2026

Coastal Carolina Riverwatch

Water Quality for Fisheries: An Assessment of Accomplishments

Grant Performance Period: July 1, 2023 – June 30, 2026 (OSBM Grant ID 41121)

Executive Summary

State investment enabled a lean, cost-effective program to deliver measurable outcomes for North Carolina fisheries, public health, and coastal economies.

Preparedness & response	Engagement & coordination	Research deliverables
• 44 trained in HAB identification; 87 reached via on-demand training video • HAB and fish kill reporting + notification system implemented • Screening SPATT detected microcystin in 50% of samplers (Jul–Sep 2025)	• 2025 Symposium: 121 registrations (119 unique names) from 45 organizations • 34 scholarship-code registrations; 21 speakers; multi-sector participation • Community engagement: 30+ events; 1,200+ direct engagements; 70+ volunteer sign-ups	• CCRW Technical Report: PFAS & heavy metals screening in oysters • RTI/CCRW plastics pilot dataset (New River sampling) • Identified priority research gaps to guide next-phase investments

Learn more / reporting tools

• CCRW Water Quality for Fisheries program:
https://coastalcarolinariverwatch.org/water-quality-for-fisheries/

• CCRW Algae Bloom Response (how to report):
https://coastalcarolinariverwatch.org/algae-bloom-response/

• NCDEQ Algal Blooms information & reporting:
https://www.deq.nc.gov/about/divisions/water-resources/water-sciences-section/algal-blooms

• NCDEQ Fish Kill & Algal Bloom Dashboard:
https://www.arcgis.com/apps/dashboards/7543be4dc8194e6e9c215079d976e716

Executive Summary (continued)

Why this work matters

• Protects water quality that underpins commercial, recreational, and subsistence fisheries and working waterfronts.

• Improves awareness and reporting pathways for harmful algal blooms and fish kills—reducing risk to people, pets, and seafood consumers.

• Generates actionable monitoring and research products that help local governments and agencies target stormwater, wastewater, and industrial pollutant solutions.

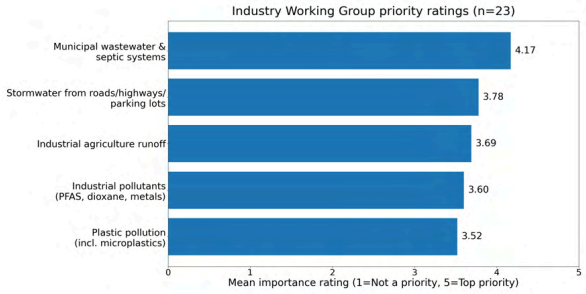
• Operates efficiently with limited funds by leveraging partnerships, student/intern capacity, and shared data systems.

What stakeholders prioritized (2025 IWG check-in)

• Municipal wastewater & septic systems

• Stormwater from roads/highways/parking lots

• Industrial agriculture runoff



Mean importance ratings (1–5), n=23 responses

Next steps and research gaps

• Sustain and expand HAB early-warning capacity (community reporting, passive monitoring, and targeted confirmation sampling).

• Continue seafood contaminant screening to characterize exposure pathways and identify hot spots (PFAS, metals, plastics/tire-derived chemicals).

• Strengthen local government partnerships to translate findings into stormwater, wastewater, and watershed policies and investments.

• Maintain transparent governance with annual public reporting of outputs, outcomes, and stakeholder priorities.

Program Overview

Contract period note: The original OSBM grant term (July 1, 2023–October 3, 2025) was extended through June 30, 2026 to support project completion, final reporting, and closeout deliverables (OSBM Grant ID 41121).

This report summarizes Coastal Carolina Riverwatch's Water Quality for Fisheries (WQ4F) accomplishments across the full OSBM grant performance period (July 1, 2023–June 30, 2026), including the primary implementation window (January 2024–October 2025), and serves as the project closeout report for OSBM Grant ID 41121. Coastal Carolina Riverwatch advanced the program through four integrated areas of focus: responding to harmful algal blooms and fish kills; building research capacity on pollutants that threaten fisheries; expanding community education and outreach; and strengthening partnerships with commercial, recreational, and subsistence fisheries stakeholders, aquaculture operations, researchers, and state and local agencies. With focused state funding and broad collaboration, the program delivered measurable outputs and decision-ready products that demonstrate efficiency, effectiveness, and strong public value for coastal communities and North Carolina's working waterfronts.

Community training was completed, and new monitoring sites were established to enhance early warning systems for harmful algal blooms and fish kills. These actions enhanced preparedness and provided communities with new tools to protect local waters and fisheries.

Public outreach expanded measurably. As of October 14, 2025, CCRW's combined following across Facebook, Instagram, and TikTok reached 5,360 people. The most successful outreach post reached more than 23,000 views, demonstrating the program's ability to draw attention to fisheries and water quality issues. The program's newsletter audience also grew to 1,928 subscribers as of July 2025, with segmented campaigns reaching open rates as high as 75–80%. This growth indicates that more people are not only becoming aware of the work but also actively engaging with it.

Research work moved forward efficiently and produced completed deliverables. CCRW and partners executed baseline assessments for plastics- and tire-associated chemicals in the New River, completed PFAS and heavy-metal analyses in farmed and wild oysters, and translated results into technical reporting products and plain-language outreach materials.

Partnerships were a cornerstone of the program's success. CCRW worked closely with leading universities, state agencies, local governments, and commercial, recreational,

and aquaculture fishermen. These collaborations ensured that limited resources stretched further and produced stronger results.

The work completed under this grant demonstrates a strong return on investment for the State of North Carolina. With limited funding and staff capacity, CCRW leveraged university, agency, and industry partnerships to build tools for faster response, expand public engagement to thousands of coastal residents and visitors, deliver new contaminant datasets and technical reporting, and convene cross-sector stakeholders. These outcomes establish a replicable framework that can be scaled with sustained funding to protect water quality, public health, and the long-term viability of coastal fisheries.

This work was made possible through a $180,000 OSBM-administered grant (Grant ID 41121). State funding supported staff capacity, research partnerships, monitoring equipment and logistics, and public-facing education materials. A contract amendment extended the grant term through June 30, 2026 to support completion of approved deliverables and closeout reporting. The accomplishments summarized in this report demonstrate alignment with OSBM objectives for efficiency, measurable public benefit, and strengthened community preparedness.

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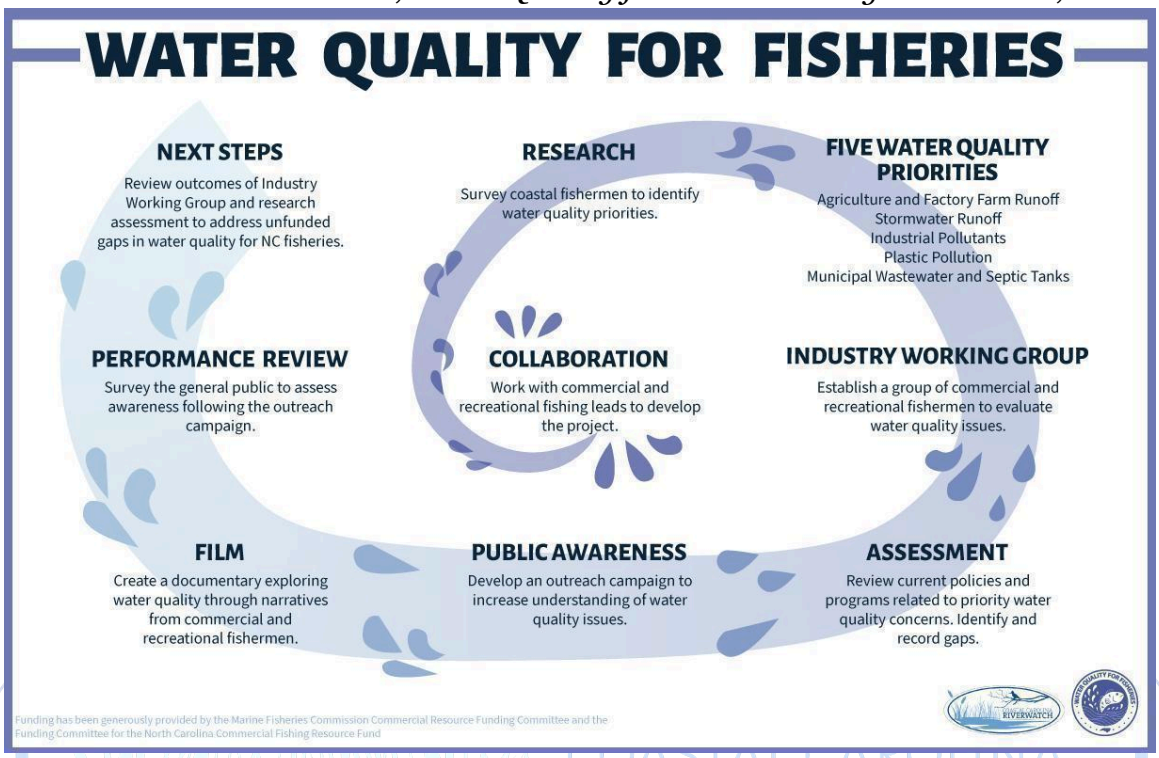
GRAPHIC: Noah Weaver, *Water Quality for Fisheries Program Outline*, 2021



Acknowledgments

This document is dedicated to the past, present, and future resilient generations of coastal communities in North Carolina.

This document was prepared by:

Lisa Rider, Executive Director, Coastal Carolina Riverwatch

Riley Lewis, Waterkeeper, Coastal Carolina Riverwatch

Cate Arnold, Water Quality for Fisheries Intern 2024 (CCRW)

Caroline Zuber, PhD Candidate, Duke University

Dr. Walker-Franklin, RTI International

Stacy Dominguez, Water Quality for Fisheries Assistant (CCRW)

Allison Padgett, Water Quality for Fisheries Intern 2025 (CCRW)

Meara Kane, Algae Bloom Student Fellow (NCSU), Algae Bloom Intern 2025 (CCRW)

The document benefited from the collaboration and support of many others.

Key Results at a Glance

Metric	Result
HAB community training	44 participants trained (2024)
HAB toxin monitoring	4 active SPATT monitoring sites; 6 deployment locations tested (2025); microcystin detected in 50% of July–Sept 2025 collections (screening-level)
Community engagement	30+ events and 1,200+ direct interactions; 381 oyster survey responses collected; multiple workshops and symposia convened across coastal NC
WQ4F Symposium participation	2024: 43 participants; 2025: 121 registrations (119 unique names), including 21 speakers; 34 scholarship-code registrations; 45 organizations represented
Industry Working Group	23 check-in survey responses (Oct 2025); HAB and Fish Kill resources workshop reached 32 participants (Jul 2025); ongoing convenings to coordinate priorities with fisheries sectors, researchers, and agencies
Social media	5,360 combined followers (Oct 14, 2025); top post reached 23,336 views

Newsletter	1,928 subscribers (July 2025); segmented campaigns reached 75–80% open rate
Collaborative research	Completed PFAS & heavy-metal analyses in farmed and wild oysters (CCRW Technical Report, 2025) and delivered RTI's New River plastics/tire-chemical screening dataset (2025) with ReadMe
Tools & materials developed	HAB reporting resources, multilingual outreach materials, and workshops to strengthen incident reporting and response readiness

Introduction

Coastal Carolina Riverwatch (CCRW) is a nonprofit organization dedicated to protecting the water quality and overall quality of life in coastal North Carolina. The Water Quality for Fisheries (WQ4F) Program is a core initiative of CCRW, established in 2021 to address the growing impact of water pollution on the state's commercial and recreational fisheries. This program was developed in direct response to concerns raised by fishermen, aquaculture operators, and community members who depend on healthy waterways for their livelihoods and way of life.

The WQ4F Program is designed to identify, monitor, and respond to water quality threats that impact fisheries, employing a comprehensive approach grounded in science, collaboration, and public engagement. It focuses on five key categories of concern identified through statewide surveys and stakeholder meetings: agricultural runoff, including runoff associated with concentrated animal feeding operations, stormwater runoff from roads and urban areas, industrial pollution, plastic contaminants, and wastewater system failures. Each of these priorities poses a risk to aquatic ecosystems and to the communities that rely on them.

This report documents work completed across the OSBM grant performance period (July 1, 2023–June 30, 2026), including the primary implementation window (January 2024–October 2025). Closeout reporting was completed May 2026. Where individual metrics (e.g., event logs) were tracked for shorter windows, the specific measurement period is noted.

The WQ4F Program continues to evolve as a living, community-informed model. Updates, educational resources, and reporting tools are maintained on CCRW's website to ensure transparency and accessibility. This report is part of an ongoing effort to support a cleaner, healthier coastal environment and to strengthen the resilience of North Carolina's fisheries.

This report fulfills the performance and documentation requirements of the **North Carolina Office of State Budget and Management (OSBM)** grant supporting the *Water Quality for Fisheries (WQ4F) Program*. All activities, metrics, and outcomes described in the following sections correspond to the approved OSBM Scope of Work, which emphasizes measurable progress in research, monitoring and response, community education, and industry partnership development. The information

presented herein demonstrates compliance with the state's performance-based reporting standards and highlights how OSBM funding directly advanced program objectives and public benefit.

OSBM Scope of Work Alignment

The table below summarizes how major OSBM Scope of Work task areas align with accomplishments documented in this report:

Task area	Performance requirement (summary)	Evidence in this report	Status
Stakeholder engagement	Increase stakeholder participation by 15% over 2024 baseline.	IWG meeting participation increased from 5 attendees (Aug 2024) to 23 attendees at the July 2025 HAB and Fish Kill workshop; expanded representation across commercial, recreational, aquaculture, research, and agency partners; 23 check-in survey responses (Oct 2025)	Met
WQ4F Symposium	Increase Symposium participation over 2024 baseline.	2024: 43 participants; 2025: 121 registrations (119 unique names), including 21 speakers; 120 in-person participants.	Met
HAB and fish kill response	Build response/notification capacity and establish	44 participants trained; weekly DEQ dashboard review protocol; SPATT	Met (core system established; continued

	baseline response metrics.	monitoring network established; resource hub and reporting tools deployed; baseline response metrics compiled from DEQ dashboard timestamps.	monitoring recommended)
Assistant role activation	Hire and activate WQ4F Assistant to support coordination.	WQ4F Assistant supported data outreach, stakeholder facilitation, and internal coordination.	Met
Survey deployment	Deploy survey tools and analyze results for program direction.	IWG check-in survey deployed (n=23) and integrated into program priorities; Oyster consumer survey deployed (n=381) to guide outreach and risk communication.	Met
Research execution	Advance research on contaminants affecting fisheries.	Completed PFAS & heavy-metal analyses in oysters (CCRW Technical Report, 2025); delivered RTI New River non-targeted screening dataset and ReadMe (2025) for plastics/tire-associated chemicals; conducted SPATT toxin tracking and plankton monitoring.	Met (deliverables complete)

Community engagement & education	Increase engagement and education outputs.	30+ community events (Sep 2024–Jul 2025); 1,200+ direct interactions; 5,360 social followers (Oct 14, 2025).	Met
Partnership development	Establish at least 3 partnerships to advance research/outreach.	Expanded collaborations with Duke University, RTI International, NCDEQ/DMF, NCSU, and multiple watershed organizations.	Met

For the most recent updates, visit:
coastalcarolinariverwatch.org/water-quality-for-fisheries

Priority Areas of Concern

The Water Quality for Fisheries (WQ4F) Program focuses on five primary sources of water pollution identified by fisheries stakeholders across coastal North Carolina. These priorities were established through a statewide survey of commercial and recreational fishermen conducted by East Carolina University's Center for Survey Research in partnership with Coastal Carolina Riverwatch. The survey highlighted key areas where pollution is known to impact fisheries habitat, seafood safety, and coastal water quality.

