Pooled Monitoring Initiative's Restoration Research Program

Where are we now and where are we going?

Pooled Monitoring Initiative - A novel approach that pools funding to support research answering key restoration questions vs site/project specific monitoring in the Chesapeake Bay

- Funders pool resources to answer restoration questions posed by regulatory community & practitioners
  - **Partnerships and collaborations** – we are all a part of this effort!
- Desire to support the best, most cost-effective practices at the most optimal sites, but differences of opinion sometimes exist, and questions about the performance and function of some of these practices persist
- Increase power, objectiveness, and ability to know what works
- Bring science back to those that can use it for their work

Lauren McPhillips Pennsylvania State University: MS student Alex Brown working on project titled, "Impacts of salt loading on nutrient and metal processing in stormwater bioretention"(2023 forum presentation here & final report due 9/1/23)

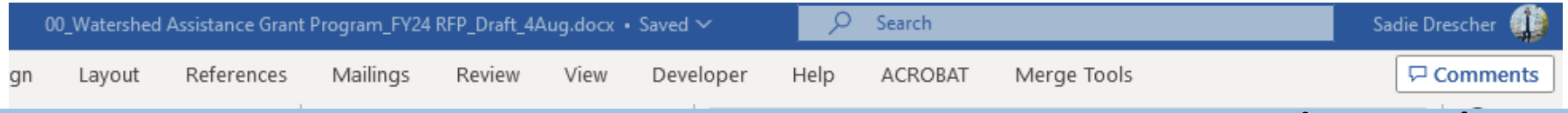
Restoration Research Award Program

- Supported 43 projects since FY 15 at >$8M
- Guided by the Pooled Monitoring Advisory Committee
- Uses scientific reviewers across the world to vet applications
- Runs all applications through a “management review”
- Projects are managed as firm fixed price contracts
- Questions are cycled off/on the RFP each year
- All awards, progress, and program products are online at: https://cbtrust.org/grants/restoration-research/

Claire Welty (UMBC) quantifying the cumulative effects of stream restoration and environmental site design (ESD) on nitrate loads in nested urban watersheds using a high-frequency sensor networkFinal report here and publication here

FY 24 awards

Award #	Organization	Title	Total Award Amount
22062	The Pennsylvania State University	Assessing the feasibility of assisted macroinvertebrate colonization in achieving ecological uplift in restored streams	$313,194
22063	University of Maryland Center for Environmental Science	Assessing the effectiveness of green stormwater infrastructure for addressing stormwater management goals at the watershed scale: application of the BACI design	$254,014
22064	The Pennsylvania State University	Impacts of Urban Soil Compaction on Stormwater Runoff Volumes and BMP Sizing	$149,322
22073	Delaware Center for the Inland Bays	Reforestation Restoration Success – Measuring Early Forest Development After Land Disturbance with Soil Chemistry and Understory Vegetation	$54,693
22076	University of Delaware	More than dirt: Soil health tradeoffs with stream and floodplain restorations	$214,838



Using stream restoration in our award making – Watershed Assistance Grant Program RFP (draft)

6. Describe the assessment that has or will be done for the drainage above ground and through underground pipes (if present) and avoiding utilities.
7. Use of the field's best practices per the US EPA Chesapeake Bay Program Office, WV DEP, and the Trust. Refer to the US EPA's Expert Panel reports and budget for any required additional calculations, sampling, and modeling that will be completed during the design phase that are available at: http://chesapeakestormwater.net/bmp-resources/urban-stream-restoration/. The Trust highly recommends applicants interested in stream restoration practices review and be familiar with the most recent science to make informed decisions on site selection and technique. Research gathered through the Pooled Monitoring Initiative's Restoration Research Program focused on stream restoration has been shared on the Trust's website (https://cbtrust.org/grants/restoration-research/ - found under the "Additional Information", "Awarded Projects and Final Products" tab). Particularly, applicants may find final products from the following projects of relevance:

