was organized and hosted by the North Inlet – Winyah Bay NERR, Coastal Waccamaw Stormwater Education Consortium, S.C. Sea Grant Consortium, Clemson Cooperative Extension, City of Myrtle Beach Stormwater, and Horry County and Georgetown County Stormwater Departments.

The keynote address was given by Dr. Erik Smith, Manager of the North Inlet – Winyah Bay NERR and Research Associate Professor in the Baruch Institute for Marine & Coastal Sciences at the University of South Carolina. His talk, "*It's All Connected: The Role of Stormwater Ponds in Coastal South Carolina*," provided an overview of the function, prevalence, and impacts of ponds. Stormwater Ponds, also called "Wet Detention Basins", are engineered structures built to control stormwater runoff and prevent flooding. Stormwater ponds are also important for improving water quality since stormwater transports nutrients, sediments, and other pollutants.

The conference also featured a session with authors of the Stormwater Ponds in Coastal South Carolina: State of Knowledge Report. They shared the latest research on hydrology,

pollution/human health, ecology, and communication related to stormwater ponds. Throughout the day, participants heard from expert speakers on topics including shoreline vegetation, integrated weed management, wildlife habitat, pond inspections, upland management, and more!

A grey, cloudy day was a perfect backdrop for observing stormwater ponds in action. During the Pond Tour and Inspection Demonstration, participants observed pond features and learned what to look for when inspecting a pond. Shoreline buffers, erosion, wildlife, and inlet/outlet structures were all topics of discussion.

Besides informative presentations, the conference provided opportunities for networking and connecting with resources. Pond owners interacted with exhibitors from local pond management organizations and businesses and learned about the services they provide. Representatives from local municipalities were available to consult and provide guidance to pond owners.



Image 2 – Grand Strand Stormwater Pond Conference (2/25/2020) attendees listen to keynote speaker Dr. Erik Smith

### The Value of Stormwater Ponds Webinar

The Value of Stormwater Pond webinar was held on May 7 and was organized by S.C. Sea Grant Consortium and Clemson Extension. This webinar provided results of Clemson research on property values and ecosystem services values of stormwater ponds in coastal South Carolina, and where residents can go for more resources to keep their ponds functional and healthy.

### Media / Outreach Materials

#### Websites/Social Media

Carolina Clear website overhaul was completed in fall 2020 for a better user experience, including septic tank website roll out. Moreover, Carolina Clear YouTube achieved 9,604 views and 322 hours watch time. Carolina Clear Facebook had 48,340 lifetime post of total reach and 130 posts in 2020, also Facebook posts including spring cleaning video series and macroinvertebrate Monday are active.

#### Television; Online Coverage

In 2020, Clemson Extension's Carolina program launched its newest mass media campaign focused on the proper management and disposal of fats, oil and grease (FOG). Consortia across the state, including the CWSEC, have identified improperly managed FOG material as a pollutant of concern. The target behavior of "Can it, Cool it, Trash it" will prevent FOGs from clogging pipes and causing environmental harm to downstream water quality. In the 2019 Carolina Clear statewide survey, 2,000 residents were asked in an open-ended question how they currently dispose of their kitchen grease. Approximately one third of the respondents (35%) let the grease cool and solidify, then they put it in the trash. The remaining 65% of respondents had varying answers including pouring it down a sink or toilet, pouring it into the trash when warm, reusing it, etc. The FOG management 2020 mass media campaign was developed and in Fall 2020 FOG management commercial was produced and aired December 2020 Coastal Waccamaw region on WBTW total viewership of 361,200 impressions. It was one minute in length and depicted someone cooking in a residential setting in which the individual was met with conflicting advice from an angelic plumber

and a grease goblin. This commercial aims at public awareness and education of FOG. To view the commercial, visit <https://www.youtube.com/watch?v=Y2-tvWMHW4Q>

#### Billboards

As of fall 2020, there were 22 copies of the billboard installed in eleven Counties around the state. This is an increase of 5 billboards from the 2018 Carolina Clear effort; the billboard campaign was made possible through a partnership with the Outdoor Advertising Association of South Carolina. Locally, billboards are rotated through select county locations and have included. US Highway 17 and US Highway 501 and resulted in a combined 383,070 estimated views (note this is a total of daily counts). Billboard went up in four locations in the Grand Strand: North Myrtle Beach, Myrtle Beach, Conway, and Georgetown.



