



South Carolina Beach Water Quality: Stakeholder Workshop Identifies Challenges, Needs, and Recommendations

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Abstract. Coastal water quality is often identified by diverse stakeholders as a major management challenge but can be difficult to define. South Carolina Beach Advocates (SCBA), a nonprofit organization formed in 2015 to educate the public, governmental authorities, and elected officials as to the environmental, economic, and societal impact of South Carolina's beaches and inlets, recognized this challenge and organized a virtual workshop in June 2022 to explore our beachfront communities' water quality management challenges, and discuss various perspectives on beach water quality. Thirty-eight participants from government agencies, local government, industry, academia, and civic society discussed this important topic and identified challenges and concerns, general requirements, needed new capabilities, and recommendations for next steps. Following the workshop, a Beach Water Quality Subcommittee was formed under the auspices of the SCBA to continue this important conversation.

MOTIVATION

Coastal communities worldwide are facing significant challenges, including sea level rise, extreme weather events of increasing intensity such as hurricanes, and amplified pressures from growing populations and urbanization, etc. Identifying and prioritizing areas of concern from an ever-expanding list is a crucial albeit complex task. Elko and Briggs (2020) reported on an extensive effort in 2018–2019 to document the most pressing problems facing U.S. coasts according to 134 coastal stakeholders from all 50 states, including local community representatives, industry consultants, state and federal agency representatives, and academics. The top five coastal management challenges identified by stakeholders included: deteriorating ecosystems, increasing storminess (more frequent and intense impacts), coastal flooding, chronic beach erosion, and coastal water quality. A notable finding of this study was that while erosion and flooding are often the primary concern, water quality jumped to the fore in regions where acute issues occur, such as harmful algal blooms in Florida.

The definition of beach water quality varies widely depending on the problems faced by a coastal community, the objectives of an academic exercise, the mandates of a government agency, or the special interests of non-profit groups. Hannides et al. (2021) explored the aspects of this definition

in a white paper on behalf of the Science and Technology Committee of the American Shore and Beach Preservation Association (ASBPA). They reported beach water quality monitoring efforts and discussed various physical (temperature, salinity/conductivity, turbidity), chemical (oxygen, nutrients, organic and metal contaminants, carbon dioxide and pH, nitrogen and sulfur dioxide) and biological (chlorophyll, coliforms, fecal indicator bacteria) parameters that are often used to identify and assess beach water quality across the U.S. Acknowledging that different perspectives lead to different definitions, they urged a move towards a more holistic and synergistic water quality definition which would further encourage and strengthen science-based policy by better describing the health of aquatic ecosystems.

Diverse perspectives can be extremely powerful and beneficial in a collective exercise, such as the definition of water quality, since they can address a broader spectrum of concerns and generate extensive consensus. While government agencies are concerned with public and environmental (ecosystem) health and resource management, the industry sector may be more focused on resource use, engineering solutions, and environmental consulting. Academics are focused on the generation and synthesis of knowledge, and civic society may be more concerned with specific interests, such as quality of life, environmental protection and conservation, and recreational activities such as bathing, fishing,

and boating. These varied perspectives typically do not intersect on a daily basis and intentional effort must be made to do so, and thus make the formulation of a synergistic broadly acceptable definition of beach water quality possible.

The authors of this article proposed to review this topic and its intricacies in the spirit of the aforementioned ASBPA white paper (Hannides et al. 2021) as it applies to S.C. during meetings of the Organizing Committee of the 2022 Annual Meeting of the nonprofit organization South Carolina Beach Advocates (SCBA). SCBA was founded in 2015 by elected officials of coastal communities in South Carolina (S.C.) to educate the public, governmental authorities, and elected officials as to the environmental, economic, and societal impact of S.C.'s beaches and inlets and to advocate for their preservation. The Organizing Committee conversations led to the realization that more time should be devoted to discussing this topic, perhaps by a discussion panel during the upcoming Annual Meeting of 2022. Instead, the SCBA announced in January 2022 that the topic of S.C. beach water quality would be the focus for its inaugural virtual summer workshop, Coastal Conversations 2022.

A Steering Committee for the virtual workshop was formed with a composition representative of the various stakeholder groups, as follows:

- Government agencies: Lindsey Lachenmyer and Bryan Rabon (S.C. Department of Health and Environmental Control), Denise Sanger (S.C. Department of Natural Resources, ACE Basin NEER)
- Local government: Janet Curry (City of Myrtle Beach)
- Industry: Patrick Barrineau (Coastal Science & Engineering)
- Academia: Angelos Hannides (Coastal Carolina University, *Committee Chair*)
- Civic society: Annie Mercer (ASBPA), Nicole Elko (SCBA, *ex officio*)

The Steering Committee met monthly and discussed the workshop duration and format, key topics, potential speakers, and the desired outcomes. The need to review the current state of knowledge and concerns/challenges as well as to generate a list of future actions and goals were both acknowledged. Moreover, there was a strong desire to devote most of the time to discussions rather than presentations, resulting in a schedule structure consisting of short five-minute talks followed by breakout groups and ending with reports back to plenary and discussion (more details are provided in the next section). Speakers and participants were recruited by Steering Committee members to cover all types of perspectives through personal contacts and the SCBA mailing list, respectively.

