



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

June 17, 2024, 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>) and via Zoom

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, Charles County, Frederick County, Harford County, Montgomery County, Prince George's County, 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, stream restoration practice effectiveness, climate impacts/solutions, enhancing monitoring efforts, 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 ten years ago, when the needs of both regulators and practitioners were articulated, and important questions asked and prioritized. The questions were posed to the researchers in the Pooled Monitoring Initiative that asks questions through the Restoration Research Award Program. This forum keeps the promise made to answer the priority questions and bring the findings back to those who asked the questions. This forum is the 9th 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 6/14/24 @ 6pm

- **9:00 am to 9:30 am** – Review agenda and kick off the meeting
 - Welcome and charge for the day, Sadie Drescher, Vice President of Programs for Restoration, Chesapeake Bay Trust
 - Science to Policy Connections - Hear from policymakers about how they use research and what research is still needed.
 - Speaker introductions & conversation facilitated by, Jana Davis, Ph.D., President, Chesapeake Bay Trust
 - Senator Sarah Elfreth and Senator Kathryn (Katie) Fry Hester

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

- **9:30 am to 10:00 am** – “Memories of the soils: Evaluation of soil nitrogen stable isotope as a robust metric to assess floodplain restoration and nitrogen removal effectiveness,” Shreeram Inamdar, Professor of Watershed Hydrology and Biogeochemistry, Plant & Soil Sciences Department, and Joe Galela, Postdoctoral Research Associate, University of Delaware
 - Translation of the presentation by Dave Hirschman, Hirschman Water & Environment, LLC
- **10:00 am to 10:30 am** – “Evaluation of watershed-scale impacts of stormwater management facilities on thermal loads to a Maryland Class IV stream using a high-frequency sensor network,” Claire Welty, Director, Center for Urban Environmental Research and Education Professor of Chemical, Biochemical, and Environmental Engineering University of Maryland Baltimore County (UMBC) & Andy Miller, Professor, UMBC
 - Translation of the presentation by Ari Engelberg, Implementation and Accountability Manager, MD DNR
- **10:30 am to 11:00 am** – “Using eDNA methods to extend biological sampling and identify candidate restorations for species reintroductions,” Bob Hildebrand, Professor, Appalachian Laboratory, University of Maryland Center for Environmental Science (UMCES)
 - Translation of the presentation by Chris Victoria, Environmental Scientist. Anne Arundel County Watershed Protection & Restoration Program & Kara Kemmerer, Natural Resource Planner III, Maryland Department of the Environment (MDE)

- **11:00 am to 11:30 am** – “Effectiveness of stormwater management practices in protecting stream channel stability,” Tess Thompson, Associate Professor, Biological Systems Engineering, Virginia Tech
 - Translation of the presentation by Stewart Comstock, Chief, Program Review Division, MDE
- **11:30 pm to 12:00 pm** – Questions for the researchers
- **12:00 pm to 1:00 pm** Lunch Break – Provided by the Chesapeake Bay Trust
- **1:00 pm to 1:30 pm** – “Identifying restoration practices and landscape variables that increase native plant establishment and mitigate plant invasion,” Gabrielle Ripa, Virginia Tech, School of Plant and Environmental Sciences
 - Translation of the presentation by Francis Smith MD DNR Natural Resource Planner with input from Anne Hairston-Strang, Maryland Department of Natural Resources (MD DNR) Forest Service
- **1:30 pm to 2:00 pm** – “Comparative assessment of the performance of grassed swales and bioswales in reducing stormwater pollution from highway runoff” Keith Eshleman, Professor, Appalachian Laboratory, UMCES
 - Translation of the presentation by Bel Martinez da Matta, Research Statistician, Water and Science Administration, MDE