Priority Areas:

1. **Agricultural Runoff, Including Runoff Associated with Concentrated Animal Feeding Operations**
   Excess nutrients and pathogens from concentrated animal feeding operations (CAFOs) and agricultural land use contribute to algal blooms, habitat degradation, and shellfish bed closures.

2. **Stormwater Runoff from Roads, Highways, and Parking Lots**
   Urbanization and impervious surfaces increase polluted runoff containing oil, grease, heavy metals, and other toxins that directly impact estuarine and nearshore waters.

3. **Industrial Pollutants**
   Discharges from industrial facilities, including legacy contaminants, pose long-term threats to sediment and water quality. These pollutants can accumulate in the tissue of fish and shellfish and persist in the environment.

4. **Plastic Pollution**
   Plastics, including microplastics and tire-derived chemicals, have been detected in coastal waters and shellfish. These materials contribute to both physical and chemical pollution, impacting aquatic health.

5. **Municipal Wastewater Treatment and Septic Systems**
   Aging or failing wastewater infrastructure, including municipal treatment plants and decentralized septic systems, introduces nutrients, bacteria, and pharmaceuticals into coastal ecosystems.

Scientific and Policy Context: Why Sustained Investment Matters

North Carolina's coastal waters support commercial, recreational, and subsistence fisheries and sustain local economies built around working waterfronts. Water quality is the foundation of these fisheries: excess nutrients and altered hydrology can trigger harmful algal blooms (HABs) and oxygen depletion, while emerging contaminants can accumulate in seafood and undermine consumer confidence. Evidence from North Carolina and the broader scientific literature shows that HAB impacts and cyanotoxin exposure are real, measurable risks that require monitoring and clear public communication (Wiltsie et al., 2018; Howard et al., 2022).

At the same time, stormwater and wastewater pathways can deliver complex chemical mixtures—including plastics-associated additives and tire-derived chemicals—into estuaries. Peer-reviewed research has identified certain tire-rubber transformation products (e.g., 6PPD-quinone) as acutely toxic to aquatic species under storm-runoff conditions, demonstrating why road runoff and stormwater chemistry are increasingly relevant to fisheries protection (Tian et al., 2021).

Persistent industrial contaminants such as PFAS also raise long-term questions for seafood safety and risk communication. Recent reviews highlight that PFAS bioaccumulation and human exposure through bivalve consumption can be site-specific and can require targeted investigation and careful interpretation (Pandelides et al., 2025).

WQ4F addresses these challenges by combining monitoring, research, education, and stakeholder convening into a coordinated framework that can be scaled. Integrated monitoring and communication approaches—linking field sampling, laboratory methods, and public reporting—are increasingly recognized as best practice for HABs and other water-quality threats (Howard et al., 2022; Tullos et al., 2025). Sustained investment is essential because water-quality threats evolve across seasons and years; long-term datasets, trusted communication channels, and strong cross-sector partnerships cannot be built through one-time funding alone.

Programmatic Approach

During 2024–2025, Coastal Carolina Riverwatch implemented a coordinated set of projects under the Water Quality for Fisheries (WQ4F) Program. These efforts focused on monitoring pollution impacts, advancing scientific research, educating the public, and engaging fisheries stakeholders in collaborative policy development. The work was guided by the five water quality priorities identified by North Carolina's coastal fishing communities and reflects a strategic approach that integrates infrastructure, policy, research, and outreach.

A significant focus of the year was the development and expansion of the Harmful Algal Bloom (HAB) and Fish Kill Response Team. This initiative enhanced detection and response times by leveraging community science, advanced monitoring tools, and inter-agency coordination. CCRW provided in-person and digital training to residents, fishermen, and coastal landowners, while also launching a public alert system and deploying toxin-tracking samplers across multiple estuarine sites. These activities directly contributed to a significant reduction in the average time required to assess and respond to bloom events.

In the field of scientific research, CCRW collaborated with Duke University, RTI International, and local oyster growers to investigate emerging contaminants in the White Oak River Basin and its surrounding coastal waters. Special attention was given to the presence of PFAS, heavy metals, and plastic-derived chemicals in oyster tissue, sediment, and surface water. Findings from these studies supported both public education efforts and ongoing support for improved wastewater infrastructure, pollution prevention, and seafood safety communication.

Community engagement remained a central pillar of the program. CCRW hosted two regional Water Quality for Fisheries Symposia and participated in more than thirty community events, distributing multilingual educational materials to increase public awareness of water quality issues. These efforts reached more than 1,200 individuals, leading to increased volunteer involvement, stronger connections with schools and educators, and growing public support for water quality improvements.

The Industry Working Group (IWG) continued to serve as a critical forum for cross-sector collaboration. Fishermen, aquaculture professionals, scientists, regulators, and nonprofit leaders met regularly to review data, share local knowledge, and shape

CCRW's research and decision-support strategies. The IWG helped develop public input opportunities, supported aerial monitoring of agricultural pollution, and generated new partnerships with agencies and municipalities focused on sustainable water management.

Together, these projects represent a comprehensive and community-centered approach to addressing water quality threats that impact coastal fisheries. The following sections provide detailed summaries of each initiative, including outcomes, metrics, and recommendations for continued progress.

Transparency and Reporting Framework

CCRW uses transparent reporting, open communication tools, and stakeholder feedback loops to keep WQ4F transparent and responsive to coastal communities and decision-makers:

WQ4F Transparency and Reporting Commitments

• Publish annual WQ4F progress reports and maintain an accessible archive of briefs, dashboards, and workshop materials.

• Share short, plain-language "Key Takeaway Briefs" on a regular cadence aligned with major closures, policy windows, or seasonal risks.

• Maintain simple reporting pathways for HABs and fish kills and track response timelines to strengthen early warning and response.

• Protect sensitive partner and grower information while providing actionable, place-based summaries for the public and regulators.

• Report back to stakeholders on how IWG and community feedback directly shaped research, outreach, and program support priorities.

• Support clear reporting, source identification, and coordinated follow-up on upstream pollution concerns.

Projects in 2024–2025

1. **Harmful Algal Bloom and Fish Kill Response Team**
    - Established partnerships and enhanced community engagement
    - Implemented response protocols for harmful algal blooms (HABs)
    - Developed educational materials and a notification system for HABs
    - Produced an annual report on HAB occurrences and responses
2. **Research and Assessment Methodologies**
    - Special studies on PFAS and heavy metals in marine life
    - Investigative research on plastic and plastic-associated chemicals
    - Conducted public workshops and seminars on water quality issues
    - Developed educational materials for community awareness
3. **Educational Impact and Community Engagement**
    - Hosted the Water Quality for Fisheries Symposium
    - Conducted outreach through social media and newsletters
    - Participated in community events and program engagement efforts
4. **Partnership Development and Industry Working Group (IWG)**
    - Created an Industry Working Group to address water quality concerns
    - Identified critical issues like nutrient pollution and habitat degradation
    - Developed recommendations for mitigating the impact on fisheries
    - Engaged the fishing community and supported their participation and priorities

Harmful Algal Bloom and Fish Kill Response Team

Project Overview and Performance Summary

The Harmful Algal Bloom (HAB) and Fish Kill Response Team project made significant progress in 2024–2025, reinforcing community preparedness and enhancing scientific monitoring within the White Oak River Basin. In collaboration with research institutions and government agencies, CCRW enhanced detection, response, and public engagement around HAB events.

The Harmful Algal Bloom (HAB) and Fish Kill Response Team achieved all key milestones outlined in the OSBM-approved Scope of Work for the grant cycle. Deliverables included one formal community training reaching 44 participants, four active SPATT monitoring sites, and twelve months of data collection and reporting coordinated with NC DEQ and NC C-CAPE.

OSBM funding directly supported labor for field sampling, educational material design, and community science coordination. These resources strengthened early-warning capacity, expanded inter-agency data sharing, and improved local readiness to respond to bloom events in the White Oak River Basin and adjoining coastal waters.

Partnerships and Initial Assessments

CCRW established and strengthened partnerships with NC State University and the North Carolina Center for Coastal Algae, People, and Environment (NC C-CAPE), contributing to the development of early detection tools and educational programs. These relationships have supported both research and community outreach, ensuring science-based, locally tailored strategies.

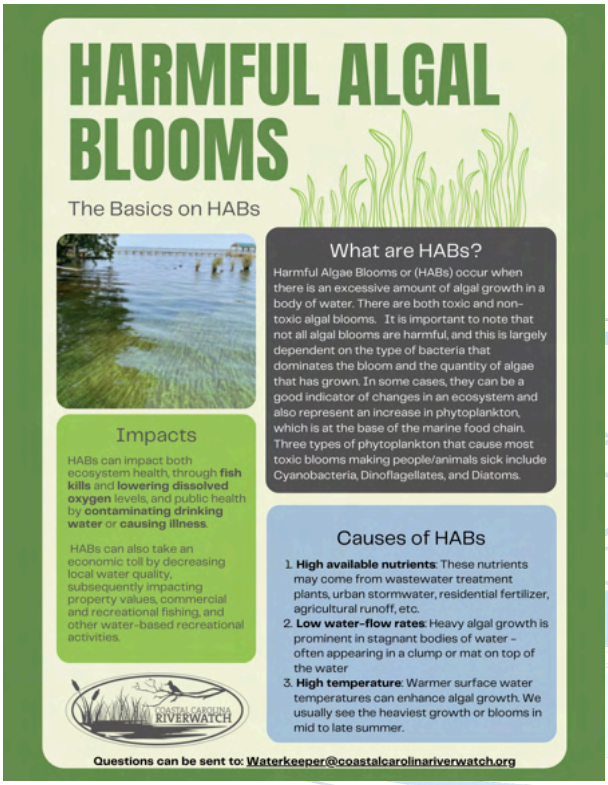
Community Engagement and Training

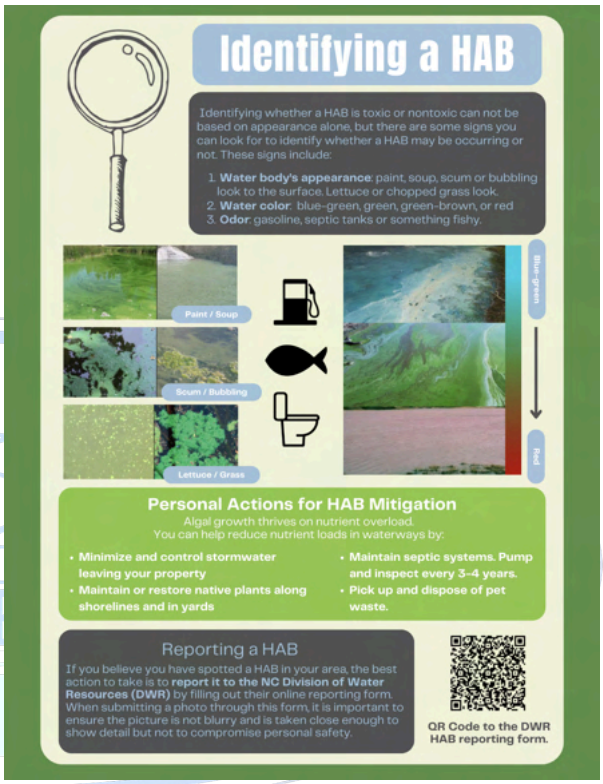
In 2024, CCRW hosted its inaugural HAB Community Training, which reached 44 participants, including commercial fishermen, riparian property owners, and concerned residents. Participants were trained to identify and report bloom events, understand the health risks associated with toxins, and use CCRW's new reporting tools. An on-demand HAB training video was distributed to 87 registrants and made accessible via CCRW's website.

Educational Materials Distributed

HAB Community Training Materials

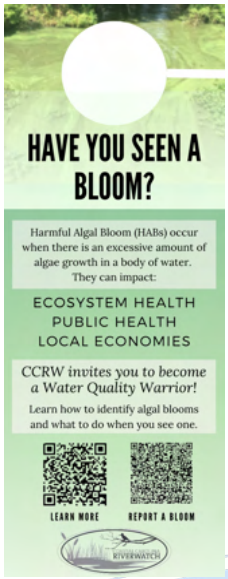
- HAB identification and health risk handouts





• Three-panel brochure on bloom prevention and reporting

• Door hangers with visual ID and contact instructions
• Infographics created in collaboration with NC C-CAPE
• Monthly newsletter inserts and a rotating social media campaign (five-part

series) 

- DWR Algae Dashboard One-Pager

CCRW's social platforms reached over 5,300 followers (5,360 as of October 14, 2025), and newsletters were sent to 1,928 subscribers as of July 2025, increasing digital engagement with HAB education and safety tools.

North Carolina Department of Environmental Quality. (n.d.). Fish Kill and Algal Bloom Dashboard. Retrieved February 15, 2026, from https://www.arcgis.com/apps/dashboards/7543be4dc8194e6e9c215079d976e716

IWG HAB and Fish Kill Resource Workshop Materials

- Half-sheet of resources for fishermen
- HAB dashboard skit
- Fish kill and HAB Dashboard one-pager
- SPATT (Solid Phase Adsorption Toxin Tracking) Introduction- carousel format
- DWR Reporting Dashboard walkthrough- carousel format
- Phytoplankton Monitoring and Identification- carousel format
- SPATTs and HABs fact sheet
- Upwelling video
- SPATT flyer
- Common Water Quality Criteria Flyer

• Common Water Quality Measurement- carousel format
• Runoff video
• July Newsletter Spotlight: “What’s Blooming? Algae, Fish, and Community Impacts”
• Newsletter inserts to promote the Resource Workshop

HAB Notification System Implementation

CCRW established the core components of a HAB notification and response system that integrates state monitoring data, CCRW field monitoring, and community reports. This system supports faster triage, consistent public messaging, and escalation to partner agencies when needed. Key components implemented during the grant period include:

• Weekly reviews of the NCDEQ Fish Kill & Algal Bloom Reporting Dashboard

• Deployment of Solid Phase Adsorption Toxin Tracking (SPATT) samplers at six White Oak River Basin locations (four active sites with repeat deployments)

• Bi-weekly plankton community assessments throughout the White Oak River Basin

• Volunteer and community training for bloom identification and safe reporting

• An online resource hub that houses training materials and reporting forms

• Monthly participation in statewide algae stakeholder work groups (e.g., NC C-CAPE/partner meetings)

Screening-level SPATT results from June–October 2025 detected measurable microcystin in 50% of samplers collected between July and September 2025. These results indicate low ambient toxin presence and reinforce the value of continued passive monitoring paired with targeted confirmation sampling when blooms are reported.

CCRW collaborated with NC C-CAPE, NCDEQ, academic partners, and community organizations to align monitoring protocols, share findings, and improve the timeliness and clarity of public communications for bloom and fish kill events.

Collage of Harmful Algal Bloom (HAB) monitoring activities conducted by Coastal Carolina Riverwatch in the White Oak River Basin, 2025. Featured images include water and phytoplankton sampling by Riley Lewis, Waterkeeper, and Meara Kane, SECU Public Fellows Intern, NCSU, CCRW; SPATT deployment sites along the New River; microscopy images of non-target organisms and Ceratium furca; and plankton tow collection. These efforts support early detection of harmful algae and inform community protection strategies. *Photos by Allison Padgett and Meara Kane.*

HAB and Fish Kill Trends Synthesis

Rather than publishing a separate standalone annual report, CCRW incorporated the 2022–2025 White Oak River Basin HAB and fish kill trends synthesis into this closeout report. This synthesis draws primarily on NCDEQ's public reporting dashboard and CCRW's internal tracking to summarize incident patterns, response timelines, and monitoring insights. It includes:

- Seasonal trends using the NCDEQ Fish Kill & Algal Bloom Reporting Dashboard (2022–2025)
- Baseline response-time metrics (event date to report resolution) derived from dashboard timestamps for fish kills and algal bloom reports
- Summary of CCRW field monitoring (SPATT toxin tracking and plankton community assessments) and community reporting pathways
- Incident categorization review to support consistent interpretation across basins and agencies

White Oak River Basin incident classification summary (dashboard review):

- Surface scum/discoloration reports: 3
- Fish kills: 3
- Odor-based reports: 1

This trends synthesis is included within this report and is intended to be a transparent, accessible reference for community members, local governments, and state decision-makers.

