

RAIN GARDEN

INSTALLATION AND DESIGN



**A step by step guide
for designing and building
your own rain garden**



Department of
WATER
RESOURCES

Introduction

A rain garden is just like other flower gardens with one important difference; it collects and treats rain water so it will not become polluted runoff. Stormwater can contain pollutants common in yards: fertilizers, pet waste, pesticides and household chemicals. This runoff often ends up in storm drains that carry it to local waterways. Rain gardens use permeable soils and hearty native plants that capture and filter stormwater so that it does no harm our local resources.

Most residential rain gardens are between 150 and 300 square feet . Native Virginian plants require little maintenance and provide habitat for birds, butterflies and beneficial insects.



Rain gardens are an attractive way to capture runoff and help replenish ground water.

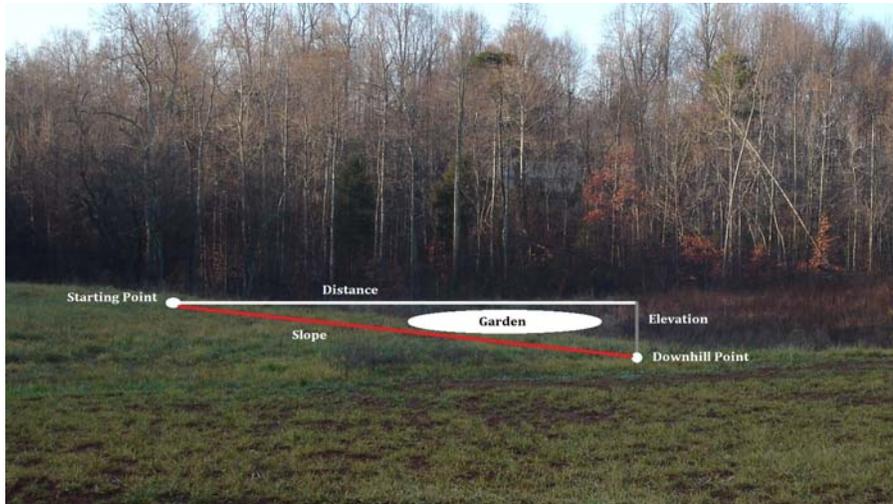
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Getting Started

Finding the right location for your garden is important. Consider the following points:

1. Rain gardens must be at least 10 feet away from your house so water does not seep into the foundation
2. Rain gardens function well downslope of impervious areas such as driveways and rooftops to maximize the amount of runoff it captures and treats.



You will need a stake or a nail, strong string, a line level and a tape measure

1. Locate an area that may accommodate a 200 square foot (10' x 20') garden
2. Tie a string with a line level to a nail at the uphill reach of the area and extend it over and beyond the spot where you want your garden. Making sure the string is level, measure the height of the string over the ground at the downhill point. This is your **Elevation**.
3. Keep the string level and measure its length from the starting point uphill to the end point downhill. This is your **Distance**.
4. Divide your elevation by your distance (E/D). Multiply that result by 100 to determine your slope.

Example: It the elevation drops 1 foot over a distance of 20 feet:

First: $1/20=0.05$ Second $0.05 \times 100= 5\%$ slope

3. Garden should be located in a spot for plants to get enough sunshine.
4. Avoid building a rain garden where water ponds; ponding water is likely an indicator that the soil does not drain well. To determine the infiltration rate of your yard, dig a hole six inches deep and six inches wide, and fill it with water. The water should infiltrate after six hours. If the water does not infiltrate, then the soils must be amended. For the recommended soil composition see the section titled "Building Your Rain Garden"
5. Consider aesthetics. And put your rain garden in a place you will enjoy it. Rain gardens have a large variety of flowering plants that attract birds and butterflies.
6. Always **Call Miss Utility** before you dig! Dial 811 or 1-800-552-7001 as to ensure no damage to underground utility lines.

