Chesapeake Community Research Symposium 2026
Special Sessions for Abstract Submissions

1. **Emerging Tools and Technologies for Monitoring and Mitigating Estuarine Acidification in the Chesapeake Bay.** Emma Venarde, Janet Reimer

As the Chesapeake Bay experiences unprecedented acidification, the Mid-Atlantic Coastal Acidification Network (MACAN) has brought researchers and managers together to collaborate and develop opportunities, data products, and methods to inform the next generation of monitoring and mitigation tools and technologies. Estuarine acidification, compounded by eutrophication, harmful algal blooms, and anomalously warm temperatures, hinders the growth and life span of many economically and ecologically significant Chesapeake Bay species, including blue crabs, bay scallops, and oysters. Novel management strategies ranging from seagrass restoration to marine carbon dioxide removal (mCDR) may support localized mitigation of acidification in the near future. We invite abstracts showcasing the latest advancements in acidification monitoring, forecasting, and mitigation on the impacts of acidification on the Chesapeake's vital species and habitats.

2. **Advancing Chesapeake Bay Water-quality Science and Management: I. Innovative monitoring techniques and modeling tools.** Qian Zhang, Kaylyn Gootman, Peter Tango, Breck Sullivan

Restoration of complex aquatic ecosystems such as Chesapeake Bay requires sustained collaboration between the science and management communities. Over more than three decades, systematic monitoring and progressively refined modeling tools have provided critical feedback on restoration progress. While these efforts have supported significant gains in water quality, new challenges are emerging as we confront a rapidly changing natural and human environment. One of the most pressing is how to harness a new generation of monitoring and modeling tools to sustain progress in this dynamic future. This session focuses on the development and deployment of tools that expand our ability to observe and simulate water quality. Topics include high-resolution in situ sensors, remote sensing platforms, satellite applications, and innovative modeling frameworks. Special attention will be given to how artificial intelligence and machine learning are being applied to enhance or emulate mechanistic models. Presentations will highlight advances that improve how we collect, integrate, and simulate data to better track restoration progress and anticipate future challenges. This is Part I of two connected sessions organized by the Chesapeake Bay Program's Integrated Trends Analysis Team.

3. **Advancing Chesapeake Bay Water-quality Science and Management: II. Novel analysis and scientific communication approaches to inform management.** Qian Zhang, James Webber, Rebecca Murphy, Kaylyn Gootman

Restoration of complex aquatic ecosystems such as Chesapeake Bay requires sustained collaboration between the science and management communities. Alongside advances in monitoring and modeling, there is a growing need for novel analytical approaches to extract new insights from data and for effective communication strategies that translate science into actionable guidance. Sustaining progress in a rapidly changing natural and human environment demands tools that can link diverse datasets and models to better explain ecosystem responses to environmental drivers and management actions. This session focuses on the development of innovative approaches for analyzing, interpreting, and communicating results in ways that directly support management. Examples include applications of advanced statistical and mechanistic methods, as well as artificial intelligence and machine learning. Contributions are also invited that highlight science communication strategies designed to transform monitoring and model-based findings into actionable information for the management community. This is Part II of two connected sessions organized by the Chesapeake Bay Program's Integrated Trends Analysis Team.

4. **Data Centers and Water, Air, and Environmental Impacts and Solution Options in the Chesapeake Watershed.** Kevin Sellner, Charles Bott

The huge proliferation of data centers in the CB watershed raises many concerns on water and air quality and options to address these expanding environmental and human health threats. Water demand (is there sufficient source water for ALL users with the >700 data center demand), discharged water quality (center additives, purposely added or resulting from operations), emissions (from diesel-powered generators at each center building), noise threats to children, extreme stormwater runoff (erosion, damage to buffers, floodplains, neighboring properties and wells, including loss of recharge areas), hazard spills and groundwater and soil contamination, terrestrial degradation/fragmentation from transmission line construction/operation, and habitat and biota losses are some of the threats specific to the watershed's current and future conditions. Other areas, such as loss of property values, e-waste, inadequate regional power supplies are also well-documented. Regional experts will address documented impacts and solutions to protect the bay, watershed, and residents.

5. **Balancing agricultural and ecological goals of Chesapeake Bay restoration: Insights from interdisciplinary team science.** Lisa Wainger, Caitlin Grady

The goals and implementation strategies of Chesapeake Bay restoration are being adjusted as partner agreements evolve and incentive structures are reconsidered. This shifting landscape presents a timely opportunity to evaluate the benefits of alternative restoration approaches. Notably, agricultural community goals have not been fully integrated into restoration planning, offering a chance to broaden the vision of desirable futures.