Performance measurements (grant period)

- Baseline response time derived from NCDEQ dashboard timestamps:
  - Fish kills: average of 46 hours from event date to report resolution
  - Algal blooms: average of 349 hours from event date to report resolution

- Monitoring participation and capacity-building:
    - 1 formal community training (44 participants)
    - 4 active SPATT monitoring sites (6 deployment locations tested)
- Community engagement and reporting readiness:
    - HAB outreach materials distributed through community events and direct mail, with QR-code reporting pathways
    - Monthly newsletter and social media content to reinforce bloom identification, reporting, and public health guidance

Monthly Progress and Continuous Reporting

Throughout the project, CCRW submitted reports documenting outreach activities, bloom reports received, sample site summaries, and follow-up actions. These reports indicate an increasing community awareness, strong interest in volunteer participation, and improved coordination with state agencies in response.

Recommendations for sustaining and scaling HAB response capacity

Recommendations to sustain and scale the HAB and fish kill response system include:

- Maintain and expand SPATT deployments and pair passive toxin screening with targeted confirmation sampling when blooms are reported.
- Formalize alert thresholds and communication workflows with NCDEQ/DMF, local health departments, and local governments for timely public guidance.
- Continue annual community trainings and improve access to reporting tools (QR codes, plain-language guides, and partner briefings) for fishermen and waterfront communities.
- Invest in sustained staffing and data infrastructure to improve reporting-to-resolution timelines and make trends more decision-ready for local policy and management.

Research and Assessment Methodologies

Project Overview and Performance Summary

Coastal Carolina Riverwatch (CCRW) expanded its Water Quality Research Program to investigate emerging contaminants in the White Oak River Basin and nearby coastal ecosystems. These studies, focused on PFAS, heavy metals, and plastic-derived chemicals, support public education, partner coordination, decision-making, and long-term protection of water quality. Findings were integrated into CCRW's public engagement strategy and academic collaborations.

Research activities completed under the OSBM-funded 2024–2025 cycle advanced all deliverables outlined in the approved Scope of Work for contaminant analysis and data dissemination. Through partnerships with Duke University, RTI International, and local oyster growers, CCRW completed PFAS and heavy-metal analyses in oyster tissue and estuarine water samples, initiated ongoing SPATT toxin tracking, and conducted baseline assessments of plastic- and tire-associated contaminants in the New River estuary. These investigations strengthened the scientific foundation needed for regulatory and community decision-making.

OSBM funds directly supported personnel time, sample processing logistics, and the preparation of technical summaries and outreach materials that translated research findings into public education tools. Preliminary results were presented at the Water Quality for Fisheries Symposium and shared with the Industry Working Group to ensure applied use of the data in management and policy discussions.

Special Studies on PFAS and Heavy Metals in Oysters and Water Samples

Through a partnership with Duke University and support from local oyster growers, CCRW completed PFAS and heavy-metal analyses in oyster tissue and environmental samples from coastal North Carolina waters. Sampling included paired farmed ("top lease") and wild reef oysters across 10 sites, with a total of 81 oyster tissue samples analyzed alongside associated water and sediment samples (CCRW Technical Report, 2025).

- Key findings from PFAS and heavy-metal assessment (completed deliverable)

  • PFAS were detected in 100% of oyster samples; the number of detected PFAS compounds per sample ranged from 5–17, reflecting widespread, low-level occurrence in coastal systems.

  • Consumption screening (based on available PFAS reference doses and a 12-oyster meal assumption) found highly variable results across compounds and sites; the minimum calculated safe meals per month across the six PFAS compounds with reference doses was 0.31 meals/month (≈4 meals/year). Metals screening indicated a minimum of ~10 meals/month across metals. These calculations are screening-level and not individualized consumption guidance.

  Deliverables completed: CCRW Technical Report—*PFAS and Heavy Metals in Wild Caught and Aquaculture Oysters* (2025), and *Oysters, PFAS, and Heavy Metals: Survey Results Report* (2025). A peer-reviewed manuscript is in preparation by Duke Ph.D. candidate Caroline Zuber.

- Privacy protections for growers

  CCRW honored confidentiality requests by anonymizing public-facing site descriptions and reporting results using general geographic descriptors and habitat classifications.

  Location-specific results were shared directly with participating oyster growers and leaseholders as part of CCRW's partner communications.

  Data products were designed to be transparent and decision-ready while protecting sensitive business information.

  Planned next step (beyond this grant): synthesis of results into a peer-reviewed publication and continued targeted sampling to reduce uncertainty for high-consumption subpopulations and additional contaminant mixtures.

Plastic and Plastic-Associated Stormwater Research

CCRW partnered with RTI International to conduct a baseline, non-targeted screening assessment of plastics-associated and roadway runoff–associated chemicals in the New River (Onslow County) within the White Oak River Basin. This work focuses on polymer additives and tire-related chemicals that can enter waterways through stormwater and may affect aquatic life, seafood resources, and community confidence in water quality.

Deliverable completed: RTI's non-targeted screening dataset and ReadMe (CCRW_FullDataSet_08252025.xlsx) documenting results from whole-water samples collected June 25, 2025 at six New River sites (NR1–NR6) plus a field blank. The dataset includes screening-level identifications (many Level 2/putative), hazard-screening fields, and site-by-site relative signal metrics.

Important limitation: Non-targeted screening provides screening-level identifications and relative signals—not confirmed concentrations. Targeted confirmation with standards and follow-up quantitative analysis are required before making risk determinations or management thresholds.

Sampling design and locations

On June 25, 2025, CCRW and RTI collected six whole-water samples across a salinity gradient in the New River (NR1–NR6) plus a field blank. Sampling locations and field parameters are summarized below (see also Figures R-1 and R-2).

Site	Description	Latitude	Longitude	Salinity (ppt)
NR1	Below wildlife viewing area at Southside Bridge (NC HWY 172)	34.56814	-77.36500	21.90
NR2	Above wildlife viewing area at	34.56803	-77.36400	18.46

	Southside Bridge (NC HWY 172)			
NR3	Downriver from bridge on NC HWY 172	34.56584	-77.36300	18.42
NR4	Upstream from bridge on NC HWY 172	34.56835	-77.35930	19.80
NR5	Downriver from Holcomb Blvd. Bridge	34.52600	-77.40500	28.45
NR6	Upstream from bridge and access point	34.53000	-77.42400	0.88

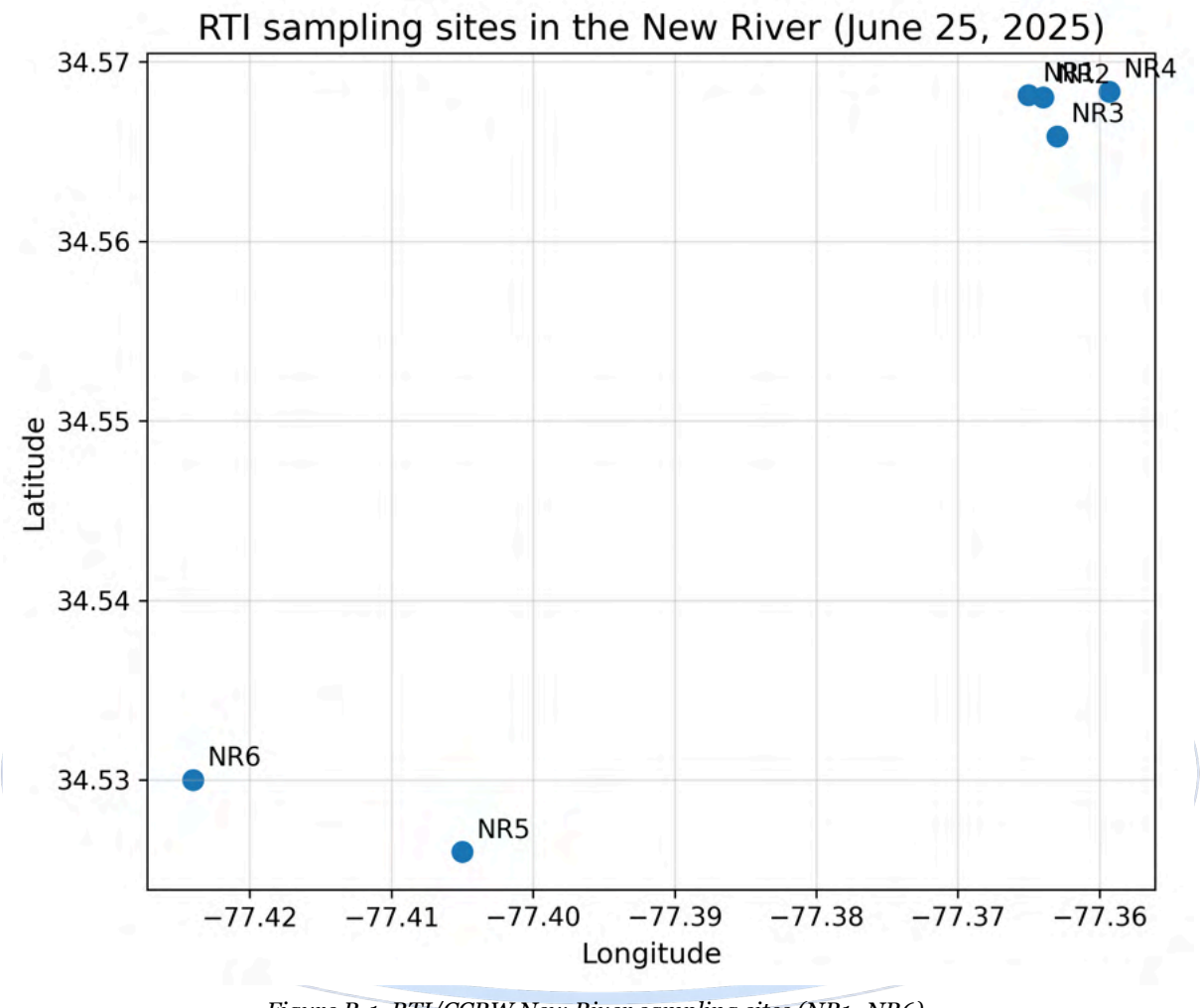


Figure R-1. RTI/CCRW New River sampling sites (NR1–NR6).

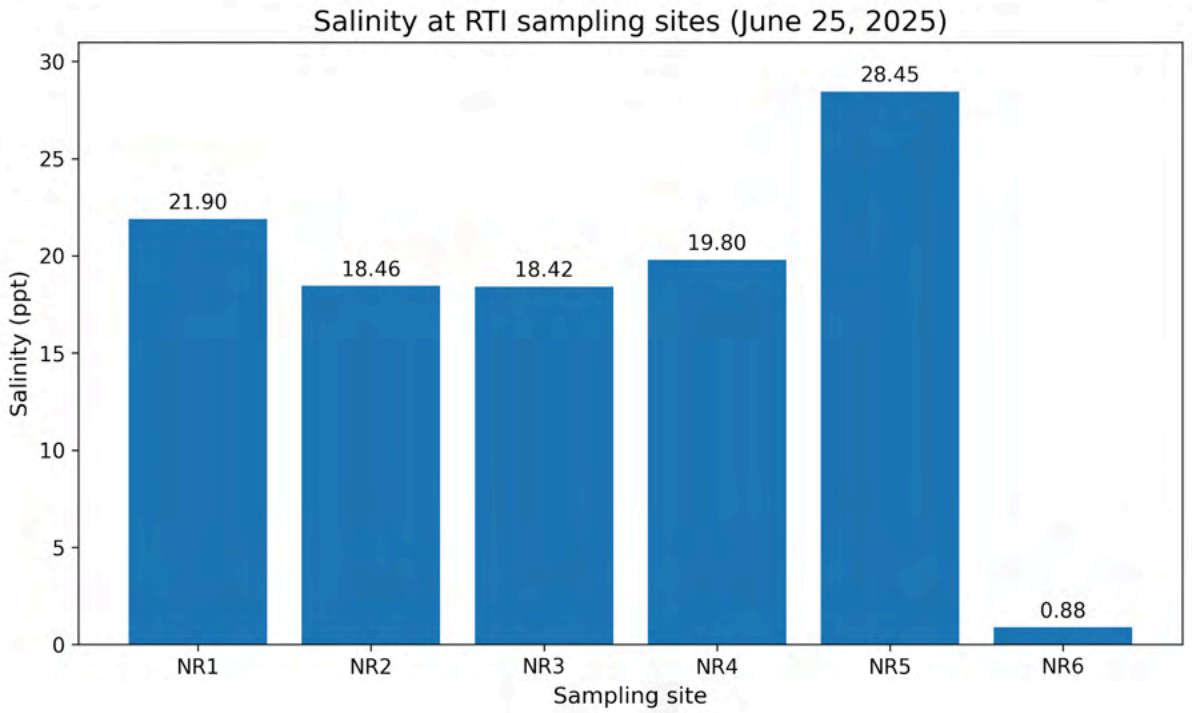


Figure R-2. Salinity at New River sampling sites (June 25, 2025).

Screening results summary (RTI dataset deliverable)

RTI performed high-resolution, non-targeted analysis (NTA) on whole-water samples. Across ionization modes, more than 2,500 background-subtracted chemical features were detected. Filtering against a curated plastics/polymer-additives list identified ~200 putative plastic-associated matches. RTI then prioritized Level 2 compound identifications and compiled a reported-compounds table to support follow-up work.

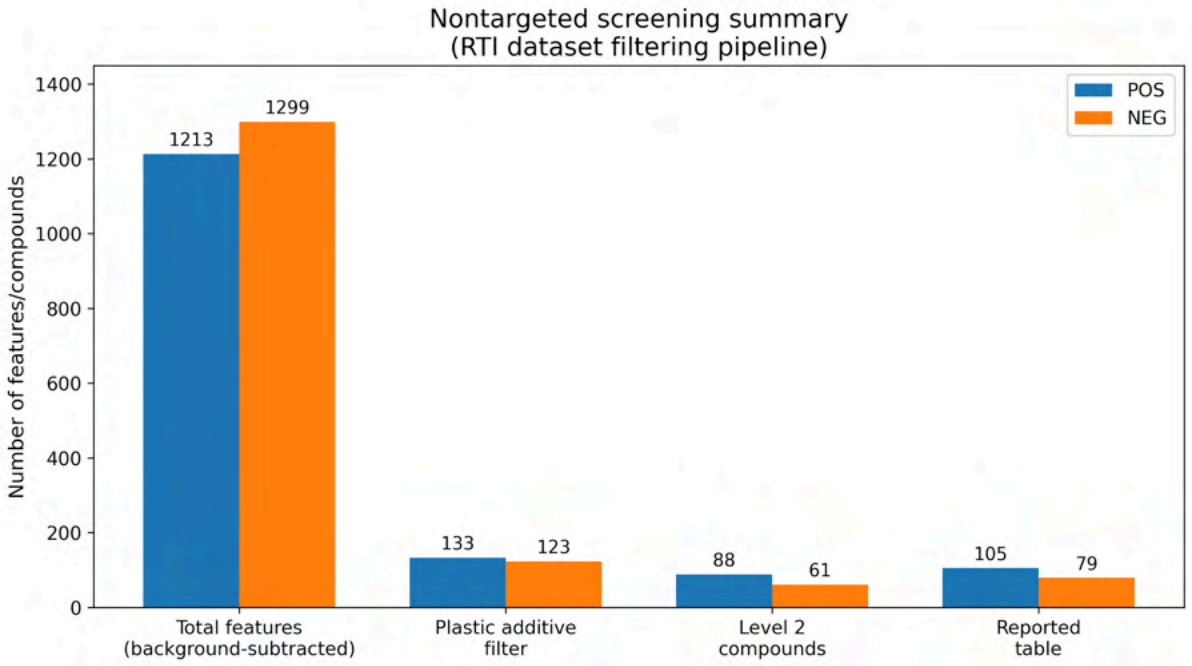


Figure R-3. RTI non-targeted screening workflow summary (counts from ReadMe).

