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Bioretention in Ultra-Urban Environments

Making the case for an alternative approach

Within any low-impact development (LID) or environmental site design (ESD) hierarchal selection chart, one will always find bioretention/biofiltration as a top-tier preferred method of managing and treating storm water runoff. It is no surprise, therefore, that these are hot topics in today's storm water world.

I recently attended the Bioretention/Biofiltration: Ask the Researcher Summit at Villanova University. The instructors were Dr. Robert Traver, Villanova University; Dr. William Hunt, North Carolina State University; and Dr. Allen Davis, University of Maryland. To many, they are the founding fathers of research and development on bioretention/biofiltration, and I agree they are an all-star team on the subject. I have participated in many similar seminars over the past 10 years, and this one was the most highly informative and practicable from start to finish. Many new ideas, techniques and data were openly discussed and enthusiastically delivered. We are lucky to have such passionate individuals representing us as stewards of our environment and the storm water profession.

As mentioned at the seminar, it is ridiculous to argue that mimicking predevelopment hydrologic conditions for any new or retrofit construction site is a bad idea. Infiltrating rainwater where it falls through a healthy plant, soil and microbe complex, into a well-draining substrate almost always is the best strategy for managing storm water.

But while it is true there are many properly designed, constructed and maintained bioretention cells that have performed well and still look great 20 years later, a significant percentage fail—mostly for reasons beyond the control of the regulator and specifying engineer. Even if the designer puts enormous effort and due diligence into researching and specifying the bioretention media, listing proper construction methods and providing proper guidance for maintenance procedures, there still is room for error. The installation contractor can come in and substitute substandard materials, improperly blend or over-compact the biomedia, or allow sediment to enter the system during construction. Unlike almost every other structural best management practice out there today, the plant, soil and microbe complex necessary for bioretention is a living system that requires great care during and after installation. To ensure success, qualified onsite supervision during construction is required.

There are instances—particularly in ultra-urban environments—where existing soils do not adequately percolate, existing utilities cannot be relocated, high groundwater is just below the surface or space is too tight for traditional large, low-flow bioretention cells to be considered. On these retrofit or new construction sites, where water quality is the primary focus, alternative tools such as high-flow/tree-box biofilters might be a better choice. Because they can treat higher flow rates, the filter surface area to drainage area ratio is reduced significantly.

Both compact and structurally sound, these biofilters can provide a space-saving alternative without sacrificing water quality. The systems utilize a consistent biomedia blend, backed by data showing comparable removal rates of solids, nutrients, metals, oil/grease and bacteria to traditional biofiltration systems. This consistent biomedia blend also helps lessen the margin of error during installation.

I fully support all of the efforts the aforementioned pioneers have made in bioretention/biofiltration and will continue to espouse the benefits of this natural storm water treatment method where they are most practicable. But in ultra-urban environments, where space is tight and protecting water resources is critical, I respectfully request that a high-flow biofilter be considered as a viable alternative. SWS

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