

Monroe County Rain Garden Starter Guide

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Prepared for Monroe County Stormwater Services

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So, Why Plant a Rain Garden?

Rain gardens are a widely adopted stormwater best management practice (BMP) that can be installed on residential and commercial properties. These depressional, landscaped areas can be planted in a variety of soils from sand to clay and planted with wildflowers and other native plants that can tolerate both waterlogged and drought conditions. Rain gardens soak up rain water while their plants filter pollutants in runoff from the garden's catchment area such as a parking lot or roof. The water is slowly filtered through the landscaped area where chemical, biological, and physical properties of the soils, plants, and microbes work together to provide watershed benefits including:

- Less stormwater runoff
- Slower runoff
- Less pollution in the runoff
- More water to replenish groundwater supplies
- Improved landscape

Urban and suburban watersheds are highly altered with impervious surfaces where stormwater runoff full of pollutants from yards, roads, and parking lots often makes its way into local rivers and lakes quickly and untreated. Rain gardens though small in size, can make valuable contributions towards clean water and are a great way for homeowners to contribute to the health of their watershed.

When you install a rain garden at your home you...

1. Increase the amount of water that filters into the ground, which recharges local and regional aquifers
2. Help protect communities from flooding and drainage problems
3. Help protect streams and lakes from pollutants carried in urban stormwater including: lawn fertilizers and pesticides, oils and other fluids that leak from cars, and numerous harmful substances that wash off roofs and paved areas
4. Enhance the beauty of your yard
5. Provide valuable bird, pollinator, insect, and riparian habitat

Okay, but What About...?

Does a rain garden form a pond?

No, rain gardens are designed to fill and drain within days (24-48 hours) of rainfall events. The garden will be dry between rainfall events.

Will rain gardens attract or breed mosquitoes?

No, again rain gardens are designed to absorb water, not create ponds. Mosquito larvae take 7-to-12 days to complete their life cycle. A well-designed rain garden will not have standing water in it nearly long enough for this life cycle to complete. In fact, rain gutters on homes are more likely to produce mosquitoes than a rain garden.

Do rain gardens have a wild and messy appearance?

No, rain gardens should have a more 'natural' appearance than manicured areas of your yard but they should not appear wild or messy. If this is a concern you should select shorter plants for your rain garden to give it a cleaner overall look.

Are rain gardens a lot of work?

Not necessarily. Like any yard work, rain gardens will require some maintenance but once your plants are established this will only include seasonal watering and weeding.

Are rain gardens expensive?

They don't have to be. A family and a few friends can provide the labor. The major cost associated with rain gardens will be the plants.

How Do I Select and Prepare a Site for My Garden?

The location of your residential rain garden will directly affect its efficiency. Factors to consider when selecting a site for your rain garden site include:

- Existing land use
- Vegetation
- Slope
- Proximity to building foundations
- Aesthetic value of the site

As a rule of thumb, the location should not have a slope greater than 12% and should not be closer than 10 feet from your home. Additionally, rain gardens should not be installed in areas of your yard where water already ponds. Instead, they should be strategically placed to catch runoff from roofs or roofs and yards (see Figure 1 for a diagram of possible residential rain garden locations).