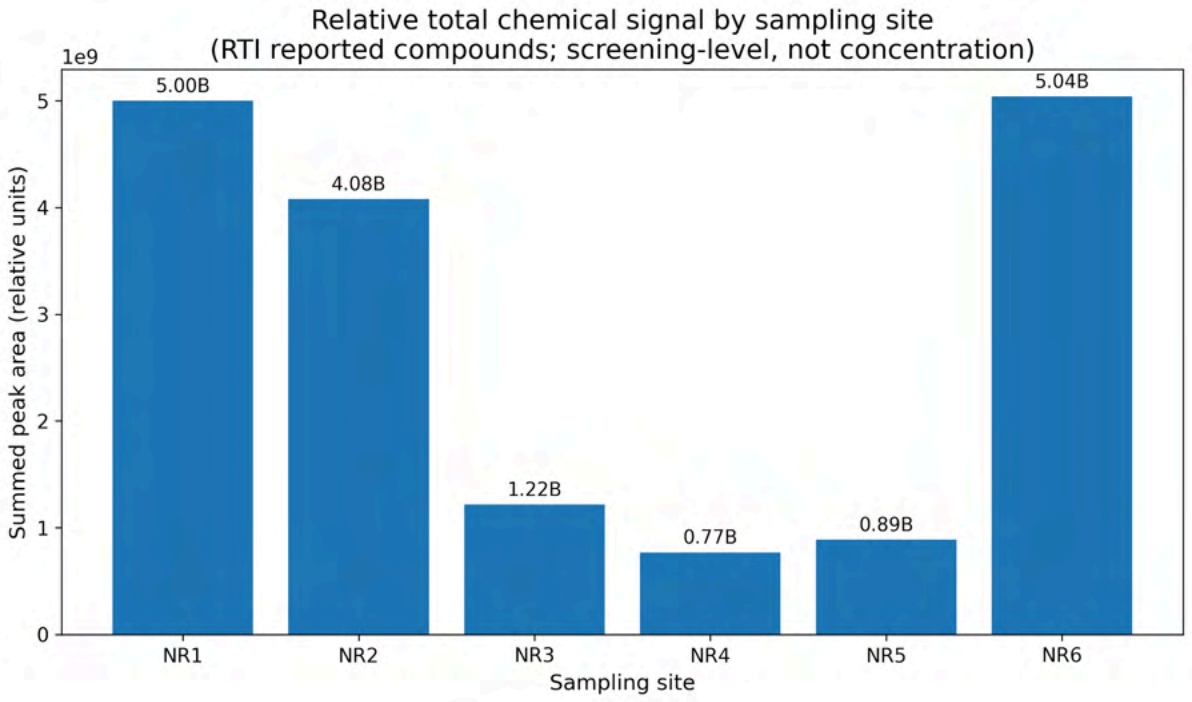


Figure R-4. Relative total chemical signal by site (summed peak area for reported compounds; screening-level, not concentration).

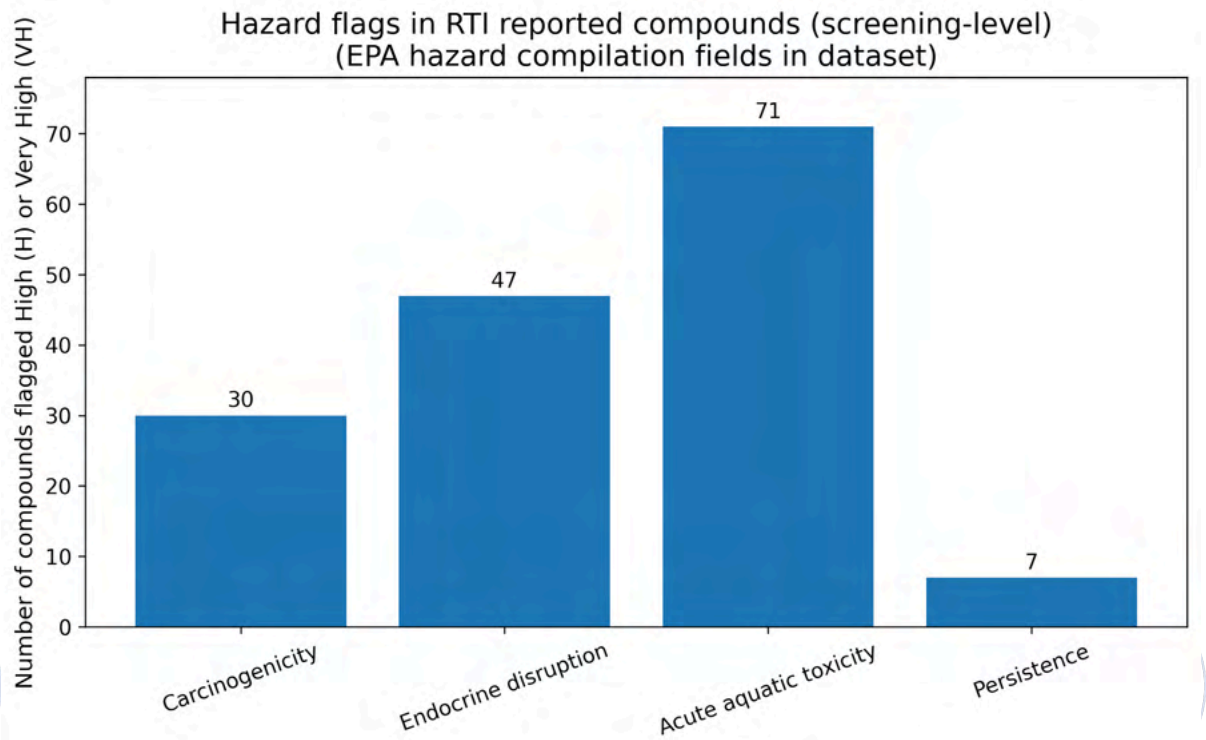


Figure R-5. Count of compounds flagged High/Very High in hazard screening fields within the RTI reported-compounds tables.

Key findings relevant to fisheries and management

Verified highlights from the RTI dataset ReadMe and reported tables include:

• The highest relative total signals occurred at sites NR1, NR2, and NR6, suggesting priority locations for targeted follow-up and source investigation.

• Across ionization modes, the dataset identified nearly 200 putative plastics/polymer-additive matches, supporting the hypothesis that stormwater and consumer-product pathways contribute to chemical mixtures in the river.

• Reported tables include screening-level (often Level 2) compound identifications with hazard-screening fields. Acute aquatic-toxicity flags were the most common High/Very High category in the dataset, indicating the need for prioritization and confirmation.

• Because the work is non-quantitative and identification confidence varies, results should be used to guide where and what to test next—not to draw conclusions about exposure or risk thresholds.

Recommended next steps for research and management

To convert screening insights into decision-ready information, CCRW recommends:

• Targeted confirmation and quantification of a short list of priority compounds (using analytical standards) at the highest-signal sites and during storm events.

• Repeat sampling across seasons and after major rainfall to evaluate how runoff and hydrology affect chemical mixtures and potential exposure pathways.

• Pair chemical screening with microplastics particle identification (e.g., FTIR/Raman) and with biological endpoints (e.g., benthic community metrics) where feasible.

• Coordinate with local governments and stormwater programs to link findings with practical interventions (green infrastructure, hotspot retrofits, and illicit-discharge investigations).

Oyster Survey Insights on Public Perceptions

In 2025, CCRW launched a public oyster-consumption and perception survey to assess consumer attitudes toward local oysters and identify barriers to confidence in seafood safety. A total of 381 responses were collected across the targeted coastal region. The survey is not intended to be statistically representative of all coastal residents; instead, it provides actionable insight for outreach, risk communication, and research transparency.

Participants expressed strong interest in learning how water quality is monitored and how contamination research relates to the oysters they eat. Open responses emphasized transparency, timely sharing of results, and clear explanations of what studies can—and cannot—conclude.

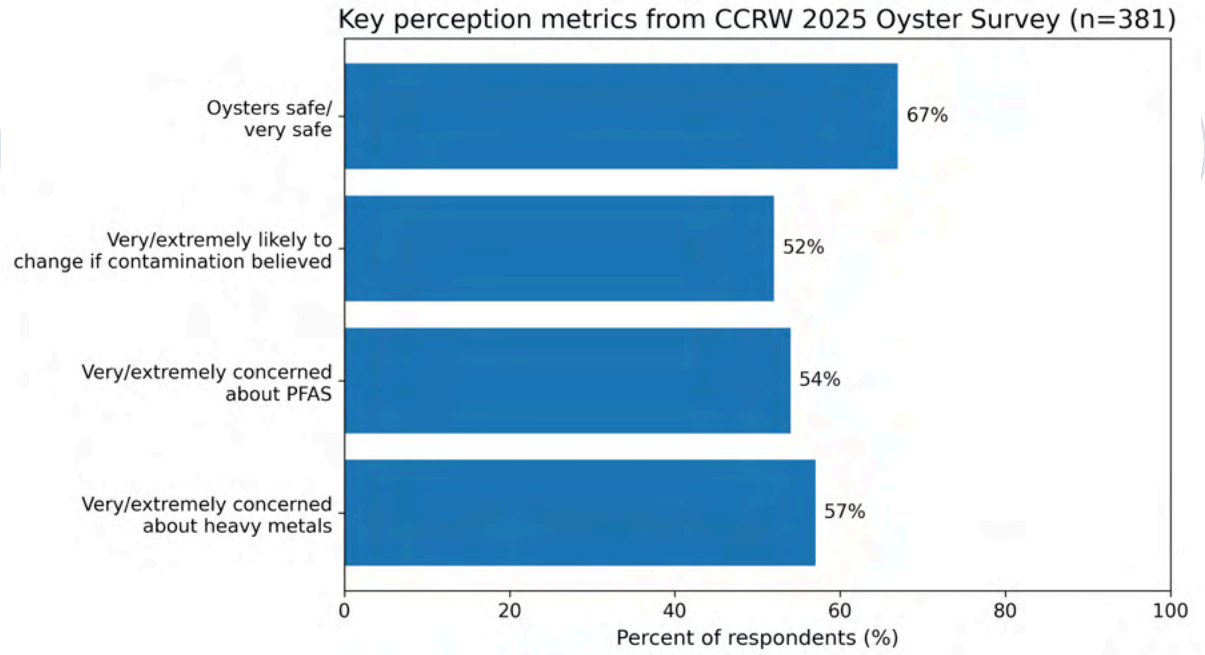
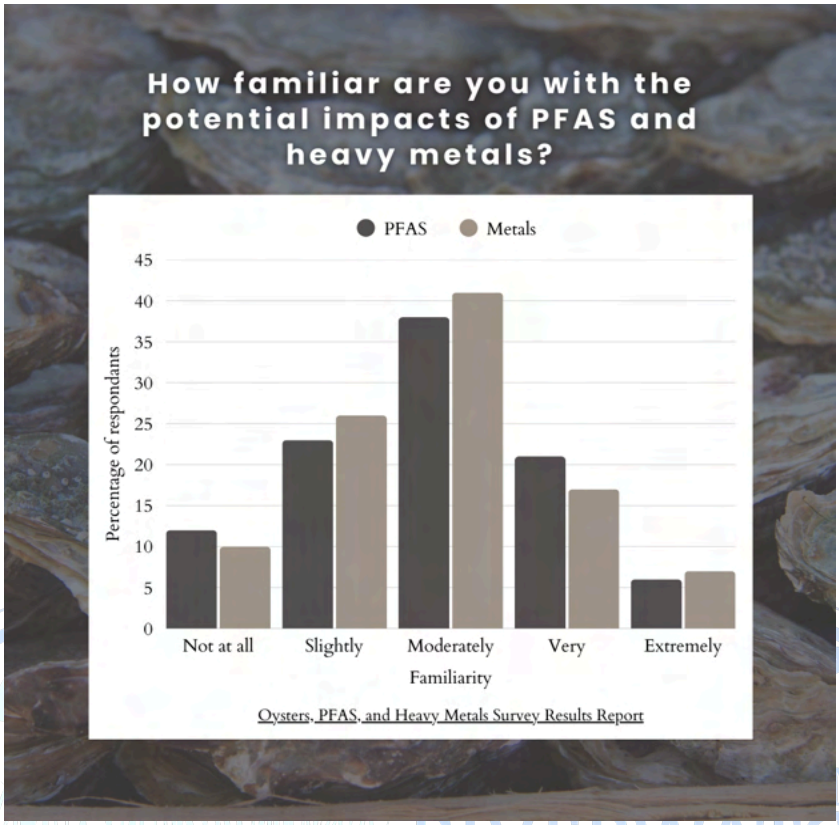


Figure R-6. Key perception metrics from CCRW's 2025 oyster survey (n=381).

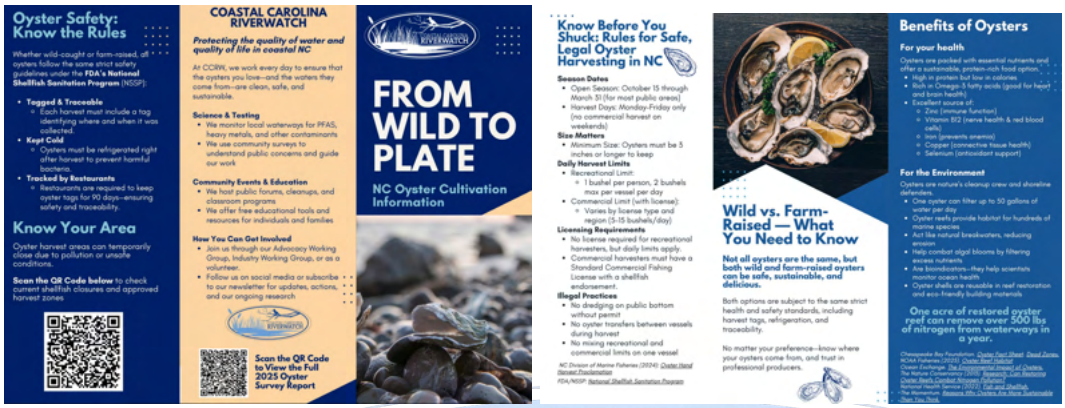
- Most respondents (52 percent) indicated they would be very or extremely likely to change their oyster consumption habits if they believed oysters were contaminated with PFAS or heavy metals—demonstrating that consumer confidence is sensitive to perceived contamination risk.



- In survey items that asked respondents to rank major environmental health concerns, industrial pollutants (including PFAS and heavy metals) consistently emerged as a top area of concern, reinforcing the value of the project's contaminant research and plain-language reporting products.

- While 67 percent of respondents believed oysters are safe or very safe to eat, concern levels were still high: 54 percent and 57 percent of respondents, respectively, identified as very or extremely concerned about PFAS and heavy metals in seafood. This combination—high trust alongside high concern—highlights why transparent monitoring, accessible reporting, and continued research are essential for fisheries, aquaculture, and public confidence.

Survey findings were translated into outreach materials (one-pagers, infographics, and community handouts) and shared with the Industry Working Group and participating oyster farmers to inform messaging and stakeholder engagement.