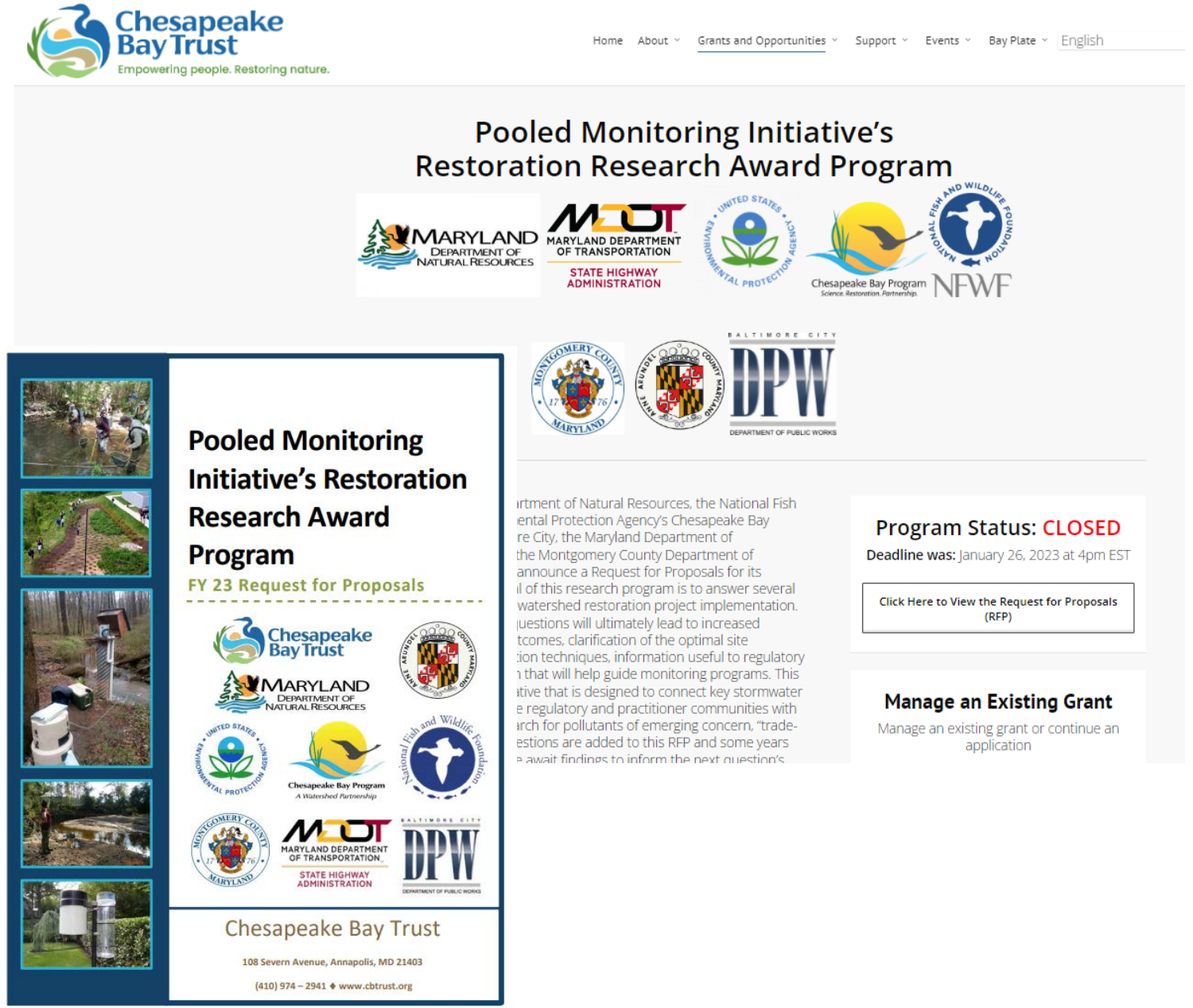
    a. Evaluating the Effectiveness and Sustainability of Novel Stream Restoration Designs for Coastal Plain Streams in Maryland: Integrating Existing and New Data from Stream Restoration Monitoring, University of Maryland Center for Environmental Science, Dr. Solange Filoso
    b. Tree Trade-Offs in Stream Restoration Projects: Impact on Riparian Groundwater Quality, University of Maryland College Park, Dr. Sujay Kaushal
    c. Quantifying the ecological uplift and effectiveness of differing stream restoration approaches in Maryland, University of Maryland Center for Environmental Science, Dr. Robert Hilderbrand
    d. Determining realistic expectations for ecological uplift in urban stream restorations, University of Maryland Center for Environmental Science, Dr. Robert Hilderbrand

