RAINGARDEN: BIORETENTION/ BIOFILTRATION

FOR MORE DETAILED INFORMATION REGARDING RAINGARDENS SEE LINKS BELOW:

- DESIGN DETAILS
- SAMPLE SPECIFICATIONS
- MAINTENANCE REQUIREMENTS
- PLANT LIST
- PERFORMANCE DATABASE
- REGIONAL EXAMPLES
RAINGARDENS:  BIORETENTION/ BIOFILTRATION

SITING AND DESIGN CONSIDERATIONS

Contributing Drainage Area
Typically raingardens are designed for small sites (e.g. five acres or less) but they can be applied to larger areas if designed properly (e.g. incorporating multiple raingardens in a series).

Pretreatment Needs
A grass buffer strip should be provided adjacent to the raingarden to reduce runoff velocity and filter out particulates before they reach the raingarden. Slopes should not exceed 3:1 for erosion protection and maintenance purposes.

Organic Mulch Layer
The organic mulch layer serves a number of functions: protects the plant bed from erosion; retains moisture in the plant root zone; provides a medium for biological growth and decomposition of organic matter; and filters pollutants.

Ponding Area
The ponding area provides temporary runoff storage prior to infiltration, filtration, evaporation, or transpiration. Ponding depth is a factor of the desired treatment volume, the area, the infiltration capacity of the insitu soils and the landscaping/planting plan. Typically ponding depths range from 6” to 3’ and should be designed to drain within 72 hours. Outlets and underdrains can be used to direct excess flow away from the raingarden.

Planting Soil Bed
For ideal infiltration, filtration and healthy plant growth the growing medium should consist of a blend of organic matter (20%), sandy soil (50%) and top soil (30%). Some clay is desirable, because clay particles adsorb heavy metals, hydrocarbons, and other pollutants. However, the clay content should not exceed 10% of the medium. To maintain infiltration rates of 0.5-3.0 in/hr, native soils with higher clay content should be amended with imported sandy soil. Soils lacking organic matter should be amended with compost. A soil pH of 5.5 to 6.5 is ideal for pollutant removal by microbial activity. Depth of planting soil in Raingardens with an amended sand/gravel bed should be a minimum of 2’.

Optional Sand or Gravel Bed
A sand or gravel bed below the raingarden area should be provided to aerate and drain the planting soil depending on the permeability of the underlying material. If the insitu soils exhibit low permeability, the underdrain may be located in the gravel bed and the raingarden will operate as a biofiltration practice.

Outlets and Underdrains
Raingardens should be designed with an emergency overflow to direct excess flow away from the raingarden and prevent undesirable inundation/ flooding. An underdrain is a perforated pipe installed in the gravel bed that collects filtered runoff and directs it toward an approved location, such as a drainage swale or an existing drainage system. The use of an underdrain results in a raingarden that will operate as a biofiltration practice.

Depth to Water Table and/or Bedrock
A minimum of 3 feet should be provided from the bottom of the practice to the seasonally high water table or bedrock. This separation is required to maintain groundwater quality and the hydraulic capacity of the practice.

Insitu Soil
Raingardens can be applied to most situations. In some cases, runoff percolates through an engineered soil bed and is returned to the stormwater system via an under drain (biofiltration). In other cases, runoff percolates through the engineered soil bed down into the naturally permeable underlying material (bioretention). In this case, the raingarden acts as an infiltration practice. For more information on the infiltration capacity of soils, see the information provided for infiltration basins and/or trenches.

Siting of Facility
Each site should be considered unique. Microclimates (light, temperature and wind) and the size of the drainage area will influence the size of the raingarden and plants selection process. Raingardens should be strategically located to receive waters from impervious surfaces (sidewalks, driveways, rain gutters etc.) Raingardens should be located a minimum of 10 to 50 feet from existing structures at a minimum 1% slope in order to keep water away from foundations.