WORKSHOP PROCEEDINGS

The virtual workshop took place over two days, June 22–23, 2022, at 1:00–3:30 PM through the software platform Zoom, hosted by Coastal Carolina University. A total of 38 participants attended and were fairly evenly distributed among the main stakeholder categories identified during the planning phase (Figure 1).

The first day of the workshop was devoted to present conditions, concerns, and challenges. The second day was focused on future goals and recommendations for actions needed to achieve these objectives.

Sessions began with five-minute “Perspectives” presentations aiming to fuel the conversations in groups that would follow. Speakers were asked to structure their short perspectives around the following three topics:

1. Introduction: What is your role in managing/monitoring beach water quality as it relates to the session title? How do you do this? What is going well?
2. Today's challenges: What are your concerns or challenges in providing this service? What are the research, data, or monitoring gaps? Are there opportunities to make small changes now to existing programs/efforts that would address these needs? What low hanging fruit/modifications would give us the most “bang for the buck”?
3. Future needs and new directions: what is the next major challenge/concern, parameter to monitor if known? How can existing programs be modified to address these needs? Are new programs needed? Which advancements are the priorities?

Each 50-minute presentation session was followed by hour-long discussions in three conversation groups moderated by Steering Committee members or speakers, and populated voluntarily by participants. The organizers identified specific objectives which aimed to focus the conversation as well as deliverables that were reported back to plenary and discussed during the final 40 minutes of the meeting on each day. The themes and topics of perspectives and conversations are detailed in Table 1.

WORKSHOP OUTCOMES

The short sections that follow detail the outcomes of the final conversations in plenary at the end of each day's proceedings as these were drafted by the workshop organizers. The language used below was carefully selected to reflect the general agreement amongst participants on topics that should be explored further since elaboration wasn't possible during our five-hour workshop. Following the workshop, a Beach Water Quality Subcommittee of the SCBA was formed, and

South Carolina Beach Water Quality

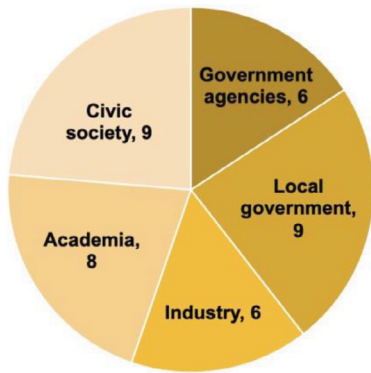


Figure 1. Workshop participant distribution by stakeholder category (total = 38).

it meets quarterly to provide an ongoing conversation forum on the following topics.

CHALLENGES AND CONCERNS

Four major challenges or concerns were identified by the workshop participants:

- Ongoing and, in many cases, accelerating development in the coastal zone and the accompanying expansion of impervious surfaces;

- The compounding effects of major pressures and inputs that will intensify in the future, such as sea level rise, rainfall, and flooding, and the concomitant issues of stormwater and/or wastewater treatment and management;
- Lack of adequate funding, which prevents translating research findings into implemented monitoring programs with appropriate data analysis and user-friendly reporting mechanisms. For instance, the BEACH Act Grant Program, which provides much of the funding for pathogen monitoring in coastal recreation waters, does not account for increased costs due to inflation, and there is a lack of state funding to match this shortfall; and
- Responsible and accurate notification mechanisms that protect public health while considering coastal tourism economies.

REQUIRED NEXT STEPS

The workshop participants identified several required immediate next steps that address the challenges and concerns:

- Definition of water quality and water quality parameter(s) and the spatial scales (e.g., coastal or watershed) over which they are monitored;

Table 1. Themes and topics of perspective presentations and group conversations.