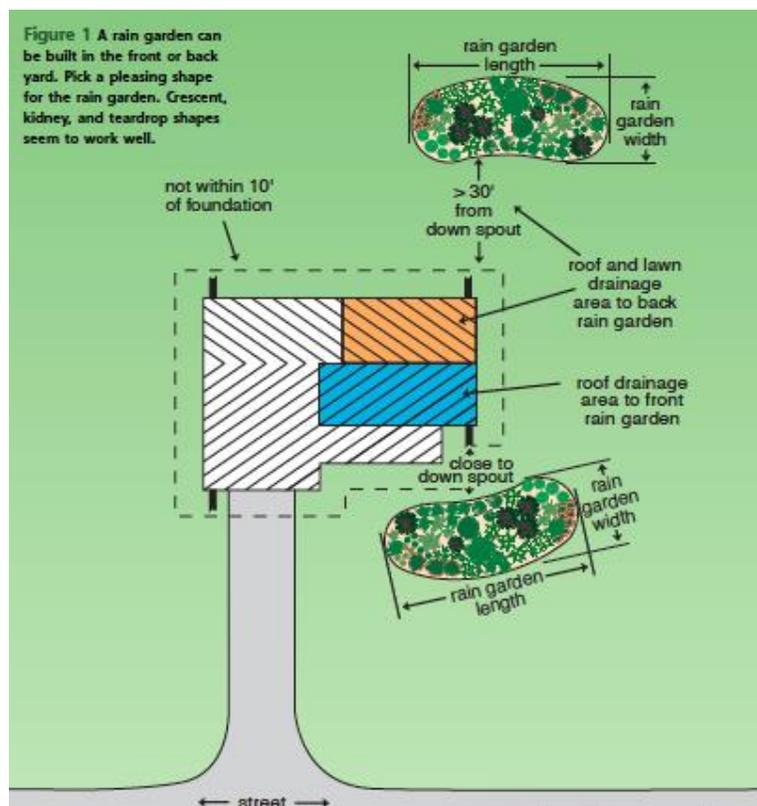


Figure 1. Residential rain garden placement locations (from Bannerman, R. and Considine, E., 2003).

How big should my rain garden be?

Along with placement, deciding the size of your rain garden will be very important to its performance. Several factors influence the size requirements of your rain garden. Some of the most important of these factors include slope, catchment area, and soil properties. The following section includes several simple calculations from which you will be able to determine the size requirements of your rain garden.

What should the slope of the hole be?

Rain gardens are typically between four and eight inches deep. The depth requirements of your rain garden will primarily be governed by the site's slope. To determine the site's slope you should perform the following steps:

1. Place two stakes 15 feet (180 inches) apart at the uphill and downhill ends of your rain garden site
2. Tie a string at ground level of the uphill stake and attach it to the downhill stake so that the string is level (you may want to use a string or carpenter's level)
3. Measure the height of the string **in inches** on the downhill stake from ground level. Write this number down and complete the equation below to find your slope.

$$100 \times \frac{\text{height}}{180} = \text{slope}$$

How deep should my rain garden be?

Once you have determined your slope, you should select the proper depth for your rain garden from the following:

Slope (%)	Depth (inches)
< 4	3-5
5-7	6-7
8-12	~8
>12	Select alternative site

What's a "catchment area?"

Most residential rain gardens are generally designed to capture the first inch of runoff from roofs and/or yards. This is called the "first flush" and is often the runoff with the highest concentration of pollutants. The size of the area of which your rain garden collects runoff from is called its catchment area. You can calculate your rain garden's catchment area by doing the following:

1. Using a tape measure (or County GIS), measure the width and length of your house.
2. Multiply the width and length to determine the area of your roof.
3. Divide that number by four (assuming your roof is normally shaped, the downspout that will feed the rain garden will collect approximately one fourth of the rain from your roof).

Use the following formula to determine your catchment area. If you decide to locate your rain garden more than ~30 feet from your home, estimate the area of your yard flowing into the rain garden and use this number for "yard catchment area." Otherwise, use zero for yard catchment area.

$$\frac{\text{house width} \times \text{house length}}{4} + \text{yard catchment area} = \text{catchment area}$$

What are my soil properties?

Soils are a mix of sand, silt, and clay. The properties of your soil are governed by the combination of these components and their relative percentages. Soils that are primarily sand will feel gritty and hold water for less time than soils that are dominated by clay, which feel smooth and slippery when wet. Silty soils fall between the porous sand and dense clay soils and feel velvety. To find out what kind of soils are on your property you can use the National Resources Conservation Service's soil survey as found here:

<https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>. If you would prefer a quick and dirtier way to test your soils you can do the following:

1. Collect a small handful of soil from your rain garden
2. Make sure the soil is moist, but not wet
3. Give the soil a firm squeeze in your hand and open your hand back up
 - a. If the soil falls apart when you open your hand, you have sandy soil
4. If the soil holds its shape when you open your hand, give it a light poke
 - a. If the soil falls apart with the poke, you have silty or loamy soil
 - b. If the soil doesn't fall apart with the poke, you have clay soil

Having an idea of your native soil type will give you a good idea of how long it will take water to infiltrate through your rain garden. Sandy soils will have higher infiltration rates, that is water will sit in your rain garden for less time than silty soils, and even less time than clay soils. If your soils are primarily silt and/or clay, you should consider amending the soils of your rain garden (see more on amended soils in the build section). This will raise the cost of your rain garden but will allow you to treat more runoff with a smaller rain garden.

