

Danielle Galloway, “Stormwater Rain Garden Performance: Investigating Under-Performing Systems and the Influence of Modeling Techniques and Design Assumptions.”

The City of Philadelphia and Pennsylvania Department of Transportation (PennDOT) are working on a \$7 billion expansion project of Interstate-95, part of which will help reduce polluted stormwater runoff within the city’s combined sewer system. Partnering with AECOM, the 25-year project will rebuild and improve eight miles of the I-95 corridor in Philadelphia, and a total of 51 miles throughout Pennsylvania. Villanova researchers instrumented and monitored rain gardens along the interstate to evaluate their stormwater management performance. Analysis of the overall system performance helps educate the public and engineers on stormwater management practice (SMP) design. The goal of this research is to improve the standards, methods and assumptions associated with designing and constructing rain gardens. These considerations in turn can help reduce the modeling gap that exists between observed and expected performance.

Optimizing rain garden performance, as well as other SMPs, supports the long-term stormwater management plan and associated expected performance and maintenance. This research evaluated the hydrologic performance of two independent linear bioswales over eight months. Findings from this research aid in understanding SMP longevity and failure. These gardens have on-going ponding and areas of no infiltration. Combining field data with modeling, we can show how the raingardens meet the design criteria for volume reduction and peak mitigation under a range of weather conditions. Specifically, the focus of analysis was on observed data, expected performance, and changes in performance over time, to determine the uncertainty of expected performance, which can ultimately inform how these systems can be designed to be more resilient.