Chesapeake Community Research Symposium 2024
Special Sessions for Abstract Submissions

1. How do we strike a balance between interpretable simplicity and realistic complexity in modeling the Bay? Anand Gnanadesikan, Sarah Preheim

Modeling a system as complicated as the Chesapeake Bay requires a host of simplifications. Most models of the Bay, for example, represent biological productivity in terms of only one or two phytoplankton functional groups, do not distinguish between different forms of dissolved organic nutrients, and do not explicitly represent decomposer communities. Such simple models have the advantage that they can be straightforwardly tuned to hydrographic properties such as dissolved oxygen and that a relatively small number of parameters may be needed to do this. However, they may not have the right response to long-term changes, or capture key processes or the impacts of ecological shifts. This session seeks presentations that examine the balance between simplicity and complexity in models. In particular we seek studies that evaluate the impact of representing the diversity of :

1. Dissolved and particulate inputs beyond nitrogen, phosphorus and total suspended sediments.
2. Phytoplankton functional groups beyond the “spring” and “summer” communities.
3. Bacterial processes such as cryptic sulfur cycling and anammox that are often not included in current models.
4. Representation of bacteria beyond the implicit dependence of pathways on oxidative thresholds
5. Sedimentary processes beyond parameterized resuspension, burial, and bioturbation.
6. Representation of the macroscopic effects of vegetation and oysters in nutrient cycling.

We are interested both in modeling studies that evaluate the impact of including particular processes and pathways, and observational studies that can be used to identify processes currently not included in Bay models. We are particularly interested in processes that could be involved in tipping points.

2. Harnessing big data and machine learning for new ecological insights into coastal ecosystem disturbance. Ryan Woodland, Vyacheslav Lyubchich, Ryan Langendord, Jeremy Testa

Understanding and predicting the effects of disturbance on coastal biota is critical for an ecosystem-based approach to natural resources management. For example, increasingly accurate and sophisticated numerical models have been developed to predict dissolved oxygen concentrations over time and space for a wide variety of coastal ecosystems, setting the stage for a new generation of habitat models for living organisms. While numerical model outputs have recently been applied to quantify the effects of water-column physical conditions on habitat availability and growth potential of marine fish species, these results are difficult to verify with available data, often do not account for mobility, do not consider food availability, and thus may be of limited aid to ecosystem assessment. To begin to overcome these and similar limitations for other types of coastal ecosystem disturbance (e.g., sedimentation, salinization, and harmful algal blooms), data assimilation and new models are required to quantify the relationships along with spatial and temporal variability in both biological and environmental conditions. Such data-model linkages can lend themselves to predictions during scenario testing and have become possible for Chesapeake Bay and other coastal systems in recent years, but to date few efforts that have undertaken this process have been published. We hope to attract presentations on state-of-the-art modeling approaches that explore biota-environment interactions, spanning numerical, hybrid statistical-numerical, and network-based approaches. The inherent flexibility in many of these modeling approaches lend themselves to model-based end-products that can be tailored to data availability and management goals.

3. Exploring the Linkage Between the Tidal Marsh Dynamics and the Key Processes in the Chesapeake Bay. Nicole Cai, Robert E. Isdell

This session offers an in-depth exploration of the intricate connections between tidal marsh dynamics and essential processes within the Chesapeake Bay ecosystem. Tidal marshes, celebrated as ecosystem linchpins, wield substantial influence over wave attenuation, landscape evolution, shoreline resilience, and biogeochemical cycling in this vital region. We welcome researchers to share their discoveries, casting light on the multifaceted tidal marsh dynamics and how the interactions among these processes shape the past, present, and future of the ecosystem. Through presentations and interactive discussions, our aim is to stimulate collaboration and deepen our comprehension of how tidal marshes actively shape the ecological fabric of the Chesapeake Bay. Participants will have the opportunity to engage in constructive dialogue with peers, exchange innovative ideas, and contribute to the ongoing discourse surrounding the Bay's environmental well-being and long-term sustainability.

4. Coupled human-natural systems in Chesapeake Bay. Raleigh Hood, DG Webster, Gary Shenk, Patrick Bitterman, Victoria Coles, Peter Claggett, Frederick Ducca, 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.