Perspectives presentations—Topics	Conversations—Objectives and Products
Day 1: Where are we? What are our present concerns and challenges?	
<u>Communities share their concerns</u> <ul style="list-style-type: none">• Fripp Island Resort (K. Schulz)• Kiawah Island Community Association (M. Hill)• City of Folly Beach (E. Lutz)	<u>Objective: Assess present concerns and challenges</u> <ul style="list-style-type: none">• What is going well?• What are areas of concern or need?• Are there opportunities to make small changes now to existing programs/efforts that would address these needs?• What low hanging fruit/modifications would give us the most “bang for the buck”? <u>Deliverable: Lists of needs, obstacles, and ideas for advancements</u>
<u>Agencies/organizations present monitoring and notification activities</u> <ul style="list-style-type: none">• The Blue Flag Program (A. Mercer)• Long Bay monitoring activities (S. Libes)• S.C. Beach Monitoring Program (L. Lachenmeyer)	
Day 2 – Where are we headed? What actions need to be taken to get there? Recommendations?	
<u>Important processes and parameters</u> <ul style="list-style-type: none">• Rivers and watersheds (C. Schildtknecht)• Sandy shores and swashes (A. Hannides)• Vibrio, fair-weather flooding and community engagement (G. Scott)	<u>Objective: Future pathways, tools/capabilities in consideration of Day 1 needs and concerns</u> <ul style="list-style-type: none">• What processes and/or indicators are we missing?• What research is needed?• How can existing programs be modified to address these needs?• Are new programs needed?• Which advancements are the priorities? <u>Deliverable: List of needed new capabilities and recommendations</u>
<u>Future Needs and Directions in Beach Water Quality</u> <ul style="list-style-type: none">• A S.C. Department of Health and Environmental Control perspective (B. Rabon)	

- Consideration of the different needs of diverse coastal communities;
- An updated statewide inventory of federal, state, and local coastal water quality monitoring efforts and local wastewater treatment approaches;
- Expansion of the spatial and temporal coverage of monitoring efforts;
- Data integration, preceded by a determination whether standardization is needed;
- Effective communication with the public and decision-makers on water quality issues and incidents, with appropriate notification mechanisms and information campaigns, as well as in support for local regulations;
- Education and outreach activities about the impacts of pollution in watersheds (including stormwater ponds) on beaches which are the ultimate receiver of upstream inputs; and
- Support for innovative solutions, including real-time sensor technologies in nature and infrastructures, novel wastewater treatment practices, natural or nature-based features as mitigation tools, and adequate workforce training in potential innovations.

NEEDED NEW CAPABILITIES

A set of new parameters that should be monitored were identified as key in tackling the challenges/concerns and requirements discussed above:

- Parameters known to trigger harmful algal blooms;
- *Vibrio* in surface waters, in addition to currently monitored *Vibrio* in shellfish;
- Water flow velocity, continuous flow, and discharge between water bodies in the coastal region;
- Toxins in biota which are known to bioaccumulate them;
- Shore sand microbial community function and its interaction with pollutants; and
- DNA fecal source-tracking to protect human health.

The participants noted the need to develop South Carolina-specific indices and thresholds for both existing and new water quality parameters to better direct and focus monitoring efforts towards appropriate spatial and temporal scales.

The need for new observations and modeling efforts was also discussed and the following four areas were stressed:

- Eutrophication in estuarine and coastal ocean waters;
- Monitoring in the nearshore, i.e., the three-mile zone from the shore;
- Salt marsh health indicators, especially nutrient assimilation capability and increasing vulnerability that impedes this important ecosystem service; and
- Water quality modeling with expanded parameters and dissemination products for the public.

RECOMMENDATIONS

The workshop's proceedings culminated in a set of four recommendations for the next steps:

1. The creation of a S.C. Water Quality Community of Practice, accomplished by:
 - Facilitating ongoing conversations/collaborations on issues, best practices, and next steps. At the time of the writing of this article, the SCBA had already formed a Beach Water Quality Subcommittee in response to this recommendation,
 - Providing networking opportunities for diverse stakeholders, including practitioners, academics, and communities, in direct continuation of the 2022 Coastal Conversations workshop,
 - Encouraging towns and communities to share lessons learned and to coordinate on project funding opportunities in order to enhance fundraising success and to pool resources,
 - Forming collaborations between state and research/academic communities to help characterize and address emerging issues.
 - "Telling the Story": Educating elected officials and the public as to ongoing activities, emerging issues, new findings, and funding needs.
2. Addressing the next major issues and parameters by focusing on select issues and/or parameters of higher priority, e.g., those related to human health, while keeping in mind that diverse beach communities will most likely have different concerns, e.g., shore vs marsh impairment, flooding vs. wastewater treatment, etc.
3. Inventory existing data and knowledge within the state by:
 - Creating a singular centralized location that can provide links to existing programs and historical repositories of information, especially grey literature,

- Working with S.C. Sea Grant Consortium and other organizations to expand and constantly update the statewide inventory of monitoring programs and encourage collaboration between programs and users.
4. Work with and within the existing policy framework by expanding it where possible, since establishing new legislation, regulations, and ordinances often takes significantly more time than amending existing ones.

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