Research Gaps and Next Steps

WQ4F research partners and stakeholders identified several priority gaps that limit North Carolina's ability to proactively protect fisheries and coastal public health. Addressing these gaps will strengthen early warning, improve transparency and reporting, and support evidence-based investments in infrastructure and pollution prevention.

• Localized, long-term monitoring: More seasonal and storm-event sampling is needed to understand when and where contaminants (e.g., PFAS, microplastics, nutrients, HAB toxins) peak—and how they translate into fisheries impacts.

• Linking contaminants to seafood and health outcomes: Continued collaboration is needed to connect environmental results with seafood safety guidance, ecosystem health indicators, and fisheries management decisions.

• Data accessibility and standardization: Stakeholders requested clearer pathways to access and interpret water-quality data, including consistent protocols and centralized reporting tools.

• Confirmation and follow-up research: Non-targeted findings (e.g., plastics/tire-related chemicals) require targeted confirmation with standards to move from screening to risk-relevant interpretation.

Recommended next steps (beyond this completed grant) include sustaining and expanding monitoring coverage where feasible, confirming and quantifying priority compounds identified through screening methods, publishing plain-language and technical research summaries, and pursuing additional funding to support targeted follow-up studies and community-centered communication tools. This report consolidates the annual HAB and fish kill trends synthesis and research deliverables; continued investment is needed to maintain momentum and reduce uncertainty in management decisions.

Educational Impact and Community Engagement

Project Overview and Performance Summary

In 2024–2025, Coastal Carolina Riverwatch (CCRW) expanded its educational outreach under the Water Quality for Fisheries (WQ4F) Program to raise awareness about pressing water quality issues.[1] Through symposia, surveys, workshops, tabling events, digital content, and educational materials, CCRW empowered the public, industry stakeholders, and local and state decision-makers to better understand and address threats such as PFAS, harmful algal blooms (HABs), heavy metals, and plastic pollution.

Education and outreach activities completed through OSBM funding met or exceeded the deliverables identified in the 2024–2025 Scope of Work. CCRW participated in more than 30 community events across coastal North Carolina, reaching over 1,200 individuals through direct engagement and distributing more than a dozen educational tools, fact sheets, and translated materials. Seventy new volunteers signed up to support ongoing monitoring and outreach, demonstrating strong public investment in local water quality protection. Digital communication expanded the reach of these efforts, with social media engagement increasing by 36 percent and newsletter subscriptions rising to 1,928.

OSBM resources directly supported labor for educational program coordination, event facilitation, and the development of accessible, multilingual materials. These efforts advanced the grant's objective to build environmental literacy, promote equitable access to information, and strengthen community resilience through measurable public participation.

WQ4F Symposium (October 9–11, 2024)

The 2024 WQ4F Symposium, hosted at the Duke Marine Lab in Beaufort, NC, brought together 43 participants, including researchers, graduate students, commercial fishermen, aquaculture professionals, NCDEQ and DMF staff, journalists, and community members.[2] Three student scholarships were awarded to promote equitable access and support youth engagement in water quality science.

[1]Coastal Carolina Riverwatch. (2025). Outreach and engagement tracking [Internal spreadsheet].

[2] Coastal Carolina Riverwatch. (2024). *Symposium 2024 – registration* [Internal spreadsheet].

Project presentation topics included:

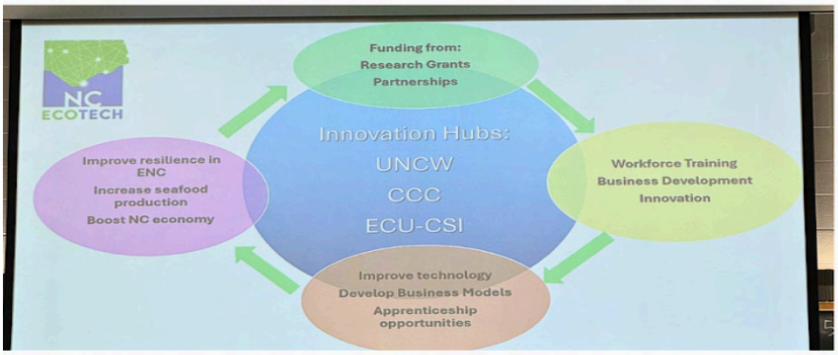
- PFAS and metals in farmed and wild oysters across the WORB - given by CCRW partner Caroline Zuber
- Harmful algal bloom response strategies
- Tire-related chemicals and plastic contaminants in surface water

Partnerships developed:

- Backcountry Hunters and Anglers
- Bask Hotel
- Cape Fear Riverwatch
- Carolina Recycling Association
- Carteret Community College Aquaculture Program
- Coastal Conservation Association North Carolina
- Commercial Fisheries Association
- Conservation Network, NC Plastic Coalition Group
- Duke Engage Program

- Duke University Marine Laboratory
- Duke University Nicholas School of the Environment
- NC EcoTech
- North Carolina Division of Marine Fisheries
- North Carolina State University - Center for Marine Sciences and Technology
- Palm Suites
- Shellfish Growers Association
- Sound Rivers
- University of North Carolina - Institute of Marine Sciences
- Waterkeeper Alliance


Community-
University
Partnership
Duke Marine
Laboratory


NC
ECOTECH
Funding from:
Research Grants
Partnerships
Innovation Hubs:
UNCW
CCC
ECU-CSI
Improve resilience in
ENC
Increase seafood
production
Boost NC economy
Workforce Training
Business Development
Innovation
Improve technology
Develop Business Models
Apprenticeship
opportunities


Duke Marine
Laboratory


Water Quality for
Fisheries Symposium


Duke Marine
Laboratory


Fisheries Advocacy Panel

WQ4F Symposium (October 27–28, 2025)

The 2025 Water Quality for Fisheries Symposium, hosted at the Duke University Marine Lab in Beaufort, NC, convened 121 registrations (119 unique names), including 21 speakers. Participants represented researchers and students; commercial, recreational, and subsistence fisheries stakeholders; aquaculture professionals; agency staff; local and state decision-makers; journalists; and community advocates. The event was designed to bridge research, policy, and practice across the White Oak River Basin and beyond.

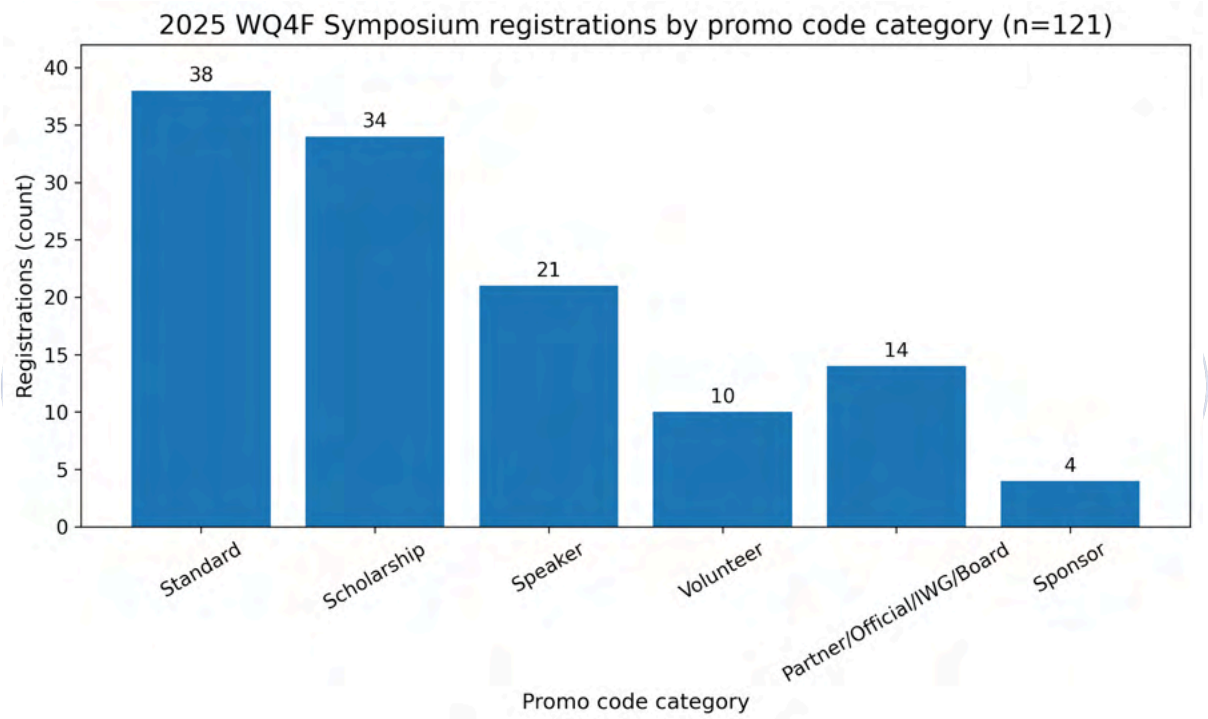


Figure S-1. 2025 WQ4F Symposium registrations by promo code category (registration records, n=121).

The Symposium opened with a keynote address by Dr. Joel Fodrie (UNC Institute of Marine Sciences), “From the Estuary to the Legislature: North Carolina’s Coastal Fisheries at a Crossroads,” exploring how science can guide coastal policy and sustainable fisheries management. Dr. James Morley (ECU Coastal Studies Institute) followed with “Ecosystem Interactions and Water Quality,” highlighting how invasive species and predator–prey dynamics affect estuarine health.

Featured sessions included:

• Advances in Understanding Contaminant Impacts on Fisheries and Health — Dr. Frannie Nilsen (NCDEQ); Chiara Klein and Megan Hoert Hughes (Duke Superfund Research Center); and Caroline Zuber (Duke University).

• Coastal Storms, Flooding, and Resiliency Best Practices — Riley Lewis (CCRW Waterkeeper); Jennifer Fickler and Kasen Wally (NC Division of Coastal Management); and Madison Haley (NC Plastics Coalition).

• Upstream Sources and Downstream Impacts: How Stormwater and Wastewater Shape Water Quality — Dr. Imari Walker-Franklin (RTI International) and Sherri Stanley (NCDEQ Division of Waste Management).

• Wastewater Systems, Septic Failures, and Public Health — Emma Dempsey (UNC Institute of Marine Sciences) and Conner Twiddy and David Ryan (Town of Nags Head).

• Coastal Heritage, Student Engagement, and Resilience Workshop — moderated by Dr. Liz DeMattia (Duke University).

• Industry Working Group Roundtable — gathered fishermen, aquaculture leaders, scientists, and local and state decision-makers to set shared program goals for the 2026–2027 cycle.

The Symposium concluded with the Shuck Reception, featuring oysters from three White Oak River Basin farms and remarks from sponsors and partners, celebrating the link between clean water and coastal livelihoods.

To promote equitable access, the Symposium offered reduced-cost scholarship registrations. A total of 34 registrations used the SCHOLARSHIP25 code (registration records). CCRW also prioritized student participation and engaged student volunteers to support logistics and learning.

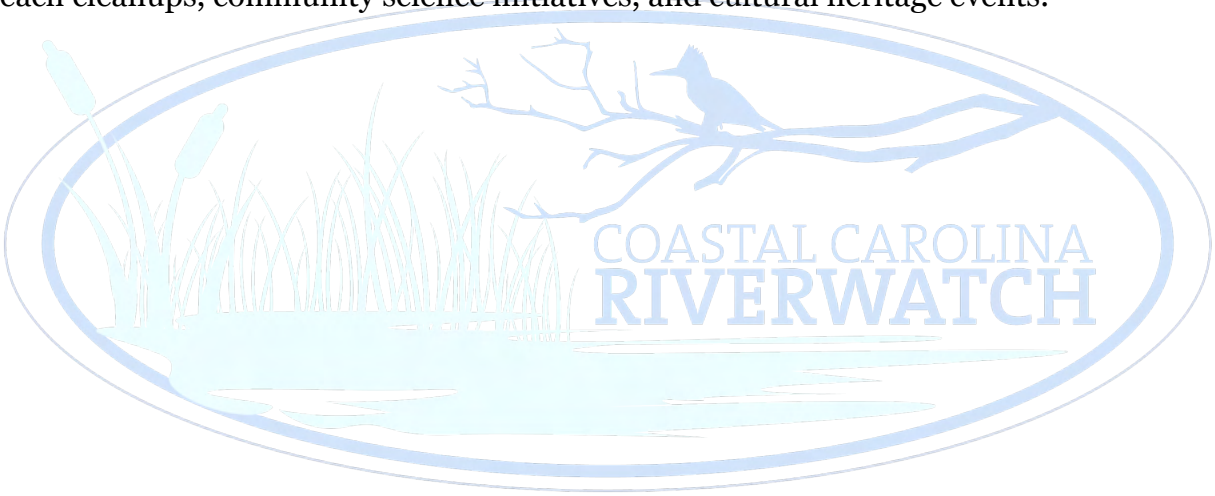
The 2025 Symposium strengthened partnerships with over 20 organizations, including the NC Division of Marine Fisheries, NC Division of Coastal Management, RTI International, Duke University Marine Lab, Carteret Community College Aquaculture

Program, Cape Fear River Watch, Carolina Recycling Association, Coastal Conservation Association NC, NC EcoTech, and Sound Rivers.

Overall Impact: The 2025 Symposium met and exceeded OSBM grant deliverables for community engagement and professional collaboration. The event generated cross-sector dialogue on research translation, water quality threats, and actionable solutions supporting fisheries resilience and coastal public health.

Community Engagement Summary

From September 2024 through July 2025, CCRW participated in over 30 community engagement events across coastal North Carolina.[3] These events ranged from youth science festivals and environmental film screenings to multi-day Earth Day celebrations, beach cleanups, community science initiatives, and cultural heritage events.



[3] Coastal Carolina Riverwatch. (2025). *Outreach and engagement tracking* [Internal spreadsheet].

PHOTO: Collage showcasing the educational and community engagement efforts of Coastal Carolina Riverwatch interns during 2025. Featured individuals include Cate Arnold, WQ4F Intern and Oyster Survey Intern, CCRW; Meara Kane, SECU Public Fellows Intern, NCSU, CCRW; Allison Padgett, WQ4F Outreach and Education Lead Intern, CCRW; and Alden Mazo, Blue Crab and SAV Study Intern, CCRW. Images highlight interactive outreach activities, including tabling events and use of the EnviroScape watershed model to educate the public on local water quality issues. *Photos by Stacy Dominguez and Allison Padgett.*

Engagement highlights

Over the reporting period, CCRW reached over 1,200 individuals through direct interaction, with spikes in engagement observed during large-scale events such as the Careers on Wheels, Wings, and Water (COW3) Expo (350 touches) and Earth Day

celebrations at Willow Pond (244 touches). Recurring community meetings in Newport provided smaller, focused opportunities for resilience planning, resource sharing and flood mitigation conversations.