5. Building Science Capacity in the Chesapeake Bay to Support Watershed Agreement Goals. Breck Sullivan

The Strategic Science and Research Framework (SSRF) was developed by the Chesapeake Bay Program (CBP) to help focus on existing science resources, leverage the research enterprise, and more effectively provide science to advance CBP's efforts and decision-making. It arose from a need to track and assess the abundance and breadth of science needs across the partnership more consistently. SSRF was specifically designed to consider both short-term operational and long-term fundamental science needs and track this updated list in the CBP Science Needs Database.

Now in the third year of the framework, the CBP better understands the science needs across the partnership and continues to provide a strategic approach to partner resources to address operational and fundamental science needs and knowledge gaps. Science providers have evolved their efforts to address CBP science priorities, but the advancement of technology, the change in climate conditions, the increase in land use change, etc., has amplified the amount of science needs within the CBP that need to be addressed to assess progress towards the outcomes established in the Chesapeake Bay Watershed Agreement. Addressing these needs requires engagement of an even broader scientific community to better align and evolve resources.

In this session, we invite presentations on innovative approaches for expanding science capacity in organizations to address science priorities, how they collaborated with partners to fill knowledge gaps, and what plans were put into place to support achievement of the needs. This session aims to highlight different resources used and unique strategies of engagement with the broader scientific community in support of decision-making and restoration goals for the Chesapeake Bay and its watershed.

6. Understanding the Landscape to Better Manage and Protect Aquatic Ecosystems.

Sarah McDonald

Climate change and population growth present challenges in managing and protecting large aquatic ecosystems such as the Chesapeake Bay and its watershed. Landscape conditions can ameliorate or exacerbate these challenges. Understanding the configuration of land use and its history at a fine scale, particularly in relation to streams and shallow estuarine habitats, is fundamental for targeting restoration and conservation efforts to protect them from degradation. This session will explore high-resolution land use and land monitoring products and their applications to conservation and restoration of the Chesapeake Bay and its watershed. The data and models discussed in this session will focus on management applications to improve water quality and living resources.

Assessing the landscape and landscape trends relative to the stream network improves our ability to manage and restore the landscape. One-meter Digital Elevation Models (DEMs), among other data, are used to derive fine-scale connectivity metrics of the landscape to the stream network. This better informs the expected impacts of land uses on water quality and aquatic life. Understanding the configuration of the landscape within riparian zones can better inform restoration efforts by identifying plantable areas nearest to streams, where trees can uptake nutrients, stabilize banks, and provide shade to cool streams, which is necessary for keystone species like brook trout. In addition, coastal wetlands, essential for a variety of waterfowl, are being squeezed between threats from the combination of sea-level rise coupled with upland development adjacent to marshes. Projects and topics discussed in this session include the Chesapeake Bay Program's 1-meter Land Use/Land Cover database, urban growth modelling via the U.S. Geological Survey's Chesapeake Bay Land Change Model (CBLCM), and landscape configuration within variable-width riparian zones, landscape connectivity, and coastal habitats. These works have been used by partners at federal, state, and local levels to identify management needs and to develop legislation. A variety of use cases of these data will be explored, including riparian forest buffer monitoring and riparian tree planting opportunities led by the U.S. Forest Service, the Maryland Forest Technical Study commissioned by the Harry R. Hughes Center for Agro-Ecology, green infrastructure assessments for Maryland's Department of Natural Resources, and a Chesapeake-wide watershed assessment to monitor watershed health and to identify at-risk or vulnerable watersheds led by the Chesapeake Bay Program and U.S. Geological Survey.