So how do we calculate the size, again?

Use the table below to determine your rain garden's "size factor" based on your slope and soil properties (table from Bannerman, R. and Considine, E., 2003):

Table 1 Rain gardens less than 30 feet from downspout.

	3-5 in. deep	6-7 in. deep	8 in. deep
Sandy soil	0.19	0.15	0.08
Silty soil	0.34	0.25	0.16
Clayey soil	0.43	0.32	0.20

Table 2 Rain gardens more than 30 feet from downspout.

	Size Factor, for all depths
Sandy soil	0.03
Silty soil	0.06
Clayey soil	0.10

Now, take the catchment area you calculated from your house and yard measurements, and multiply it by the size factor you derived from your soil type and soil depth, above.

$$\text{catchment area} \times \text{size factor} = \text{rain garden size requirement}$$

How Do I Build It?

Now that you have determined the site and size of your rain garden its time to move to the building phase. Don't forget to call 811 or visit <http://indiana811.org/> before you dig! A rain garden will take approximately six hours to dig with a shovel alone. Recruiting your friends, neighbors, and family to help will cut down on that time and give you an opportunity to educate them on the importance of rain gardens in our community!

Mark off the boundaries of your rain garden with some string, rope, spray paint, hose, etc. Starting from the uphill stake you should work your way downhill keeping in mind the rain garden itself should be level. It is good practice to place the excavated soils at the downhill side of the rain garden boundary. These soils will be used to create a berm on the downhill side of your rain garden which will keep water from continuing to run downhill and instead stay in your rain garden. Berms embanking rain gardens being built on bigger slopes may require additional soil (Figure 2). If your downspout drains close to the foundation of your home you should extend the spout or dig a shallow swale to direct the water towards your rain garden.

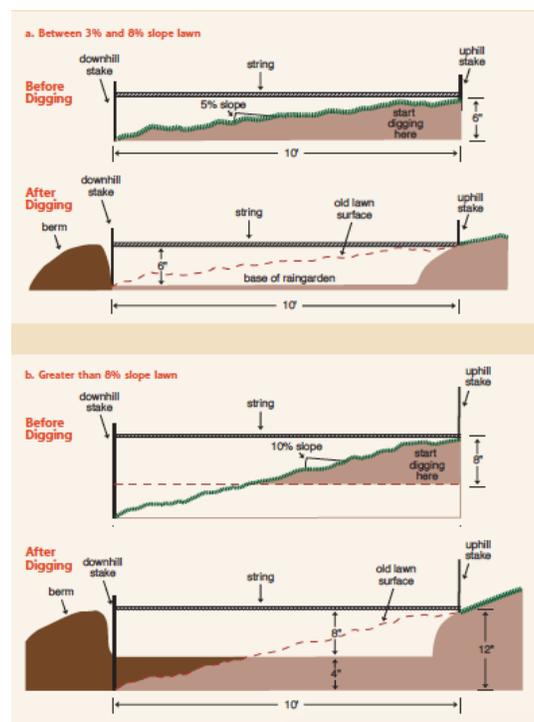


Figure 2. Where to dig and where to put the soil you have dug (from Bannerman, R. and Considine, E., 2003).

What's a berm?

The berm for your rain garden should encompass all of the sides of your rain garden that are not receiving runoff (i.e. all sides except the uphill side). The berm should be tallest on the downhill side of your rain garden. To prevent the berm from eroding it should be covered with vegetation. This could be grass preserved from your yard where your rain garden now is, seeded grass (cover with straw during seeding), or a seed mix of native, drought tolerant vegetation such as prairie dropseed.

Why should I amend my soil?

