Pooled Monitoring Forum: Restoration Research to make Science and Regulatory Connections

June 21, 2023, from 9 AM to 5 PM
Maryland Department of the Environment - 1800 Washington Boulevard, Baltimore, MD 21230
(directions and parking at https://mde.maryland.gov/pages/directionstomde.aspx)

The Maryland Department of Natural Resources, the National Fish and Wildlife Foundation through the Environmental Protection Agency's Chesapeake Bay Program Office, Anne Arundel County, Baltimore City, the Montgomery County Department of Environmental Protection, the Maryland Department of the Environment, the Maryland Department of Transportation's State Highway Administration, the Chesapeake Bay Trust, and other Pooled Monitoring partners welcome you to a forum in which the most recent restoration research will be presented and discussed. At this forum, regulatory staff and practitioners will have an opportunity to ask new questions and clarify the current state of scientific knowledge. Topics include efficacy of research practices for water quality and biological resources, potential chemical/physical impacts, effectiveness of stream restoration practices, climate change impacts/solutions, and "trade-offs." The speakers and audience will be charged with discussing how this science is used or could be used by regulators, discussing how the existing scientific knowledge could be translated to be useful for regulators and others, and identifying what questions remain unanswered.

This Pooled Monitoring Initiative's Restoration Research award program started as a follow up item from a series of similar conversations held in 2012, 2013, 2014, and 2015, when the needs of both regulators and practitioners were articulated, and important questions asked and prioritized. The questions were posed to the research community to garner their help through the program that is the Pooled Monitoring Initiative that asks questions through the Restoration Research award program. This forum keeps the promise made following those prior meetings to work towards answering the priority questions. This forum is the 8th annual event where the Restoration Research awardees present their work to the regulatory audience and a few practitioners for their use and receive feedback for future research needed to support their work. At this forum we will gather additional research questions for future Request for Proposals in the program. Finally, the Pooled Monitoring Program was added as an option in the Maryland MS4 permit BMP Effectiveness Monitoring and Watershed Assessment Monitoring (Assessment of Controls section) which expands the amount of research the program will support in future years and is an innovative strategy by the state to support and use the latest research results.

Charge to participants

Regulatory Community: Use the information from this Forum to help inform the permit process. Ask the restoration researchers questions that can help with the permit process and help design future research projects to answer lingering questions.

Practitioners: Use the information from this forum to design and build the most effective projects possible from a water quality and stream ecology standpoint. Ask questions that can help design future research projects that will help determine the types of projects that are most effective, as well as where and how they should be built.

Researchers: Present your findings that addressed the key restoration question posed in the Restoration Research Request for Proposals. Be specific about the research question(s) identified for the study, previous work done on the subject, the experimental design, the results, the level of uncertainty/confidence in the findings, and most importantly how the audience can use the information you presented. Listen to what the audience still needs to know to make management decisions in their respective fields and how you might address their questions in future research.

Learn more about the Pooled Monitoring Initiative and its Restoration Research Award Program and the research projects completed by awardees at https://cbtrust.org/grants/restoration-research/.

Agenda - as of 6/20/23

- **9:00 am to 9:30 am** – Review agenda and kick off the meeting
  - Charge for the day, Sadie Drescher, Vice President of Programs for Restoration, Chesapeake Bay Trust
  - Speaker introduction by, Jana Davis, Ph.D., President, Chesapeake Bay Trust

- <u>Welcome and opening remarks</u>, Matt Rowe, Assistant Director of Maryland Department of the Environment's (MDE's) Water and Science Administration

<u>Presentations from recent Pooled Monitoring Initiative's Restoration Research projects</u> to answer the key restoration questions in watershed restoration in Maryland and throughout the Chesapeake Bay. This work is tailored to be useful to the regulatory and practitioner efforts.

