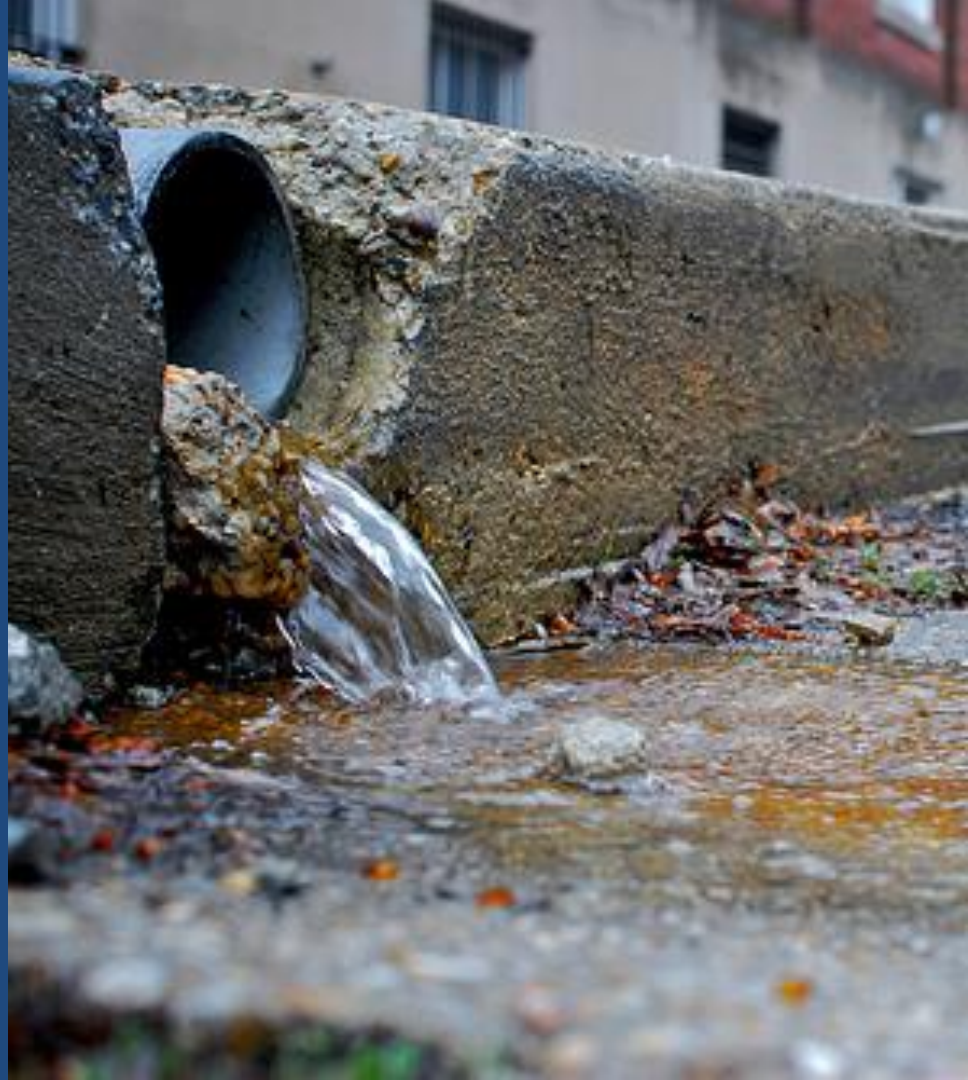
Methodologies and Tools to Support Climate-Resilient Stormwater Best Management Practices



RAND
Community Health and Environmental Policy Program

Project Overview

- **Objective**: Create an integrated toolkit of guidance materials, web-based tools, and references for integrating climate considerations into stormwater planning, management and/or design, as well as enhancements to Chesapeake Bay modeling. Including:
  - i) a two-part vulnerability assessment tool,
  - ii) a decision-support tool and framework for integrating the information from a widely-used future precipitation tool,
  - iii) guidance on resilient design adaptations for stormwater infrastructure and restoration, and
  - iv) modeling enhancements to characterize the sensitivity of BMPs to climate change.
- **Timeline:** April 2024 – 12/31/2028
- **Funder:** U.S. EPA

Project Team

RAND

Dr. Michelle Miro (PI)
Dr. Krista Romita Grocholski (Co-PI)

Chesapeake Stormwater Network

David Wood

Carnegie Mellon University

Dr. David Rounce
Dr. Sarah Fakhreddine

The Water Institute

Dr. Jordan Fischbach
Dr. Nastaran Tebyanian
Dr. Ioannis Georgiou

Cornell University

Dr. Art DeGaetano

Activity 4. BMP Climate Sensitivity Modeling

- **Objectives:**
  - Estimate the impact of future hydrology on a range of widely used BMPs in the Chesapeake Bay watershed.
  - Produce model simulations that provide the pollutant removal efficiencies for different BMPs and uncertainties associated with future hydrological conditions.
- **Output:**
  - One technical report that contains: literature review of existing urban and agricultural BMPs; synthesis of model simulations that provide pollutant removal efficiencies for BMPs; look up tables for pollutant removal efficiencies under a range of conditions by 12/17/2026
  - One to two peer reviewed journal articles submitted by 12/31/2026

Activity 4. General Approach

1. Research design

a. Literature Review
- Understand past efforts
- Evaluate data availability
- Ensure consistency with larger modeling efforts

b. Stakeholder input
- Prioritize BMPs
- Identify representative sites

2. Implementation

a. Baseline scenario
- Model calibration (SWAT/SWMM)
- Historic simulation (1991 – 2000)
- No BMPs or existing BMPs

b. Future climate scenarios
- Multiple climate projections
- BMP scenarios (one-at-a-time)

c. Output analysis
- Hydrologic changes (runoff timing, magnitude, frequency)
- Loading of TN, TP, TSS (exceedances, frequency, totals)
- Relative BMP removal efficiencies
- Uncertainty analysis

3. Synthesis of Outputs

a. Technical Report
- Literature review
- Detailed modeling procedure and outputs

b. BMP Curves/Tables
- Simplified relationships for BMP type, hydrologic condition, and removal efficiency

Workgroup Feedback

Full Workgroup - January 9

- Expressed interest and willingness to engaged with us on modeling approach, guidance on representative sites and to refine the list and specifications for agricultural BMPs.
- Suggested deriving relative removal efficiencies, rather than absolute, from our analysis.
- For GCM selection, suggested use of same ensemble included in prior work.

Ad Hoc Meeting – Feb. 20

- Discussed general approach for research design, modeling and analysis, and synthesis.
- Will arrange a presentation from the modeling workgroup to our team on their modeling efforts.
- Requested Dec 2025 for initial modeling results.

- *Workgroup followed up via email with list of top 20 BMPs by most implemented and effectiveness*

Next Steps

- *Literature Review*
  - Understand past efforts
  - Evaluate data availability
- *Continue Engagement with Workgroup*
  - Ensure consistency with other modeling efforts
  - Finalize prioritized list of BMPs
  - Identify representative sites (physiographic regions, etc.)
- *Finalize model selection*

Thank you.

Contact Information
Michelle Miro: Michelle_Miro@rand.org

Cornell University

Carnegie Mellon University

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MARISA
a NOAA Mid-Atlantic RISA team