7. River Corridor Sciences and Management. Labeeb Ahmed, Marina Metes

River corridors consist of channels, adjacent floodplains, and the riparian area. The condition and composition of river corridors in terms of geology, soils, landforms, vegetation, and land use significantly impact water quality. By quantifying processes within river corridors such as sediment fluxes, our understanding and management of these complex systems can be improved especially in the context of climate change. The aim of this session is to provide an overview of approaches to characterize river corridor conditions and communicate the information to decisionmakers to improve channel and floodplain management. From a technical perspective, advances in remote sensing technologies such as high-resolution imagery and lidar along with advances in computational efficiency and artificial intelligence have revolutionized our ability to characterize landforms such as channels and floodplains at fine resolution (~ 1-meter) and regional scales, model complex processes such as sediment fluxes, ground water interactions, stream temperature, and stream flow periodicity. The inventory of such key processes and measures have enabled support and development of better channel and floodplain management strategies and enabled a better understanding of channel stability. Understanding and mapping channel stability is essential for inventorying stream restoration opportunities, assessing the vulnerability of infrastructure to flooding, and for deriving floodplain ecosystem services. Creating such data and making it easily accessible and interpretable by decision makers are needed to make river corridor science actionable.

8. Water-quality patterns and trends in the Chesapeake Bay and its watershed: I. Innovative monitoring techniques and modeling tools. Kaylyn S. Gootman, Alexander Gunnerson, Efeturi Oghenekaro, Peter Tango

Restoration of complex aquatic ecosystems such as Chesapeake Bay requires continued, coordinated efforts from the science and resource management communities. These efforts often include development of innovative monitoring techniques and modeling tools that provide feedback on restoration progress. Over three decades of coordinated restoration, the waters of the Chesapeake Bay and its watershed have been monitored systematically with both existing and new techniques and modeled with tools that are incrementally enhanced with new scientific findings. Potential examples of relevant topics include but are not limited to innovative monitoring approaches, development of novel modeling tools, integration of satellite imagery, development/deployment of new technologies, and the integration of living resources considerations. This is Part I of two connected sessions organized by the Chesapeake Bay Program's Integrated Trends Analysis Team.

9. Water-quality patterns and trends in the Chesapeake Bay and its watershed: II. Novel analysis and scientific communication approaches to inform management. Qian Zhang, Isabella Bertani, Kaylyn S. Gootman, John Clune

Restoration of complex aquatic ecosystems such as Chesapeake Bay requires continued, coordinated efforts from the science and resource management communities. These efforts often include development of novel analysis approaches to gain new insights from monitoring data and science communication approaches to communicate these results to inform management. This session aims to highlight water-quality patterns and trends along the land-river-estuary continuum, with a focus on empirical and mechanistic approaches that link different types of data and models to help understand how various drivers have triggered such responses. We welcome applications of novel statistical and mechanistic tools to understand watershed and estuarine responses to land changes and management actions. In addition, we seek contributions that highlight science communication approaches designed to transform these 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.

10. Applications of remote sensing for water quality management. Stephanie Schollaert Uz, Shelly Tomlinson

We invite submissions that apply Earth observations for monitoring water quality around the Chesapeake Bay. Derived products may include data fusion with integrated observing systems, ecosystem models, and machine learning to assess and predict coastal water quality. Specific interest includes the discussion of challenges and opportunities for one or more remote sensing capabilities: optical– including hyperspectral, thermal, synthetic aperture radar, altimetry, and scatterometry. We welcome novel techniques for the application of these methods around the Bay for monitoring and early warning activities to safeguard living resources.

11. Tackling Ecosystem-Level Impacts from Rising Water Temperatures in the Tidal Waters of Chesapeake Bay. Julie Reichert-Nguyen, Jamileh Soueidan, Bruce Vogt

Tidal water temperatures are rising in the Chesapeake Bay as surface air temperatures increase with global climate change. This leads to various ecosystem-level impacts, including changes in the range and abundance of key Bay fish, shellfish, and submerged aquatic vegetation species (SAV). These ecosystem-wide changes will affect progress towards the water quality, habitat, and living resource goals in the Chesapeake Bay Watershed Agreement. The Chesapeake Bay Program's Scientific and Technical Advisory Committee (STAC), in collaboration with the Climate Resiliency Workgroup and other technical experts throughout the partnership's water quality, sustainable fisheries, and habitat goal implementation teams, released the 2023 workshop report, "Rising Watershed and Bay Water Temperatures–Ecological Implications and Management Responses." This report identifies management implications and provides recommendations related to monitoring, modeling, research, and collective action to prepare for and adapt to the effects of rising water temperatures on the Bay's ecosystem.

