Rain Garden

Alternative Names: Vegetated Infiltration Basin, Bioretention, Biofiltration


Discovery Center, Kansas City, MO
http://www.raingardennetwork.com
Retrieved 01/22/2008

DESCRIPTION

Rain gardens are landscaped areas that collect and treat stormwater runoff using bioretention. Bioretention systems collect and filter stormwater through layers of mulch, soil and plant root systems, where pollutants such as bacteria, nitrogen, phosphorus, heavy metals, oil and grease are retained, degraded and absorbed. Treated stormwater is then infiltrated into the ground as groundwater or, if infiltration is not appropriate, discharged into a traditional stormwater drainage system. Rain gardens may look similar to traditional landscaped areas, but they differ in design and function. Rain gardens can be planted with a variety of perennials, grasses, shrubs and small trees. Native plants are typically preferred. Rain gardens are a valuable addition to both residential and commercial sites.

BENEFITS

Overall

- Reduces stormwater runoff volume, flow rate and temperature
- Increases groundwater infiltration and recharge
- Provides local flood control
- Treats stormwater runoff
- Improves quality of local surface waterways
- Enhances the beauty of residential or commercial sites
- Provides wildlife habitat
- Reduces soil erosion
- Provides a cost-effective way of treating stormwater as the ratio of cost to volume of runoff treated is lower than many other stormwater best management practices

Pollutant Removal

Pollutant removal can be affected by many factors, such as the types of plantings and maintenance of the rain garden. Properly designed rain gardens can be very effective at eliminating many pollutants that are of concern in the Charles River watershed:

- Total Suspended Solids: 23% - 81%
- Total Phosphorus: 38% - 72%
- Nitrate (as N): 8% - 80%
- Lead: 62% - 91%
- Zinc: 63% - 76%
- Copper: 53% - 65%[4, 7]

Volume Attenuation/Flow Reduction

- 100% for small storms
- 90% for large storms when antecedent conditions are dry
- 30-90% when antecedent conditions are wet[5]

MAINTENANCE

Needs and Frequency

Periodically and after rain events:

- Check vegetation and drainage structures
- Remove sediment and debris
- Clean and repair inflow and outflow pipes

As needed:

- Maintain vegetation, more frequent watering and weeding may be required during the first two years
- Replace plants
- Replace mulch so built-up pollutants do not harm the vegetation

Cost

Similar to traditional landscaping

INSTALLATION COST

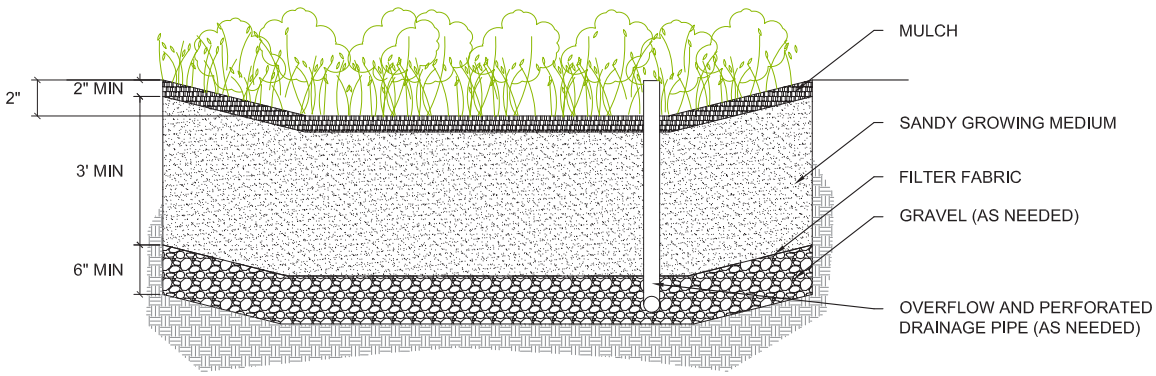
Cost will vary depending on the garden's size and the types of vegetation used, however, professional installation of a rain garden typically costs $10 - $12/square foot.[10] Residential rain gardens are typically 100 to 300 square feet in size.[1]

RECOMMENDED PLANTS FOR NEW ENGLAND RAIN GARDENS[9]:

New England Aster
Common Evening-Primrose
Black-Eyed Susan
Switchgrass
Ostrich fern
Summersweet clethra
Red-osier dogwood
Highbush blueberry
Compact inkberry holly


Franklin, MA[3]

SCHEMATIC



Adapted from:
Designing Rain Gardens (Bioretention Areas)
http://legacy.ncsu.edu/classes-a/bae/cont_ed/bioretention/lecture/design_rain.pdf
Accessed 01/22/2008

EXAMPLE PROJECTS

Franklin Rain Garden Demonstration Project
Franklin, MA
A rain garden was constructed at a private residence in Franklin, MA as a demonstration for other homeowners. The rain garden was designed to collect rooftop runoff. The 220 square foot garden prevents 8,000 gallons of polluted stormwater runoff from entering the Charles River each year.[3]

Town of Milton
Milton, MA
Three bioretention cells (large-scale rain gardens) were constructed along Pine Tree Brook, a tributary of the Neponset River, to improve stream water quality.[8]

ADDITIONAL CONCERNS OR UNKOWNS

- Best for use in areas that drain less than a 5% slope
- May not be appropriate in areas with high water tables[5]
- Rain gardens should be situated at least 10 feet from a building due to overflow and flooding concerns[1]
- May require safety overflows for times when water capacity is exceeded
- Rain gardens designed to infiltrate groundwater should only be placed above uncompacted soils with a minimum infiltration rate of two inches per hour, otherwise, an underdrain system is required to carry treated water to a traditional stormwater drainage system[5]

SOURCES

[1]Bannerman, R. and E. Considine. (2003). Rain Gardens: A How-to Manual for Homeowners. University of Wisconsin–Extension and Wisconsin Department of Natural Resources. Available at: http://www.water.rutgers.edu/Rain_Gardens/home.rgmanual.pdf.

[2]Center for Watershed Protection. (2007, August). Urban Stormwater Retrofit Practices Appendices. Urban Subwatershed Restoration Manual Series.

[3]Comprehensive Environmental Inc. (2007). Low Impact Development (LID) Committee - Franklin, MA Raingarden Demonstration Project. Accessed December 19, 2007. Available at: http://www.ceiengineers.com/LID/franklinma.htm.

[4]Davis, A., R. Stack, R. Kangas, JS Angle. (2003). Water Quality Improvement Using Rain Gardens: University of Maryland Studies.

[5]Environmental Services - City of Portland. Vegetated Infiltration Basins. City of Portland Stormwater Solutions Handbook.

[6]Low Impact Development Center. (2007). What is a Rain Garden? Rain Garden Design Templates. Accessed December 19, 2007. http://www.lowimpactdevelopment.org/raingarden_design/whatisaraingarden.htm.

[7]Liptan, T. and R. Murase. (2002). Handbook of Water Sensitive Planning and Design. Robert France, (Ed.), Watergardens as Stormwater Infrastructure in Portland, Oregon. CRC Press LLC.

[8]Neponset River Watershed Association. (2006). Bioretention Cells. NepRWA.org. Accessed December 19, 2007. Available at: http://www.neponset.org/BioretentionCells-PTB.htm.

[9]Rocklen, C. (2007) Neponset River Watershed Association. Personal Communication.

[10]Roy, S. (2007). GeoSyntec. Personal Communication.