

# GREEN from the Ground Up

Nature-friendly design practices for land-savvy developers

Capitalize  
on your  
natural  
assets



This fact sheet is one of a series on nature-friendly development practices created by Metro through its Nature in Neighborhoods initiative.

Nature-friendly development practices minimize the impact of development on natural resources, and can help developers save money and add value to their properties.

Metro's Nature in Neighborhoods initiative is a long-term effort to conserve and restore nature throughout the urban area and ensure that every citizen in the region has access to nature.

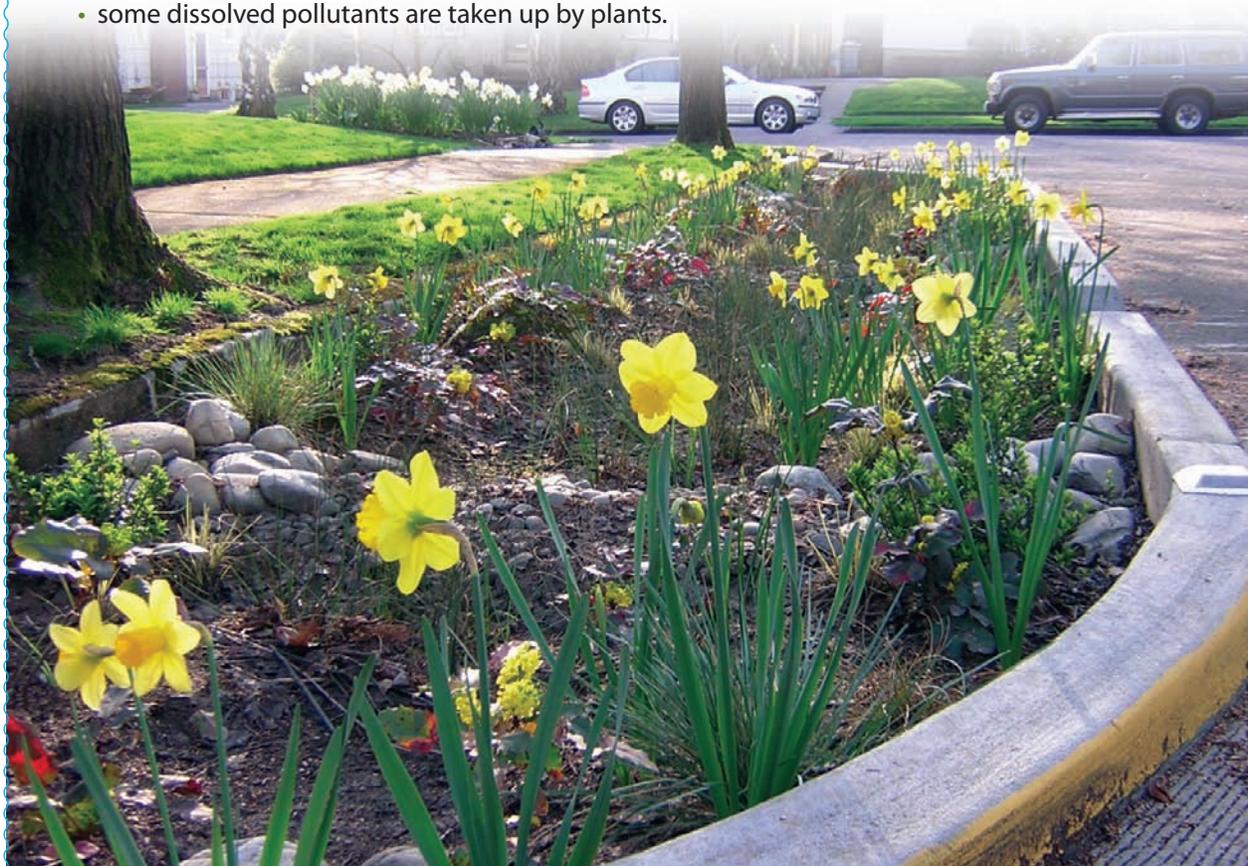
## Rain gardens and swales

### Description of practice

The terms rain garden and swale (also called bioretention) refer to a fairly broad variety of landscape treatments and facilities that consist of landscaped topographic depressions designed to capture stormwater runoff and allow it to infiltrate and/or be detained. Some rain garden facilities are designed and maintained to provide significant aesthetic benefits. Others employ similar features, materials and functions, but are more utilitarian, although still visually appealing. The plants, soils and topography of a rain garden are selected and arranged to work together to reduce runoff volume, runoff rate and pollutants in the stormwater leaving the facility. Swales are similar to rain gardens except they are designed to also convey stormwater.