Recommendations in the report focused on several themes to build resilience to the effects of rising water temperatures on living resources in tidal waters, including:

- promoting ecosystem-based management by improving knowledge on water quality and environmental change thresholds for species and habitats,
- maximizing nearshore habitat restoration and protection and watershed best management practice strategies to minimize living resource impacts at a local-scale,
- increasing understanding of extreme stressors (e.g., marine heat waves) on living resources (e.g., striped bass, oysters, blue crabs, eelgrass) and habitats (e.g., oyster reefs, SAV),
- minimizing other stressors (e.g., fishing pressure, low dissolved oxygen, increased sediment loads, sea level rise) to protect habitat and lessen overall stress on vulnerable living resources, and
- assessing and preparing for future water temperature conditions and the associated ecosystem changes through research and communication efforts with stakeholders.

This session invites research on the above tidal recommendation topics. Talks can range from assessing water quality thresholds and habitat suitability for fish, benthic organisms, and SAV to climate change modeling or model data synthesis related to habitat, living resource response, and/or species community shifts. We welcome presentations on watershed or habitat strategies, particularly research related to mitigating increasing water temperatures in the nearshore tidal waters, reducing other stressors that affect living resources in tidal waters, providing thermal refugia, or protecting key fish-related habitats (e.g., marshes, oyster reefs, SAV). We also encourage presentations on social science research, including communication strategies or behavior change research related to rising water temperature effects on fisheries and habitats or implementation of actions to adapt to changing climate conditions.

12. Bivalve shellfish and water quality: observations, experiments, and models. Elizabeth W. North, Stephen Tomasetti

Bivalve shellfish – oysters, mussels, clams – hold a unique place in the cultural, commercial, and ecological identity of the Chesapeake ecosystem through their support of commercial fishing and aquaculture industries and their substantial filtration capacities that can promote water clarity and denitrification. Oysters and mussels also create structured habitat that can support biodiversity, dampen waves and/or reduce shoreline erosion. Yet, despite the importance of bivalves, challenges remain with assessing their effect on water quality in situ and in the laboratory, with simulating their impact on water quality at spatial scales relevant to tributaries, reefs, harvest areas, and leases, and with understanding the influence of climate change on their populations and their corresponding ecosystem services. This session will bring together observational, laboratory, and modeling studies that focus on the influence of bivalve shellfish on water quality from the present into the future in the Chesapeake Bay and beyond.

13. Recent Advancements in Estuarine Water Modeling and Monitoring via Remote Sensing, Artificial Intelligence, or Machine Learning. Jon Derek Loftis, Russell Lotspeich

Modeling techniques leveraging passive and active remote sensors along with recent advancements in edge detection and machine learning algorithms has made the development of next generation water modeling and observing systems technologically feasible. Given the recent global access to online artificial intelligence toolsets popularized by generative text protocols such as ChatGPT, Bard, and others, there has been an increased interest in researching marine science insights derived from acoustic, image, and remotely sensed video training samples as alternative inputs. Novel estuarine modeling and monitoring research applications of artificial and convolutional neural networks as new artificial intelligence-augmented approaches to modeling and monitoring estuarine water elevations and water quality are the intended emphasis of this session.

14. Innovations in Machine Learning for Chesapeake Bay Ecosystem Modeling. Kimberly Van Meter, Shuyu Chang

Machine learning (ML) approaches are increasingly showing great promise for ecosystem modeling by offering the ability to extract meaningful patterns and relationships from complex and diverse datasets. These algorithms excel at capturing nonlinear interactions, adapting to changing environmental conditions, and handling large-scale data. As new datasets with high spatial and temporal resolutions are emerging at an unprecedented rate, machine learning is opening up new avenues of research and innovative solutions to understanding how water quality and living resources across the Chesapeake Bay will change under changing management, land use, and climate. This session seeks to bring together a diverse cohort of researchers, scientists, policymakers, and community advocates to build collaboration in leveraging cutting-edge technologies, to enhance and improve Chesapeake Bay modeling.

