

State of the Science of Salinity Risks in the Chesapeake Bay and Its Tributaries: Connecting Monitoring, Modeling and Management

Steering Committee: Sujay Kaushal (University of Maryland) (Co-Chair), Stanley Grant (Virginia Tech) (Co-Chair), Steven Bieber (Metropolitan Washington Council of Governments), Greg Noe (USGS), Lewis Linker (EPA, Chesapeake Bay Program), Kaylyn Gootman (EPA, Chesapeake Bay Program), Paul Mayer (EPA), Conor Keitzer (UMCES IAN), Megan Rippey (Virginia Tech), Steven Nelson (WSSC), Rosemary Fanelli (USGS), K.C. Filippino (Hampton Roads Planning District Commission), Matthew Baker (UMBC), Lisa Ragain (MWCOG), Caitlin Bolton (MWCOG), Peter Tango (USGS, Chesapeake Bay Program)



Salty STAC Report Is Coming Soon

We are very grateful for Meg Cole and Tou Matthews and all of our STAC Steering Committee and speakers and participants...



Workshop Objectives

- Our objectives were to assess the state of the science of salinization in the Chesapeake Bay watershed, gain a better understanding of long-term trends and the magnitude and frequency of extreme salinity events, and identify effective ways to anticipate and manage changes in salinization.
- Given that salt now affects the whole system from land to sea, we assessed salinization risks from the headwaters to the Chesapeake Bay.



Participants

56 participants met representing universities and research institutions; federal, state, and local government agencies; regional planning organizations and interstate commissions; drinking water and wastewater utilities; environmental organizations