- **9:30 am to 10:00 am** – "Assessing the effectiveness of ESD for achieving stormwater management objectives in the Upper Little Patuxent River Watershed, Howard County, MD" <u>Keith Eshleman</u>, Professor, Appalachian Laboratory, University of Maryland Center for Environmental Science (UMCES)
  - Translation of the presentation by <u>Kimberly Grove, P.E</u>., Chief, Office of Research and Environmental Protection, Baltimore City Department of Public Works
- **10:00 am to 10:30 am** – "Reliability of Two-Dimensional Hydrodynamic Models for Assessing Susceptibility of Stream Restorations to Flood Damage and Potential Effects of Climate Change" <u>Art Parola</u>, University of Louisville
  - Translation of the presentation by <u>Scott Lowe</u>, CC-P, Director, Environmental Services, McCormick Taylor (with input from <u>Erik Michelsen</u>, Deputy Director, Bureau of Watershed Protection and Restoration, Anne Arundel County's Department of Public Works)
- **10:30 am to 11:00 am** – "Watershed Effects on Success of Stream Restoration for Excess Nitrogen Mitigation," <u>Erich Hester</u>, Associate Professor, Department of Civil and Environmental Engineering, Virginia Tech
  - Translation of the presentation by <u>Shannon McKenrick</u>, Natural Resources Planner, Water and Science Administration, Maryland Department of the Environment
- **11:00 am to 11:30 am** "Climate Change Impacts to Restoration Practices," <u>Jon Butcher</u>, Senior Hydrologist, Tetra Tech, Inc.
  - Translation of the presentation by <u>Guido Yactayo</u>, Watershed Protection, Restoration, and Planning Program, Water and Science Administration, Maryland Department of the Environment
- **11:30 pm to 12:00** pm – Question for the researchers
- **12:00 pm to 1:00 pm** <u>Lunch Break – Provided by the Chesapeake Bay Trust</u>
- **1:00 pm to 2:00 pm** – "A Power Analysis Tool in R to Enhance Monitoring Studies" <u>Dong Liang</u>, Assistant Research Professor, Chesapeake Biological Laboratory (UMCES)
  - Optimizing Sampling & Monitoring – What is the science telling us? How are we using the latest science in our programs? How can we use the latest science in our programs?
    - <u>Joshua Thompson</u>, Senior Engineer, Watershed Protection & Restoration Program, Anne Arundel County Department of Public Works & <u>Dong Liang</u>, Assistant Research Professor, Chesapeake Biological Laboratory (UMCES)
- **2:00 pm to 2:30 pm** – "Effectiveness of stormwater management practices in protecting stream channel stability," <u>Tess Thompson</u>, Associate Professor, Biological Systems Engineering, Virginia Tech
  - Translation of the presentation by <u>Chris Ruck</u>, Ecologist IV, Stormwater Planning Division, Watershed Assessment Branch, Fairfax County Department of Public Works & Environmental Services
- **2:30 pm to 3:00 pm** – "Evaluation of watershed-scale impacts of stormwater management facilities on thermal loads to a Maryland Class IV stream using a high-frequency sensor network," <u>Claire Welty</u>, Director, Center for Urban Environmental Research and Education Professor of Chemical, Biochemical, and Environmental Engineering University of Maryland Baltimore County (UMBC) & <u>Andy Miller</u>, Professor, UMBC
  - Translation of the presentation by <u>Greg Golden</u>, Environmental Review Program, Department of Natural Resources
- **3:00 pm to 3:30 pm** – "Using eDNA methods to extend biological sampling and identify candidate restorations for species reintroductions," <u>Bob Hildebrand</u>, Professor, Appalachian Laboratory, UMCES
  - Translation of the presentation by <u>Jay Kilian</u>, Maryland Department of Natural Resources
- **3:30 pm to 4:00 pm** – "Impacts of salt loading on nutrient and metal processing in stormwater bioretention," <u>Lauren McPhillips</u>, Assistant Professor, Penn State College of Engineering
  - Translation of the presentation by <u>Sadie Drescher</u>, Chesapeake Bay Trust
- **4:00 pm to 4:30 pm** – Question for the researchers
- **4:30 pm to 5:00 pm** – We want to hear from you! (Chesapeake Bay Trust)
  - What did you hear that you can use and how will you use it? What does this research mean for me? What other research questions would you like to see in the next Restoration Research Request for Proposals that will be released this fall? Any other suggestions for us?
- **5:00 pm to ?** – Continue the conversation at Checkerspot Brewing Company, 1399 S Sharp St, Baltimore, MD 21230, provided by the Chesapeake Bay Trust (light appetizers and drinks)

We are looking forward to seeing you all at this forum, hearing the recent Pooled Monitoring findings, and compiling research questions for next year's call for proposals.

More about the Pooled Monitoring Initiative's Restoration Research program speakers:

- Matt Rowe, Assistant Director of Maryland Department of the Environment's (MDE's) Water and Science Administration which oversees approximately 300 staff implementing state and federal water programs regulating public drinking water systems, wastewater, stormwater, wetlands, and compliance, as well as water quality monitoring, standards development, TMDL and non-point source management programs, with a focus on Chesapeake Bay restoration and building climate resiliency into Maryland's water programs. Matt received a BA degree from Eckerd College, a BS degree in Environmental Science/Stream Ecology from Oregon State University, and an Executive Education Program certificate in National Smart Growth Leadership from the University of Maryland. Matt serves the Chesapeake Bay Program partnership in support of the Principals' Staff Committee and as co-chair of the Conowingo WIP Steering Committee, has served on the Maryland Water Monitoring Council Board of Directors and chaired Leadership Development Program implementation throughout MDE, and is a certified Climate Change Professional with the Association of Climate Change Officers. Prior to MDE, Matt worked in streams research at the University of Maryland, as a field biologist with the Oregon Dept. of Fish and Wildlife, as a research fellow with EPA's National Health and Environmental Effects Research Laboratory, and as an engineering technician in the private sector.
- Keith Eshleman, Ph.D., Professor, University of Maryland Center for Environmental Science Appalachian Laboratory. Keith has published more than 60 peer-reviewed papers and dozens of technical reports. Prior to returning to academia, Keith was employed at the USEPA Environmental Research Laboratory in Corvallis, Oregon, and at The Ecosystems Center in Woods Hole, Massachusetts. Keith's research interests are in the areas of watershed and wetlands hydrology; groundwater/surface water interactions; biogeochemical processes in upland and wetland ecosystems; hydrochemical modeling; and ecosystem responses to natural disturbances, energy development, and land use change. Keith has a Ph.D. in Water Resources and S.M. in Civil Engineering from Massachusetts Institute of Technology and B.A. in Environmental Sciences from the University of Virginia.
- Arthur Parola, Ph.D., Director of the University of Louisville Stream Institute and Principle of Riverine Systems, LLC., University of Louisville Research Foundation, Inc. Art specializes in design of stream-wetland systems, riverine mechanics, and sediment transport. He has directed the design of more than 275,000 feet of stream channel re-establishment, rehabilitation, and enhancement, and hundreds of acres of riparian habitat restoration, including re-establishment, rehabilitation, and enhancement of floodplain wetlands. Art has partnered with state and federal agencies on stream restoration projects requiring complex riverine modeling, including two-dimensional hydrodynamic and sediment transport analysis. He also provides training to contractors and agency personnel to improve techniques used in restorations. He has extensive experience with urban restoration and has designed best management practice approaches for urban outfalls, bridges/culverts, and other infrastructure.
- Erich Hester, Ph.D., P.E., Associate Professor, Department of Civil and Environmental Engineering, Virginia Polytechnic Institute and State University (Virginia Tech). Erich's areas of interests include: 1) hydrology, hydraulics, environmental fluid mechanics, groundwater, surface water-groundwater exchange, hyporheic exchange, floodplain exchange; 2) ecohydrology and ecohydraulics; 3) ecology and ecological restoration of streams, rivers, and wetlands; 4) pollutant migration and transformation in aquatic systems; 5) watershed planning and environmental sustainability of water management; and 6) surface coal mine hydrology. Erich worked as a hydraulic engineer for Herrera Environmental Consultants in Seattle, WA, and as a water resources engineer at Philip Williams and Associates in San Francisco, CA, as well as two other positions as an engineer and staff scientist in CA, before joining Virginia Tech in 2009. Erich has a Ph.D. in Ecology from the University of North Carolina – Chapel Hill, a M.S. in Civil and Environmental Engineering from Stanford University, and a A.B. in Biology from Dartmouth College.
- Jon Butcher, Ph.D., P.H., Director, Tetra Tech, Inc. Jon is a registered Professional Hydrologist and environmental engineer with over 35 years of experience in watershed planning, risk assessment, and the development, application, and communication of hydrologic, hydraulic, and water quality models. Jon has led technical efforts to support EPA, state, and local governments in a variety of climate change adaptation, TMDL, wasteload allocation, watershed modeling, and water body restoration and protection studies. He is a nationally recognized expert in the application of HSPF, SWAT, and other watershed models and has worked with model developers to test, debug, modify, and improve modeling code. Jon has led a variety of projects for EPA ORD to evaluate impacts of climate change on watershed hydrology, pollutant transport, and BMP performance. He has a Ph.D. in Environmental Engineering from Duke University, a Master of Environmental Management Water Resources from Duke University, and a B.A. from Harvard University.
- Dong Liang, Ph.D., Assistant Research Professor, Chesapeake Biological Laboratory (UMCES), Dong's research investigates the statistical issues in synthesizing environmental data sets collected at various places, frequencies, accuracies, and ways. He often uses Bayesian hierarchical models and geo-spatial tools to fuse information from survey design and multiple sources. His collaborators study fisheries, ecosystem science, restoration ecology, environmental health, spatial epidemiology and social science. He is a founding member of the Environmental Statistics Collaborative, which is hosted at the Chesapeake Biological Lab. Dong has a Ph.D., in Statistics from the University of Iowa.
- Joshua Thompson, Ph.D., Senior Engineer, Watershed Protection & Restoration Program, Anne Arundel County Department of Public Works. Josh specializes in hydrological analysis with applications in water quality and aquatic ecology. Josh supports Anne

Arundel County's TMDL program through watershed modeling, flood risk assessment, decision support tool development, and applied research. Josh has a Ph.D. in Hydrology from Queen's University Belfast.