Using stream restoration in our award making – Watershed Assistance Grant Program RFP (draft) – cont'd

e. Evaluating the Performance of Regenerative Stormwater Conveyances in Urban Versus Rural Watersheds, Smithsonian Institution, Dr. Thomas Jordan
f. Improving Success of Stream Restoration Practices – Revised and Expanded, Virginia Polytechnic Institute and State University, Dr. Theresa Thompson
g. Determining the effects of legacy sediment removal and floodplain reconnection on ecosystem function and nutrient export, Towson University, Dr. Vanessa Beauchamp
h. Quantifying the cumulative effects of stream restoration and environmental site design on nitrate loads in nested urban watersheds using a high-frequency sensor network, University of Maryland Baltimore County, Dr. Claire Welty
i. Climate Impacts to Restoration Practices, Tetra Tech, Inc., Dr. Jon Butcher
j. Impacts of Regenerative Stormwater Conveyance on Iron in Restored Streams and Potential Effects on Aquatic Organisms, EA Engineering, Science, and Technology, Inc., PBC, Dr. Jamie Suski
k. Evaluating impacts of freshwater salinization on mobilization of nutrients and metals from stormwater best management practices, University of Maryland College Park, Dr. Sujay Kaushal
l. Literature Review on Techniques to Reduce Salt Loading to Streams, Center for Watershed Protection, Carol Wong.
m. Vertebrate Community Response to Regenerative Stream Conveyance (RSC) Restoration as a Resource Trade-Off, Tetra Tech, Inc., Mark Southerland

Research Qs:

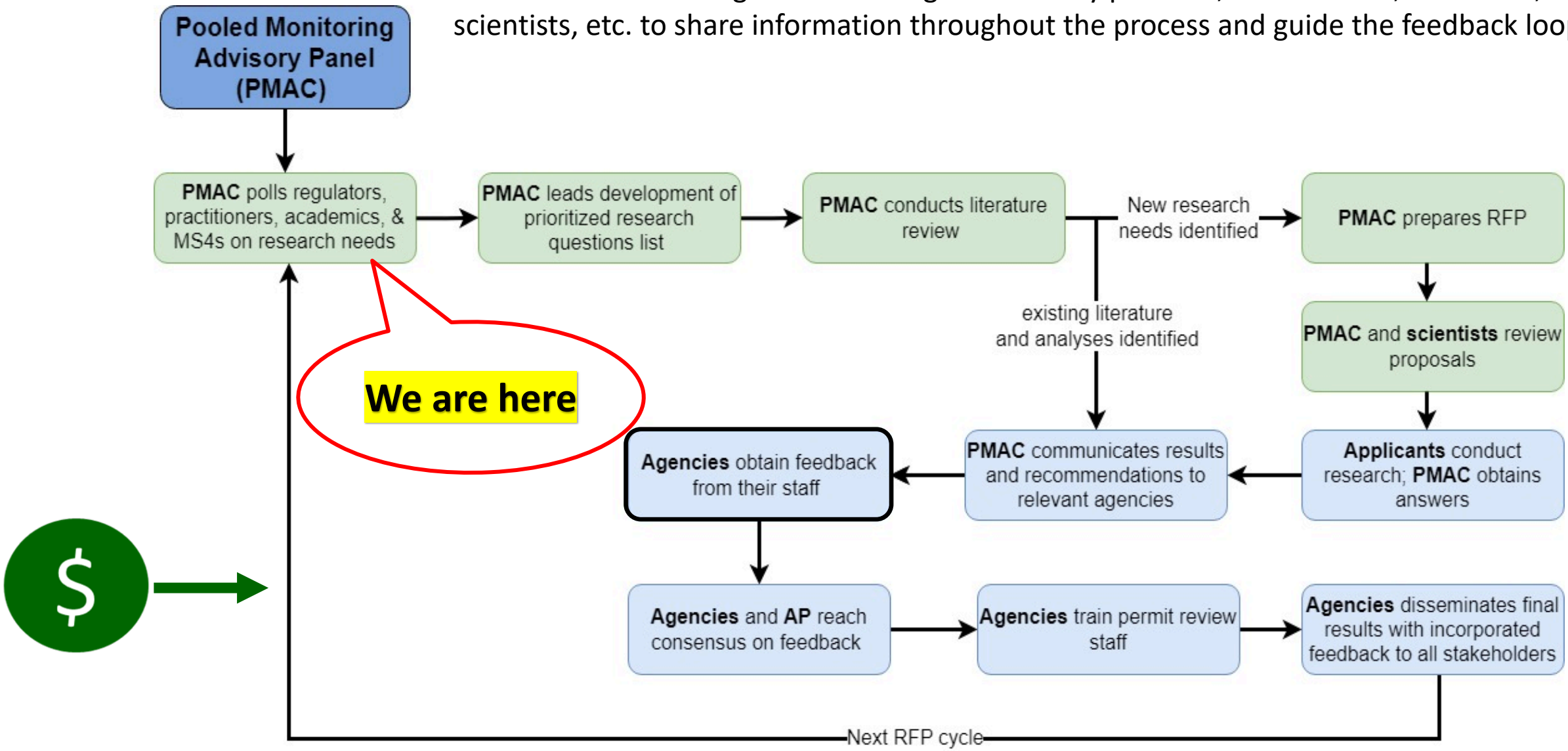
- BMP Effectiveness
- Watershed Restoration Assessment
- Biological Community Restoration
- Climate Change
- Pollutants of Emerging Concern
- Restoration trade-offs
- New research topic each year TBD by the Pooled Monitoring Advisory Committee