Key discussion points will include:

1. Data Integration: Strategies for effectively incorporating diverse datasets into Chesapeake Bay models to enhance their accuracy and applicability.
2. Machine Learning Applications: Case studies and practical implementations showcasing how machine learning algorithms are improving water quality modeling, habitat assessments, and ecosystem predictions.
3. Model Calibration and Validation: Methodologies for calibrating and validating data-driven models to ensure their reliability in capturing real-world conditions.
4. Uncertainty and Sensitivity Analysis: Approaches for quantifying and managing uncertainty in data-driven models, as well as assessing model sensitivity to critical parameters.
5. Stakeholder Engagement: Strategies for engaging stakeholders and communicating the value of data-driven modeling in Chesapeake Bay management and policy decisions.

Join us for an informative and collaborative discussion aimed at advancing the field of Chesapeake Bay modeling through data-driven innovation. We look forward to your participation and insights as we work together to enhance our understanding and management of this vital ecosystem.

15. Nutrient Ecosystem Services - Removing N and P From Chesapeake Bay. Jeffrey Cornwell

Mitigation of the nutrient-driven eutrophication of Chesapeake Bay has a number of successes and ongoing challenges. While major decreases in point source and atmospheric inputs are improving water quality, non-point source inputs remain elevated. In this session, we encourage presentations on alternative ways to mitigate nutrient inputs and/or remove them from both freshwater inputs and tidal waters. New approaches could include processes such as the use of bivalve filtration/nutrient transformation in freshwater and estuarine environments, stabilization of eroding shorelines to minimize erosive inputs and encourage plant uptake and denitrification, floating wetlands, innovative reuse of dredged materials for wetland creation, active nutrient removal via algal “scrubbing” and management of large and small impoundments for trapping and transformation of particulate and dissolved nitrogen and phosphorus. New approaches that work the scales of small bays or subestuaries and at the whole bay scale are of interest. Assessments of current levels of nutrient ecosystem services are also of interest. Presentations can include new measurements, reviews of removal processes, and modeling.

16. Future Scenarios for Agriculture and Environmental Outcomes in the Chesapeake Bay Watershed. David Abler, Lisa Wainger

This session will explore the effects of changing biophysical and social conditions on agricultural systems and environmental outcomes in the Chesapeake Bay Watershed (CBW) using a scenario-based approach. The session will describe how stakeholders representing a diverse set of organizations including farms, agribusinesses, nonprofits, government agencies, and academia can develop narrative scenarios for how the future of agriculture in the CBW could be or should be. The session will examine how these narrative future scenarios can be converted into quantitative scenarios for use by modelers evaluating future environmental and agricultural outcomes. The session will also examine approaches used to select and scale quantitative future projections from disparate sources and apply data to scenarios. The session will discuss results from scenario modeling using ecohydrological models such as the Soil and Water Assessment Tool (SWAT), and economic models such as the Regional Environment and Agriculture Programming (REAP) model.

17. Co-designing solutions to support community resilience in the Chesapeake Bay Watershed. Vanessa Vargas-Nguyen, Sidney Anderson, Lili Badri, Veronica Lucchese, Bill Dennison

The challenges associated with promoting coastal sustainability and building community resilience in the Chesapeake Bay Watershed can be tackled through transdisciplinary approaches and cooperative efforts among stakeholders. This involves creating adaptation strategies developed collaboratively to manage the various impacts of multiple hazards on a temporal and spatial scale. It requires the integration of physical and social sciences and community stakeholders, including governance structures, civil societies, and the general public.

This session aims to showcase innovative theories, methods, and case studies demonstrating the benefits, challenges, lessons learned, and societal impacts of co-produced research and management strategies in the Chesapeake Bay Watershed. Presentations may include novel community engagement activities that incorporate the voices of marginalized groups in research, communication of risk and uncertainty through probabilistic modeling, the use of local and traditional ecological knowledge, or the incorporation of complex modeling in decision-support tools to meet the needs of local stakeholders.

This interactive session will interest those working on solutions in the Chesapeake Bay Watershed, focusing on interactions between natural, human-built, and social systems within transdisciplinary teams. By the end of the session, the audience will contribute to a theory of change and the development of a vision for a just, sustainable, and resilient Chesapeake Bay Watershed. An inclusive process of developing a theory of change includes a) describing the current situation, b) identifying what needs to be done, and c) establishing short- and long-term desired outcomes. This theory of change provides a framework for establishing a shared vision incorporating diverse perspectives.