This session will highlight research that explores synergies and tradeoffs among agricultural and environmental goals in the Chesapeake Bay watershed and similar contexts. Due to the nature of these concerns, we welcome insights from team science where investigators are examining alternative management approaches. Presentations are invited from interdisciplinary teams, including agricultural and environmental economists, watershed and nutrient mass balance modelers, and soil and agronomy researchers.

Contributions will include findings from stakeholder-driven scenario development and model-based analysis. Modeling tools offer a policy sandbox to test ideas and behavioral incentives under changing climate and land use conditions. While methods will vary across researchers, scenario thinking is a common approach used to explore policy and incentive options. Scenarios may be co-developed with stakeholders including farmers, agribusinesses, developers, government agencies, and NGOs concerned with food systems and environmental outcomes. These scenarios may be informed by empirical models of human responses to incentives and translated into inputs for simulation models to test performance.

Scenarios may compare business-as-usual (BAU) to future visions that explore changing system drivers and introduce innovations to address persistent challenges. Topics of interest include ongoing shifts in agricultural production, nutrient use efficiency, and farm types that reflect global market forces and technological change and will shape future conditions in the watershed. Climate and land use change also influence agricultural decisions and the effectiveness of conservation practices in reducing nutrient and sediment runoff.

We expect speakers to cover any aspect of scenario development to modeling results. Some scenario modeling results suggest that substantial departures from current trends are needed to meet water quality goals. These needs are driven by findings that agricultural intensification poses greater nutrient runoff risks than urbanization or climate change. Stakeholder engagement is an important element as it provides a critical “reality check” on farm and market behaviors. Further, we welcome empirical models that may be used to test human behavior in response to change, such as consumer willingness to pay a premium for local food, thereby helping to define realistic bounds for future scenarios.

6. **Supporting a healthier future for freshwater stream ecosystems with machine learning and multi-jurisdictional data analysis.** Rosemary Fanelli, Kelly Maloney

Maintaining and improving the health of freshwater stream ecosystems remains a major goal of the Chesapeake Bay restoration effort. Landscape and regional drivers, such as urban growth, increased agricultural intensification, and shifting precipitation patterns, have altered the health and biological integrity of streams and rivers in Chesapeake Bay watershed. These landscape drivers often trigger changes in abiotic conditions in and around stream channels, including modified streamflow, degraded habitat and water quality, and increased occurrence of contaminants. These stressors can reduce the abundance, diversity, and functioning of living resources within freshwater stream ecosystems.

Local and regional managers have been tasked with implementing restoration and conservation practices to protect or restore stream ecosystems within the watershed. Knowing where stressors are absent/minimal (for conservation) or elevated (for restoration) would help guide the placement of these practices. Local and regional monitoring programs have been established to collect information about stream stressors and stream health, but spatial and temporal gaps in the networks often exist, which limits their use. However, when harmonized across multiple jurisdictions, these data can be coupled with emerging AI tools, like machine learning, to provide a more holistic picture of stream ecosystem conditions and responses to management practices. A key aspect to these models is their ability to predict conditions in unmonitored areas, which can help guide watershed-wide conservation and restoration implementation efforts needed to improve future stream health conditions.

This session will showcase studies that leverage local and regional monitoring data to better characterize, track, and predict changes in freshwater stream ecosystems. For example, the USGS has been leveraging such monitoring networks to develop predictive models for estimating benthic macroinvertebrate and fish community composition, salinity, and physical habitat across all stream reaches within the watershed. New projects are focused on estimating stream temperature and visualizing these predictions so that managers can access the results and dynamically incorporate them into their workflows. We welcome additional examples of predictive modeling, data visualization, and data analysis that leverages local and regional data collection efforts to better understand freshwater stream ecosystems and the effects of management practices.

7. **Coupled human-natural systems in Chesapeake Bay.** Raleigh Hood, DG Webster, Patrick Bitterman, Victoria Coles, Peter Claggett, Sevgi Erdogan, Theodore Lim

The grand challenges confronting management and decision making in Chesapeake Bay airshed, watershed and estuary result from the interaction of humans with their environment. Commercial and recreational fisheries, air quality, agricultural and energy production practices, population growth, and land use change all impact the function of the land and water systems that together comprise the Chesapeake Bay socio-environmental system. In turn, the health and quality of the environment affect humans and decision-making at multiple spatial and temporal scales – from individuals up through the state and federal levels, today and decades into the future. Models – from the conceptual to the mathematical – are representations of how we understand this critical nexus of interacting issues. Yet, coupling social, economic, policy and governance models with environmental models to assess the impact of strategic management and policy actions remains challenging. This session invites research relevant to conceptual, theoretical or numerical models of socio-environmental systems or that identifies gaps and challenges hindering the integration of social and environmental models, to better understand their combined impact.