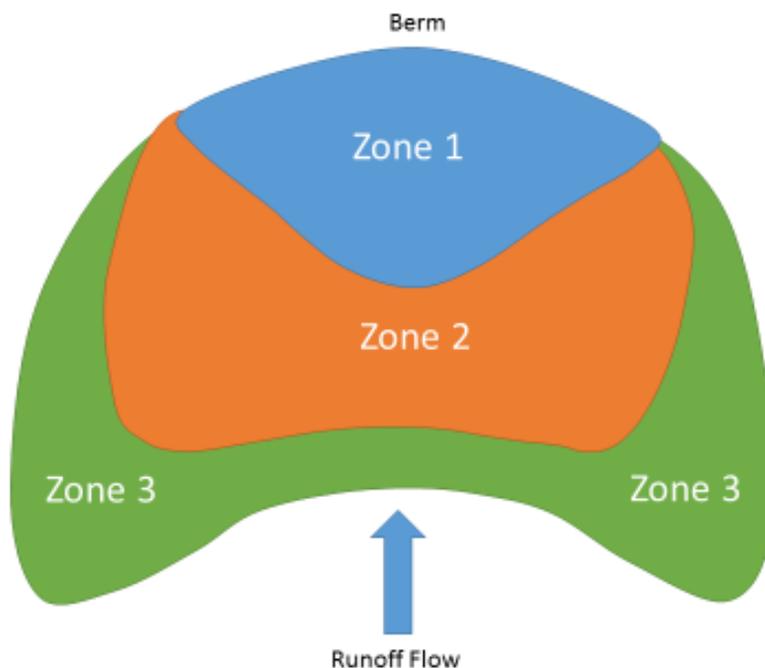
Having the right mixture of sand, silt, and clay in your rain garden will assure your plants have the best chance of establishment and survival while maximizing your rain garden's infiltration rate and overall function. Rain garden soils are best when they are comprised of ~50% sand, 25% compost, and 25% topsoil.

What Should I Plant?

Your rain garden will only be as successful as its plants. It is good practice to plant native plants as they are best adapted to our climate. For a comprehensive list of native plants appropriate for bioretention areas and rain gardens in central and southern Indiana refer to:

http://www.co.monroe.in.us/TSD/DesktopModules/Bring2mind/DMX/Download.aspx?TabID=140&Command=Core_Download&EntryId=5868&PortalId=0&TabId=140

In this manual we have included several native plantings templates that you also may choose to follow. It is important to consider the moisture and light requirements of your selected plants when designing the layout of your rain garden. The templates included here provide some notes on the conditions they are designed for including light and soil conditions. They are delineated into three zones, zone one is the wettest part of the rain garden, zone two mesic, and zone three is the driest. In rain gardens without amended soils, there are less zone three (dry) plants due to longer infiltration rates. If you are unfamiliar with native plants it would be best to consult a local native plant nursery or a representative from Monroe County Stormwater Services for technical advice.



Template Rain Garden #1 – Full Sun, Amended Soils

Zone 1 species:

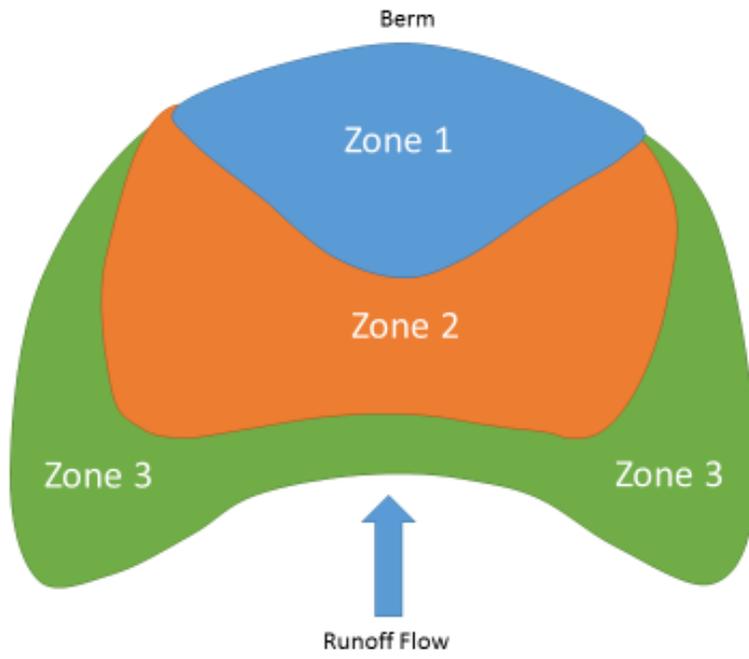
Boneset (*Eupatorium perfoliatum*)
Blue Flag Iris (*Iris virginica* var. *shrevei*)
Swamp Milkweed (*Asclepias incarnate*)