Rain gardens commonly remove pollutants by several means:

- relatively large particles (e.g., litter and vegetative debris) tend to be filtered out of the stormwater by grasses and fine-textured, low-lying plants which function as a sieve to screen out and retain the particles
- fine particles, oils/greases and some other pollutants tend to adhere to soils and plants
- dense particles (e.g., eroded soils, silt) generally settle out in depressed areas
- some dissolved pollutants are taken up by plants.





Rain gardens can be incorporated into almost any landscaped area, such as the grounds at St. Phillip Neri Church (top), the parking lot at Clean Water Services' field operations center (center) and the parking lot at New Seasons grocery store (bottom).

Typical rain gardens include low-lying areas that contain specific layers of soil, sand and organic material such as compost. These layers reduce the amounts of common pollutants such as oil, grease, heavy metals, nutrients, sediment and fertilizers, thereby providing protection for the receiving waters. Swales, which may be used to convey stormwater above ground instead of in a pipe, can be designed, built and maintained to function as a linear rain garden.

Rain gardens can be used in open space areas such as gardens on single-family lots, in common areas typical of an apartment complex or office campus, in parking lot islands, between parking rows, or alongside roadways. Rain gardens should be located downgrade from the house on an individual lot.

### Appropriate site conditions for use

In general, a rain garden is most appropriate when the following conditions are met:

- the areas that drain toward the rain garden (on-site as well as off-site) measure less than three acres, and preferably less than one acre
- Rain gardens should not be used in areas where the infiltrating water could cause problems (e.g., impair foundation conditions, slope stability conditions, groundwater quality in a groundwater protection area or increase the rate at which subsurface pollutants migrate toward springs and/or wells).

**Note:** Check local codes to determine requirements in your jurisdiction.

### Cost compared to conventional development techniques

The cost of rain gardens on residential sites will depend on soil conditions and the density and types of plants used. The cost of rain gardens on commercial, industrial and institutional sites will vary based on the need for control structures, curbing, storm drains and underdrains. In any facility, the cost of plants can vary substantially and can account for a significant portion of the facility's expenditures. The cost of a rain garden is slightly greater than that of a typical landscaping treatment because of the increased number of plantings, additional soil excavation, backfill material and use of underdrains.

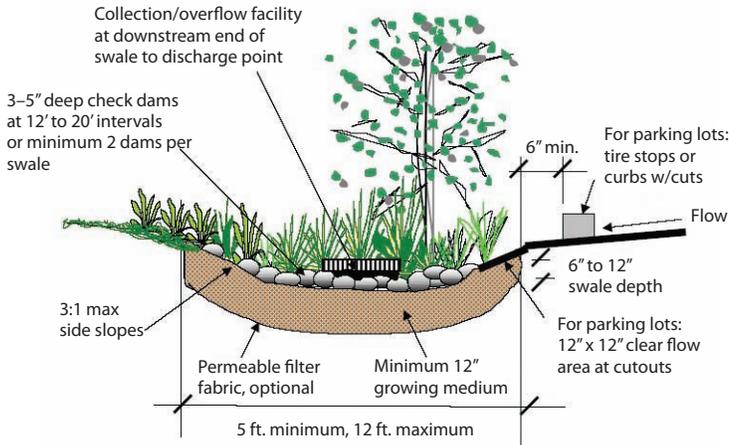
If used extensively throughout the site, the cost savings compared to the use of traditional structural stormwater conveyance systems can make rain gardens and swales quite attractive financially.



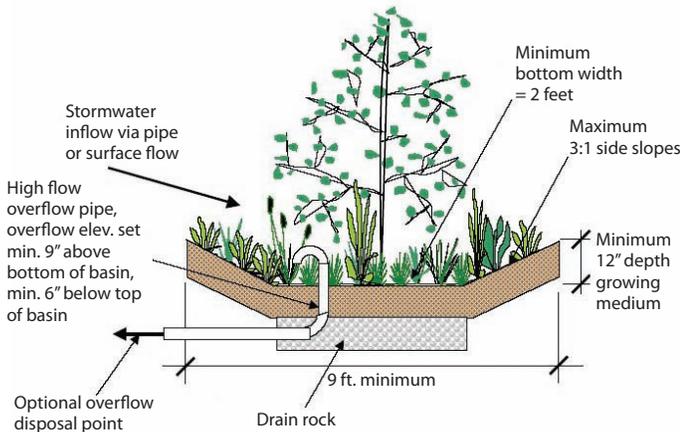
Rain gardens can beautify a streetscape as well as provide stormwater management as seen at High Point development in Seattle (left) and New Seasons store in Portland (right).

