Rain Gardens and Bioretention – What's the Difference?

This article was researched and developed by Cascadia Consulting Group on behalf of the Department of Ecology. Input was provided by Lisa Port, Jessi Bloom, Chris Webb, and Zsofia Pasztor.

Low Impact Development (LID) is coming to Washington State in the newest round of municipal stormwater permits, called National Pollution Discharge Elimination System (NPDES) Permits. These permits are issued by the Washington State Department of Ecology and cover more than 90 Cities and Counties in Western Washington and 24 cities and counties in Eastern Washington, By June 2015, Seattle, Tacoma, and unincorporated King, Snohomish, Pierce and Clark Counties will require the use of low impact development (LID) on both new and redevelopment projects. Most other Western Washington NPDES permittees will need to adopt these requirements by the end of 2016. The Eastern Washington NPDES permittees are required to update their codes, if needed, to allow the use of LID by the end of 2017.

How do Rain Gardens and Bioretention fit into LID?

Low Impact Development landscapes can include either rain gardens or bioretention facilities. Both facilities consist of shallow depressions combining vegetation with amended or designed soils to filter and absorb water – much like a forest floor. The soil mix and vegetation enhance the infiltration, storage and removal of pollutants from stormwater. When designed properly, they hold standing water for no longer than forty eight hours after the end of a rain event with maximum ponding depths of 6-12 inches. These properties can help new and redevelopment projects meet stormwater requirements.

Bioretention facilities (cells, swales, or planters) are engineered to treat and infiltrate a specific amount of stormwater. They have exact design criteria to ensure they function according to the design intent. These facilities have operation, maintenance and inspection requirements since they are part of a stormwater treatment and flow control system. The facilities include designed soil mixes and sometimes control structures like under-drains to aid in the control of overflow, catch basins to filter sediment, and check dams or weirs to slow the flow of water moving through the facility. Bioretention facilities are commonly found on commercial properties or in a public right of way.

Rain gardens are typically smaller systems that do not need to be engineered. Rain gardens include compost-amended native soils or designed soil mixes, usually have a simple inflow where rainwater enters the garden, and an above-ground overflow where excess water exits. Rain gardens do not require complex modeling, but operation and maintenance is critical to proper performance (see operation & maintenance checklist).

Both rain gardens and bioretention facilities require thorough site assessments prior to design and installation. The site assessments include an inventory of existing structures and function such as hardscaping, utilities, natural drainage and vegetation, soil quality and texture (clay, silt, and sand ratio), water infiltration rate, contributing impervious area, slope, exposure, and cultural conditions. Without a thorough assessment, the facility may flood or pond for longer than desired and cause problems with stagnant water. "We've repaired projects that failed due to lack of proper assessment," says Jessi

Bloom, owner and designer of NW Bloom. “Redoing projects is costly and easily avoided. Upfront investment in design and assessment is critical.”

How do I know which one can be used on a site?
It depends on what you and your client are trying to achieve with the Rain Garden or Bioretention Facility. If you are installing the feature as simple improvement to the landscape, a Rain Garden is probably the way to go. The *Rain Garden Handbook for Western Washington Homeowners*, http://raingarden.wsu.edu/ can provide you with more information on how to build a Rain Garden.

If the Rain Garden or Bioretention facility is part of a larger project, you can use it to help meet the upcoming LID requirements for new and redevelopment. The Department of Ecology provides the following guidance for cities and counties for new and redevelopment projects:

1. A Rain Garden can be considered if your project:
   - Creates or replaces less than 5,000 square feet of hard surfaces (such as building an addition, adding a new driveway, patio or walkways)
   - AND disturbs less than 32,670 square feet (¾ acre) of ground
2. Bioretention is considered for projects that are larger than either of the above areas.

For more information, see the 2012 Stormwater Management Manual for Western Washington: http://www.ecy.wa.gov/programs/wq/stormwater/manual.html .

Minimum Requirements for New and Redevelopment are discussed in Chapter 2 of Volume I.

Cities and Counties may have their own requirements and you should check with your permit office when planning your project.

How are rain gardens and bioretention facilities operated and maintained?
The best time to observe the operation of rain gardens and bioretention facilities is during and immediately following rain events. Check the water flow to ensure proper infiltration and storage. If stormwater is causing erosion or is standing for more than 48 hours after the end of a rain event, the facility may need to be renovated. Facilities receiving a lot of sediment may require extra attention to ensure water infiltration.

Beyond careful observation of the water flow and ponding, rain garden and bioretention facilities require minimal maintenance. Too much foot traffic in the cells can cause soil compaction which reduces water infiltration. “I often include stones in my rain garden designs to provide aesthetic appeal as well an entry way for maintenance staff to use without causing compaction,” says Bloom.