Zone 2 species:

Smooth Beardtongue (*Penstemon digitalis*)
Riddell's Goldenrod (*Solidago riddellii*)
Showy Black Eyed Susan (*Rudbeckia flugida speciosa*)
Fox Sedge (*Carex vulpinoidea*)
Frank's Sedge (*Carex frankii*)

Zone 3 species:

Heath Aster (*Aster ericoides*)
Purple Prairie Clover (*Dalea purpureum*)
Ohio Spiderwort (*Tradescantia ohioensis*)
Prairie Dropseed (*Sporobolus heterolepis*)



Template Rain Garden #2 – Partial Sun, Amended Soils

Zone 1 species:

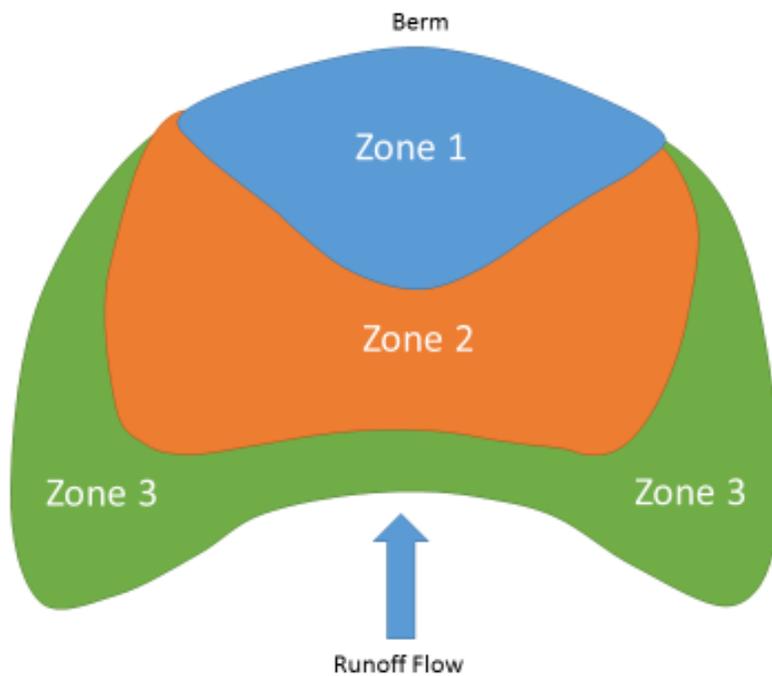
Blue Lobelia (*Lobelia siphilitica*)
 Blue Mist Flower (*Eupatorium coelestinum*)
 Cardinal Flower (*Lobelia cardinalis*)
 Gray's Sedge (*Carex grayi*)
 Palm Sedge (*Carex muskingumensis*)

Zone 2 species:

Calico Beardtongue (*Penstemon calycosus*)
 Boneset (*Eupatorium perfoliatum*)
 Blue-stemmed Goldenrod (*Solidago caesia*)
 Tufted Hair Grass (*Deschampsia caespitosa*)

Zone 3 species:

Short's Aster (*Aster shortii*)
 Bradbury's Monarda (*Monarda bradburnii*)
 Wild Geranium (*Geranium maculatum*)



Template Rain Garden #3 – Full Sun, Soils Not Amended

Zone 1 species:

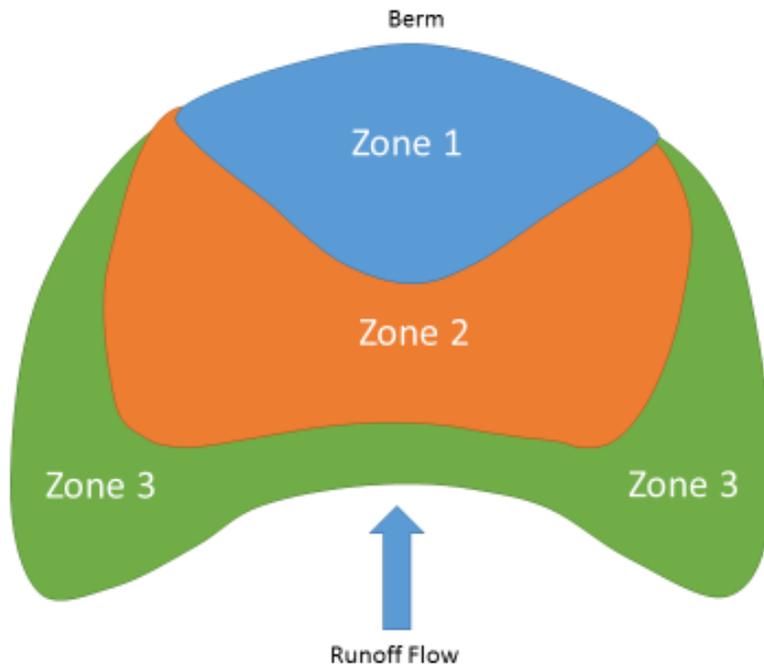
Swamp Aster (*Aster puniceus*)
 Woolgrass (*Scirpus cyperinus*)
 Blue Flag Iris (*Iris virginica* var. *shrevei*)
 Queen of the Prairie (*Filipendula rubra*)
 Swamp Rose Mallow (*Hibiscus moscheutos*)

Zone 2 species:

Virginia Mountain Mint (*Pycnanthemum virginianum*)
 Fox Sedge (*Carex vulpinoidea*)
 Spiked Blazingstar (*Liatris spicata*)
 Purple Joe-Pye Weed (*Eupatorium purpureum*)

Zone 3 species:

Rattlesnake Master (*Eryngium yuccifolium*)
 Sweet Susan (*Rudbeckia subtomentosa*)
 River Oats (*Chasmanthium latifolium*)



Template Rain Garden #4 – Partial Sun, Soils Not Amended

Zone 1 species:

Blue Mist Flower (*Eupatorium coelestinum*)
Gray's Sedge (*Carex grayi*)
Palm Sedge (*Carex muskingumensis*)
Yellow Fox Sedge (*Carex annectens xanthocarpa*)
Buttonbush (*Cephanthus occidentalis*)

Zone 2 species:

Calico Beardtongue (*Penstemon calycosus*)
Yellow Wingstem (*Verbena alternifolia*)
Wild Senna (*Senna hebecarpa*)

Zone 3 species:

Boneset (*Eupatorium perfoliatum*)
River Oats (*Chasmanthium latifolium*)



Figure 3. Common invasive species.

- a. Cat tail (*Typha latifolia*)
- b. Garlic Mustard (*Alliaria petiolata*)
- c. Oriental Bittersweet (*Celastrus orbiculatus*)
- d. Crown Vetch (*Cornollia varia*)
- e. Russian Olive (*Elaeagnus augustifolia*)
- f. Silverberry (*Elaeagnus pugngens*)
- g. Autumn Olive (*Elaeagnus umbellate*)
- h. Common privet (*Juncus vulgare*)
- i. Japanese Honeysuckle (*Lonicera japonica*)
- j. Amur Honeysuckle (*Lonicera maackii*)
- k. Morrow Honeysuckle (*Lonicera morrowii*)
- l. Tartarian Honeysuckle (*Lonicera tatarica*)
- m. Purple Loosestrife (*Lythrum salicaria*)
- n. Reed Canary Grass (*Phalaris arundinacea*)
- o. Common Reed (*Phragmites australis*)
- p. Common Buckthorn (*Rhamnus cathartica*)
- q. Alder Buckthorn (*Rhamnus frangula*)

How Do I Maintain My Rain Garden?

(For the purposes of this guide, we assume spring planting, since the burden of watering is lowest then.)