## Vegetated swale

Drawings courtesy of City of Portland, Bureau of Environmental Services



## Rain garden



ties and conditions in the watershed areas that contribute storm runoff. Other potential tasks include replacing dead vegetation, adjusting soil pH, repairing erosion at inflow points, replenishing mulch, inspecting and unclogging underdrains (if present) and repairing overflow structures if used. Depending on pollutant loads, some soils may need to be replaced five to ten years after construction.

In general, a routine maintenance schedule can be followed. An example is presented on [http://www.lid-stormwater.net/bio\\_maintain.htm](http://www.lid-stormwater.net/bio_maintain.htm) and in the Prince George's County

## Maintenance considerations

The primary maintenance requirement for rain gardens and swales is the same routine periodic maintenance required of any landscaped area. Native plant species are selected to minimize fertilizer, pesticide, water and overall maintenance requirements. Rain garden system components should blend over time through plant and root growth, organic decomposition and the development of a natural soil horizon. Over time, these biological and physical processes will tend to lengthen the facility's life span and reduce the need for extensive maintenance.

Removal of accumulated sediment and debris, especially at the inflow point, will occasionally be needed and will primarily depend upon the activi-



## Benefits/value added

Rain gardens function as natural and beautiful storm-water management solutions because they:

- reduce annual stormwater flow by intercepting, detaining, infiltrating and storing water
- establish a unique sense of place by featuring plants native to the area
- encourage environmental stewardship and community pride
- provide a host of additional environmental benefits (i.e. habitat for wildlife and native plants, improved air quality and mitigation of urban heat island effect)
- increase real estate values by the use of aesthetically-pleasing landscaping.



Swale and narrow roadway, a Seattle Street Edge Alternative Project. Photo courtesy of Puget Sound Action Team.



Rain garden at Portland State University. Photo courtesy of Portland Bureau of Environmental Services.

Green development adds value to your property and helps your bottom line grow





## Example project: Buckman Heights Apartments

Portland Bureau of Environmental Services



A 2-acre redevelopment project in Portland's combined sewer area, Buckman Heights Apartments is a 150-unit, four-story apartment building with both surface and underground parking. The buildings are organized around a main courtyard which is defined by low seating walls along the sidewalk and two 18- by- 45 foot planting beds designed as rain gardens to

filter and absorb the stormwater from the buildings' downspouts. The gardens accept runoff from the rooftops and the surrounding courtyard pavement. Water in the planter may range from 6 to 18 inches deep. Moisture tolerant plants including spirea, iris, Oregon grape and astilbe were planted within a Japanese holly border. An overflow pipe is set 9 inches above the bottom of the basin. Runoff enters the landscape infiltration area and soaks into the soil, except for large storms that flow out the overflow. During a storm, this keeps the water at a maximum depth of 9 inches, with percolation rates estimated at 2 inches per hour. At this rate, the area is expected to drain within five hours. Buckman Heights is located in Northeast Portland and developed by Prendergast Associates.

Bioretention Manual. For rain gardens in low-density residential developments, the maintenance responsibilities are often transferred to the individual property owner. Experience has shown that the economic incentive of maintaining property values ensures that most homeowners will maintain their landscape. For rain gardens in common areas, homeowner associations may assume upkeep responsibility. In commercial and industrial settings, the standard on-site facility maintenance agreement can be used for rain gardens and swales with modifications as necessary.

### For more information

on nature-friendly development practices or Metro's Nature in Neighborhoods initiative, visit [www.oregonmetro.gov/nature](http://www.oregonmetro.gov/nature), e-mail [nature@oregonmetro.gov](mailto:nature@oregonmetro.gov) or call (503) 797-1555.

### References

1. Coffman, L.S., R. Goo and R. Frederick. 1999. Low impact development: an innovative alternative approach to stormwater management. Proceedings of the 26th Annual Water Resources Planning and Management Conference ASCE, June 6-9, Tempe, Arizona.
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4. Liptan, Tom and Murase, Robert. 2002. "Watergardens as Stormwater Infrastructure in Portland, Oregon," in Handbook of Water Sensitive Planning and Design, Ed. Robert France, Lewis Publishers.



Clean air and clean water do not stop at city limits or county lines. Neither does the need for jobs, a thriving economy and good transportation choices for people and businesses in our region. Voters have asked Metro to help with the challenges that cross those lines and affect the 25 cities and three counties in the Portland metropolitan area.

A regional approach simply makes sense when it comes to protecting open space, caring for parks, planning for the best use of land, managing garbage disposal and increasing recycling. Metro oversees world-class facilities such as the Oregon Zoo, which contributes to conservation and education, and the Oregon Convention Center, which benefits the region's economy.

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### GREEN

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