STAC Salinity Workshop
May 26 - 27, 2026

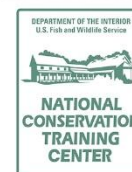


Photo Courtesy: Meg Cole & Tou Matthews



An Opportunity to Share Knowledge

- Oral Presentations
- Poster Presentations
- Group Discussions

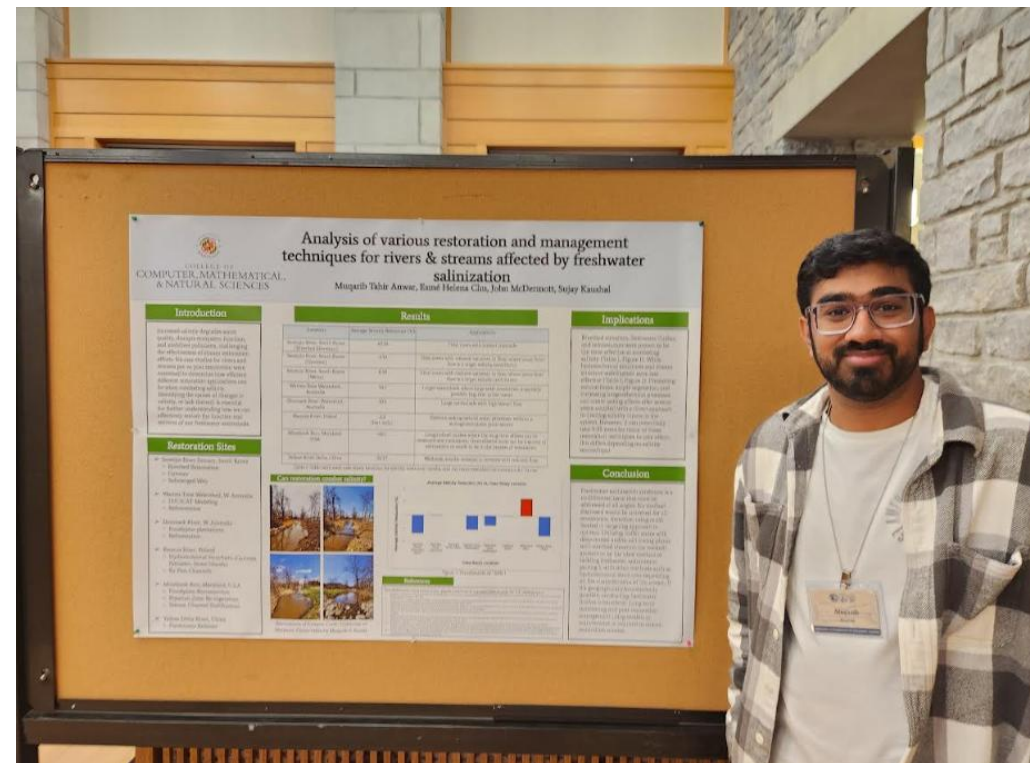
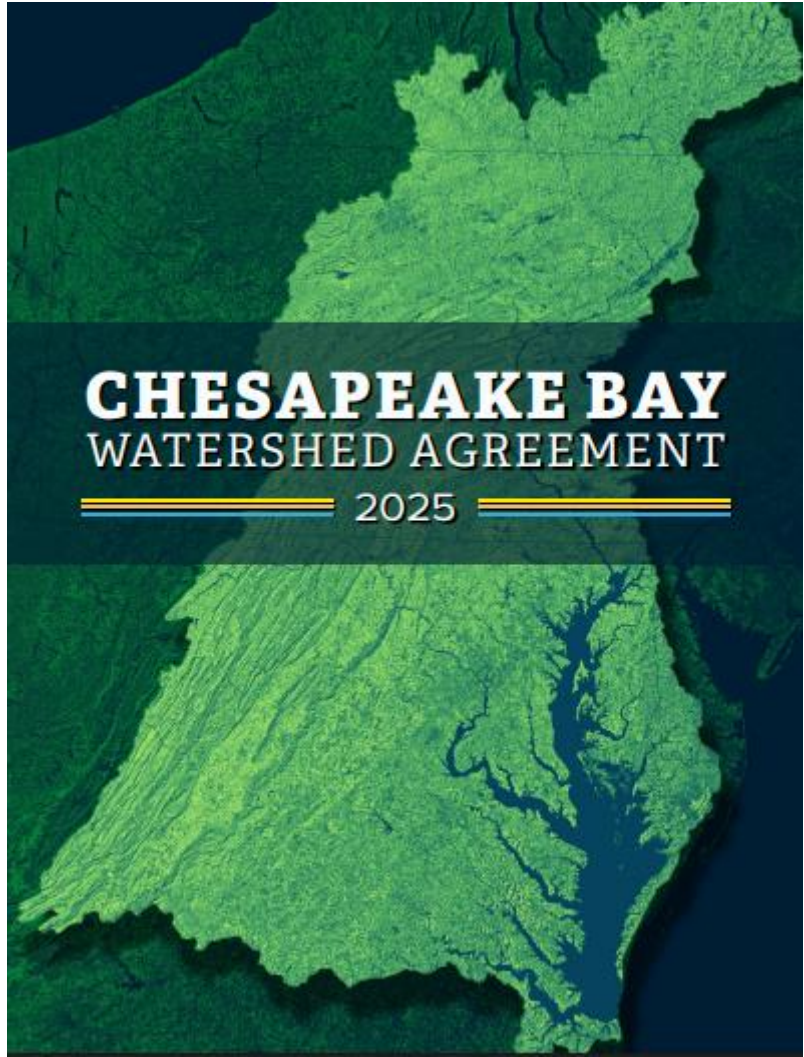