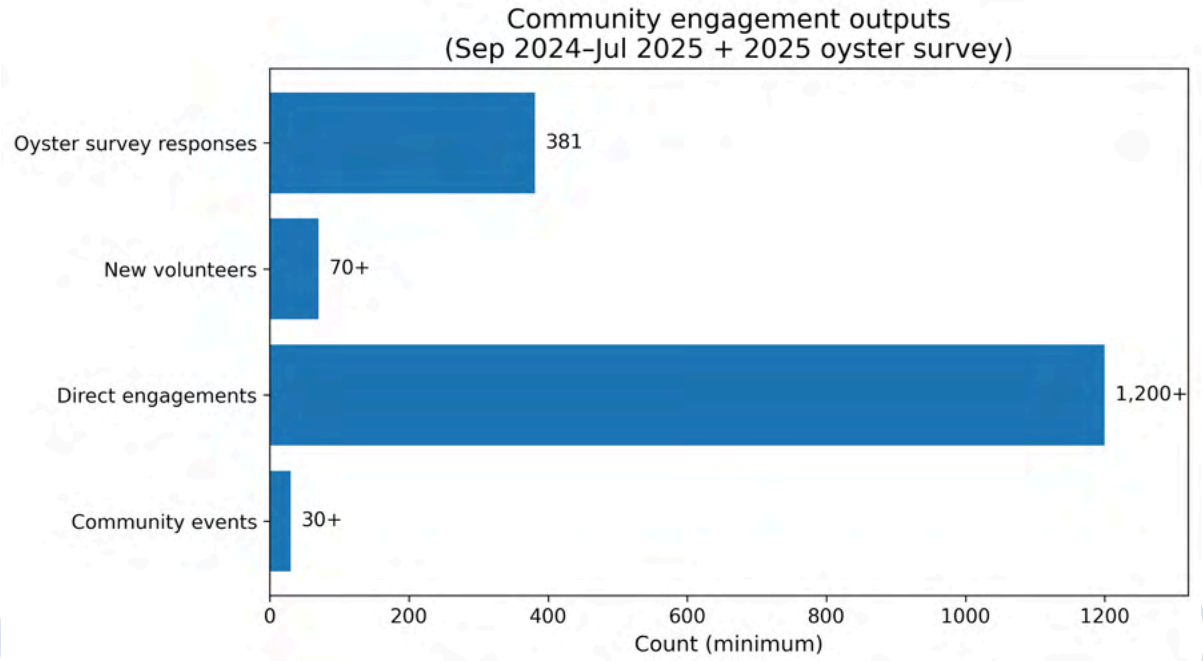


Figure CE-1. Community engagement outputs (minimum counts; Sep 2024–Jul 2025 + 2025 oyster survey).

Key Themes Identified

- **Water Quality & Pollution Prevention**: Across nearly every event, stormwater runoff, marine debris, and water quality were central concerns. The EnviroScape watershed model proved highly effective at sparking hands-on learning and in-depth discussions.

- **Flooding & Resilience**: Residents frequently shared firsthand experiences of flooding, particularly in the Newport and Sneads Ferry areas. Many events explored how sea level rise, king tides, and development are impacting coastal resilience.

- **Community Science & Education**: CCRW's King Tide Mapping, Adopt-A-Drain, and Project WET programming drew strong interest, particularly from educators and students. Several educators requested classroom visits and long-term partnerships.
- **Volunteerism & Stewardship**: 2024–2025 saw a consistent increase in volunteers expressing interest in joining CCRW efforts, particularly following youth education events and interactive demonstrations.
- **Inclusive Community Engagement: Events such as the Indigenous Speaker Series and Onslow County Black History Festival highlighted CCRW's commitment to inclusive environmental education and stewardship across coastal communities.**

Volunteer Engagement Highlights

In addition to strong public participation, CCRW's outreach efforts successfully inspired volunteer interest across a range of community events.[4] As shown in the chart below, several events, particularly the Newport Resiliency Project meetings, Olde Beaufort Farmers' Market, and Ocean Fest, generated high levels of volunteer sign-ups. In total, over 70 individuals expressed interest in supporting CCRW's work, with spikes aligning with hands-on demonstrations like the EnviroScape and direct conversations about local flooding, pollution, and resilience. This trend highlights the power of interactive education and personal storytelling to spark civic engagement.

[4] Coastal Carolina Riverwatch. (2025). *Community event engagement tracking* [Internal document].

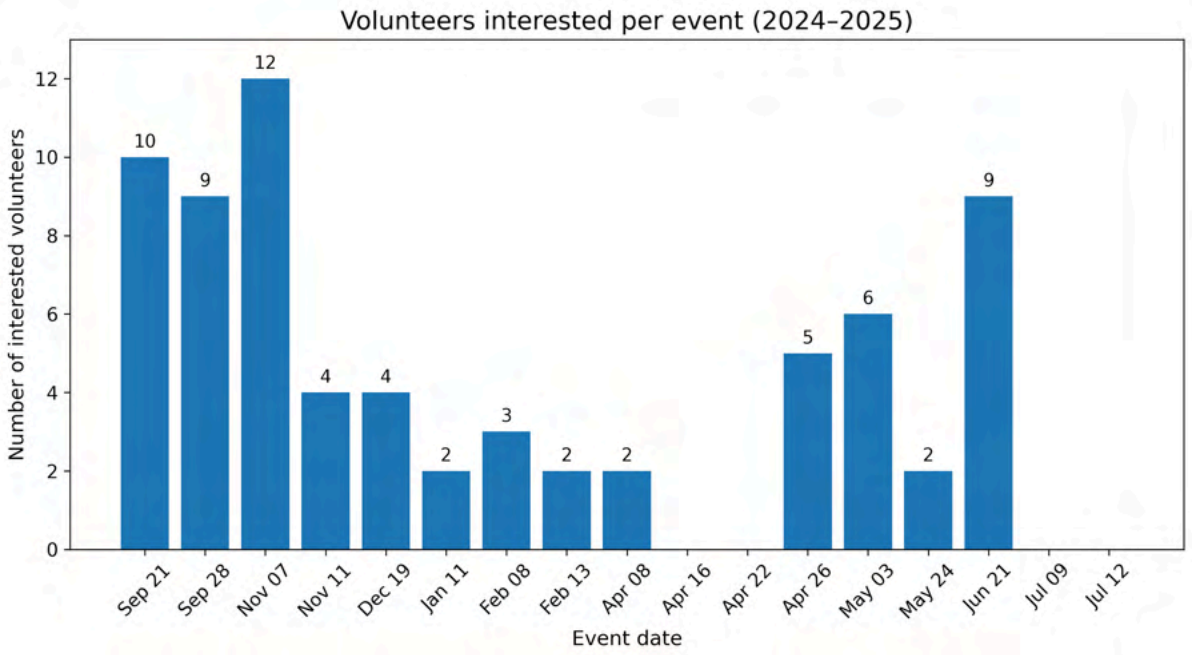


Figure CE-2. Volunteer interest per event between September 2024 and July 2025 (CCRW volunteer sign-up logs).

Stakeholder and Community Feedback Integration

Throughout the reporting period, CCRW used multiple feedback channels—including the 2025 Water Quality for Fisheries Symposium feedback wall and post-it exercises, and the October 2025 Industry Working Group (IWG) check-in survey—to ensure WQ4F priorities reflect on-the-water experience, community values, and actionable needs.

Across stakeholder groups, recurring themes included: (1) stable and equitable funding for septic repairs and resilient wastewater and stormwater infrastructure; (2) expanded monitoring for PFAS, microplastics, nutrients, and pathogens; (3) clearer reporting pathways and coordinated follow-up for upstream pollution sources; and (4) plain-language communication tools that connect water-quality threats to public health, local seafood, and coastal economies.

In the 2025 IWG check-in survey (n=23), municipal wastewater and septic systems were rated the highest-priority issue (mean 4.17/5; 83% rated High or Top Priority). Stormwater runoff ranked second (mean 3.78/5; 61% rated High or Top Priority). When

asked to select two focus areas for the next year, respondents most often selected wastewater & septic (13 responses) and stormwater (11 responses).

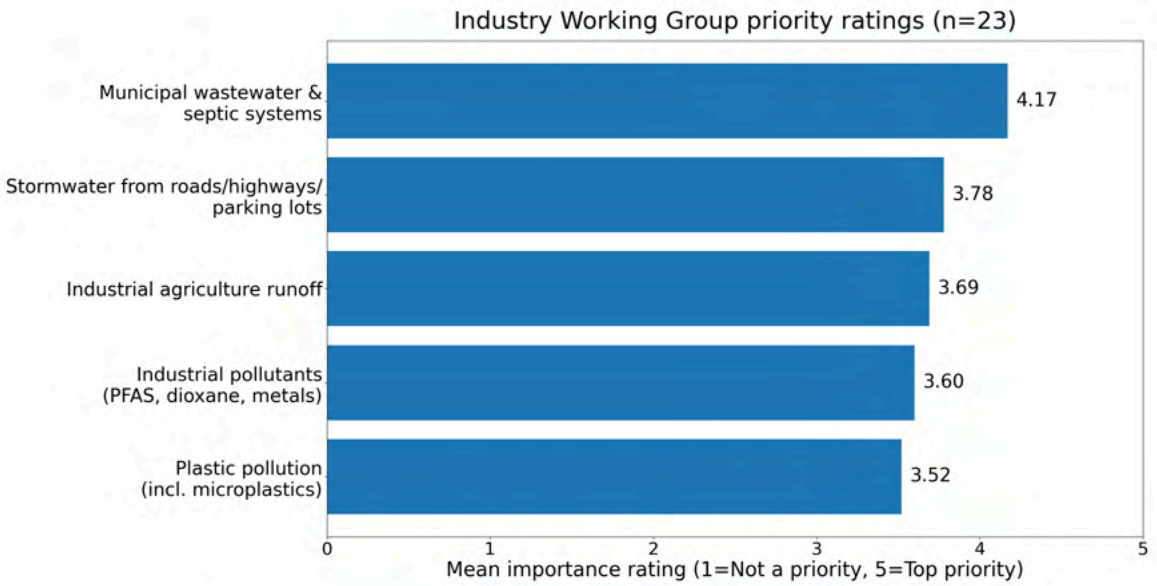


Figure IWG-1. Mean priority ratings from the 2025 Industry Working Group check-in survey (n=23).

These inputs directly informed CCRW's 2026–2027 planning, including an emphasis on infrastructure coordination, targeted monitoring, and community-ready tools that translate science into decisions.

Stakeholder priority	What we heard	How WQ4F responds (2026–2027 actions)
Wastewater & septic systems	Need stable, equitable funding for repairs/upgrades and coastal-adapted solutions that	Advance infrastructure coordination, share decision-ready briefs for local officials, and support monitoring

	reduce closures and contamination after storms.	that helps target upgrades and track failures.
Stormwater runoff & flooding	Increase adoption of green infrastructure and nature-based solutions; improve preparedness and publicized success stories.	Promote stormwater BMPs through trainings and policy education, and translate monitoring results into local resilience planning.
PFAS & industrial pollutants	Expand localized testing and link contaminants to ecosystem, seafood, and public-health outcomes.	Continue collaborative contaminant research, publish plain-language summaries, and elevate policy options that reduce exposures.
Plastics & microplastics	Support source reduction (e.g., EPR) and more research on physiological impacts to fisheries species.	Build on plastics/tire-chemical studies, develop outreach tools, and support evidence-based source-reduction strategies.
Transparency and reporting	Clear reporting pathways, regular public updates, and clearer follow-up pathways for upstream pollution sources.	Maintain reporting tools and dashboards, publish regular summaries, and strengthen transparency and reporting in program engagement.

Educational Materials and Community Outreach

To reinforce science-based messaging, CCRW developed and distributed translated, accessible outreach tools at events, online, and via direct stakeholder outreach:

- WQ4F poster - translated into Spanish
- "PFAS in Marina Dry Stack Facilities" brochure shared with 41 marina owners. Translated into Spanish

- "Heavy Metals in the Estuarine Environment" brochure and fact sheet. Translated into Spanish
- Plastic Pollution Handout, highlighting tire-derived chemicals and microplastics in fisheries waters
- Social media content series (PFAS, plastics, HABs, oysters, stormwater) posted regularly
- Community events: CCRW participated in 30+ outreach and engagement events across the coast during the grant period, including science festivals, dockside conversations with fishermen, and community meetings.
- Community science: Volunteers signed up to support oyster tissue sampling, maintain SPATT samplers, and participate in HAB and microplastics monitoring.

Survey and Community Feedback

CCRW administered a fisheries-focused survey to better understand oyster consumption patterns and community awareness of PFAS. Questions focused on:

- Frequency of oyster consumption
- Sources of seafood
- Concerns about pollution in seafood and water

Survey responses indicated that while many residents consume local oysters regularly, there is a broad desire for more accessible information about seafood safety, water quality, and the impacts of contaminants.[5]

In response, CCRW developed a public-facing Oyster Survey Summary Report and an outreach brief highlighting key themes and opportunities for community education.

These materials are being used to shape messaging for future events, inform communications with stakeholders, and align research priorities with public concerns. This feedback continues to guide the development of tools that promote transparency, enhance seafood confidence, and support local fisheries.

[5] Coastal Carolina Riverwatch. (2025). *Oysters, PFAS, and heavy metals: Survey results report*.

- Social media post series - sharing the results from the survey
- One-page infographic - for social media, website, and event messaging
- Oyster cultivation pamphlet - sharing information across all platforms

Digital Engagement and Communications

Performance Summary

Digital engagement outcomes align directly with the OSBM Scope of Work goals for measurable communication impact and cost efficiency. As of October 14, 2025, Coastal Carolina Riverwatch increased its combined social-media following to 5,360 (approximately +15% since October 14, 2024) and achieved newsletter open rates above the national nonprofit average, reflecting strong audience growth and retention. These outcomes were achieved without additional cost to the state, as OSBM funds primarily supported staff coordination and intern labor for digital content creation. This efficient use of resources expanded statewide awareness of fisheries-related water quality issues, elevated partner research visibility, and enhanced transparency and reporting for the Water Quality for Fisheries Program.

Social Media[6]

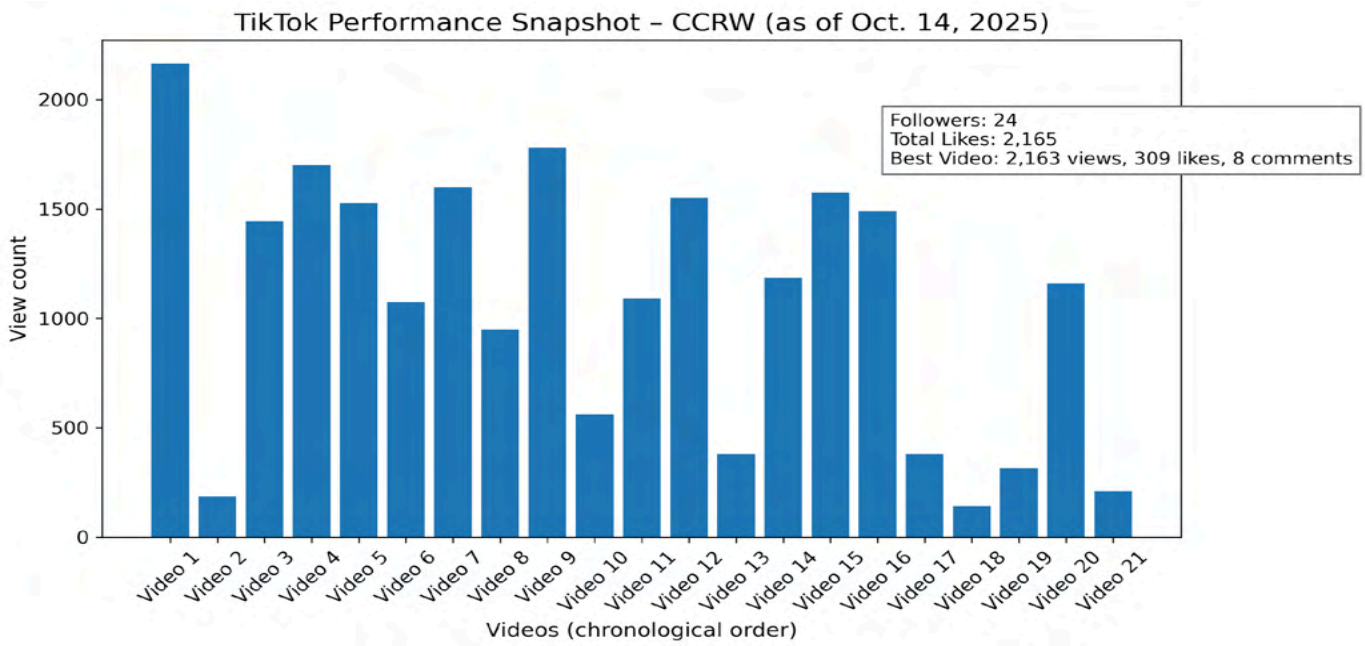
As of October 14, 2025, Coastal Carolina Riverwatch has a combined following of 5,360 across Facebook, Instagram, and TikTok which reflects an overall growth of approximately 15% since October 14th, 2024. This includes 3,682 Facebook followers (an increase of approximately 13.6%) and 1,654 Instagram followers (a growth of approximately 16.6%) and 24 TikTok followers (new platform).