Landing page https://cbtrust.org/grants/restoration-research/

Process is Inclusive and Transparent

The Pooled Monitoring Initiative integrates the key partners, stakeholders, end-users, scientists, etc. to share information throughout the process and guide the feedback loop



Communicating results

- Held eight annual forums to hear the research results
- Maryland Stream Restoration hosted Pooled Monitoring researchers
- Webinars to relay results to the Pooled Monitoring Advisory Committee as needed
- Fact Sheets for completed projects and all final materials online: https://cbtrust.org/grants/restoration-research/
- Peer to peer information sharing

Pooled Monitoring Initiative's Restoration Research Award Program

Project Title

Climate Change Impacts to Restoration Practices

Lead Entity

Dr. Jon Butcher, Tetra Tech

Partners

David Sample, Tess Thompson, Sami Towsif-Khan, Virginia Tech

The Pooled Monitoring Initiative pools resources to support scientists who answer key restoration questions posed by the regulatory and practitioner communities. The research teams then provide the answers back to those who asked the questions for direct application. The goal of the program is to answer these key restoration questions that serve as a barrier to watershed restoration project implementation.

Questions? See cbtrust.org/grants/restoration-research/

Research questions

Climate change models predict that frequency and intensity of rain events will increase, that growing season will lengthen, and that other processes related to the Chesapeake community's approved set of BMPs will change. Should standards for stormwater practices, stream restoration, and other BMPs also change (e.g., plan to treat a two-inch rain event versus a one-inch rain event; design stream restoration practices for more frequent storms)?

Issues addressed

There are multiple global climate models (GCMs) and each model was run for multiple warming scenarios. Further variability is introduced by ways in which the model output is downscaled to a local spatial scale and daily or finer time scale relevant to evaluation of stormwater practices. We need to look across the range of predictions to evaluate potential future risks.
In prior work for CBT we developed methods and applied them across Maryland to update the rainfall intensity-duration-frequency (IDF) curves used in stormwater design based on GCM output with local bias correction. In the current work we address three important issues:

1. To what extent does downscaling method bias results?
2. Do Maryland's Environmental Site Design (ESD) requirements need to be changed to maintain similar levels of hydrologic control in a warming world?
3. How do results for protecting stream stability based on IDF analysis compare to continuous simulations of future climate?

Project findings

Different commonly used downscaled climate archives do contain systematic relative biases.

IDF calculations (e.g., the depth of a future 10-yr, 24-hr rainfall event) differ depending on whether the LOCA, MACA, or CORDEX archive is used. There is no "right" answer for future climate, but potential risks should be evaluated across multiple products.