18. Examining Chesapeake Climate Change Impacts With Advances in Monitoring, Assessment Analyses, and Fine Scale Models. Lewis Linker, Joseph Zhang, Gopal Bhatt, Gary Shenk

This session examines new approaches in Chesapeake modeling, monitoring, and assessment of climate change in the watershed, airshed, estuary, and living resource habitats. Ongoing advances in computational power, data availability, and new analysis approaches are leading to higher spatial resolution models with attendant advances in understanding nutrient processes, their transport and fate, and their influence on living resource habitats and in tidal shallow waters.

The emergence of high-resolution data and new approaches in monitoring, modeling, and analyses will be critical building blocks for improved environmental management in the Chesapeake Bay Program. The new approaches will contribute to the next generation of Chesapeake Bay Program management models that will integrate multiple local TMDLs with the Chesapeake TMDL while providing forward looking insights in the management of climate change challenges in the region. Session topics covered include aspects of the improved scale available in next generation models; advances in the analyses of land cover, airshed, watershed, estuary, and habitat simulations of the Chesapeake region; and how they will be leveraged together for better understanding and advancing targeted local and Chesapeake Bay-wide management decisions. Development of climate adapted environmental management for stormwater and nonpoint sources will also be highlighted. The session welcomes presentations and discussions on these wide-ranging topics.

19. Carbon cycling in Chesapeake Bay. Raymond Najjar, Zhaohui Aleck Wang

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. 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.

20. Harmful Algal Blooms impeding restoration in the Chesapeake Bay watershed: From the Shenandoah River to tidal Freshwater to Estuarine Waters. R. Christian Jones, Margaret Mulholland, Rosalina Christova, Judy O'Neil

This session invites presentations focusing on the increasing incidence of Harmful Algal Blooms in all types of aquatic environments in the Bay watershed. Individual presentations may be focused on one type of HAB outbreak in one type of aquatic ecosystem or may seek to synthesize studies from multiple areas. HAB organisms are expected to range from benthic cyanobacteria to planktonic dinoflagellates. Studies which provide new insight into the range of HAB taxa in the bay watershed, their basic growth dynamics, and factors influencing their outbreak, persistence, and toxicity are especially welcome. This session is intended to provide a forum for comparing key characteristics of blooms in different environments, assessing the relative importance of these outbreaks to Bay watershed ecosystems, and exploring implications for resource management and beneficial uses of Bay environments.

21. Quantifying Benefits of Natural Designs for Coastal Shoreline Protection. Tom Ihde

Natural designs like living shorelines are increasingly used to improve the resilience of our coasts. They offer a range of benefits that include improved water quality, reduced erosion, habitat protection and restoration, and increased production of forage and commercial species. The need for nature-based approaches has fostered the establishment of common designs tailored to the requirements of local environments. However, there are comparatively few examples of monitoring and assessment of the benefits of specific approaches, and few funding opportunities that facilitate this critical step in an adaptive management approach. An improved understanding of the effectiveness of different designs in different environments for diverse benefits and co-benefits could allow us to maximize the intended impact of our investments in these expensive applications. This session seeks to bring together practitioners, funders, and researchers working to examine benefits of natural-based designs to both share results and lessons learned.

22. How do we achieve Fishable, Swimmable Urban Waters? Efeturi Oghenekaro, Jennifer Keisman, Liz Chudoba

This session aims to bring together scientists, managers, and stakeholders who are focused on the unique issues and science needs of urban areas in the Chesapeake Bay Watershed. Primary drivers limiting usability of urban waters are often very different compared to the broader watershed. For example, greater intensity of stormwater runoff amplifies the effects of bacteria, road salts, nutrients, sediment, and other pollutants on water quality and aquatic habitats. Approaches to solving these problems need to be tailored to provide equitable solutions that are most effective for these specific environments and communities. We welcome abstracts that highlight science needs, management and restoration efforts, policies, and innovative solutions for improving the ecological health of urban waters and increasing access to their resources while also benefiting communities that live in and around them.

23. 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.

24. Poster session

We welcome all poster abstracts that are related to the Symposium theme.