The highest reach on Facebook this year came from a post featuring blue crab research and results from our newsletter, which significantly outperformed previous top-performing content (tire chemicals in seafood in 2024). The standout post (view newsletter) garnered:

[6] Social media growth and key demographic data retrieved from Facebook and Instagram via Meta Business Suite analytics

- 23,336 views
- 15,483 reach
- 39 interactions
- 247 link clicks

This represents a substantial increase compared to last year's top-performing content, which averaged 980 impressions per post. This highlights improved reach and engagement tied to timely research-driven content.



Launched this year, CCRW's TikTok is already building momentum, earning 2,165 likes and over 20,000 total views across 21 posts. The platform's top-performing video reached more than 2,000 views and 300+ likes, highlighting growing engagement with CCRW's digital outreach.

We continue to share consistent content on PFAS, harmful algal blooms (HABs), plastic pollution, and community science, with a growing emphasis on engaging storytelling, partner features, and calls to action.

Geographic and Demographic Engagement Summary (2024–2025)

The Water Quality for Fisheries (WQ4F) program continues to make measurable outreach impacts through social media platforms.

- On Facebook, the strongest geographic reach came from Wilmington, NC, accounting for 6.7% of total U.S.-based reach. Other highly engaged cities included Beaufort, NC, Morehead City, NC, and New Bern, NC. Demographically, the most active age group was 35–44, with women accounting for 17.0% and men 6.3% of engagement in this group.
- On Instagram, the strongest geographic reach came from Beaufort, NC, accounting for 8.7% of total U.S.-based reach. Other highly engaged cities included Morehead City, NC, Wilmington, NC, and Raleigh, NC. Demographically, the most active age group was again 35–44, with women accounting for 19.1% and men 6.0% of engagement in this group.

This data highlights the importance of maintaining tailored outreach strategies for North Carolina coastal communities and young to middle-aged adult populations. These findings help inform targeted engagement for future community programs, outreach campaigns, and youth education efforts.

Newsletter[7]

As of July 2025, Coastal Carolina Riverwatch's newsletter subscriber base has grown to 1,928 recipients, marking a 7% increase from ~1,800 subscribers in 2024. This steady growth reflects successful outreach through in-person events, website traffic, and volunteer sign-ups.

From July 2023 to June 2024, newsletters were distributed monthly or bi-monthly, focusing on topics such as bloom alerts, public education, reporting tools, community

[7] Coastal Carolina Riverwatch. (2025). Newsletter comparison table (July–June) [Internal spreadsheet].

updates, surveys, and new research. Among emails sent to the full subscriber base without targeted filtering, the average performance was:

- Open Rate: 20.5%
- Click-Through Rate: 1.6%

In 2025, CCRW shifted to a more regular bi-monthly cadence to better match audience preferences and internal capacity. The content mix expanded to include volunteer opportunities, partner event invitations, and success stories, while maintaining core messaging around water quality education and program engagement.

Between July 2024 and June 2025, unsegmented newsletters have shown:

- Open Rate: 22.9%
- Click-Through Rate: 1.4%

This reflects a +2.4 percentage point increase in open rate, and a slight decline of -0.2 points in click-through rate compared to the previous year. While the gains in visibility are encouraging, the decline in click engagement suggests a need to continue refining content layout, link placement, or call-to-action clarity.

Importantly, segmented email campaigns targeted to specific groups, such as workshop attendees or volunteers, have significantly outperformed unsegmented sends, with open rates reaching 75–80% and click rates up to 25%. While these targeted campaigns are not included in the year-over-year analysis above, they strongly demonstrate the impact of personalized outreach. These results strongly support continued investment in segmented outreach strategies, as well as improvements in list hygiene and tailored messaging.

As CCRW continues to grow its digital engagement, these metrics offer a strong foundation for refining communications strategy, testing campaigns, and enhancing newsletter content based on user behavior. By increasing newsletter readership, CCRW is strengthening water quality knowledge and support for continued projects that protect water quality for fisheries.

Outreach Performance Measurements

Engagement Metrics

In 2024, Coastal Carolina Riverwatch developed a range of outreach materials to support education and engagement, including three publicly available brochures and fact sheets, five social media posts in regular monthly rotation, two technical reports, and a peer-reviewed manuscript in preparation for submission (publication planned beyond this OSBM closeout report).

Engagement outcomes from 2024 included 43 participants in symposium events[8], three scholarships awarded to support participation or professional development, and outreach to over 60 stakeholders through in-person events. Additionally, 133 community members signed pledges in support of water quality policy, and 37 new volunteers were added to CCRW's monitoring efforts. Social media channels saw a 16% increase in followers over the previous year, reflecting steady growth in digital engagement.

As of July 2025, CCRW has produced more than 12 brochures and fact sheets and developed, managed, and distributed over 60 distinct social media posts that can be rotated for reuse. CCRW also published multiple technical products (e.g., research briefs, survey summaries, and meeting reports) that translate findings into decision-ready information for the public and partners. Peer-reviewed manuscripts based on PFAS/metals and plastics work are in preparation.

Engagement outcomes during the grant period include 121 symposium registrations, 34 scholarship-code registrations, and outreach to more than 1,200 community members through events and tabling. CCRW also collected 381 responses to the oyster survey, strengthening the program's ability to align research communication with public concerns and seafood-consumption behaviors.

Social media following as of October 14, 2025 stands at 5,360 total followers across platforms, representing approximately +15% growth since October 14, 2024.

[8] Coastal Carolina Riverwatch. (2024). *Symposium 2024 – registration* [Internal spreadsheet]

Recommendations to sustain and expand outreach impact

Priority areas for continued investment include:

- Publishing additional plain-language briefs and infographics that translate technical findings (PFAS/metals and plastics-associated chemicals) into actionable guidance for fishermen, growers, and local decision-makers.

- Developing short educational videos on pollution pathways (stormwater, wastewater, plastics) and how local actions connect to fisheries health.

- Maintaining and expanding HAB toxin monitoring and reporting education alongside contaminant research to support early warning and public confidence.

- Supporting seafood-safety and water-quality communications campaigns that reinforce responsible monitoring and avoid misinformation-driven market harm.

- Providing decision-support materials and briefings tailored for local elected officials, planning boards, and watershed managers.

- Continuing to build a digital community-science toolkit that helps the public safely report blooms, fish kills, and pollution concerns.

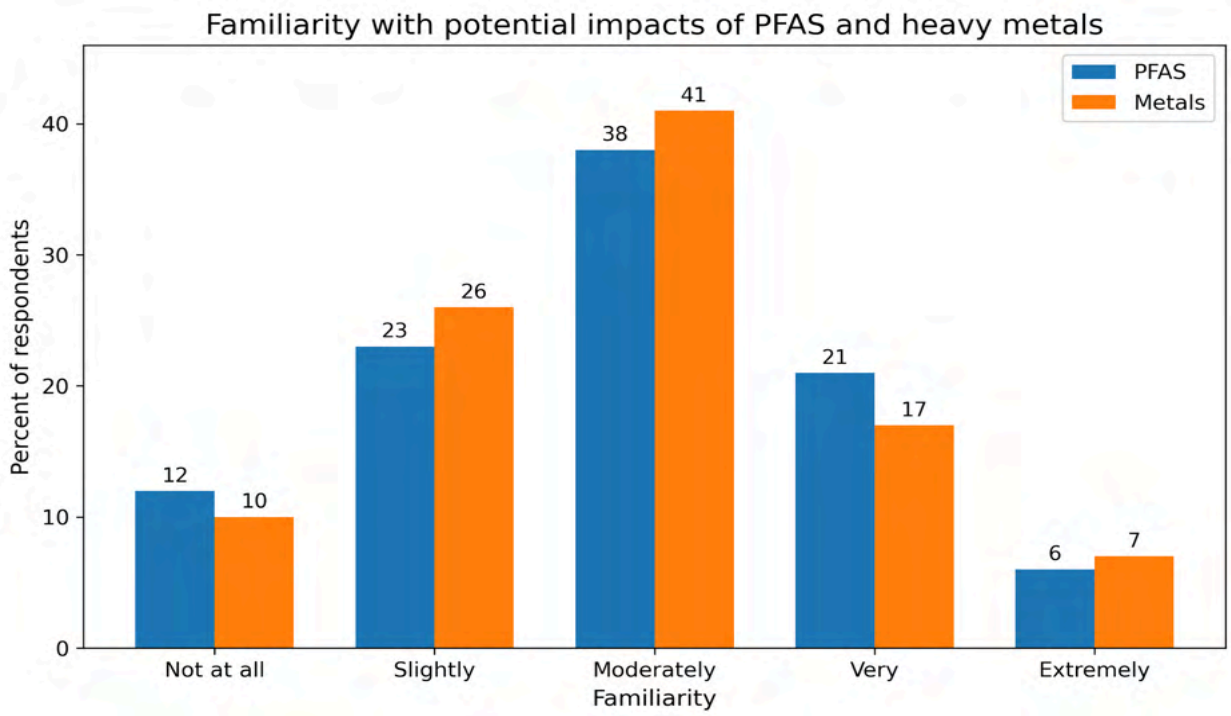
These next steps are designed to enhance public understanding of contaminant pathways and increase community capacity to take action.

Industry Working Group (IWG) and Partnership Development

Project Overview and Performance Summary

Coastal Carolina Riverwatch (CCRW) continued to lead the Industry Working Group (IWG), an initiative that brings together coastal fisheries stakeholders to identify and address priority water quality issues. This collaborative forum includes commercial fishermen, aquaculture operators, seafood processors, recreational anglers, and environmental professionals. The IWG plays a crucial role in shaping the research direction, program priorities and decision-support needs, and outreach activities aligned with the Water Quality for Fisheries (WQ4F) Program.

The Industry Working Group (IWG) and partnership coordination tasks achieved full alignment with the OSBM-approved Scope of Work for stakeholder engagement and policy advancement. Across the 2024–2025 cycle, CCRW hosted seven formal IWG meetings and workshops, engaging over 25 active members representing the commercial, recreational, aquaculture, research, and regulatory sectors. These sessions produced three public input opportunities, two policy letters, and one emerging proposal for stormwater infrastructure investment in fisheries-dependent towns.

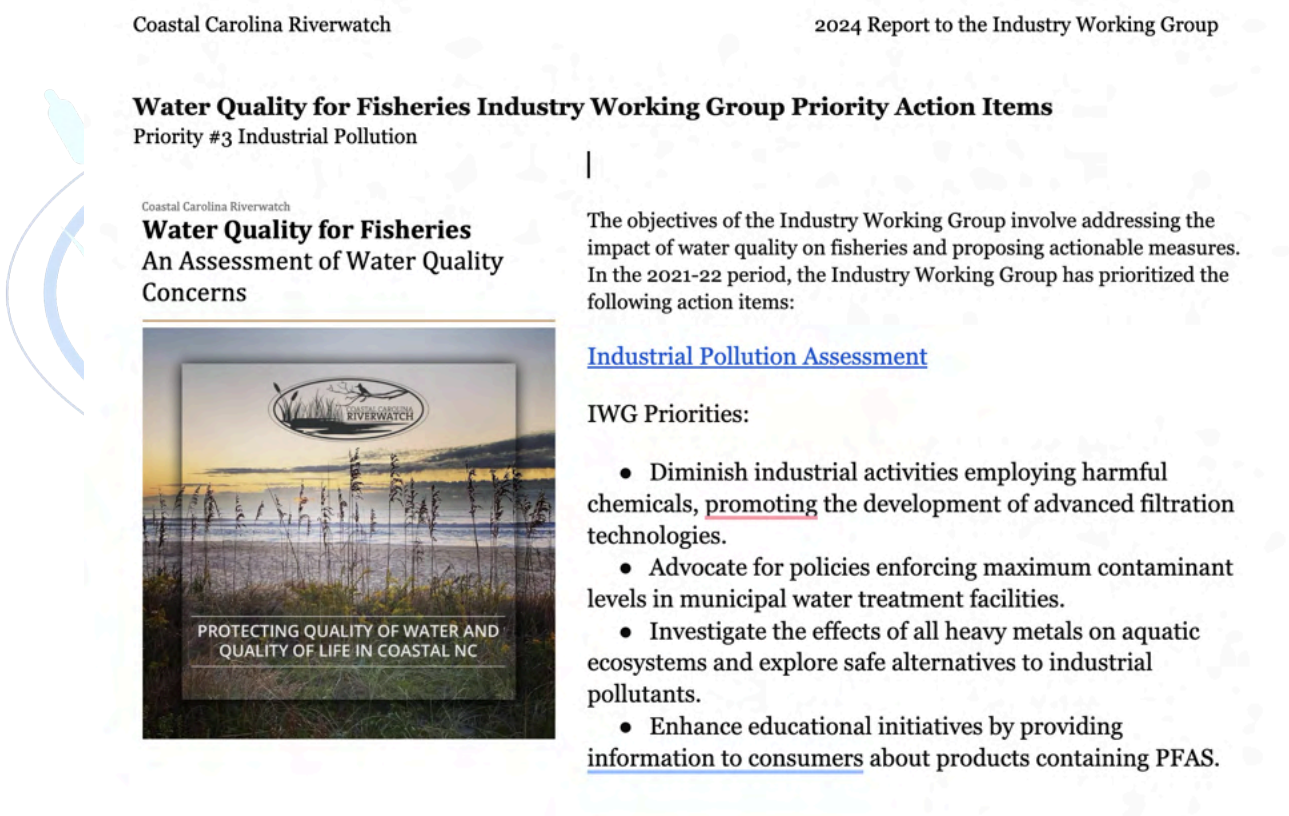


Composition and Collaboration

The IWG met quarterly in 2024 and 2025, addressing pressing environmental threats identified by the fisheries community.

Meeting topics reflected WQ4F's priority categories:

- **April 2024 (Priority 3: Industrial Pollutants)**
  Focus: Illicit discharges, legacy contaminants, and industrial runoff into coastal tributaries.
  Outcome: Request for more baseline data on pollution near fishery-dependent businesses.



Coastal Carolina Riverwatch 2024 Report to the Industry Working Group

Water Quality for Fisheries Industry Working Group Priority Action Items
Priority #3 Industrial Pollution

Coastal Carolina Riverwatch
Water Quality for Fisheries
An Assessment of Water Quality Concerns

The objectives of the Industry Working Group involve addressing the impact of water quality on fisheries and proposing actionable measures. In the 2021-22 period, the Industry Working Group has prioritized the following action items:

Industrial Pollution Assessment

IWG Priorities:

- Diminish industrial activities employing harmful chemicals, promoting the development of advanced filtration technologies.
- Advocate for policies enforcing maximum contaminant levels in municipal water treatment facilities.
- Investigate the effects of all heavy metals on aquatic ecosystems and explore safe alternatives to industrial pollutants.
- Enhance educational initiatives by providing information to consumers about products containing PFAS.

- **August 2024 (Priority 1: Agricultural Runoff, Including Runoff Associated with Concentrated Animal Feeding Operations)**

Focus: CAFO pollution, nutrient overload, and aerial monitoring data.
Outcome: Recommendations for community education and clearer permit reporting.