Image 3 – Clemson Extension and CWSEC Fats, oils, grease billboard in Conway

## Water Quality Monitoring

### Volunteer Monitoring

The small MS4s of the Myrtle Beach Urbanized Area (MBUA) continue to partner in volunteer-based water quality monitoring programs that help fulfill MCMs #1 and #2 for public outreach and engagement and MCM #3 for illicit discharge detection and elimination. Volunteers from communities across the Grand Strand engage in bimonthly monitoring programs along the Waccamaw River, in the Town of Surfside Beach, in the Town of Briarcliffe Acres, and in Murrells Inlet.

To address MCM #1, all monitoring data are accessible through public websites maintained by CCU's Waccamaw Watershed Academy. The URLs for these websites are advertised via business cards individualized for each monitoring program. The URLs are collectively presented at: <https://www.coastal.edu/wwa/datasets/> to enable rapid location of data. Web counters are used to document traffic at these sites. Data are also being uploaded to various external databases including the US EPA's Water Quality Exchange that is accessed via the National Water Quality Monitoring Councils Water Quality Portal. The Waccamaw Watershed Academy's monitoring programs are part of the USA Volunteer Water Monitoring Network and the South Carolina Coastal Water Monitoring Network. In an effort to expand geographic reach and public involvement in our watershed, WWA staff began training for the Saltwater Adopt-A-Stream program in 2020 with hopes of launching the first saltwater Adopt-A-Stream monitoring sites in summer 2021.

Despite the pandemic, dedicated volunteers in the Grand Strand continued to conduct water quality monitoring while adhering to new safety precautions. Additional opportunities for involvement have been implemented to replace face-to-face events for volunteers who are unable to participate in sampling activities. These include monthly newsletters, social media, and virtual events.

A brief summary of the volunteer water quality monitoring programs is provided below along with highlights from 2020.

### *Waccamaw River (WR)*

The bi-state effort on the Waccamaw River has been monitoring twelve sites in South Carolina since 2006 and six sites in North Carolina since 2011 and engages over 50 volunteers annually. The extensive data set provides a basis for identifying spatial and temporal trends. The Waccamaw Riverkeeper serves as the Field Coordinator for the program.

The 2020 Annual Data Conference for the Waccamaw River volunteer water quality monitoring program was held virtually on November 10. Dr. Susan Libes, founding director of the Waccamaw Watershed Academy, discussed trends and potential water quality issues that have been observed in the watershed. A focus of her presentation was how flooding impacts our water quality on the river and in particular the role of discharges from urbanized tributaries, like Crabtree Canal. A special guest presentation was given by Chrissa Waite, the Project Manager with the US Army Corps of Engineers for the Crabtree Swamp Aquatic Restoration Project. This project aims to restore habitat for native species by reconnecting adjacent floodplains. The restoration may also result in improved water quality. The Kingston Lake Watershed Plan developed in 2005 with funding from a US EPA Wetlands Program Development Grant, identified the restoration of Crabtree Swamp as a priority goal.

Frequently observed impacts of repetitive flooding on the Waccamaw include decreased conductivity and dissolved oxygen. Most notable was an extensive period during which the oxygen saturation was less than 60% (May 2020 through November 2020). During 2020, 30 percent of the oxygen measurements contravened the regulatory water quality standard of 4.0 mg/L. Nevertheless, no major fish kills were reported in 2020. Dissolved oxygen is the parameter which most often contravenes the regulatory water quality standard in the Waccamaw River Watershed. The low dissolved oxygen measurements in the Waccamaw River have resulted in an approved TMDL for the lower half of the river in 1999. Based on the entire volunteer monitoring dataset collected since 2006, 24% of the dissolved oxygen measurements in the main stem of the Waccamaw River have contravened the water quality standard. This occurs primarily during summer and fall, when water temperatures are higher thus decreasing the solubility of oxygen in water. Low dissolved oxygen is a natural occurrence in blackwater rivers but can

also be an indicator of pollution and should be considered when evaluating the health of the Waccamaw River.