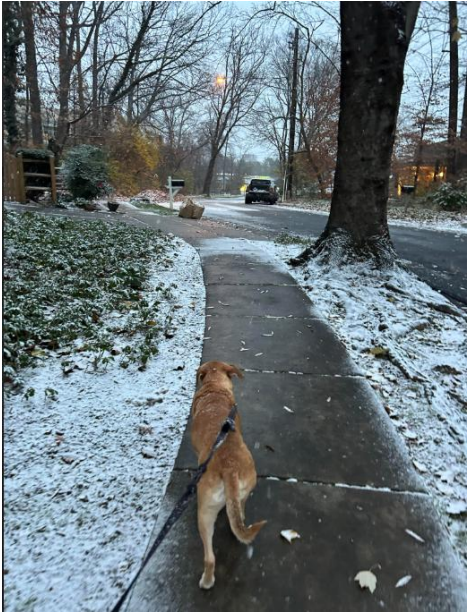
Photo Courtesy: Muqarib Anwar



The Four Interconnected Goals of Watershed Restoration

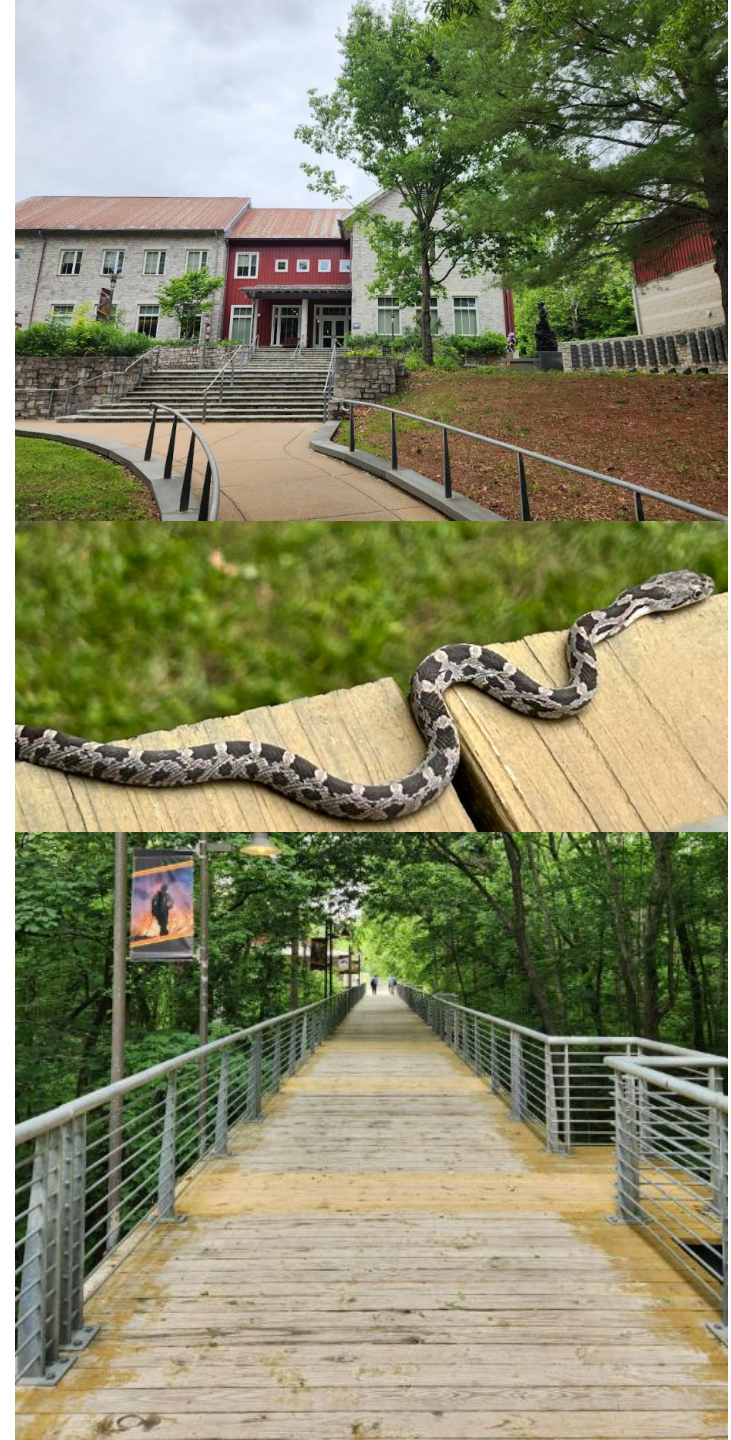


Workshop emphasized freshwater salinization as a serious, cross-cutting environmental challenge with implications for the Chesapeake Bay Program goals and outcomes.



Daily Plan

- **Day 1 Objective:** Build a shared understanding of salinization drivers, processes, and trends across tidal and nontidal systems, and how they interact to affect watershed and Bay outcomes.
- **Day 2 Objective:** Develop and prioritize actionable recommendations for monitoring, modeling, and management approaches to reduce salinization risks, with attention to both short-term and long-term strategies.



Example Takeaways

- Freshwater salinization is harming drinking water, ecosystems, agriculture, infrastructure, and economies across the Chesapeake Bay region.
- Freshwater Salinization Syndrome has different stages and risk factors across different geographic areas of the Chesapeake Bay region.
- There are diverse benchmarks for identifying stages and risks of Freshwater Salinization Syndrome.
- Freshwater Salinization Syndrome from watershed pollution and saltwater intrusion is affecting millions of people across the Chesapeake Bay region.

Examples of What We Learned about Salty Watersheds....

- Freshwater salinization triggers a syndrome of impacts and chemical cocktails harming ecosystems, drinking water, and infrastructure.
- Major drinking water sources for millions of people are being impacted by freshwater salinization in the Chesapeake Bay region.
- Freshwater salinization is widespread and there are risk factors for rising trends.
- There are thresholds of changes in salinity with impervious surface cover that can inform conservation, restoration, and management.
- Salinity data are measured, reported, and stored in many different ways, and there are opportunities for better coordination and leveraging monitoring programs.
- There are distinct stages in detecting watershed salinity risks with public perception for communication.

