GROWERTALKS

Features

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# Using Plants to Manage Stormwater

*Debbie Hamrick*

Cities need plants … millions of them. That's the gist of what green infrastructure is all about. The positive benefits of plants include features like carbon sequestration, reducing air pollution, providing wildlife habitat, reducing site level and regional temperatures, infiltrating rainwater into the aquifer, and preventing soil erosion, to name just a few ecological services. Add that plants in cities are increasingly making a positive impact on society, as well as feeding people, reducing crime and boosting health outcomes.

Green infrastructure is a term that's becoming common. For selling plants, right now the largest and fastest growing green infrastructure market is for managing stormwater. Green stormwater infrastructure is booming. It works and it's showing little sign of slowing down.

The back story

Plants manage water in a number of ways. To start, every plant is a mini air conditioner, taking up water through its roots and transpiring that water through its leaves into the atmosphere. Cities love plants for their ability to cool temperatures. The city of Louisville, which is 20F warmer than the surrounding countryside, according to NASA data, is looking to plant 450,000 trees to help cool the city through transpiration and through shading structures.

Second, plant roots and the soil fauna they foster infiltrate water into the ground, thus recharging aquifers. This water then becomes available to be transpired through plants back into the atmosphere or evaporated from the ground back into the atmosphere, in turn feeding the local area hydrological cycle.

Third, plants manage water by interception. The cupped leaves of blue spruce (Picea pungens) showed they can store 0.07 in. of rain in simulated tests. A portion of the water that's intercepted is evaporated back into the atmosphere directly from the plant canopy. Another portion is held within the canopy and falls to the ground slowly, sometimes even after the rain has ended.

The Environmental Protection Agency (EPA) estimates that about 10 trillion gallons of contaminated water runs into U.S. surface waters. Not only that, but 772 cities in the U.S. (and some in Canada) have combined sewer and stormwater systems that become overwhelmed in heavy rainfall and discharge raw sewage (a.k.a. sewer overflows). Every year there's enough raw sewage released to cover the state of Pennsylvania, with a 1-in. thick layer.

*Pictured: Streetside stormwater green infrastructure at Lancaster Brewing in Pennsylvania. North Creek Nursery's Claudia West redesigned the planting plans after the engineers were having problems. This photo from June 2015 shows plants the first season after replanting.*

The Clean Water Act, implemented through regulation by the EPA prohibits discharge of pollutants and sewage into water. EPA is forcing cities to clean up water. There are two main ways they do this: one way is through consent decrees signed by cities with antiquated stormwater infrastructure that's combined with sewers. Consent decrees force cities to eliminate/reduce sewer overflows. Currently, when cities sign EPA consent decrees, green infrastructure is one of the mandated ways they must employ to reduce overflow problems. Directly reducing the volume of water that's running through combined systems is an important management tool. The City of Philadelphia is famously implementing more than $2 billion of green stormwater infrastructure to meet an EPA consent decree to reduce CSOs.

Some cities have separated sewer and stormwater systems; they're known as MS4s and operate under the second way EPA compels cities to clean up their water—National Pollutant Discharge Elimination System (NPDES) permits. In some cases, EPA is mandating green infrastructure in new NPDES permits. The main goal for regulation in an MS4 is controlling pollution discharge, which may also be known as nutrient control. These areas must reduce the amount of nutrients they introduce into surface waters. Prior to releasing stormwater, it needs to be treated on-site to remove pollutants. Green infrastructure is being employed in these locales as well. Raleigh, North Carolina, for instance, is an MS4. The city council recently approved a green infrastructure implementation plan to begin using more vegetated stormwater management practices, permeable pavement and rainwater catchment systems to manage stormwater.

If you're targeting green stormwater infrastructure markets in your region, it's very helpful to understand the main regulatory driver behind the regulations because it will also be driving the way the rules are implemented on the ground.

Emergent market

Green stormwater infrastructure markets are nascent; we're in the early years. There's a lot that's unknown. So far, the horticulture industry hasn't been a major stakeholder in determining how the rules are written or implemented. For the most part, entrepreneurial firms in the horticulture industry—whether it's a nursery, greenhouse, landscape contractor, landscape maintenance company or even allied supplier—will be working within guidelines that have been established by others, primarily regulators, ecologists and engineers. If the green infrastructure project is large, a landscape architect is also likely to be involved.