8. **Advancing the Development and Management Applications of Next-generation Airshed, Land-use, Watershed, and Estuarine Models.** Zhengui Wang, Gopal Bhatt, Joseph Delesantro, Wenfan Wu

This session explores the evolving Chesapeake Bay ecosystem through watershed, airshed, and estuarine perspectives. We are interested in highlighting advances in monitoring, data analytics, environmental management, and modeling that improve characterization of physical and biogeochemical water quality processes, and its association with ecosystems across atmospheric, terrestrial, and aquatic domains. Emphasis is placed on understanding drivers of nutrients and sediment loading, the downstream effects on critical habitats for living resources, and how these insights could inform decision-support tools such as the Chesapeake Bay Program’s CAST in improving assessments of past and future watershed planning and management.

A key focus will be placed on the development of the Chesapeake Bay Program’s next generation Phase 7 modeling framework, where greater emphasis is being placed on better representation of scale, biogeochemical processes, and incorporation of emerging high-resolution datasets in the model development. These advances would provide improved estimates of water quality response, habitat conditions, and management outcomes under current and future environmental pressures.

We welcome presentations on studies across land, air, and water that enhance understanding of nutrient and sediment sources and transport, assess management and modeling effectiveness, and advance of Phase 7 model components. The session aims to provide a multidisciplinary forum for improving ecosystem understanding and informing adaptive management across the Chesapeake Bay and its watershed, and we also welcome presentations on the use of existing models such as Phase 6 for informing management decisions of CBP and other systems.

9. **Incorporating transdisciplinary practices and team science into AI-based research.** Alexandra Fries

Artificial Intelligence (AI) and machine learning are rapidly transforming how we observe, model, and manage complex environmental systems. Within the Chesapeake Bay and beyond, AI applications now extend from data collection to ecosystem forecasting to decision-support tools for restoration and resilience. Yet, as these technologies become more integral to environmental research, the full potential of AI can only be realized through transdisciplinary collaboration—bringing together computer scientists, ecologists, social scientists, data managers, and community stakeholders to ensure that tools are not only powerful but also usable, ethical, and aligned with management needs and goals.

Co-designing and co-developing research projects across disciplines leads to more effective outcomes and better use of results. As AI tools are incorporated into research methods and projects, this is becoming increasingly important. This session will explore how team science principles and transdisciplinary practices can be incorporated into AI-based environmental research to enhance innovation, communication, and impact. While AI excels at pattern recognition and prediction, it requires contextual grounding—ecological understanding, stakeholder input, and social insight—to guide meaningful application. Talks will highlight real-world examples where collaborative frameworks improved the design, interpretation, and application of AI systems for water quality modeling, habitat restoration, and climate adaptation planning.

The session will distill lessons from research projects using AI tools—ranging from hybrid ecological modeling teams to cross-sector AI ethics initiatives. It will also identify barriers such as disciplinary silos, data incompatibility, and uneven access to computing resources, and propose strategies to overcome them through collaborative infrastructure, shared language, and inclusive governance.

10. Carbon cycling in Chesapeake Bay and other coastal waters. Raymond Najjar, Cassie Gurbisz, Whitman Miller, and Amanda Knobloch

Carbon is a common thread that links numerous important estuarine issues, such as hypoxia, acidification, marsh inundation, and declining water clarity. Estuarine carbon is also important because it is the primary linkage between land and sea in the global carbon cycle, which is a key component of the climate system. Increasingly, estuaries are being considered as sites of carbon storage, both natural—including blue carbon sinks in submerged vegetation and tidal wetlands—and anthropogenic (e.g., marine carbon dioxide removal via ocean alkalinity enhancement). This session seeks contributions on all aspects of carbon cycling in Chesapeake Bay and other coastal systems, including biological, chemical, and physical processes that transport and transform carbon in all of its forms (dissolved, particulate, organic, and inorganic). Studies that characterize linkages among the different carbon reservoirs, such as rivers, tidal wetlands, estuarine open waters, the atmosphere, and sediments, are particularly welcome. Approaches for studying carbon cycling may include measurements of carbon stocks and fluxes, numerical modeling, isotopic analysis, and remote sensing. Efforts to place carbon cycling in Chesapeake Bay in a broader context, particularly linkages to other phenomena in Chesapeake Bay and contrasts with other estuarine systems, are encouraged.