Examples of What We Learned about Salty Coastal Lands...

- Freshwater salinization, saltwater intrusion, and sea level rise are rapidly changing different coastal ecosystems and infrastructure (forests, wetlands, water intakes).
- Saltwater intrusion threatens forests and coastal farms throughout the Mid-Atlantic, with the extent of severe visible impacts rapidly expanding in recent years
- Loss of agricultural farmlands to saltwater intrusion is costing millions of dollars on the Eastern Shore of the Chesapeake Bay (see Mondal presentation and Mondal et al. 2023)
- Loss of forests to sea level rise and saltwater intrusion is causing the formation of ‘ghost forests,’ which degrade thriving habitats for some species

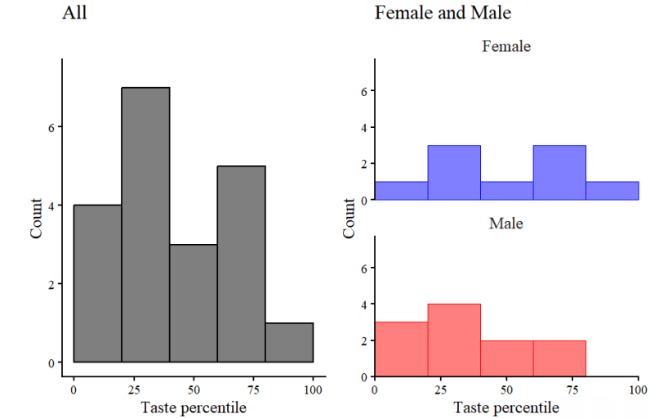
Examples of What We Learned about Salty Drinking Water...

- Major drinking water sources are also experiencing freshwater salinization.
- Long-term data show drinking water reservoirs for New York City could exceed the State of New York's maximum contaminant level for chloride within the next 30-40 years (see presentation from Adam Bosch)
- Research is investigating how the significant rise in chloride might affect other reservoir dynamics and water quality issues, such as reservoir mixing, the production of organic taste and odor compounds, anoxia, and the corrosion of infrastructure (see presentation from Adam Bosch)
- Harmful disinfection by-products could form due to freshwater salinization and salt ions (see presentation Lisa Ragain)
- There are diverse management strategies for dealing with drinking water salinity



Some steering committee members in front of major drinking water sources on the Patuxent River affected by salinization.

Salinity Taste Test Conducted at Workshop



Congrats!
STAC Member Greg Noe had
the best sense of taste

What We Learned about Adding Salt to Models...

- The Chesapeake Bay Estuarine Model is being used to study the impacts of sea level rise on salinity intrusion and hypoxia.
- Emerging modeling approaches can complement large, spatially resolved models with computationally efficient tools designed for prediction, scenario testing, and decision support.

Examples of What We Learned about Salt Management...

- Utilities are the front lines for adapting to salinization risks. Drinking water and wastewater utilities can translate salinity science into risk thresholds, alternative treatment strategies, infrastructure decisions, and public-facing awareness.
- Salinity problems are easier to manage when agencies move from reactive monitoring to proactive planning
- Salinity management requires combinations of source reduction, stormwater management, and adaptation
- Freshwater salinization is a product of multiple sources of anthropogenic salts over time.
- Salt source tracking approaches can be developed for addressing risks

Some Future Recommendations

- Determine how salinity issues from watershed pollution and saltwater intrusion are related to achieving current Chesapeake Bay Watershed Agreement (CBP, 2025) goals and outcomes.
- Leverage the common understanding and syntheses available on the regional salinity problem so that management and adaptation targets and actions can be considered.
- Explore how to discuss cross-cutting salinity topics such as thriving habitats and clean water within the existing Chesapeake Bay partnership and explore avenues for further partnerships and information sharing dealing with salt pollution and saltwater intrusion.

Gain more knowledge through future STAC workshops on managing salinity risks to track this growing problem across ecosystems, document actionable solutions, and analyze management, mitigation, and adaptation tradeoffs and report on their effectiveness



Drive home from STAC workshop – salinity adaptation, mitigation, and prevention on the horizon



[Link to Otter!](#)