Designing Your Rain Garden

Proper planning of your rain garden is crucial. It will make installation easier and ensure proper function. Make sure you

1. Rain gardens should be one-third the size of the drainage area they collect.

Calculate drainage area- (*length x width = size of drainage area*)

Calculate rain garden size- (*size of drainage area X 0.33*)

Example: If your rain garden will be collecting roof runoff, first determine the area of your roof. Multiply the length of your house by its width to get the total square footage.

Determine which downspout will drain to your rain garden. If you have a 1800-square-foot roof and four downspouts, each downspout drains about 450-square-feet. If your garden receives runoff from one downspout, it will need

2. Your rain garden must be at least 18 inches deep to ensure adequate infiltration. Rain gardens should be located in an area where they will not intercept ground water. Care should be taken to ensure that the bottom elevation of the rain garden is at least 2 inches above the water table. This can be checked by digging down 2 inches below the estimated bottom of your rain garden and seeing if the hole fills up with water. If it does, it may be necessary to locate the rain garden at a higher elevation in the yard.
3. A berm will need to be constructed to prevent stormwater from running out of the garden and hold it in place while it infiltrates. A berm is a dam made of earth that surrounds the downhill portion of the garden and reaches around the sides.
4. Choose plants that are native to Virginia. Species that can tolerate wet roots but withstand periods of drought are ideal choices. The following is a short list of plants that work well in rain gardens.

Please See Appendix A for a list of Native Virginia Plants recommended for rain gardens.

Building Your Rain Garden

1. Be sure there are no underground utilities in the area of your rain garden. Always call **Miss Utility** before you dig.
2. Mark the area with spray paint or flags to help you visualize the shape and placement of your rain garden. Consider a natural shape such as a kidney bean or oval.
3. Excavated the area to the necessary depth (See Section titled Designing your Rain Garden). A 200-square-foot rain garden may make up to six hours to dig.
4. Construct a berm around the downhill portion of the garden using the soil you excavated. The height of the berm should be equal to the depth of the garden and about 12 inches wide. Pack the soil in place firmly. To prevent the berm from eroding, it should be planted with grass seed or covered with mulch after you complete construction of the garden.
5. Fill your rain garden with permeable soil. The proper rain garden mix should contain:

- 85 percent– 88 percent sand
- 8 percent– 12 percent fine topsoil
- 3 percent—5 percent leaf compost

Important: Be sure to till or “rough up” the base of your rain garden before you fill it with soil mix. This will aid in infiltration.

Note: In areas that have dense clay subsoil it may be necessary to install a perforated drain pipe at the bottom of the rain garden to help drain it. See steps 5A and 5B.

5A. Dig a trench extending down slope of your rain garden and line the bottom with landscape fabric (do not line the bottom of your rain garden with fabric). Lay perforated pipe along the bottom of the garden and the full length of the trench. Be sure the pipe empties into a downhill drainage ditch or planting bed.

5B. Wrap the pipe with landscape fabric or a drain tile sock to keep fine particles from clogging it. Back fill the trench with enough washed gravel to cover the pipe. Finish filling the trench with topsoil and see or sod it, if necessary.

6. Plant shrubs 8 feet to 10 feet apart and perennials 1 foot apart to allow enough space for growth. Plant species of different heights and textures next to each other for a natural appearance. Be sure to use plants that bloom at different times and group like species together to create areas of focus throughout the year. It is a good idea to keep container labels and stakes near your plants so you can identify them later, especially when it is time to remove weeds.
7. Spread 3 inches of hardwood mulch over the entire rain garden. This will retain moisture and help new plants grow.

Maintaining Your Rain Garden

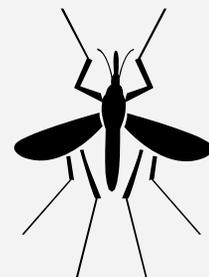
1. The garden will need to be watered to help new plants grow. The plants will need about 1 inch of water per week. Water the garden immediately after planting and continue to water twice a week until plants are established.
2. Weed removal will be necessary so they do not compete with your rain garden plants. It is best to pull or dig up weeds by hand and remove the whole root system
3. Most native perennials will become dormant in cold weather and can have their stems and leaves left intact for winter interest.