- <u>Tess Thompson</u>, Ph.D., Associate Professor, Biological Systems Engineering, Virginia Polytechnic Institute and State University (Virginia Tech). Tess has worked as an engineer in state government and private consulting, and as a consultant to US AID. Her research in watershed management focuses on stream and wetland restoration, urban stream systems, and streambank erosion. A former president of the American Ecological Engineering Society, she currently serves as chair of the River Restoration Committee of American Society of Civil Engineers Environmental and Water Resources Institute (ASCE-EWRI). Tess has a BS in Agricultural Engineering from VT, MS in Civil Engineering from NC State University, and a Ph.D. in Biological Systems Engineering from Virginia Tech.

- <u>Claire Welty</u>, Ph.D., Director, Center for Urban Environmental Research and Education Professor of Chemical, Biochemical, and Environmental Engineering University of Maryland Baltimore County. Claire's research interests are in developing an end-to-end system of field-deployed sensors and fully coupled groundwater-surface water mathematical models to quantify and predict the urban hydrologic cycle and coupled biogeochemical cycles from neighborhood to regional scales. This work's goal is to be able to assimilate sensor data into hydrologic and water quality models in near-real time for predicting flow paths, fluxes and stores of water and chemicals on land surfaces and in the subsurface. Claire works in collaboration with the NSF Baltimore Ecosystem Study Long-Term Ecological Research Site and the USGS MD-DE-DC Water Science Center. While methods are being developed using place-based research in Baltimore area, the methods are widely applicable to other urban areas. Claire has a Ph.D. in Civil and Environmental Engineering from M.I.T., and MS in Environmental Engineering from The George Washington University, and a BS in Environmental Sciences from the University of Virginia.

- <u>Andy Miller</u>, PhD., Professor, Geography and Environmental Systems, Center for Urban Environmental Research and Education, University of Maryland Baltimore County. Andy's research interests are in hydrology, hydraulics and geomorphology of extreme floods with a particular focus on urban floods and more recently on the potential impact of climate trends on rainfall intensity and flood frequency. Additional research interests include fate and transport of sediment in the landscape, including sediment released by dam removal as well as historical legacy sediment stored in valley bottoms; the effectiveness of stream restoration and other approaches to mitigation of the consequences of urban development and urban runoff; and the application of Structure from Motion, 2-d hydraulic modeling, and now Particle Image Velocimetry to simulate or reconstruct flood flows. Andy is also interested in watershed-scale response to environmental stress and to restoration efforts. Andy is currently Vice-Chair and in September 2019 I will begin a 2-year term as Chair of the Chesapeake Bay Program Scientific and Technical Advisory Committee. Andy has a Ph.D. in Geography and Environmental Engineering from Johns Hopkins University and a BA in Geological Sciences from Brown University.

- <u>Robert H. Hilderbrand</u>, Ph.D., Associate Professor, University of Maryland Center for Environmental Science Appalachian Laboratory. Areas of Expertise: Ecology and conservation biology of running waters; Watershed and stream habitat restoration; and Linking landscapes and populations Education: Ph.D. from Utah State University: (Ecology) Bob has a M.S. from Virginia Tech (Fisheries Science) and a B.S. from Frostburg State University (Wildlife & Fisheries; Minors – Chemistry, Biology).

- <u>Lauren McPhillips</u>, Ph.D., Assistant Professor, Civil & Environmental Engineering, Agricultural & Biological Engineering, Penn State University. Lauren has a BS in Science of Earth Systems, Cornell University, MS in Biological and Environmental Engineering, Cornell University, and Ph D, Biological and Environmental Engineering, Cornell University. She also previously worked as a hydrologic technician at the US Geological Survey in Reston, VA, and completed a postdoctoral fellowship with the Urban Resilience to Extremes Sustainability Research Network based at Arizona State University. Lauren's research interests are water quality, stormwater management, green infrastructure, urban ecohydrology, biogeochemistry, and sustainable development. Her lab leverages a variety of approaches including field monitoring, modeling, geospatial analysis, and lab and greenhouse experiments.

- <u>Sadie Drescher (your emcee)</u>, Vice President of Programs for Restoration, Chesapeake Bay Trust. Sadie and her team lead restoration programs that use innovative partnerships to work with and engage watershed organizations and community members in our work. The Trust's mission is to engage and empower diverse groups to take actions that enrich natural resources and local communities of the Chesapeake Bay region. She has a M.S. in Environmental Studies from the College of Charleston and a B.S. in Environmental Biology from Tennessee Technological University. Sadie using the latest science and best practices, to benefit the water and people in the Chesapeake Bay.