Side bar or text box:

Operation and maintenance check list:

- Watering
  - In the first two to three years while plants establish
  - Once established, a well designed rain garden will not require much water
- Erosion control
  - Inspect inflow and outflow and ponding area
  - If erosion occurs, assess flow, gradient and control structures
  - If erosion occurs, replace soil, plants, and mulch as needed
- Sediment accumulation
  - Inspect inflow and outflow and ponding area
  - Remove sediment when mulch is discolored or infiltration appears compromised
- Vegetation
  - Assess health
  - Prune and replace dead plant material occasionally
  - Weed invasive and nuisance plants manually before going to seed
- Mulch
  - Replace mulch annually or if discolored if the facility serves a road or parking lot
  - Maintain a 2-3 inch layer of mulch

For more information, see The *Rain Garden Handbook for Western Washington Homeowners*, http://raingarden.wsu.edu/

Selling LID Facilities to Your Customers

Often customers do not know enough about LID to request it in their landscapes. Nevertheless there are ample opportunities for professionals to use LID to address clients' concerns and desires. The more comfortable you are talking about the structure and benefits of these facilities, the more likely your clients will select LID. "I've made rain gardens a part of my tool kit just like any other landscape feature," says APLD Certified Landscape Deisgner, Lisa Port of Banyon Tree Studio. "When I see an opportunity at a site for a rain garden, swale or cistern, I include it as a design option." Port installs rain gardens along driveways or paths and uses a lot of contemporary designs including square and rectilinear shapes.

Residents and developers are increasingly recognizing the many benefits of LID, but some customers question if standing water will increase mosquitoes and endanger small children, or if plantings will reduce visibility or space for recreation, and increase maintenance and upkeep. While there are answers to address some of these concerns, others will diminish as property owners become more comfortable with LID. Mosquitoes require 7-14 days in larvae stage before hatching. A properly functioning rain garden should only hold standing water for48 hours after a rain event. For children, the benefits of rain gardens mostly outweigh the risks. "Rain gardens can be a great education tool for children", says Lisa Port when describing a 300' rain garden at The Clearwater School in Snohomish County. "Kids find and learn about frogs and salamanders in the garden." Rain gardens enhance streetscapes, beautify neighborhoods, and improve walkability. Programs like 12,000 Rain Gardens http://www.12000raingardens.org and RainWise https://rainwise.seattle.gov are increasing property owners' familiarity with LID.

For developers, bioretention cells can be a very economical choice. Chris Webb, PE, a civil engineer with Maul Foster and Alongi in Bellingham says "When bioretention cells are used for stormwater treatment and can be built as the required landscaping for a project they are the most cost effective treatment method available." Webb explained that when something can serve two purposes, that is stormwater treatment and landscaping, it's inherently more cost effective. According to Webb, "Over the past 10+ years the industry has come a long way in Western Washington in particular. The lessons learned from the field, about such elements as the proper soil specification, together with the research ongoing at the Washington Stormwater Center, http://www.wastormwatercenter.org/, will support the continued development and implementation of these approaches". See the case study 'Reining in the Rain" from the City of Bellingham on the use of rain gardens to manage stormwater, http://www.cob.org/documents/pw/environment/rain-garden-cob.pdf.

New Opportunities for Landscape Professionals

New LID regulations create new opportunities for design, installation, maintenance, plant and soil production for landscape and nursery professionals. As LID increases, public, private, and commercial, new and redeveloped sites will benefit from coordinated efforts that incorporate all aspects from design to installation and maintenance. Professionals involved in facility design will benefit from installer and maintenance feedback. In turn, installers and maintenance professionals learn about facility structures and function from designers. Your professional input is also valuable as city and county law makers consider changes to address the upcoming regulatory changes. Contact your local planning department to provide input. Consult the Municipal Research and Services Center of Washington website http://www.mrsc.org/research/research.aspx, to find planning department officials in your area. Attend trainings and industry events to network with people across the industry. For a list of events visit www.wsnla.org and www.walp.org.

Resources:

- 2012 Stormwater Management Manual for Western Washington, http://www.ecy.wa.gov/programs/wq/stormwater/manual.html
- 2004 Stormwater Management Manual for Eastern Washington, http://www.ecy.wa.gov/programs/wq/stormwater/easternmanual/manual.html
- Department of Ecology Trainings, http://www.ecy.wa.gov/programs/wq/stormwater/municipal/EcyWorkshops.html
- 2012 LID Technical Guidance Manual for Puget Sound, http://www.psp.wa.gov/LID_manual.php
- Draft of Eastern Washington LID Guidance Manual, http://www.wastormwatercenter.org/news/?id=249
- Rain Garden Handbook for Western Washington Homeowners, http://raingarden.wsu.edu/ (To be updated in June, 2013)
- 12,000 Rain Gardens, http://www.12000raingardens.org
- Rain Wise, https://rainwise.seattle.gov/city/seattle/overview
- Resource lists, www.walp.org, www.wsnla.org
- The Municipal Research and Services Center of Washington, http://www.mrsc.org/research/research.aspx