Stormy Weather, Murky Water?

Stormwater treatment center brings clarity.

Challenge

One of the greatest threats to water quality nationwide begins with a storm. Rain washes over the landscape, picking up pesticides, fertilizer, sediment, oil, road salt, heavy metals, trash, toxic chemicals, and disease-causing microbes. Eventually, runoff carries this blend of pollutants—known as nonpoint source pollution—into streams, creeks, estuaries, and coastal harbors where it degrades water quality and threatens human health. Phase II of the Clean Water Act mandates communities to address this challenge, yet often they lack the information to make cost-effective decisions about stormwater treatment systems that will protect water quality.

Response

The University of New Hampshire Stormwater Center was established in 2004 to help coastal managers develop stormwater management programs to protect water quality. The center operates an independent field facility that tests stormwater devices and treatment systems in a side-by-side setting. It is the only test bed of its kind in the nation.

The Center’s field site is located next to a nine-acre parking lot in Durham, N.H. The contributing drainage area—almost completely impervious—generates stormwater flows typical of developed urban and suburban subcatchments. The site contains three classes of stormwater treatment systems: manufactured devices; conventional structural designs; and Low Impact Development (LID) designs, all of which have been scaled to address an equal volume of runoff. When rain runs off the lot, it is channeled in equal quantities into each system. The effluent from each system is then tested for quality and quantity.

Impact

Since its inception, the UNH Stormwater Center has become a resource for stormwater managers, researchers, municipalities, regulators, and device manufacturers. Preliminary research results are shedding light on the impact of commonly used stormwater treatment systems on water quality, providing valuable insight for managers and manufacturers.

The concentration of stormwater treatment systems and devices in one location provides an ideal setting for technology demonstrations and workshops. Best Management Practice (BMP) workshops and outreach activities that were first attended by managers from New Hampshire, are now drawing participants from throughout the Northeast. Researchers are exploring ways to support managers in other regions as well.

Learn More

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Tools for Clean Water & Healthy Coasts
A Year in Data

UNH Stormwater Center reports on its first year of stormwater treatment evaluation.

Between September 2004 and August 2005, researchers from the UNH Stormwater Center evaluated 12 stormwater treatments for water quality performance and volume reduction during 11 rain-fall-runoff events with varying characteristics. This analysis assessed pollutant removal, peak flow reduction, maintenance requirements, cost of installation and materials, and standard water quality parameters such as pH, temperature, dissolved oxygen, specific conductivity, and turbidity.

The evaluation revealed distinctive trends. Several new LID designs exhibited pollutant removal efficiencies of 80 to 99 percent. In contrast, conventional structural approaches did poorly to moderately at best. The performance of manufactured devices varied widely—systems with storage volumes were the most effective, those without, the least. Certain design elements, regardless of stormwater treatment, promoted pollutant removal. These included hydraulic residence time, infiltration and filtration mechanisms, low turbulence, and the use of dense root mats and herbaceous plants.

Other important findings include:

* First flush observed for a wide range of storms events.
* Cold climate (frozen filter media) appeared unproblematic.
* No system addressed chloride removal.
* LIDs maintenance requires further analysis.
* Vegetated LIDs better at nitrogen removal.
* Highest diesel range organic removal was demonstrated by the gravel wetland, bioretention system, ADS subsurface infiltration unit, and sand filter.
* Highest total suspended solid removal was demonstrated by infiltration systems such as the gravel wetland, bioretention system, ADS subsurface infiltration unit, and the porous asphalt parking lot.
* Highest zinc removal was demonstrated by the bioretention system, ADS subsurface infiltration unit, and gravel wetland.

The complete report will be published online in spring/summer 2006. For a print version, please contact Cindy Tufts at CICEET: cindy.tufts@unh.edu

Porous Potential

UNH Stormwater Center researchers evaluated the potential of an all-porous asphalt parking lot as a stormwater management strategy. The design sizing criteria was based on the need to provide storage for a 10-year rainfall event. The water quality performance was similar to sand filters, exhibiting excellent contaminant removal, with the exception of nitrogen. While maintenance requires further evaluation, the approach may have the potential to reduce the amount of road salt needed for cold climates.