Coastal Carolina Riverwatch Group — 2024 Report to the Industry Working

Water Quality for Fisheries Industry Working Group Priority Action Items

Priority #1 Industrialized Agriculture

Coastal Carolina Riverwatch

Water Quality for Fisheries

An Assessment of Water Quality Concerns

The objectives of the Industry Working Group (IWG) involve addressing the impact of water quality on fisheries and proposing actionable measures. In the 2021-22 period, the IWG has prioritized the following action items:

Industrial Agriculture Pollution Assessment

IWG Priorities:

- Advocate for Updated Waste Management Systems for Industrial Agriculture and Factory Farms
- Advocate for Policies that Improve Groundwater and Surface Water Protections
- Evaluate Best Management Practices
- Bridge the Gap Between Scientists and Policymakers

- **November 2024 (Priority 4: Plastic Pollution)**
  Focus: Tire chemicals in waterways, aquaculture gear waste, and microplastics in oysters.

Outcome: Formal support for state-level extended producer responsibility (EPR) policies.

Coastal Carolina Riverwatch 2024 Report to the Industry Working Group

Water Quality for Fisheries Industry Working Group Priority Action Items
Priority #4 Plastic Pollution

The objectives of the Industry Working Group (IWG) involve addressing the impact of water quality on fisheries and proposing actionable measures. In the 2021-22 period, the IWG has prioritized the following action items:

Plastic Pollution Assessment

IWG Priorities:

Advocate for changes in the manufacturing process of plastics that prevent plastic pollution.

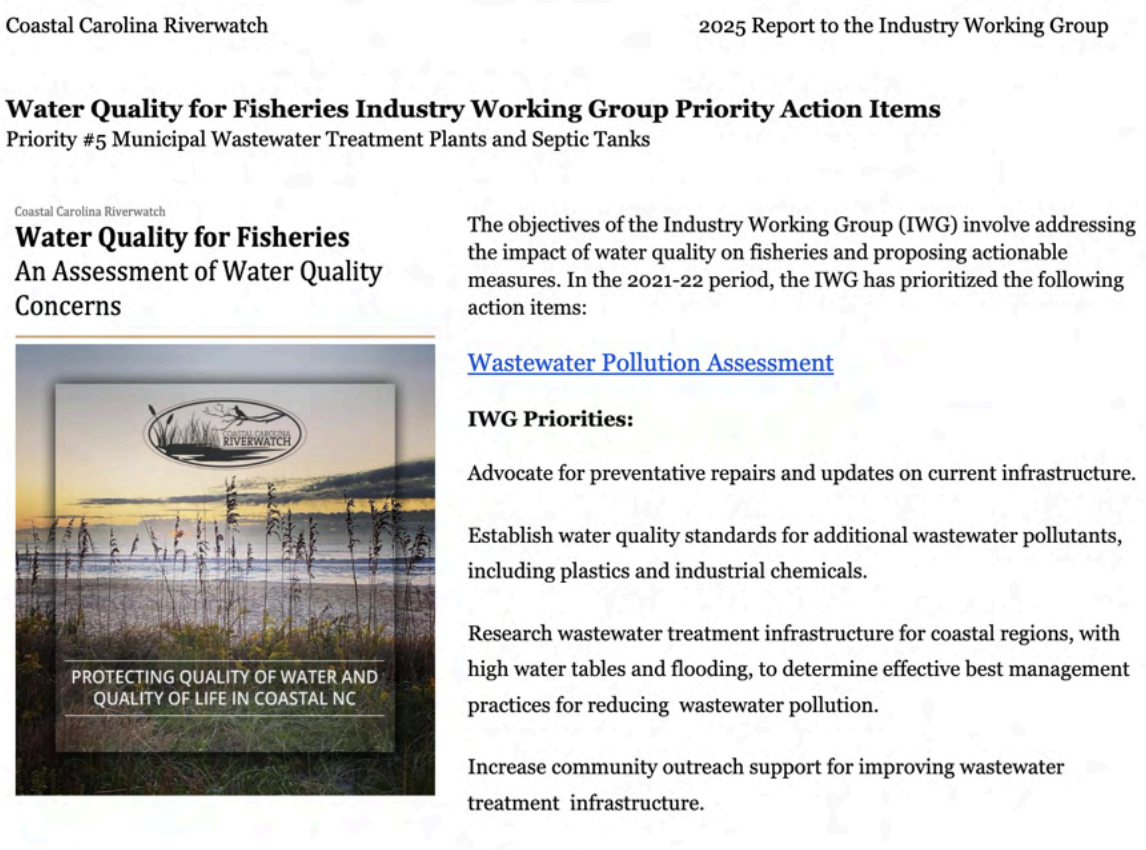
Advocate for single-use plastic bans and extended producer responsibility.

Research green chemistry (alternatives to current chemical composition of plastic) and research the physiological effects of plastic on fish.

Develop and support public outreach regarding human contributions to aquatic plastic pollution from land sources.

- **January 2025 (Priority 5: Wastewater Pollution)**
  Focus: Aging septic systems, municipal wastewater infrastructure gaps, and nutrient loading.

Outcome: Submitted pollution data to regulators, expanded outreach, and supported infrastructure upgrades.



Coastal Carolina Riverwatch 2025 Report to the Industry Working Group

Water Quality for Fisheries Industry Working Group Priority Action Items
Priority #5 Municipal Wastewater Treatment Plants and Septic Tanks

Coastal Carolina Riverwatch
Water Quality for Fisheries
An Assessment of Water Quality Concerns

The objectives of the Industry Working Group (IWG) involve addressing the impact of water quality on fisheries and proposing actionable measures. In the 2021-22 period, the IWG has prioritized the following action items:

Wastewater Pollution Assessment

IWG Priorities:

Advocate for preventative repairs and updates on current infrastructure.

Establish water quality standards for additional wastewater pollutants, including plastics and industrial chemicals.

Research wastewater treatment infrastructure for coastal regions, with high water tables and flooding, to determine effective best management practices for reducing wastewater pollution.

Increase community outreach support for improving wastewater treatment infrastructure.

- **March 2025 (Priority 2: Stormwater Runoff)**
  Focus: Urban runoff, marina storm drains, and nature-based infrastructure needs.
  Outcome: Draft policy support letter encouraging local BMP investments.

Water Quality for Fisheries Industry Working Group Priority Action Items
Priority #2 Stormwater Runoff from Roads, Highways, and Parking Lots

The objectives of the Industry Working Group (IWG) involve addressing the impact of water quality on fisheries and proposing actionable measures. In the 2021-22 period, the IWG has prioritized the following action items:

Stormwater Assessment

IWG Priorities:

Implement sustainable development techniques (wetland and forest protection, permeable surfaces, increased vegetated areas, on-site runoff treatment technologies).

Advocate for green infrastructure policy development (standardize the use of permeable pavement, green streets, filtration systems, and nature-based infrastructure).

Enhance the monitoring of stormwater runoff.

Publicize successful stormwater control efforts.

- **June 2025 (DMF/MFC, Symposium Input)**
  Focus: 2025 Symposium input and Division of Marine Fisheries collaboration on MFC authority.
  Outcome: Compiled IWG feedback on content, activities, and participation.

- **July 2025 (HAB and Fish Kill Workshop)**
  Focus: HAB tracking, individual reporting, and DEQ dashboard tools.
  Outcome: Increased awareness of monitoring resources and identified gaps in fisherman reporting and data access.[9]

Meeting documentation (agenda, reports, and video recordings) are archived by CCRW and shared with participants to maintain transparency and encourage continued engagement.

Recommendations and Program Outcomes

The IWG collectively produced a working list of recommendations that informed CCRW's stakeholder engagement, outreach, and research strategy.[10] Key outcomes from these recommendations include:

- **Formation of a CCRW Program Support Working Group** to track and respond to regulatory updates.
- **Aerial monitoring of CAFOs** through a partnership with SouthWings, with quarterly compliance reports submitted to NC DEQ.
- **Public input opportunities and community forums on CAFO permits and wetland protection.**
- **Membership in the NC Plastics Coalition** to support sustainable alternatives and manufacturer responsibility.
- **Support for the annual Marine Debris Symposium** to showcase plastic-related research and amplify fisheries voices.
- **Billboard campaigns and local workshops** to increase public awareness about nutrient pollution and support participation in state-level decision-making.

[9] Coastal Carolina Riverwatch. (2025). *Stakeholder engagement & learning analysis: IWG – Algal bloom & fish kill resource workshop* [Internal report].

[10] Coastal Carolina Riverwatch. (2025). *Industry Working Group: Derived outcomes and strategic recommendations - 2025.* [Internal document].

- **Increased engagement in wastewater coordination**, including submission of bacterial source data from CCRW's monitoring efforts to state regulatory agencies and collaboration with local governments on infrastructure upgrades.
- **Promotion of nature-based stormwater solutions**, with information on permeable pavement, bioswales, and rain gardens in municipal planning.
- **Development of tools and dashboards** to help fishermen recognize and report harmful algal blooms (HABs) and fish kills, in coordination with DEQ and other partners.
- **Expansion of community science efforts**, including new workshop formats, pre/post evaluations, and user-friendly educational materials aimed at building reporting confidence and environmental response readiness.
- **Improved regulatory engagement**, driven by CCRW-facilitated education around DMF/MFC roles and public comment processes, leading to increased participation from fishermen in advisory forums.
- **Advancement of mobile-accessible outreach**, with recommendations to develop low-vision and audio-friendly resources, podcasts, and field tools to better serve working fishermen and rural communities.

These actions reflect the IWG's evolving priorities and CCRW's commitment to translating participant feedback into strategic program support. Future programming, including the 2025 Water Quality for Fisheries Symposium, continues to be informed by this collaborative model.

Decision-Support Recommendations and Future Opportunities

Stakeholder input through the IWG and Symposium feedback activities highlighted several near-term policy opportunities where CCRW can help translate science into action and support decision-makers with credible, community-grounded recommendations:

• PFAS and emerging contaminants: Continue evaluating data-driven approaches and funding that expand monitoring and reduce exposure pathways in coastal waters and seafood.

• Wastewater and septic infrastructure: Identify funding pathways for septic upgrades and resilient wastewater improvements, prioritizing rural and low-income communities.

• Stormwater management: Provide information to support green infrastructure approaches and incentives (e.g., permeable pavement, vegetated buffers, wetlands restoration), paired with pre-storm planning and maintenance strategies.

• Plastic source reduction: Continue evaluating extended producer responsibility (EPR) and other source-reduction strategies, alongside research and pilot solutions for tire-related and microplastic pollution.

• Transparency and reporting: Provide information to support consistent public reporting on contamination incidents, clearer coordinated follow-up mechanisms for chronic pollution sources, and cross-agency coordination to improve response and communication.

Community Engagement

The IWG served as a critical link between technical research and the lived experiences of fisheries stakeholders. CCRW ensured meetings were accessible and productive by:

- Offering virtual participation options
- Sending pre-meeting reports with summarized water quality data
- Inviting participants to co-develop outreach materials and public statements
- Incorporating IWG perspectives into symposium panels and newsletters

Engagement in IWG meetings grew steadily. The August 2024 meeting had 5 attendees, while the November 2024 meeting had 11 RSVPs and 9 in attendance. In comparison, 2025 saw a marked increase in both average attendance and diversity of participation. The January and June meetings hosted 12 and 16 participants, respectively, and the July 2025 HAB and Fish Kill Workshop reached a record high of 23 attendees—the highest to date.[11]

[11] Coastal Carolina Riverwatch. (2025). *IWG Meeting Attendance Log*. [Internal spreadsheet].

Regular post-meeting surveys continued to indicate high satisfaction and value placed on cross-sector dialogue. Year-over-year data shows an increase in average attendance from 10 in 2024 to 15.5 in 2025, reflecting CCRW's successful efforts to expand outreach, retain stakeholders, and deepen engagement across sectors.[12]

Performance Measurements

Stakeholder Participation

In 2024, the Industry Working Group held four meetings, engaging over 20 individual stakeholders from across the fisheries, research, nonprofit, and regulatory sectors. Approximately 65% of participants attended more than one meeting, demonstrating strong continuity and commitment among core members.

By comparison, 2025 showed noticeable growth in both reach and retention. As of July, four meetings had been held with participation from over 25 individual stakeholders. The average meeting attendance increased from 10 in 2024 to 15.5 in 2025, with the July 2025 HAB and Fish Kill Workshop reaching a record high of 23 attendees. Additionally, 72% of participants attended more than one session, indicating deeper engagement and sustained interest in collaborative water quality work.

Public Engagement and Decision-Support Outputs

- 3 public input opportunities supported by IWG input
- 2 formal letters submitted to regulatory agencies
- 1 policy proposal under development focused on stormwater infrastructure in fisheries-dependent towns

Research Collaboration

- RTI plastics and tire study presented at the November IWG

[12] Coastal Carolina Riverwatch. (2025). *IWG Meeting Attendance Analysis: 2024 vs. 2025.* [Internal document].

- Feedback from August IWG integrated into CCRW's CAFO monitoring reports
- Program Support Working Group formed in direct response to IWG recommendations

Budget Report

OSBM funds were used exclusively to support project-specific labor, research, monitoring, education, and outreach deliverables. Matching contributions and in-kind support from partners, including Duke University, RTI International, and UNC-IMS, extended the program's reach and efficiency. No unapproved costs were incurred, and all expenditures comply with OSBM fiscal reporting standards.

Next Steps

To continue expanding the IWG's impact, CCRW plans to:

- CCRW hosted a 2025 joint session with aquaculture businesses and municipal staff to strengthen cross-sector dialogue on wastewater, permitting, and sustainable practices.
- Develop a rotating fisheries stakeholder spotlight in CCRW newsletters to elevate the lived experiences and expertise of IWG participants.
- CCRW released a 2025 Industry Working Group (IWG) Summary Report with policy-relevant takeaways, research highlights, and outcomes from the year's workshops and check-in survey.
- Facilitate a working session on local ordinance education related to plastic bans, microplastic mitigation, and stormwater controls.

- Explore mobile-accessible and audio-friendly outreach tools (e.g., podcasts or digital meeting summaries) to make WQ4F resources more accessible to on-the-water stakeholders.[13]

- Replicate successful training formats (like the HAB and Fish Kill Workshop) seasonally or by topic (e.g., microplastics, cold stun events) to build community capacity for environmental response.[14]

Conclusion

Across this reporting period, WQ4F demonstrated that strategic state investment—paired with strong partnerships—can rapidly expand monitoring capacity, translate research into community-ready tools, and convene the stakeholders needed to protect fisheries. By combining incident response readiness (HABs and fish kills), targeted contaminant research (PFAS/metals and plastics-associated chemicals), and a growing education network, CCRW is positioned to scale impact in the next cycle. Continued support will allow the program to move from screening to confirmed, decision-ready data; deepen infrastructure coordination, decision-support, and public education aligned with stakeholder priorities; and maintain transparent communication that protects both coastal ecosystems and coastal livelihoods.

Together, we protect the quality of water and quality of life in coastal North Carolina.

[13] Coastal Carolina Riverwatch. (2025). *Industry Working Group: Derived outcomes and strategic recommendations - 2025*. [Internal document].

[14] Ibid.

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Appendix A: Board of Directors (2023–2025)

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- Jan Farmer, Vice President
- Susan Land, Treasurer
- Joel Dunn, Secretary
- Ryan Bethea
- Rachel Carter
- Dr. Lee Ferguson
- Sterling Gillikin
- Sammy Johnson
- Dr. Rick Kearney
- Tom Mattison
- Tancred Miller
- James Trammel
- Suzanne Wheatcraft

Appendix B: Board of Directors (2025–2026)

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