11. **Geospatial Targeting of Restoration and Conservation Actions.** Peter Claggett, John Wolf

Achieving the goals of the Chesapeake Bay Watershed Agreement requires tools that combine cutting-edge science with practical usability. This two-part session explores how emerging technologies and stakeholder-driven design are shaping the next generation of targeting tools for restoration and conservation.

Session A: High-Resolution Geospatial Data and Technical Advances
Description: The ever-increasing availability of aerial and satellite imagery, tax parcels, protected lands, and other large spatial datasets along with emerging technologies and techniques for extracting information from big data, present unprecedented opportunities for targeting and monitoring restoration and conservation actions in the Chesapeake Bay watershed. When coupled with policies and programmatic commitments, targeting tools can increase the efficiency and effectiveness of investments to restore and maintain the health of waterways. Emerging technologies and techniques have enabled the mapping of land use and land use change at 1-meter spatial resolution and the mapping of small streams, ditches, and land management practices. Efforts to leverage these data in tools and models include the development of the Phase 7 watershed model, the Chesapeake Bay Program’s Targeting Portal, parcel-level targeting for land conservation, rapid stream delisting protocols, and inventories of Best Management Practices such as riparian forest buffers and conservation tillage. These efforts can only be successful, however, through programmatic comments to consider the information in resource allocation decisions.

Session B: Audience-Driven Design for Conservation and Restoration Tools, Maps, and Data
Description: This session will explore how user research and usability testing are shaping the redesign of the Chesapeake Bay Targeting Portal to better serve diverse audiences. Participants will learn about the key findings from this research, including common barriers such as complex interfaces, outdated data, and fragmented resources, and the specific improvements users requested: locally relevant, parcel-scale information; actionable outputs for planning and reporting; and intuitive designs supported by clear documentation and case studies.

The session will demonstrate how these insights are informing the portal redesign, including streamlined access to authoritative datasets, improved search and categorization, and features that help users communicate conservation and restoration outcomes effectively. Beyond interface changes, the redesign emphasizes delivering data, maps, tools, and fact sheets that directly address stakeholder needs under the updated Chesapeake Bay Watershed Agreement.

Attendees will see examples of planned enhancements, learn about the next steps for testing and implementation, and engage in discussions about strategies for embedding stakeholder feedback into tool development. This session is designed for practitioners, planners, and technical staff who want to ensure geospatial tools are not only scientifically robust but also practical and indispensable for advancing watershed restoration.

12. **Accelerating our response to an uncertain future – collaborations leveraging models, big data, and AI to address environmental challenges raised by stakeholders.** Ryan J. Woodland, Victoria Coles

Human activities continue to catalyze change in Chesapeake Bay and coastal ecosystems around the world. These activities and their attendant processes are manifold and can alter the fundamental hydrodynamics, biogeochemistry, and productivity of coastal ecosystems. The ecological consequences associated with these changes are often negative for biota and there is a critical need to understand how natural populations and communities will respond to management decisions and larger, global phenomena. Predicting such ecological change is difficult, with complex interactions among drivers such as climate change, eutrophication, fisheries harvest, and shoreline development (to name only a few) likely to influence coastal systems and their associated ecosystem services in unanticipated ways. Further, models are often not designed to provide guidance on issues relevant to stakeholders. However, statistical and mechanistic modeling approaches continue to develop, increasing the feasibility of addressing relevant processes. For example, large, integrated ecosystem model environments such as the Chesapeake Bay Program's Phase 6 (and soon Phase 7) models provide high-resolution, spatially and temporally explicit model output that can be used as predictors in ecologically relevant forecast and hindcast simulations.

We argue that a collaborative approach is needed to bring stakeholders, technological and model innovations, and big data together to accelerate progress on environmental challenges. This session provides a forum for scientists, managers, and other professionals collaborating on models and data to present their stakeholder-relevant research. We encourage submission of suitable abstracts on a broad array of subjects in this realm, spanning trophic levels, spatiotemporal scales, and methodologies. Abstracts that emphasize cross-disciplinary approaches, new models that take advantage of emerging cyber solutions, or novel applications that leverage pre-existing models are encouraged. Ecological modeling and forecasting sits at the nexus of many disciplines and the goal of this session is to bring together multi-disciplinary research teams that are working at this interface, as well as managers that are tasked with holistically managing coastal ecosystems for an uncertain future. This session is intended to help foster communication across those communities, share novel ideas and examples of successes (and failures) in ecological forecasting, and develop a network of colleagues working in this space.

