

Rain Garden

PURPOSE: Rain gardens are small-scale bioretention areas that benefit water quality by removing pollutants from runoff. They also reduce the speed of runoff and promote infiltration of runoff into the groundwater supply.

Rain gardens are designed to mimic the layered conditions of a forest floor, which naturally filters pollutants from water. The rain garden consists of a vegetated or stone ponding area, a mulch layer, a planting soil layer, a sand bed, and a gravel base. The multiple layers work together to filter pollutants from water, allowing it to infiltrate into the groundwater supply uncontaminated.

Rain gardens are well-suited for use on individual residential sites, as they provide for stormwater management on a lot-by-lot basis. The vegetated or stone surface layer initially slows the velocity of runoff and provides temporary storage for runoff before water either evaporates or infiltrates the soil. Plant material aids with evapotranspiration of water, and plant roots create pathways for water to infiltrate soil. Water retained in the ponding area is absorbed into the mulch layer, where bacteria that live among plant roots digest pollutants, even petroleum-based solvents. Mulch also aids with preventing erosion, protects underlying soil from drying, and provides a medium for biological growth and decomposition of organic matter. The soil layer provides water and nutrients to plants. Voids within the soil are where runoff is stored prior to infiltration to deeper ground. Addition of a subsurface infiltration bed will help to move water from the surface ponding area into the ground, and will aid with aerating the soil layers in order to enable them to absorb additional runoff. Runoff then filters through a layer of nonwoven geotextile material before seeping into a bed of sand for additional filtering. Lastly, water is received into a stone base, which allows the water to drain into the ground below.

Unlike bioretention areas, rain gardens traditionally do not include an underdrain feature to convey water to a storm sewer system because their purpose is to allow runoff to infiltrate the groundwater supply.

Rain gardens can be used in conjunction with porous paved parking areas, infiltration trenches, and filter strips for pretreatment of stormwater runoff.



Benefits and Uses

- Filters contaminants from runoff prior to its discharge to the storm sewer system or streams
- Reduces peak velocity and volume of stormwater runoff delivered to storm sewer system or streams
- Alleviates flooding and erosion downstream
- Inexpensive to install and maintain
- Enhances aesthetics of local landscape
- Recharges groundwater supply
- Applicable to all types of sites (residential/commercial/industrial)
- Can be used to treat runoff from streets, parking lots and driveways
- Provides habitat for wildlife
- Reduces mosquito breeding by removing standing water in yards
- Reduces potential of home flooding

Additional Resources

PA Department of Environmental Protection
www.depweb.state.pa.us - search Pennsylvania Stormwater Best Management Practices Manual

Alliance for the Chesapeake Bay
www.AllianceChesBay.org

Cahill Associates
www.thcahill.com - click on "Technologies" for project examples and general information

Rain Garden Network
www.raingardennetwork.com

Stormwater Manager's Resource Center
www.stormwatercenter.net

General Design Considerations

- Effective for draining areas of less than 5 acres
- Effective for nearly all types of soils and topography; best suited for areas with moderate permeability, more than 0.25 inch per hour
- Allow space between basin bottom and water table and bedrock to prevent groundwater contamination
- Design should include overflow drainage to remove excess stormwater
- Not suitable for receiving runoff with high levels of sediment
- Underdrains should not be used in rain garden design (see *bioretention area* for drainage)
- Recommended side slope is 3:1, or 2:1 in areas where space is limited
- Select native vegetation that is tolerant of varying water conditions (see reverse side)
- Plant depth should be at least 24 inches for herbaceous plants
- Soil should be a loam, loam/sand mix or sandy loam capable of supporting vegetative cover; modify soil with compost if needed
- Use a maximum of 2 to 3 inches of mulch
- Replace mulch annually
- Restrict ponding depth to 6 inches or less
- Pruning and weeding should be performed as necessary
- Rain gardens may require watering during dry periods
- Follow erosion control procedures
- Inspect regularly for clogging, litter, or rills or gullies caused by erosion

Native Vegetation

Native vegetation refers to plants, shrubs and trees that have existed in an area before it was settled by Europeans. More than 2,100 native plant species grow in Pennsylvania.

Using native plants is beneficial, as they are acclimated to the local climate and therefore, require less maintenance than introduced species. Native plants also contribute to the preservation of Pennsylvania's plant heritage.

Cultivars are varieties of native plants bred for a particular characteristic (size, color, etc.). Cultivars may be used in place of a native species.

Other Native Plants

Examples of some other types of native plants include:

Flowers

Wild Columbine	Jack-in-the-Pulpit
Wood Geranium	Common Milkweed
Phlox	Sundrops
Common Blue Violet	Partridge-berry
Virginia Bluebell	May-apple
Cardinal Flower	Trillium

Grasses

Virginia Wild Rye	Switch Grass
Indian Grass	Bottlebrush Grass
Lurid Sedge	Big Bluestem