Image 4 – Waccamaw volunteers smile behind their masks during sampling.

### ***Surfside Beach (SB)***

Two Surfside Beach sites have been monitored since 2010 by five volunteers. Ken Harth continues to serve as the field leader for this program. Carol Harth also provides rain data as a CoCoRaHs volunteer observer.

Beginning in 2019 and continuing into 2020, at the request of the stormwater manager, volunteers performed additional sampling in Myrtle Lake to identify sources of E. coli and continued additional sampling in Lake Dogwood to identify sources of turbidity and E.

coli. In both cases, the additional sampling was undertaken in response to elevated levels having been detected during routine sampling.

Lake Dogwood continues to experience turbidity levels that are significantly higher than seen from 2010 to 2018. These higher levels have been attributed to sediment runoff from construction work upstream of the town and shallowing of the lake over the years. The town plans to perform maintenance dredging of the lake in the near future.

Water quality reports were presented at quarterly meetings of the Town’s Stormwater Committee to summarize the town’s volunteer water quality monitoring and SCDHEC’s beach monitoring data.



Image 5 – Surfside Beach volunteers sample on a cold morning.

### ***Briarcliffe Acres (BA)***

The Town of Briarcliffe Acres has been monitoring two upland lake sites and one site in the Briarcliffe swash since 2019. Additional samples are also collected at the head and the mouth of the swash for regulatory-level Enterococcus analysis by CCU’s state certified Environmental Quality Lab. The goal of this work is to investigate the role of the swash as a potential source of Enterococcus contamination to a 303(d) listed site located downstream in the surf zone. By the end of 2020, sufficient data had been collected to establish site-specific norms. As in the other volunteer programs,



these site-specific norms are used by the volunteers to identify anomalous results and are included in sampling event reports (aka provisional reports) sent to the Town of Briarcliffe Acres and the Horry County Stormwater Department’s watershed planner. An online training event was held in Spring 2020 to teach the volunteers and town’s stormwater committee how to interpret these provisional reports. Also, in Spring 2020, a harmful algal bloom was reported in South Lake and discussed with SC DHEC’s new SC HABNet’s coordinator.



Image 6 – Briarcliffe Acres volunteer monitors use a golf cart to get around to their sampling sites.

**Murrells Inlet (MI)**

Eight Murrells Inlet sites have been monitored since 2008 by two dozen volunteers. Bob Steffens continues to serve as the field leader. In 2020, the Murrells Inlet Watershed Committee continued to meet, albeit via Zoom. Several volunteer monitors are on the committee and the board of directors for Murrells Inlet 2020. In both capacities, they have sought to inform implementation of the Murrells Inlet watershed-based plan approved by SC DHEC in 2014 that includes their volunteer monitoring data.

In 2020, E. coli concentrations frequently contravened the SC DHEC Class FW water quality criteria (349 CFU/100 mL) and the EPA recommended threshold (235 CFU/100 mL) as shown in the following table. At all but the saline sites, stormwater BMP’s have

been in place for several years. These BMP’s were funded by a US EPA 319 grant.