13. **Pairing scientific rigor with end-user accessibility for data visualizations.** Taryn Sudol, Kayle Krieg, Lauren Mariolis

Understanding current monitoring and future forecasts under changing environmental conditions, such as sea level rise and other effects of a warming climate, is imperative for decision makers across government, commercial, and residential sectors. These users have differing levels of technical knowledge or experience interacting with data platforms. While scientists strive to provide accurate and precise data to inform decisions, this must all be balanced with relevance and usability for the intended audience.

Numerous data visualizations (i.e. models or tools which display some environmental status or prediction) exist or are being developed around the Chesapeake Bay to inform end-users about changing environmental conditions. This session will showcase those data visualization products while highlighting the efforts developers made to address end-user needs, incorporate their feedback, and/or co-produce the tool with end-users. Presentations will also address challenges and solutions around data accuracy versus usability. Time will be allotted for open discussion on participants' experiences, best practices, and questions. This session should interest those considering new data visualizations or strategies to encourage tool adoption.

14. **Low-Cost Physical Environmental Monitoring Systems.** Michael Maddox, Taryn Sudol

On December 2nd, 2025, the new 15-year plan was signed into action by the Chesapeake Bay Program Partners. The new agreement adds a new emphasis on resilience and community engagement. The 2025 agreement states "One of the most important lessons the partners have learned from the past four decades is that although watershed-wide partnerships can help to coordinate and catalyze progress, implementation is locally inspired and driven".

Localizing mitigation and adaptation planning and implementation requires more localized data and observations. Currently, there remains swaths of "data deserts" in the Chesapeake Bay watershed that need to be filled to make the best possible decisions at the local level with limited resources. To fill this data gap, several groups have developed lower to low-cost sensors that can be installed in dense networks or have invested in uncrewed arial systems. These systems offer approaches for filling in gaps in larger observation networks. Data at the local level also helps inform earth system models, data assimilation efforts and risk analysis.

This session will focus on advances in low-cost and/or densely located sensors and observation systems designed to inform more localized decision-making.

15. **Next Generation Tools and Team Science for Chesapeake Bay Living Resource Assessment and Management.** Bruce Vogt, Christina Garvey

The Chesapeake Bay Program Partnership's efforts, guided by the revised Chesapeake Bay Watershed Agreement (Beyond 2025), are entering a critical new phase defined by adaptive management and long-term goals extending to 2040. Achieving the Agreement's commitment to thriving habitat, fisheries and wildlife and addressing recommendations from the Comprehensive Evaluation of System Response Report require a significant evolution in how we monitor, assess, and manage the Bay's living aquatic resources—including critical habitats (e.g., wetlands, SAV, oyster reefs) and ecologically or commercially important species (e.g., blue crab, striped bass, forage species, invasive blue catfish). As the Bay faces a "dynamic future" characterized by environmental variability, evolving human pressures, and the emergence of new technologies, the established methods for monitoring, assessing, and researching these resources must adapt.

This session invites presentations that showcase next generation tools and transdisciplinary approaches that are reshaping how we understand and manage the Bay's living resources and the habitats they depend on. We seek contributions that move beyond traditional ecological monitoring to embrace innovative methodologies that enhance the speed, scale, and utility of living resource data for management decisions.

Key topics and areas of interest include:

- Advanced Monitoring and Data Collection: New applications of high-resolution remote sensing (aerial, satellite, acoustic), autonomous underwater vehicles (AUVs), and in-situ monitoring networks for tracking species movement, habitat change (e.g., SAV or oyster reef growth), and water quality impacts on biota.
- Machine Learning and AI in Assessment: Novel uses of Artificial Intelligence (AI) and Machine Learning (ML) techniques for processing complex datasets, such as automated species identification from acoustic or image data, forecasting fisheries stock dynamics, modeling habitat suitability under future climate scenarios, or emulating mechanistic ecosystem models.
- Integrating Social and Ecological Data: Research that successfully merges ecological data (e.g., fish stock surveys, oyster restoration success) with social science data (e.g., human behavior, stakeholder acceptance, economic models).
- "Team Science" for Management: Case studies and methodologies that demonstrate effective transdisciplinary collaboration between resource managers, modelers, researchers, and stakeholders to translate complex ecological research into timely, actionable management policy for specific species or habitat restoration targets.
- Addressing Data Challenges: Strategies for managing the high volume of new data, ensuring data quality, and effectively communicating complex or uncertain results (especially those derived from AI/ML) to policymakers and the public in a manner that builds trust.
- Integrating Diverse Data Streams: Methodologies for synthesizing information from multiple sources—such as citizen science, historical surveys, and novel high-frequency data—to create comprehensive and robust assessments that guide living resource management and restoration targets.