Downspouts should always direct water away from the foundation of the house into the garden. Splash guards may also be used when necessary.

Mosquito Concerns

A well-designed and constructed rain garden will not become a mosquito breeding pool. Water in the garden should drain down in six to eight hours after normal storms and within a day after large storms. Mosquitos need at least a week of standing water to lay eggs and hatch.



Additional Information

For More Help

For more advice about rain garden design and installation, contact the **City of Lynchburg Department of Water Resources** at 434-485-RAIN (7246) or visit

www.lynchburgva.gov/stormwater

Resources

Chesterfield County Environmental Engineering Department

www.chesterfield.gov

Department of Forestry

<http://www.dof.virginia.gov/>

Fairfax County

<http://www.fairfaxcounty.gov/nvswcd/raingardenbk.pdf>

James River Association

www.jamesriverassociation.org

Virginia Department of Conservation and Recreation

http://www.dcr.virginia.gov/natural_heritage/nativeplants.shtml

Virginia Tech BMP Clearing House

<http://vweec.vt.edu/swc/>

Appendix A

| Common Name | Scientific Name | Preferred Growing Conditions | | Size |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|------------------------------|-----------|------|
| | | Light | Moisture | |
| Flowering Perennials | | | | |
| Swamp milkweed | <i>Asclepias incarnata</i> | Sun-pt. shade | Moist-Wet | 2-4' |
| Description/Notes: Rose flowers May-June, host for Monarch butterfly, attracts butterflies and beneficial insects. Can tolerate drought. Deer resistant. | | | | |
| New England Aster | <i>Symphotrichum novae-angliae</i> | Sun | Moist | 2-4' |
| Blue to lt. purple flowers Aug.-Oct., host for the Pearl crescent butterfly, attracts butterflies and bees. Tolerates drought and flooding. | | | | |
| Turtlehead | <i>Chelone glabra</i> | Sun-shade | Moist-Wet | 3-6' |
| White flowers Jul-Oct, host for Baltimore checkerspot butterfly, attracts butterflies and hummingbirds. Needs continuously moist or wet soils. | | | | |
| Blue mistflower | <i>Conoclinium coelestinum</i> | Sun-shade | Dry-Wet | 1-3' |
| Violet-purple flowers Jul-Oct, attracts bees and butterflies. Can be aggressive in the garden. | | | | |
| Joe-Pye weed | <i>Eupatorium fistulosum</i> | Sun-pt. shade | Dry-Wet | 3-8' |
| Pink-purple flowers Jul-Oct, attracts butterflies, songbirds and hummingbirds. | | | | |
| Ox-eye sunflower | <i>Heliopsis helianthoides</i> | Sun-pt. shade | Dry-Moist | 3-5' |
| Yellow flowers Jun-Sep, attracts butterflies and hummingbirds. | | | | |
| Marsh mallow | <i>Hibiscus moscheutos</i> | Sun | Moist-Wet | 3-5' |
| White, pink or magenta flowers Jun-Aug, attracts hummingbirds. | | | | |
| Blue flag | <i>Iris versicolor</i> | Sun-pt. shade | Moist-Wet | 2-3' |
| Blue-violet flowers May-Jun, attracts songbirds, waterfowls and mammals. Can flourish in normal garden soils, but also tolerates flooding. | | | | |
| Blazingstar | <i>Liatris spicata</i> | Sun-pt. shade | Dry-Moist | 3-4' |
| Rose-purple flowers Jul-Aug, attracts butterflies, bees and songbirds. | | | | |
| Cardinal flower | <i>Lobelia cardinalis</i> | Sun-shade | Moist-Wet | 3-6' |
| Red flowers Jul-Oct, attracts butterflies, hummingbirds, songbirds, and beneficial insects. Needs continuously moist or wet soils. | | | | |
| Beardtongue | <i>Penstemon digitalis</i> | Sun-pt. shade | Dry-Moist | 2-5' |
| White flowers Jun-Jul, attracts hummingbirds. Tolerates poor drainage/occasionally saturated soils. | | | | |
| Obedient plant | <i>Physostegia virginiana</i> | Sun-shade | Dry-Wet | 3-5' |
| Pink flowers Aug-Nov, attracts butterflies, hummingbirds and beneficial insects. Deer resistant. Can be aggressive in the garden. | | | | |
| Wild bergamot | <i>Monarda fistulosa</i> | Sun-pt. shade | Dry-Moist | 2-4' |
| Pink-purple flowers Jun-Sep, attracts butterflies, songbirds and hummingbirds. Deer resistant. | | | | |
| Beebalm | <i>Monarda didyma</i> | Sun-pt. shade | Moist-Wet | 3-4' |
| Red flowers Jul-Sep, attracts butterflies, hummingbirds and beneficial insects. Deer resistant. | | | | |
| Black-eyed susan | <i>Rudbeckia hirta</i> | Sun-pt. shade | Dry-Moist | 1-3' |
| Yellow flowers with black centers, Jun-Nov, attracts butterflies, songbirds, and beneficial insects. Extremely drought tolerant. | | | | |
| Rough-stemmed goldenrod | <i>Solidago rugosa</i> | Sun-pt. shade | Moist-Wet | 3-5' |
| Yellow flowers Aug-Sept, attracts bees, songbirds and beneficial insects. Tolerates drought. Will spread. | | | | |
| Blue vervain | <i>Verbena hastata</i> | Sun-pt. shade | Moist-Wet | 2-5' |
| Blue to purple flowers Jun-Oct, attracts butterflies and songbirds. | | | | |
| Ironweed | <i>Vernonia noveboracensis</i> | Sun-pt. shade | Moist-Wet | 5-8' |
| Purple flowers Aug-Oct, attracts butterflies. | | | | |

