EPA United States Environmental Protection Agency

RESEARCH PROJECT

National Risk Management Research Laboratory
Water Supply and Water Resources Division
Urban Watershed Management Branch

Evaluation of Soil Media for Stormwater Infiltration Best Management Practices (BMPs)

IMPACT STATEMENT

This project will improve the performance of structural management practices, and provide guidance that will allow designers to balance infiltration rates with sorption capacity. This project will also perform a standard column test procedure for evaluating candidate soil media.

BACKGROUND:

Existing stormwater infrastructure regulations require a combination of management practices to improve the quality of urban stormwater runoff before discharge to receiving waters. Bioretention systems are becoming more a common way to meet these stormwater runoff management needs. A bioretention system is a soil and plant-based filtration stormwater management device shown to remove a variety of contaminants in stormwater. These systems are currently at the forefront of federal and state initiatives for urban stormwater management and water quality control. A combination of physical, biological, and chemical processes in the systems remove pollutants, such as heavy metals and nutrients transported with the runoff. The performance of bioretention systems depend on many factors, especially those that influence pollutant trapping (partitioning of pollutants between solution and sediment and between coarse and fine sediment fractions); sorption of soluble metals and nutrients; biological uptake and transformation of nutrients; and volume reduction (i.e., infiltration and evapotranspiration).

The soil media, a key component in these bioretention BMPs, must support plant growth, while providing contaminant sorption sites. Media sorption may be the most significant subsurface mechanism for removing metals and nutrients, particularly phosphorus, in bioretention BMPs. Several recommendations exist for the media. These generally rely solely on texture with a sandy loam or loamy sand commonly recommended. Practitioners are increasingly using engineered soils, with favorable sand and clay content, such as infield mix soils for bioretention media.

DESCRIPTION:

An increasing number of bioretention systems are being adopted as a stormwater management practice, and attention must be paid to investigate the impact of this technology on underlying groundwater and surface water quality. This project determines the adsorptive capacity of selected media for identified stressors of concern under dynamic conditions. Results will be combined with results of batch studies to predict the breakthrough pattern under different operating conditions and to identify optimum conditions for infiltration based practices (e.g., swales and rain gardens).

RESEARCH PARTNERS:
Contractors: PARS Environmental
Collaboration: EPA Region 3; U.S. Geological Survey; City of Fairfax; Virginia Department of Environmental Quality

EPA GOAL: Goal #2 -*Clean & Safe Water*; Objective 2.2.1 - *Improve Water Quality on a Watershed Basis*
ORD MULTI YEAR PLAN: Water Quality (WQ) Long Term Goal - WQ-2 *Protection and Restoration of Aquatic Systems*

Expected Outcomes and Impacts

The results from this experiment will be used to improve the design characteristics of bioretention BMPs, such as rain gardens and swales. Consequently, this will advance the performance of these bioretention BMPs in attenuating contaminants of concern in urban stormwater runoff, which will improve human, animal and ecological health.

Outputs:

Current and future outputs of the project will consist of conference presentations: 1) Approaches for determining swale performance for stormwater runoff - Proceedings of the 2nd National LID Conference, Wilmington, NC, March 12-14, 2007; 2) Swale performance for stormwater runoff. Proceedings of the World Environmental and Water Resources Congress: Restoring Our Natural Habitat, Tampa, FL, May 15-18, 2007; and 3) The Effects of Lime Amendment on the pH of Engineered Soil Mix for the Purposes of Bioretention, ASCE Journal of Irrigation and Drainage Engineering – Technical Note, September/October 2008.

Resources:

National Risk Management Research Laboratory (NRMRL): http://www.epa.gov/nrmrl/

NRMRL Urban Watershed Management Research: http://www.epa.gov/ednnrmrl/

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