By bringing together scientists and managers focused on aquatic resources, this session aims to articulate a roadmap for leveraging new technologies and "team science" to sustain and accelerate progress toward a healthy Chesapeake Bay in the face of future challenges.

16. **Recent Modeling Advances in Compound Flooding, a 10-year Retrospective of Technological Innovations in Hydrodynamic Modeling and Monitoring Since 2016 Hurricane Matthew.** J. Derek Loftis, Navid Tahvildari, Patrick Taylor

The hallmark of a well-rounded inundation prediction model is the ability to successfully characterize flood depths, extents, and duration before an impending catastrophe. The ability of a predictive model to identify these three facets of flooding in advance can be most challenging during compound flooding scenarios, due to the inherent complexities involved in calculating the combined flood impacts of rainfall, storm surge, and tides. Sensitivity of different meteorological inputs (wind speed and direction, air pressure, precipitation) converging upon varying conditions on the ground (initial soil moisture and saturation, infiltration through ground surfaces of varying permeability, spatially varying vegetation cover, and storm water drainage impoundment), quickly translate into a seemingly insurmountable modeling problem to address. Yet, technological advancements in big data and real-time water monitoring systems on the ground coupled with remote sensing data can now deliver enhanced predictive inputs for hydrodynamic, hydrologic, and machine learning models to provide realistic forecasts for compound flooding applications.

This special session invites authors to present their recent original research advancements in flood modeling and monitoring for compound flooding applications leveraging hydrodynamic, hydrologic, or machine learning models. This session does not require submitted abstracts to directly address 2016 Hurricane Matthew, Chesapeake Bay's largest compound flooding event in recent history, but it is anticipated that over half of the submitted talks for this special session submitted to the 2026 Chesapeake Community Research Symposium will address it. Presentations addressing anticipated impacts of storms similar to 2016 Hurricane Matthew in the future (in the context of projected sea level rise and more precipitative storms correlated with climate change in the Mid-Atlantic Bight) are also appropriate for this session.

17. **Marine Debris in the Chesapeake Bay Watershed: Data-driven Methods for Characterizing Impacts and Developing Solutions.** Noah Tait, Meredith Seeley

Marine debris, defined as any manmade materials or objects abandoned, disposed, or otherwise discarded which persist unattended in coastal or oceanic environments, is a globally recognized issue. In 2014, it was estimated that 5.25 trillion particles weighing over 260 million tons are present in the world's oceans (Eriksen et al. 2014). Marine debris presents several threats to marine ecosystems and coastal communities which rely economically on oceans and estuaries. Marine macroplastics (often defined as objects or fragments greater than 5 mm in diameter) threaten wildlife via ingestion and entanglement, act as dispersion vectors for invasive species, and can introduce potentially harmful chemical additives and contaminants to marine food webs. Microplastics (plastic particles < 5 mm) also function as a mechanism for introduction of toxic compounds to food webs via incidental ingestion and bioaccumulation, including trophic transfer to human diets. Abandoned, lost and derelict fishing gear (ALDFG) such as traps, nets, and lines have also garnered considerable attention due to their ability to entangle vulnerable wildlife, entrap target and non-target bycatch species (ghost fishing), and introduce plastic contaminants as they degrade. As the largest estuary in the United States, the

Chesapeake Bay watershed sustains a human population of over 18 million people. Due to its large size and high level of human activity, the Bay is heavily impacted by marine debris.

We propose holding a special session on the topic of marine debris at the Chesapeake Community Research Symposium. Speakers will be invited to share oral presentations about research which deals directly with marine debris in the Chesapeake Bay. Presentations may be about any category of marine debris and may deal broadly with research that relates to description, effects, prevention, or removal of debris. In keeping with the theme of the Symposium, “Next Generation Tools for a Dynamic Future”, presentations should introduce novel research that leverages innovative investigative or restoration methods, including but not limited to long-term monitoring data, geospatial analysis, remote sensing, or artificial intelligence/machine learning. Abstracts need not fit perfectly into one of these categories, and consideration will be given to all proposals which showcase innovative marine debris research. The session will be chaired by a researcher with a derelict fishing gear background and co-chaired by at least one other researcher with expertise in microplastics and plastic compound analysis.

18. **Increasing the Effectiveness and Impact of Technical Assistance Delivery to Low-Capacity Communities.** Elizabeth Van Dolah

Low-capacity communities (i.e., socially vulnerable communities with limited agency to plan, respond, and adapt) struggle with the cost and complexities of increasing their resilience to environmental hazards, including flooding, urban heat, and contaminated sites. Technical assistance is one way many universities, government agencies, and non-profit organizations are supporting capacity-building in these communities. However, the usability of scientific and technical resources is often challenged by other systemic social barriers in these places, including limited human and financial resources, weak coordination and partnership networks, and limited political power. As a result, those most socially vulnerable to environmental challenges may still be left behind despite these good intentions. Co-production offers a valuable approach for increasing community capacity by increasing economic, social, and human capital. It is also one approach that can be effectively integrated into technical assistance projects to support more holistic resilience-building for those most in need across the Chesapeake region.

