

Status Update on Bioretention Soil Media

This focus sheet provides an update to the March 2013 focus sheet regarding bioretention pollutant removal performance and its regulatory status in the municipal stormwater NPDES permit program.

Performance of Bioretention in Reducing Stormwater Pollutants

An initial study on bioretention performance by the city of Redmond raised concerns about the release of copper and nutrients from bioretention swales built using the current recommended (default) bioretention soil media (BSM) specification of 60% mineral aggregate and 40% compost. That specification appears in Chapter 7, Volume V of the Stormwater Management Manual for Western Washington (SWMMWW) as BMP T5.30 (Best Management Practice). Since then, Ecology has reviewed updated performance information collected under several monitoring projects:

- The city of Tacoma monitored a bioretention cell and a bioretention swale serving a new residential area.
- Washington State University (WSU) Puyallup has a long-term study of bioretention mesocosms (4 soil types with multiple replicates). This project is still ongoing with a final report due in 2016.
- The city of Redmond analyzed the performance of six bioretention swales filled with four different bioretention soil medias.
- Kitsap County led a team in a study investigating the leaching potential of multiple materials, and tested small-scale soil columns of potential new bioretention soil medias.

Herrera Environmental Consultants, Inc. published a draft synthesis report that considered most of the data collected in these projects. A final report should be forthcoming in 2016.

WHY IT MATTERS

Bioretention and rain gardens are two of the most common onsite BMPs used to meet the objectives of Low Impact Development (LID) due to their hydrologic benefits.

The 2014 SWMMWW and new five-year Western Washington Municipal Stormwater Permits include increased requirements to manage stormwater on-site through either use of listed LID BMPs (such as bioretention and rain gardens), or the achievement of a LID performance standard.

MORE INFORMATION

2014 SWMMWW Webpage:

www.ecy.wa.gov/programs/wq/stormwater/manual.html

2012 Permit Reissuance Webpage:

www.ecy.wa.gov/programs/wq/stormwater/municipal/2012Reissuance.html

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Accommodations Requests

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Persons with impaired hearing may call Washington Relay Service at 711. Persons with speech disability may call TTY at 877-833-6341.

In addition, a cooperative project between U.S Fish and Wildlife Service, the National Oceanic and Atmospheric Administration, WSU Puyallup, and Suquamish Tribe tested the capacity of the bioretention soil media specified in the 2014 SWMMWW (60% mineral aggregate, 40% compost) to prevent toxicity to Coho salmon. Municipal permittees, under the Regional Stormwater Monitoring Program (RSMP), funded this project, in part. Results of the study found direct, unfiltered urban highway stormwater runoff was lethal to all adult Coho used in the study within 24 hours, and caused developmental abnormalities to Coho embryos. Stormwater runoff filtered through the 60/40 bioretention soil media not only prevented mortality in the adult salmon, it also prevented symptoms of ‘pre-spawn mortality’. The bioretention soil media showed measurable improvements in Coho embryo development as well.

Based on those studies, Ecology’s assessment of the pollutant removal performance of the specified bioretention soil media is the following:

- Total Suspended Solids (TSS) removal exceeds the Basic Treatment goal.
- Dissolved zinc removal exceeds the Enhanced Treatment goal.
- Fecal coliform bacteria counts decrease significantly.
- Polycyclic Aromatic Hydrocarbons (PAH) and phthalate concentrations decrease significantly.
- Nitrate concentrations increase for a short-time period but do not reach levels of concern.
- Phosphorus concentrations usually increase significantly for an extended time.
- Dissolved copper results show some bioretention swales with compost in the BSM have higher effluent than influent concentrations for many months following installation. ECY is actively seeking more information prior to making any changes to the enhanced treatment credit.
- Toxicity testing indicates that effluent copper concentrations are not negatively affecting salmon survival.

Current Ecology Guidance and Municipal Stormwater Permittee Legal Obligations

Ecology continues to support the bioretention guidance within the 2014 SWMMWW. That guidance provides specifications for the default bioretention soil media and custom bioretention soil medias. It also advises against the use of bioretention in these circumstances:

- Within one-quarter mile of phosphorus-sensitive waterbodies (assuming no underdrain), if the underlying native soil does not meet the soil suitability criteria for treatment as described in Chapter 3 of Volume III of the SWMMWW.



- With an underdrain when the underdrain water would be routed to a phosphorus-sensitive receiving water.

Note: Proponents cannot use the existence of a downstream phosphorus sensitive water body and a low native soil infiltration rate (between 0.3- and 0.6-inches per hour) as indication that bioretention is infeasible when using the list option to meet Minimum Requirement #5.

Ecology expects municipal stormwater NPDES Permittees in western Washington to fully implement the requirements of Appendix 1 of their permits in accordance with the deadlines in the permits. That includes approving the use of bioretention and rain gardens to meet Minimum Requirement #5 at new development and redevelopment project sites where those BMPs are proposed consistent with Appendix 1, and consistent with the “Application and Limitations” and “Infeasibility Criteria” in the SWMMWW.

Implementing Appendix 1 also includes use of BMP T5.13 – Post-Construction Soil Quality and Depth - for all lawn and landscaped areas subject to stormwater requirements. The soil specification for BMP T5.13 is not the same as that for BSM. Ecology is not studying effluent quality from the soil specification for BMP T5.13 and has no concerns regarding the specification.

This approach of continuing with the current default BSM specification until additional research identifies one or more improved bioretention soil media specifications is affirmed by the decision of the Pollution Control Hearings Board in the last round of appeals to the municipal stormwater permits (See PCHB P12-093c, and P12-097c).

Long Term Strategy

While the current default BSM provides significant water quality benefits, Ecology acknowledges that the addition of nutrients and copper to stormwater runoff, even if only for an initial period, is not desirable. Therefore, Ecology has funded a two-phase project to build upon recent investigations for potential new bioretention soil media. Phase 1 involves evaluating bioretention soil media components, and the permeability and plant growing capability of media blends. Phase 2 will evaluate the bioretention media blends developed in Phase 1 for their pollutant export potential, pollutant capture capability, and the ability to reduce stormwater toxicity in aquatic organisms.

Upon review of the project results, as well as the final reports for the previously listed monitoring projects, Ecology will consider an update to the bioretention soil media specification. That update could coincide with the 2018 reissuance of the municipal stormwater permits for Western Washington, and the concurrent update to the SWMMWW.