Award # 19278

Pooled Monitoring Initiative Gains Support & Research is Valued

- Part of the EPA Chesapeake Bay Program Office's Stream Health Work Plan (Habitat Goal Implementation Team)
- Demonstrated buy-in from Maryland Department of the Environment who will allow permittees to "pool" resources vs. conducting site specific monitoring in new MS4 (municipal separate storm sewer system) permit
  - Currently in the pool: Anne Arundel County, Baltimore City, and Charles County
  - Pending final executed MOUs: Montgomery County, Frederick County, and Harford County

Keith Eshleman (UMCES)
"Assessing the effectiveness of ESD to achieve stormwater management objectives" - 2023 Forum presentation here

Similar Model in Washington State

- Dept. of Ecology manages the Regional Monitoring Program to see if things are getting better, what is working, what is n working, and what is more cost effective
- Stormwater Work Group (SWG) establish in 2008 & Stormwater Action Monitoring (SAM) is the regional stormwater monitoring program
- Recommended to establish a Regional Stormwater Monitoring Program in 2010 ($10.5M in first permit cycle)
  - Status and trends
  - Effectiveness studies
  - Source identification
- Permit Required Monitoring in 2013
  - Permittee either pays into the collective fund or conducts individual monitoring
  - Costs allocated by population

Washington State's Pooled Resources program: SAM administration - Washington State Department of Ecology

FACT SHEET FOR THE PHASE I, WESTERN WASHINGTON PHASE II, AND EASTERN WASHINGTON PHASE II MUNICIPAL STORMWATER PERMITS

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM AND STATE WASTE DISCHARGE GENERAL PERMIT FOR DISCHARGES FROM SMALL, MEDIUM, AND LARGE MUNICIPAL SEPARATE STORM SEWER SYSTEMS IN WASHINGTON STATE

AUGUST 16, 2023

DEPARTMENT OF ECOLOGY
State of Washington

5.2.3. Stormwater Action Monitoring (SAM) Collective

The SAM Collective is the regional stormwater monitoring program which is primarily funded by Phase I and Phase II permittees in western Washington through Special Condition S8. Monitoring and Assessment requirements. SAM was launched in 2014 and is implementing the SWG's strategy and recommendations to produce stormwater focused studies with actionable findings in three focus areas:

1. The effectiveness studies investigate whether various stormwater management approaches work or fail, why or why not, and under what conditions;
2. The source identification projects identify the most common problems and propose regional actions; and
3. The status and trends monitoring projects evaluate conditions in the freshwater and marine waterbodies MS4s discharge to.

Between 2014 and 2023, SAM initiated a total of 22 effectiveness, five source identification, and eight status and trends monitoring projects. In summer 2023, SAM is soliciting requests for new studies that will begin in 2024.

5.2.4. How has SAM study findings resulted in changes to the Phase I and Phase II Western Washington Permits and other Ecology programs?

SAM's goal is to capture a regional understanding of how stormwater management actions can lead to water quality protection and restoration. Stormwater managers, field practitioners, and Ecology use SAM findings to improve management practices and to set project and funding priorities. The following is a partial list of recommendations adopted by Ecology from the effectiveness studies and source identification projects completed during the 2019-2024 MS4 permit cycle (BMP references below are to BMPs in the SWMMWW, some of which also correspond to BMPs in the SWMMEW):

- **Paired watershed retrofit & restoration study (interim findings)**[27] - The City of Redmond is the lead agency on this multi-year complete watershed-scale stormwater retrofit effectiveness study. Early findings suggest that to detect changes in receiving water peak flows in any given watershed, a meaningful threshold of flow control implementation is needed. As part of this study, a short-term project to evaluate effectiveness of the individual BMPs used in the project found street sweeping improved the water quality of the small streams. Ecology also continues to fund infrastructure improvements and maintenance activities, like street sweeping.

https://fortress.wa.gov/ecy/ezshare/wq/permits/MS4_2024_FactSheet.pdf

Pooled Monitoring Initiative expansion will answer more of our questions

- Gained funding partners over the years demonstrating the value of the research program and buy-in from restoration community
- Other states, organizations, City/Counties want to pool funds to answer their "burning" questions
- What research questions does this group have for FY 24 RFP consideration?

Chesapeake Bay Trust
Program Contacts:

Sadie Drescher, Vice President of Programs for Restoration
sdrescher@cbtrust.org
410-974-2941 xt 105

Jana Davis, Ph.D., President
jdavis@cbtrust.org
410-974-2941 xt 100