Currents

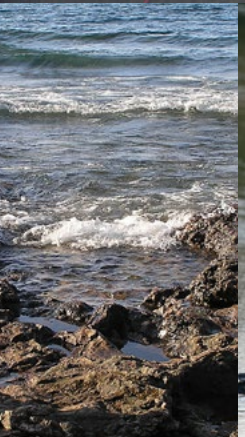
A publication of LimnoTech Water Environment Scientists Engineers

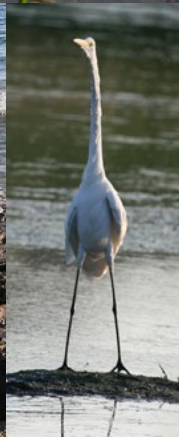
Vol. 17, No. 1 - Spring 2016

In This Issue...

- Green Infrastructure: Reducing the Quantity and Improving the Quality of Stormwater Runoff
- Monitoring the Benefits of Green Infrastructure
- Reintegrating Nature into a Dense Urban Environment

www.limno.com





In Focus: Managing Urban Stormwater

In this issue of Currents, we talk about green infrastructure—engineered or designed systems to control stormwater that mimic natural hydrologic processes—and its increasing role as the alternative of choice for urban stormwater managers over, or in conjunction with, traditional "gray" construction.

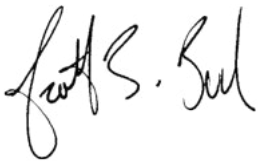
Green infrastructure employs "green" technologies—green roofs, bioretention cells, engineered wetlands, ponds, or swales and other manmade features—to promote infiltration, to retain and treat stormwater, and to moderate the negative and even damaging effects of excess surface runoff in urban areas.

The reasons to consider "green" infrastructure are numerous. In many cases, green infrastructure projects can be distributed throughout urban areas, thereby reducing stormwater runoff closer to the source. Where green infrastructure increases stormwater infiltration, pollutant loading from nutrients and other pollutants to waterways can be significantly reduced. In cases where sewer separation is planned to address combined sewer overflows (CSOs), green infrastructure may be able to help reduce the size of stormwater "gray" infrastructure. If municipalities are concerned with sanitary sewer overflows (SSOs), green infrastructure projects can help keep stormwater inflow out of sanitary sewers. Green infrastructure can reduce peak runoff flows from urban areas, which will help reduce problems from stream hydromodification and excessive erosion. Ancillary benefits of green infrastructure are also numerous, potentially including improved neighborhood aesthetics and quality of life, habitat for birds and other wildlife, and educational opportunities. Widespread implementation of green infrastructure in urban areas may someday decrease heat island effects and help reduce greenhouse gases.

At LimnoTech we believe green infrastructure is an important tool in the toolbox for solving our clients' stormwater management challenges, and we have employed green infrastructure technologies in projects for not only stormwater management, but also CSO reduction, TMDL achievement, and urban river and stream restoration. We've contributed to development of green infrastructure plans for major urban areas in the United States, including St. Louis, Washington, DC, Cleveland, and Cincinnati.

In this issue we also highlight our work in Waller Creek, an urban creek in Austin, Texas, that has historically experienced severe flooding, channel erosion, invasive species, and pollution from stormwater runoff. LimnoTech is part of a team evaluating engineering solutions for this creek. Work has included hydrologic and hydraulic modeling, evaluating the effects of managed flows, and assessing the influence of stormwater inflows. Future phases of the project will include design and construction of instream restoration and preservation features, stream bank stabilization, and innovative stormwater management alternatives.

We hope that you will find the topics in this newsletter interesting and informative. Please contact us with any questions or comments that you may have.



Scott Bell, PE, BCEE
Vice President
sbell@limno.com

Green Infrastructure—Reducing the Quantity and Improving the Quality of Stormwater Runoff

"Green infrastructure," or GI, is the generic term used to describe engineered or specifically designed systems to control stormwater that mimic natural processes occurring in plants, soils, and physical landscape features such as swales, ponds, or wetlands. These processes provide water quantity and quality benefits such as stormwater volume control, peak flow shaving, channel protection, and pollutant removal, as well as other environmental and social benefits such as decreasing heat island effect, reducing greenhouse gases, and improving aesthetics.

The use of green infrastructure for stormwater control evolved as stormwater managers moved away from large regional control structures, such as ponds that served primarily as flood controls or for channel protection, to more distributed management features focused on retention and infiltration. Green infrastructure can fit well into an urban environment because it can take many different forms—such as green roofs, bioretention, rain barrels, cisterns, etc.—that can work within site constraints.

Green infrastructure elements require less area than traditional "gray" treatment structures and may be easier to insert in urban environments.

Much of LimnoTech's recent work has focused on GI as a potential tool for regulatory compliance. This work has typically involved one of two areas: GI used for volume control to help reduce sewer overflows, such as in combined sewer overflow (CSO) Long Term Control Plans, and GI used to help reduce pollutant loading, which can contribute to meeting Total Maximum Daily Loads (TMDLs). GI can be a good solution for either regulatory need. Distributed GI practices can help reduce runoff volume by capturing and retaining runoff; GI practices can also reduce pollutants by retaining runoff, allowing pollutants to settle out, and facilitating infiltration into the soil where natural processes remove pollutants. The following examples show how GI has been used to help plan for regulatory compliance for CSO volume and TMDL pollutant load reduction requirements.

Green Infrastructure to Control Runoff Quantity

DC Water is currently under a Consent Decree to reduce combined sewer overflows (CSOs). The original Consent Decree called for construction of large centralized tunnels to manage CSOs. In January 2016, DC Water's Consent Decree for combined sewer overflow reduction was amended to include requirements for green infrastructure in the CSO control plan. The role of green infrastructure is to capture and infiltrate or evaporate stormwater locally before it enters the collection system, thus diminishing the amount of water in the combined sewer system and preventing overflows caused by surcharged pipes. Specifically, the amended Consent Decree prescribes the construction of GI facilities to manage a 1.2-inch storm event from 498 impervious acres in two combined sewer areas of Washington, DC, with the intention of reducing the need for centralized tunnel storage at the downstream end of the system. The amended Consent Decree holds the District to the same CSO overflow requirements as the original Consent Decree.

LimnoTech has provided comprehensive hydraulic and hydrologic modeling of the potential impact of GI on the CSS collection system, and has developed tools, including a SWMM-based GI model, to quantify the benefits expected with the implementation of distributed green infrastructure. The GI model will be used to evaluate sensitivity to several variables, including investigation of maximum beneficial GI volume capture, optimal GI location within sewersheds, and verification of the overall implementation strategy. Pre-construction monitoring data will be collected throughout 2016, post-construction monitoring data will follow, and both will be used to calibrate and validate the effectiveness of GI in the models.

Replacing tunnel storage with distributed green infrastructure allows incremental runoff reductions to occur more quickly because GI can be implemented without the long construction periods typically required by large capital projects such as storage tunnels. Using modeling to evaluate the ability of GI to meet runoff reduction goals for CSO control can be an important part of the planning process. The methodology for modeling GI practices described is increasingly being applied in communities throughout the United States.

Green Infrastructure to Improve Water Quality

Green Infrastructure can be an effective tool to reduce the amount of pollutants discharged to streams and rivers by stormwater runoff. It can remove or trap many of the potential pollutants in stormwater runoff—including nutrients, sediments, bacteria, metals, and toxics—before they reach