Site name	Total samples	WQS Percent Exceedances		BMP Notes
		235 CFU/100 mL	349 CFU/100 mL	
BHR	23	87%	87%	Filtrex filter sock
HS	23	83%	70%	Filtrex filter sock
Woodland Drive Pond	23	57%	52%	Floating Wetlands
Marina Colony Pond	23	35%	35%	Floating Wetlands
Bike Bridge	23	35%	22%	Constructed Wetlands
Rum Gully Creek	23	0%	0%	Saline
Oyster Landing Beach	21	0%	0%	Saline



Image 7 – Murrells Inlet volunteers at their monitoring site

**CCU Campus**

The goal of CCU’s Campus Monitoring Program is to provide an assessment of water quality conditions in the stormwater ditches and retention ponds on campus, all of which eventually send waters off campus towards the Waccamaw River. This program was started in 2009 to help meet the requirements of a wetlands permit issued to enable construction of Wall Pond. A web page with a program description and portal to the data is located at: <https://www.coastal.edu/www/vm/programs/campus/>.

Campus water quality monitoring at CCU occurred throughout the year. During 20, 34 undergraduate students and 1 graduate student sampled 3 sites on the Coastal Carolina University campus. While

sampling is typically performed weekly, COVID presented an unforeseen difficulty for the program and sampling was done whenever possible. All students participating in the CCU Campus monitoring program are trained. Training covers laboratory procedures, field measurement protocol, and meter calibration. These topics are covered in two sessions for all students.

The Engineering Program at CCU, is led by Dr. Monica Gray. The Program is four years old with a goal to train future leaders by engaging students in real-world community-based projects. The Program seeks to integrate Consortium activities in the engineering curriculum; such as community-based projects in the introduction to engineering, cornerstone and capstone courses. During the fall 2020 semester a successful prototype of these activities was conducted in ENGR 199/299 Cohort Grant Challenge I & II cornerstone course sequence. The objective of this two-course sequence is for students to identify and formulate complex engineering problems utilizing the National Academy of Engineering's 14 Grand Challenges for Engineering in the 21st century as a framework for community-based projects. Projects, including a collaboration with Georgetown County Stormwater, were focused on various aspects of the Grand Challenge – “*Provide Access to Clean Water*”. Collaborating with representatives from municipalities and educational providers that are members of the Consortium to provide current stormwater-related engineering design challenges to student groups. Students also competed in EPA's Campus Rainworks Challenge – Green Infrastructure competition.

Water quality data collected by the Waccamaw River and the Coastal Carolina University campus monitoring programs was reported for the 2020 Secchi Dip-In and to the World Water Monitoring Database. All sampling data is shared with both programs. Data uploaded included between 19 - 23 sampling dates for each of the 18 Waccamaw River sites and 20 - 24 sampling dates for the 3 Coastal Carolina sites, for a total of 462 samples.



Image 8 – CCU students sample on Wall Pond.

### **Volunteer Involvement**

#### **North Inlet Winyah Bay Clean Team Cleanup**

On January 5<sup>th</sup>, the NI-WB NERR initiated the North Inlet Winyah Bay Clean Team Cleanup initiative. The goal of the program is to make the vision of trash-free bay a reality. An open house for new friend groups to engage and recruit volunteers for research, monitoring and outreach activities such as water quality, phytoplankton, shorebirds, and community education events was organized.

#### **Storm Drain Marking - Coastal Montessori**

The CWSEC is continuing the storm drain marking program and data collection effort. Storm drain marking promotes awareness that storm drains transport pollution directly to local waterways. Marking volunteers such as students and Scout groups conduct research to investigate possible sources of pollution going into the drains and to determine whether markers result in pollutant-reducing behaviors.

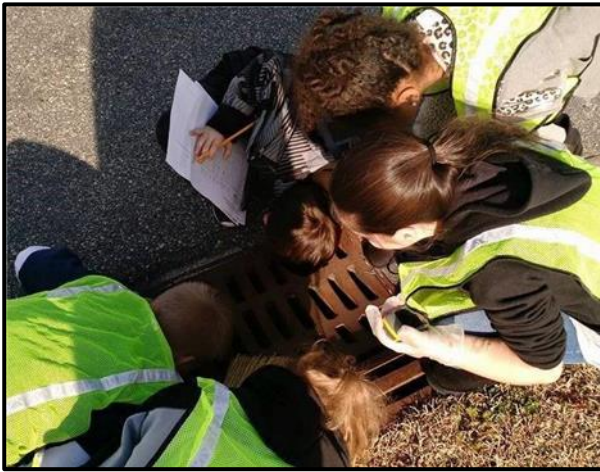


Image 9 – Storm Drain Marking Program

## Technical Assistance

### Technical Advisements

Several technical advisements were provided by the Waccamaw Watershed Academy serving all CWSEC communities, to a variety of sources including MS4s, the US EPA, and university students from across the state and country.