| Common Name | Scientific Name | Preferred Growing Conditions | | Size |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|------------------------------|-----------|--------|
| | | Light | Moisture | |
| Grasses, Grass-like Plants & Ferns | | | | |
| Broomsedge | <i>Andropogon virginicus</i> | Sun-pt. shade | Dry-Wet | 1-3' |
| Grows in tufts, flowers Aug-Nov, reddish-tan fall color. Host for the Zabulon skipper butterfly. Used by mammals, songbirds and butterflies. | | | | |
| Sea oats | <i>Chasmanthium latifolium</i> | Sun-pt. shade | Dry-Moist | 2-4' |
| Clumping grass, attractive oat-like seedheads, flowers Jul-Sept, tan-gold fall color. Used by mammals, songbirds and butterflies. Deer resistant. | | | | |
| Soft rush | <i>Juncus effusus</i> | Sun-pt. shade | Moist-Wet | 1-3' |
| Grows in clumps, greenish-brown flowers Jun-Sep. Used by songbirds, waterfowl and mammals. Needs continuously moist-wet soils. | | | | |
| Cinnamon fern | <i>Osmunda cinnamomea</i> | Sun-shade | Moist-Wet | 3-5' |
| Reddish-brown fertile fronds Apr-May. Needs continuous moisture in full sun, but can tolerate drought in shade. Used by songbirds and mammals. | | | | |
| Royal fern | <i>Osmunda regalis</i> | Sun-shade | Moist-Wet | 2-6' |
| Reddish-brown fertile fronds Apr-Jun. Delicate lacy foliage. Needs continuous moisture in full sun, but can tolerate drought in shade. Used by mammals. | | | | |
| Switchgrass | <i>Panicum virgatum</i> | Sun-pt. shade | Dry-Wet | 3-6' |
| Clumping grass, flowers Jul-Oct, pale-bright yellow color in fall. Many attractive cultivars available. Host for the Delaware skipper butterfly. Used by mammals, songbirds and butterflies. | | | | |
| Indian grass | <i>Sorghastrum nutans</i> | Sun-pt. shade | Dry-Moist | 3-6' |
| Clumping grass can reach 8', flowers Aug-Sep, frond-like seed heads, tan-rose fall color. Host for the salt and pepper skipper butterfly. Used by mammals, songbirds and butterflies. | | | | |
| Shrubs & Trees | | | | |
| Serviceberry | <i>Amelanchier canadensis</i> | Sun-shade | Moist-Wet | 15-25' |
| White flowers Apr-May. Red-purple berries Jun-Jul. Fall color is orange to red. Multi-trunked. Used by songbirds and mammals. | | | | |
| Red chokeberry | <i>Aronia arbutifolia</i> | Sun-pt. shade | Dry-Wet | 6-12' |
| White flowers May-Jul. Red berries Sep-Dec. Fall color is orange to red. Tolerates flooding. Used by songbirds and mammals. | | | | |
| Black chokeberry | <i>Aronia melanocarpa</i> | Sun-pt. shade | Dry-Wet | 3-6' |