20 MIN BREAK - 2:00 pm TO 2:20 PM

- **2:20 pm to 2:50 pm** – “Watershed Effects on Success of Stream Restoration for Excess Nitrogen Mitigation,” Erich Hester, Associate Professor, Department of Civil and Environmental Engineering, Virginia Tech
 - Translation of the presentation by Joe Berg, CERP, PWS, CSE, Senior Ecologist, Practice Leader, Biohabitats
- **2:50 pm to 3:20 pm** – “A Power Analysis Tool in R to Enhance Monitoring Studies,” Dong Liang, Assistant Research Professor, Chesapeake Biological Laboratory (UMCES)
 - Translation of the presentation by Scott Lopez, Program Officer, Chesapeake Bay Trust
- **3:20 pm to 3:50 pm** – Questions for the researchers
- **3:50 pm to 4:20 pm** – Updates from two ongoing projects - “Work in the Wet Versus Work in the Dry for Stream Restoration: A Comparison of Downstream Turbidity and

Sediment Loads,” Bryan Seipp & Rich Starr, Ecosystem Planning and Restoration & “The Long-Term Effects of BMP Implementation on Stream Channel Stability in Urban Watersheds,” Lisa Fraley-McNeal, Center for Watershed Protection, Inc.

- **4:20 pm to 4:50 pm** – We want to hear from you! (Chesapeake Bay Trust)
 - What does this research mean for you? What did you hear that you can use and how will you use it?
 - What other research questions should we add to the next Restoration Research Request for Proposals? Any other suggestions for us?
- **5:00 pm to ?** – Continue the conversation at Checkerspot Brewery Brewing Company, 1421 Ridgely Street, 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:

- Science to Policy Connections (opening speakers):
 - Senator Sarah Elfreth (confirmed) [Sarah K. Elfreth, Maryland State Senator](#)
 - Senator Kathryn (Katie) Fry Hester (confirmed) [Katie Fry Hester, Maryland State Senator](#)
- Shreeram Inamdar, Ph.D., Professor of Watershed Hydrology and Biogeochemistry, Plant & Soil Sciences Department, University of Delaware. Shree received his BE degree in Civil Engineering, MS in Agricultural Engineering from University of Kentucky and his PhD in Biosystems Engineering from Virginia Tech. His research interests are in studying hydrologic and biogeochemical processes in riparian zones, sediments and watersheds. More online at: <https://sites.google.com/a/udel.edu/inamdar/>
- Joe Galella, Ph.D. Postdoctoral Research Associate, University of Delaware (UD). Joe received his PhD from University of Maryland in Geological Sciences. His PhD research focused on investigating freshwater salinization effects on biogeochemistry. At UD, Joe investigates the use of stable N isotopes of soil sediments as a metric for denitrification N removal in floodplain sediments.
- Robert H. Hilderbrand, 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).

- Tess Thompson, 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.
- Gabrielle Ripa, pursuing a Ph.D. in the School of Plant and Environmental Sciences in the College of Agriculture and Life Sciences and affiliate with the Global Change Center and Fraun Life Sciences Institute at Virginia Tech.
- 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.
- 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.
- 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.

- [Claire Welty](#), 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.
- [Andy Miller](#), 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.
- [Sadie Drescher \(your emcee\)](#), 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. Connect with me at: www.linkedin.com/in/sadiedrescher.

****Rescheduled** Moved to a July/August webinar** – “Reliability of Two-Dimensional Hydrodynamic Models for Assessing Susceptibility of Stream Restorations to Flood Damage and Potential Effects of Climate Change,” Jesse Robinson (lead presenter) and Art Parola, University of Louisville

- Translation of the presentation by Scott Lowe, CC-P, Director, Environmental Services, McCormick Taylor

Jesse Robinson, P.E. · University of Louisville Stream Institute and Principle of Riverine Systems, LLC., University of Louisville Research Foundation, Inc. Jesse is a senior research engineer with the University of Louisville Stream Institute (ULSI) and a senior engineer with Riverine Systems, LLC. His work is in the applied research and design of resilient, high functioning stream and wetland restoration solutions. His design experience in the eastern United States ranges from highly constrained urban environments to large, rural headwater basins with miles of connected stream and wetland restoration. He has technical specializations in terrain development, creation and optimization of restoration strategies, and the application of two-dimensional hydrodynamic modeling throughout all phases of restoration.

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.