GREEN STORMWATER INFRASTRUCTURE (GSI) FACT SHEET

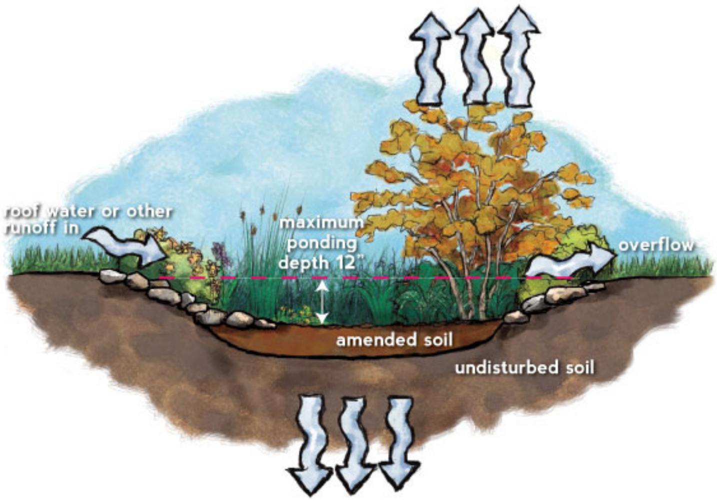
BEST MANAGEMENT PRACTICE

Bioretention

WHAT IS IT?

Bioretention systems are shallow vegetated basins designed to filter out and remove sediments, nutrients, and pollutants from stormwater runoff. Because they are often planted with eye-catching species and managed as a landscape feature, they are commonly referred to as rain gardens. Regardless of the name, bioretention systems are an aesthetically-pleasing and functional addition to any site.

CRITICAL COMPONENTS



- Inlet - pretreatment and energy dissipation (if necessary for concentrated flows)
- Basin – generally sized to capture a 1″ storm event
- Soil media – sand, topsoil and compost mixture (depth of 6-18″ in residential applications, 18-30″ in commercial applications)
- Soil cover - 2-3″ of hardwood mulch
- Plants - native, site-appropriate plants (provide increased wildlife habitat value over non-native plants and are more resilient to local climate extremes)
- Outlet - infiltrative parent material or under drain system (if needed to provide adequate de-watering rate) and stable overflow area to accommodate larger storms

BENEFITS

Stormwater Volume Reduction: Moderate (dependent on sizing)

Stormwater Treatment: High (less if underdrained)

APPROPRIATE USE AND CONSTRAINTS

Bioretention systems are designed to retain the run-off volume from moderate-sized storms and work well for smaller drainage areas. Designs must take into account precipitation volumes and frequency, impervious drainage area, and the factors that determine infiltration rate (soil type, water table depth). Stormwater that enters a bioretention system should drain in 48 hours or less. Bioretention cells should:

- be 100′ from wells
- be 10′ from building foundations
- avoid utility crossings & septic infrastructure
- be at least 2′ above the water table on well-drained or moderately well-drained soils

In some cases, the potential for groundwater contamination precludes usage of bioretention as a management tool unless a liner and underdrain is used.

Factsheet prepared by the Vermont Green Infrastructure Initiative, a program of the Watershed Management Division of the VT Department of Environmental Conservation (http://watershedmanagement.vt.gov/).

VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION
WATERSHED MANAGEMENT DIVISION
GREEN INFRASTRUCTURE INITIATIVE

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COSTS

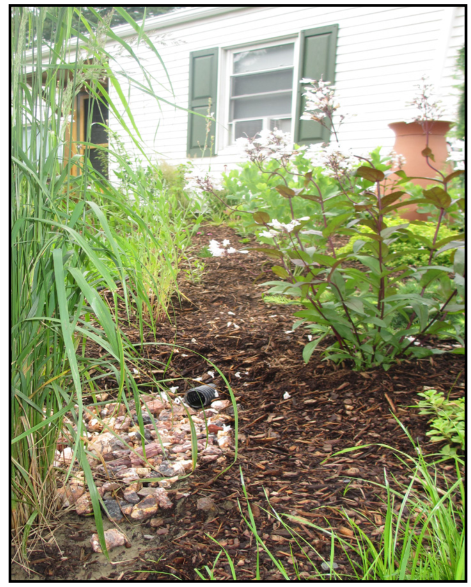
Materials/Construction:

$10—$17 /square ft.

Costs vary due to overall BMP size (e.g. large BMP construction may require heavy equipment), design (e.g. under-drain, connections to other infrastructure), and aesthetics (e.g. plant selection)

Annual Maintenance:

$1.25 /cubic foot of stormwater volume treated



GRAVEL ENERGY DISSIPATION AT OUTLET
BURLINGTON, VERMONT

MAINTENANCE

Once constructed, bioretention systems require regular garbage and sediment removal from the pretreatment area, seasonal plant trimming and replacement, and replacement of mulch. These tasks can be managed by motivated volunteers (like garden clubs) or by existing groundskeeping staff. Selection of the number of plant species should reflect the resources available for long-term maintenance needs; often three or four species of grasses and sedges is all that is necessary to provide functional benefits and acceptable aesthetics. Careful planning in the design phase should include identifying areas of snow storage; snow storage should not occur in bioretention system. Over time, it may be necessary to remove deposited sediment to restore the functional capacity of the bioretention system.

PARKING MEDIAN BIORETENTION CELL
MONTPELIER, VERMONT

ADDITIONAL CONSIDERATIONS

Because bioretention systems have living plants with root systems that are home to a variety of micro-organisms, they are particularly effective in treating stormwater. The physical structure of plants slows the velocity of stormwater and thereby facilitates settling of sediment. The biological activity of the plants and associated micro-organisms uptakes and transpires water (providing additional stormwater volume control) as well as takes up pollutants such as nutrients, heavy metals, and some hydrocarbons.

REFERENCES

City of Lancaster, Pennsylvania. 2011. City of Lancaster Green Infrastructure Plan Appendix A: Green Infrastructure Technology Fact Sheets. http://www.dcnr.state.pa.us

Minnesota Pollution Control Agency. 2005. Minnesota Stormwater Manual Chapter 12: Best Management Practice Details. http://www.pca.state.mn.us

Milwaukee Metropolitan Sewerage District. 2013. Regional Green Infrastructure Plan- Chapter 5: Green Infrastructure Benefits and Costs. http://www.freshcoast740.com

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