This special session will share case-studies where co-production has been used to enhance technical assistance delivery to low-capacity communities across a range of Chesapeake socio-environmental contexts. We will explore approaches for facilitating co-production and discuss how they improved technical deliverables and contributed to capacity-building on the ground in other ways. Through presentations, a panel discussion, and audience engagements, researchers, practitioners, and community partners will be given the opportunity to share their reflections on the value-add and challenges of engaging in co-production processes, as well as lessons learned and considerations for effectively integrating co-production into technical assistance projects. Case studies will showcase projects where co-production has been used to support climate resilience planning, activate nature-based decision-making, enhance the delivery of co-benefits, and empower communities in charting their own environmental futures.

These case studies will highlight applicable frameworks for facilitating and evaluating the impact of co-production, illuminate key enabling conditions for effectively leading co-production processes and sustaining resulting benefits, and raise new insights to improve the delivery of science and technology to better meet the complexities of today's socio-environmental challenges.

19. **Advanced Data Analytics for Water Quality and Public Health.** Jianyong Wu, Dongmei Alvi, Efeturi Oghenekaro

As concerns about waterborne diseases and emerging contaminants grow, understanding water quality dynamics becomes crucial for protecting public health. This special session will focus on how advanced technologies can be applied to model, monitor, and manage water quality in the Chesapeake Bay region and beyond. By integrating advancements in machine learning, artificial intelligence (AI), Geographic Information Systems (GIS), and remote sensing, this session highlights innovative approaches to tackling public health challenges posed by contaminants in water.

Participants will examine how machine learning algorithms can improve the prediction and monitoring of water quality parameters, enabling the timely identification of pollution events and hotspots. The session will also showcase GIS-based methods for spatial analysis and visualization of health risks associated with emerging contaminants, providing actionable insights for water resource managers and public health officials. Additionally, the use of remote sensing technologies for large-scale monitoring of water quality and emerging contaminants will be discussed, emphasizing high-resolution, timely data collection to support restoration and management efforts in dynamic environments.

This session invites contributions that demonstrate the integration of these novel tools with traditional monitoring approaches, highlighting interdisciplinary applications and "team science" strategies. Case studies and practical examples of data-driven approaches to water quality monitoring and public health protection in the Chesapeake Bay or similar ecosystems are especially encouraged. Discussions will also consider challenges associated with interpreting complex datasets, managing misinformation, and communicating results effectively to stakeholders in a rapidly changing natural and human environment.

By convening managers, scientists, and stakeholders, this session aims to foster dialogue around the next generation of tools for water quality assessment and their implications for public health. Topics may include, but are not limited to:

- Application of machine learning algorithms for water quality prediction and monitoring.
- GIS-based spatial analysis and visualization of health risks from emerging contaminants.
- Remote sensing approaches for large-scale water quality monitoring.
- Integration of AI and mechanistic models for forecasting water quality dynamics.
- Interdisciplinary and team science approaches for addressing emerging water quality challenges.

20. **Understanding localized hypoxia to decrease its impact on living resources.** Eric Schott, Sarah Preheim, Maya Gomes

The 2025 Chesapeake Bay Program report (A Critical Path Forward for The Chesapeake Bay Program Beyond 2025) reframes the restoration of the Bay with a focus on habitat restoration, and in the context of regional or local partnerships. The long-term goal of meeting nutrient reduction targets and decreasing deep channel hypoxia has not been abandoned. Instead the goal have been refined to include increasing the quantity and quality of tidal shallow water fish habitat and in areas closer to shore. A key barrier to creating quality fish habitat is localized hypoxia and anoxia, which typically occurs in the spring through autumn. Consequently, habitat volume and access to benthic foraging is restricted in the months that fish are most active. Localized hypoxia and anoxia can also impact nitrogen cycling, trophic energy transfer, redox state and therefor bioavailability of trace metals, and biological mercury processing. The resolution of anoxic stratification in late summer or autumnal "turn overs" can be dramatic, with upwelling of sulfide-rich anoxic waters that kills fish and other aerobic nekton. Deep water upwelling can also bring sulfur metabolizing bacteria to the surface, in what is sometimes termed a "pistachio tide".