Watering

- The best time to water your rain garden is in the early morning. Avoid watering later in the day, if possible. The goal is to give your plants' leaves time to dry before the cooler evening temperatures set in. Wet leaves at night can lead to mold and fungi.
- For the first 6 weeks, the garden should be watered once or twice a week if weekly rainfall is less than 1 inch. If you suspect underwatering, note the wilting of plants throughout the day- If plants recover in the evenings, watering is not needed, but if wilt continues through the evening, watering is needed. Be careful, though, since wilt is also a sign of overwatering. If the plants feel soft or appear rotting at the base, leaves are yellowing, or spots occur, overwatering is likely the problem.
- Until Fall, the garden should be watered every week to two weeks, depending on how well the plants have established themselves. Again, be wary of overwatering, checking for rotting and wilt that does not persist through the evening.
- Weeding and Debris Removal
- For the summer, weeding should be performed every two to three weeks, although mulching will prevent most weeds. For best results, avoid herbicides. Never perform blanket spraying. After establishment weeds should not be much of a problem, although seasonal removal of invasive species may be necessary.
- Dead or diseased plant material may be removed throughout the establishment process, but be sure to leave some material at the end of the growing season as a haven for beneficial insects, such as biocontrol species that prey on pests. Perennial species may be trimmed back for appearances' sake, although leaving seed heads in place provide food for birds.

Post-establishment Care

- After the first year, you may notice your mulch is unevenly distributed or has collected in the garden's inlet. To fix this, mulch can be raked evenly over the bed, but more mulch is most likely not necessary.
- If your rain garden appears thin, new plantings can be made in the fall or spring, as long as the plants' space requirements are met. For perennials established plants can be divided and replanted over a wider area.
- After the second year, your mulch may be getting thin and in need of replacement.

Pruning

- "Deadheading," or removing dead flower heads can increase flowering throughout the season.
- If you include woody plants such as trees, shrubs, or roses, prune shortly after flowers fade.
- Avoid over-pruning. The bushier your garden, the more effective it will be at removing water! Also, do not prune woody plants between July 15th and October 15th. This may cause plants to put on new growth that may not survive October frosts.

Troubleshooting

- Problem: Conditions are drier than anticipated, and plants die from underwatering after establishment. Solution: Check to make sure your downspouts are correctly channeling water into your inlet. If so, plant with more drought-tolerant species.
- Problem: Mulch floats away or collects in drifts after storms. Solution: Add river rock to rain garden inlet to slow water velocity.
- Problem: Sediment is caking or erosion is occurring around inlet.

Solution: Remove any sediment with a flat shovel, and fill any erosion with topsoil and mulch layer. Then add river rock over previously eroded area.

- Problem: Deer are eating plants.

Solution: Deer repellents are available for purchase. Deer are also repelled by particularly pungent plants. Planting lavender, garlic, chives, or catmint may repel deer. In addition, jarring sights and sounds such as windmill ornaments and windchimes make deer wary.

- Problem: There is a gully (path cut into the soil, like a stream) forming where rainwater flows through the garden.

Solution: Add a berm, more river rocks to the water intake or more plants.

Additional Resources

Bannerman, R. and Considine, E. 2003. Rain Gardens: A how-to manual for homeowners. Publication GWQ037. University of Wisconsin Extension.

Burns, M.J., Fletcher, T.D., Walsh, C.J., Ladson, A.R., Hatt, B.E. 2012. Hydrologic shortcomings of conventional urban stormwater management and opportunities to reform. *Landscape and urban planning*, 105, 230-240.

Dietz, M.E., Clausen, J.C. 2005. A field evaluation of rain garden flow and pollutant treatment. *Water, Air, and Soil Pollution*, 167, 123-138.

Frequently Asked Questions about Rain Gardens. Clear Choices Clean Water, LLC.

Jaber, F., Woodson, D., LaChance, C., York, C. 2012. Stormwater Management: Rain Gardens. Texas A&M Agrilife Extension.

<https://www.thespruce.com/easy-diy-soil-tests-2539856>

<http://www.stormwater.allianceforthebay.org/take-action/installations/rain-gardens>