| White flowers Apr-May. Black berries Sep-Nov. Fall color is orange to red. Multi-trunked. Used by songbirds and mammals. | | | | |
| Buttonbush | <i>Cephalanthus occidentalis</i> | Sun-shade | Moist-Wet | 6-12' |
| White ball-like flowers Jul-Aug. Interesting green-brown fruits Sep-Jan. Tolerates flooding. Attracts birds, mammals, butterflies and beneficial insects. | | | | |
| Silky dogwood | <i>Cornus amomum</i> | Sun-shade | Moist-Wet | 6-12' |
| White flowers May-Jun. Blue berries Aug. Fall color is orange, red or purple. Maroon twigs. High wildlife value. Used by birds and mammals. | | | | |
| Winterberry | <i>Ilex verticillata</i> | Sun-shade | Moist-Wet | 6-12' |
| White flowers May-Jul. Bright red berries on female plants Aug-Feb. Male plants needed for pollination (5:1 ratio F:M). Tolerates drought. High wildlife value. Used by birds and mammals. | | | | |
| Virginia sweetspire | <i>Itea virginica</i> | Sun-shade | Moist-Wet | 4-8' |
| White flower tassels Jun-Jul. Fall color is red to purple. Tolerates drought and flooding. Attracts birds, mammals and beneficial insects. | | | | |
| Spicebush | <i>Lindera benzoin</i> | Pt. shade-shade | Moist-Wet | 6-12' |
| Yellow flowers Mar-May. Scarlet berries Sep-Oct. Yellow fall color. High wildlife value. Host for Spicebush and Eastern tiger swallowtail butterflies. Attracts butterflies, birds and mammals. | | | | |
| Ninebark | <i>Physocarpus opulifolius</i> | Sun-pt. shade | Dry-Wet | 6-12' |
| White-pink flowers May-Jul. Orange to red capsule-like fruits Jul-Mar. Fall color is yellow to purple. Attractive peeling bark. Attracts birds, mammals and beneficial insects. | | | | |
| Elderberry | <i>Sambucus canadensis</i> | Sun-shade | Dry-Wet | 6-12' |
| Showy white flowers Jun-Jul. Purplish-black berries Aug-Sept. High wildlife value. Used by birds and mammals. | | | | |
| Highbush blueberry | <i>Vaccinium corymbosum</i> | Sun-shade | Dry-Wet | 6-12' |
| White flowers Apr-Jun. Blue-black berries Jul-Aug. Bright yellow to red fall color. High wildlife value. Attracts butterflies, birds and mammals. | | | | |
| Arrowwood viburnum | <i>Viburnum dentatum</i> | Sun-shade | Dry-Wet | 6-8' |
| White flowers May-Jun. Blue-black berries Sept-Nov. Red-purple fall color. Attractive form in winter. High wildlife value. Host plant for the spring azure butterfly. Also used by birds and mammals. | | | | |



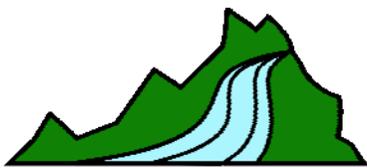
Department of **WATER RESOURCES**

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