In 2025, Baltimore's Inner Harbor experienced a 3 week-long pistachio tide where the upwelling of sulfidic, anoxic waters killed up to 100,000 menhaden. It also fueled a bloom of green sulfur bacteria that sent strong sulfide odors over 3 km away and made the downtown waterfront area unpleasant. The location and severity of this disaster was surely related to both local natural and anthropogenic conditions, because stratification and anoxia are often worsened by human modifications to shores and waterways. Additionally, urban and suburban runoff can be locally intense, bringing warm water that carries nutrients and contaminants to the upper layers of locally deep waters. Chesapeake Bay shorelines and nearshore habitats are dramatically engineered for ports and harbors, both contemporary and historical. Therefore localized hypoxia has resulted in pistachio tides and other types of blooms that compromise habitat restoration in many settings in Chesapeake Bay. The search for solutions will require a solid understanding of what factors drive local hypoxia, and a collaborative approach to re-engineering the system to minimize factors when possible.

This session invites presentations on studies, data, or ideas that can contribute to minimizing local hypoxia, especially in highly engineered locations. This may include definition of hypoxic areas, measurements or models that visualize the spatiotemporal extent of localized hypoxic areas, or the impacts on invertebrate and fish habitat. It may also address other forces that impinge on local hypoxic zones such as runoff, seasonal patterns, or legacy sediments. Approaches may range from classic field or remote sending methods, continuous monitoring data, or new analytical techniques. There may be opportunities for deep learning strategies to investigate the causes and consequences of localized hypoxia, with the goal of using knowledge to predict or develop mitigation strategies to protect Chesapeake Bay's living resources.

21. **General: Estuarine and Watershed Processes.** Raleigh Hood

This session invites abstract submissions related to the general topic of estuarine and watershed processes, which includes a wide range of research disciplines (physical, chemical, biological and ecological) and trophic levels (from plankton to living resources). Submission of management- and social science-oriented abstracts is also encouraged.

22. **Poster Session**

We welcome all poster abstracts that relate to the Symposium theme.

23. **Molecular Approaches for Chesapeake Bay Ecology and Biogeochemical Functions: from Genes to Insights.** Sairah Malkin, Isabel Baker

Molecular biology, genetics, and genomics tools have become indispensable for identifying and understanding ecological processes in aquatic systems, from biogeochemical cycling and pathogen dynamics to species distributions and ecosystem responses to environmental change. The Chesapeake Bay has served as a testbed for foundational studies in biogeochemical cycling including understanding the foundational associations between nutrient loading and deoxygenation in coastal systems. A particularly transformative frontier lies in connecting our rapidly growing molecular datasets with biogeochemical models, arguably representing one of the greatest opportunities to advance our mechanistic and predictive understanding of the Chesapeake Bay. Where molecular patterns show strong relationships with environmental variables, they suggest predictive potential and may help constrain existing models or reveal missing processes. Conversely, models can provide testable hypotheses for molecular ecologists about which genes, taxa, or pathways should respond to specific environmental conditions.

This session aims to bring together researchers employing molecular approaches to study Chesapeake Bay ecosystems. We welcome contributions spanning diverse applications, including but not limited to: microbial community dynamics, biogeochemical transformations, pathogen ecology, harmful algal bloom ecology, species distribution and biodiversity, climate change responses, and pollution impacts. We particularly encourage presentations that explore opportunities for integrating molecular data with other observational or modeling approaches, as well as those highlighting methodological innovations or novel applications of existing tools. We intend for this session to provide a forum to bring together members of the Chesapeake Bay research community using ‘omics tools to foster collaborations and explore new approaches. We especially encourage submission from early career scientists including students.

24. **Phytoplankton Dynamics in Chesapeake Bay: Analysis, Methods and Models.** Emily Brownlee, Greg Silsbe, Catherine Wazniak

In coastal and estuarine environments, the rapid turnover of phytoplankton is a function of both short division times and tightly coupled consumer-prey interactions. Phytoplankton in these dynamic environments are quick to respond to stochastic events, and at times community assemblages become dominated by so-called harmful algal blooms (HABs) that present significant risks to the economy and human health. Yet fundamental knowledge gaps in our understanding of phytoplankton and protist ecology remain, in part to the scarcity of routine monitoring. Consequently, advancements in the prediction, detection, and monitoring of phytoplankton in general and HAB events in particular continue to be high-priority objectives for state agencies and other stakeholders. This session aims to bring together researchers interested in phytoplankton dynamics in coastal and estuarine environments. We specifically invite research that span a range of approaches, including statistical and machine-learning, ecological and habitat modeling, and observational platforms including satellite remote sensing and high-throughput imaging systems.