The WWA participated in a research study in aquatic citizen-based/volunteer water monitoring. This research is intended to help understand ongoing programmatic needs and impacts related to volunteer water monitoring as a result of COVID-19, and to define next steps for shared learning among program coordinators.

Collaborators from the SCCIN developed four two-hour continuing education elective courses to provide real estate professionals up-to-date information and resources on four topics – coastal ecosystem/biodiversity, water quality at the neighborhood level, flooding and flood maps, and rebuilding regulations. From these topics, continuing education courses were developed under the

Calling the Coast Home Series including: Coastal Lifestyle for Clean Water; The Land Water Connection; Living with Water; and Tidelands, Water & Beach: Regulations & Rebuilding. To date each of the four courses have been offered virtually (May 13, June 18 & 23, and July 23).

In 2019, the products completed as part of the Collaborative include the Stormwater Ponds in Coastal South Carolina State of the Knowledge Full Report and Executive Summary. The comprehensive report contains up-to-date scientific findings on stormwater ponds, their effectiveness as a control measure, pollutant levels, public perception, and best management practices, as well as a listing of knowledge gaps regarding stormwater ponds in South Carolina. Hardcopies of the report were published/printed March 2020 but due to pandemic very few have been distributed (approximately 25); however, the report PDF has been downloaded from the SC Sea Grant Consortium website 312 times. PDF versions are available for download from the S.C. Sea Grant Consortium’s website at <https://www.scseagrant.org/sc-stormwater-pond-research-and-management-collaborative/>.

Results of the SOK examination provide a firm foundation for future research and development efforts which will have economic, environmental, and public health benefits for the region and state as it addresses the challenges of continued development, ecosystem and public health, and changes in climate and weather.

## **CONCLUSION**

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In 2020, despite the COVID-19 pandemic's impact, the Coastal Waccamaw Stormwater Education Consortium continued to achieve its primary goal of developing and implementing effective stormwater education and outreach programs for member SMS4s located across the Waccamaw River Basin and coastal watersheds along South Carolina's northern coast in order to maintain compliance with NPDES Phase II federal requirements. Although the number of activities was less than previous years due to impacts of the COVID-19 pandemic, the collaborative approach taken by CWSEC core education providers and member SMS4s resulted in the successful completion of activities outlined in the 2020 Activity Plan as well as additional efforts beyond the plan that sought to address multiple target pollutants and audiences.

Earlier this year, Lisa Swanger, former CWSEC Coordinator left the position creating a vacancy in this role. Ms. Victoria Green became the Interim CWSEC Coordinator, covering major duties in addition to her role as the Volunteer Monitoring Coordinator of WWA. In Summer 2020, Dr. Monica Gray assumed the role of CWSEC Director. In her role as Program Director for CCU's Engineering Program, her goal is to integrate CWSEC activities in the engineering curriculum as well as leverage the skills and talent of students as a resource to address the needs of CWSEC members. In November 2020, Ahmed Bakr joined the CWSEC as the new Coordinator. Despite significant impacts in 2020, CWSEC strategically provided a myriad of high-quality stormwater education and outreach (MCM #1) and involvement (MCM #2) activities in support of the NPDES Phase II permit program. Additional activities executed throughout the year assisted member SMS4s to meet other minimum control measures as well, including illicit discharge detection and elimination (MCM #3) and good housekeeping practices (MCM #6). Using a regional watershed approach, CWSEC continues to serve as a model for collaborative stormwater education

and involvement that seeks to increase stormwater and watershed awareness, inform decision-making, and promote behavior change to address water quality impairments in South Carolina.