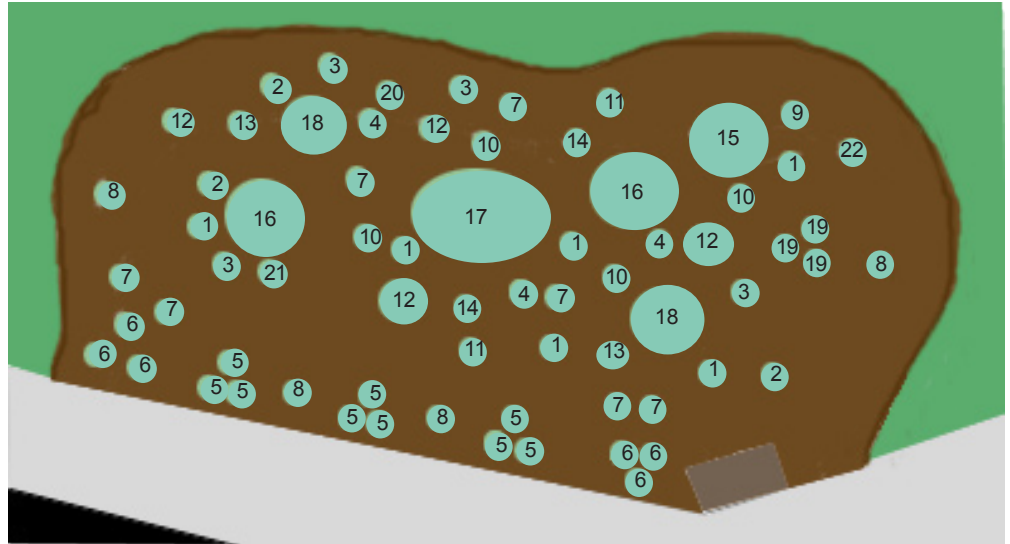
Shrubs

Red Chokeberry	Silky Dogwood
Black Chokeberry	Flowering Dogwood
Winterberry	Wild Plum
Fragrant Sumac	Virginia creeper
Mountain Laurel	Redbud

Trees

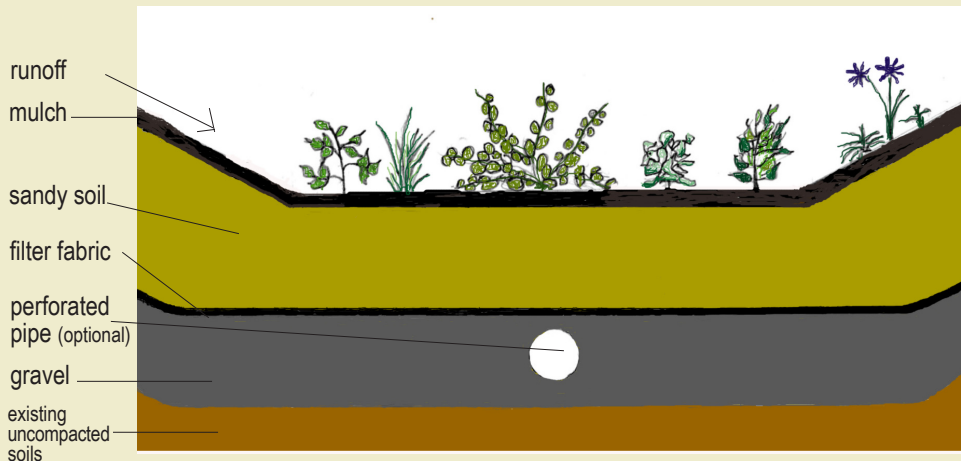
Red Maple	Sugar Maple
Tulip Poplar	Eastern White Pine
American Beech	Sycamore
Swamp White Oak	Chestnut Oak
White Oak	Red Oak
Black Birch	Yellow Birch

Native Vegetation planted in the BMP Tour Rain Garden



Key	Flowers/Shrubs	Latin Name	Flowering time
1	Foxglove Beardtongue	<i>Penstemon digitalis</i>	May-July
2	Swamp Sunflower	<i>Helianthus angustifolium</i>	Aug-Oct
3	Swamp Milkweed	<i>Asclepias incarnata</i>	July-Oct
4	Dogtooth Daisy/Sneezeweed	<i>Helenium autumnale</i>	Aug-Nov
5	Mouse-eared tickseed cultivar	<i>Coreopsis auriculata</i> 'Nana'	May-Sept
6	Black-eyed Susan cultivar	<i>Rudbeckia speciosa</i> 'Goldsturm'	Aug-Oct
7	Marsh Blazing Star	<i>Liatris spicata</i>	July-Sept
8	Stout Blue-eyed Grass	<i>Sisyrinchium angustifolium</i>	May-July
9	Evening primrose cultivar	<i>Oenothera fruticosa</i> 'Lemondrops'	May-Aug
10	New England Aster	<i>Aster novi-angliae</i>	Aug-Oct
11	New England Aster cultivar	<i>Aster novi-angliae</i> 'Purple Dome'	Aug-Oct
12	Spiderwort cultivar	<i>Tradescantia ohioensis</i> 'Mrs. Loewer'	June-July
13	Simler's Joy/Blue Vervain	<i>Verbena hastata</i>	June-Oct
14	Boneset	<i>Eupatorium perfoliatum</i>	July-Sept
15	Elderberry	<i>Sambucus canadensis</i>	June
16	Virginia Sweet Spire cultivar	<i>Itea virginica</i> 'Henry's Garnet'	June-July
17	Red Osier Dogwood	<i>Cornus sericea</i>	June-July
18	Summer Sweet cultivar	<i>Clethra alnifolia</i> 'Ruby Spice'	July-Sept
19	Goldenrod cultivar	<i>Solidago sphacelata</i> 'Golden Fleece'	Aug-Oct
20	Great Blue Lobelia	<i>Lobelia siphilitica</i>	Aug-Oct
21	Eastern Joe-pye Weed	<i>Eupatorium dubium</i>	June-Sept
22	Narrow-leaf Echinacea	<i>Echinacea angustifolia</i>	June-Aug

A Closer Look at the Layers of a Rain Garden



Step 1- Excavation of basin for rain garden (left)



Step 2 - Layer of stone is added (above)



Step 3 - Layer of soil is added (left)