While federal regulations are the primary driver behind green stormwater infrastructure markets, each state

implements the rules differently. Identifying the state level administrative department and then cultivating contacts locally or regionally within that department is optimum. In my home state of North Carolina, the Department of Environmental Quality is responsible for implementation of EPA federal stormwater regulations. Most of our cities are MS4s and we use Low Impact Development (LID) to manage stormwater to reduce the nutrient load flowing into surface waters. Depending on the specific watershed, there may be additional runoff requirements to meet nutrient reduction goals. LID is a term that embodies a philosophy and tools to maintain a site's pre-development hydrology. LID is racing across the country (and world) as an effective, economical way to handle stormwater. It's the main way that green stormwater infrastructure is being developed and deployed across the U.S.

At the local city or county level, stormwater is again handled differently. Sometimes stormwater management is part of a water utility; for others it's a separate entity. If your locality has a stormwater management program and actively seeks to use green infrastructure, they may be an eager partner for educational outreach to your retail or wholesale customers, or even to promote your business and others vending plant material for stormwater management through their publicly funded outreach channels.

Plants

Plant material for green stormwater markets will likely be specified by regulation if it's destined for public or commercial installation that's required by regulation. The LID Center maintains a list of links to the LID Best Management Practices and/or technical manuals of many states implementing LID practices. You can access that link and links to a number of other excellent resources here: http://www.lowimpactdevelopment.org/links.htm. Plant material lists are frequently included in the appendix at the back of these manuals if they're not contained within a separate chapter.

Native plants are generally preferred for stormwater green infrastructure and are most often specified in plant lists for stormwater features, like rain gardens, bioswales, constructed wetlands, etc. Some jurisdictions have added language like "adapted plants." Adapted non-native plants are not invasive and thrive in the local climate. Native plants for green stormwater markets are notoriously in short supply. It's a complaint that's heard at any meeting where green stormwater infrastructure is a featured topic.

The one class of plants that's applicable in green stormwater applications coast-to-coast is grasses/sedge. A number of native and adapted grasses and sedges are ideal in green stormwater infrastructure. Grasses and sedges are a great choice for green infrastructure that needs to be ultra-low maintenance, yet looks good. Many species also offer great wildlife benefit, especially when they're mixed with other shrub, tree and perennial species. Various locations may have specific requirements for allowed or preferred species.

Green stormwater infrastructure plants must provide functionality within the stormwater practice to which they're installed. Plants that are specified are typically selected from native wetland species, with some upland species included in plant lists for the drier portions of the vegetated practices. Lists generally include trees, shrubs, perennials and grasses/sedges.

Green roof plants

Green roofs are an important aspect of green infrastructure for many locations. Cities seeking to reduce stormwater volumes into their combined sewer/stormwater systems like green roofs for their ability to soak up rainfall and keep it in place. If your customer base is in a region under an EPA consent decree and has a

combined sewer/stormwater system, then green roofs are likely incented and this could be a good market for you. Regions where the stormwater and sewer systems are separated (MS4) seek to reduce nutrient (nitrogen, phosphorus, others) runoff. Green roofs aren't as successful when reducing nutrient runoff, though they have other benefits (temperature reduction, wildlife habitat, etc.).

There's also a difference in green roof performance across North American geographies. In general, green roofs haven't been as successful in southern climates as they have in more northern climates. However, there's research to better inform plant choices. And using irrigation systems to supplement naturally occurring rainfall and moderate temperature extremes can mitigate problems.

While native species are gaining more and more traction for green roofs, they're a fraction of the total plant sales. Sedums dominate the green roof plant market because they work well under the extreme conditions on most rooftops. They have an ability to adapt how they grow based on the conditions they experience, meaning they can respire when conditions are good and stop when conditions are poor.

A great business opportunity in the area of green roofs is to become a "fixer." In regions where thousands and thousands of square feet of green roofs have been installed, there's a healthy market for specialists that can come in and revitalize an older green roof or fix issues of roofs that have been previously installed. There's a lot that needs to be right when you're growing plants up in the air under the harsh conditions on most rooftops. **GT**

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