

A HOW-TO MANUAL FOR HOMEOWNERS

RAIN GARDENS

Your Personal Contribution
to Cleaner Water



PRODUCTION CREDITS

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INTRODUCTION

Rain Gardens: A how-to manual for homeowners

Homeowners in many parts of the country are introducing rain gardens—landscaped areas planted with wildflowers and other vegetation that can capture and soak up rainwater in their yards to help improve the environment. Rainwater flowing from the roof, lawn, paved driveway, walkway, etc., fills the rain garden with the first few inches of rain from a storm, minimizing the amount of water entering a storm drain or nearby stream. For the next several hours (up to a day), the water slowly seeps into the ground and is filtered by the soil and plants in the garden.

A rain garden allows approximately 30 percent more water to soak into the ground compared to a conventional

lawn. Building a rain garden on your property is a beautiful way to help *Slow the Flow* and improve the quality of water in nearby lakes and streams.

The garden, consisting of plants, mulch, loose soil and sometimes a layer of small gravel, utilizes several methods to absorb and disperse water. Plant roots absorb water for use in the biological processes of plant metabolism, where it is transpired or “breathed” out through the leaves into the atmosphere. Water

not used by the plant roots is absorbed into the loose soil. As water moves downward through the mulched layer, chemical and biological processes filter and break down many pollutants found in water that runs off the land after a storm. Over time, excess water evaporates into the atmosphere.

This manual provides homeowners and landscape professionals with the basic direction needed to design and build rain gardens on residential lots. Guidelines presented in this manual also can be used

to treat roof runoff at commercial and institutional sites.

However, rain gardens for parking lots, busy streets or other heavily paved areas where stormwater may require pretreatment should

rely on more technically engineered designs. For more information about rain gardens in those areas, please go to the stormwater management agency in your local community.

It is a good idea to look through this entire manual before you get started. In Appendix A you will find a list of plants to help you select the right plant for the spot you have chosen for your rain garden.

“A rain garden allows approximately 30 percent more water to soak into the ground compared to a conventional lawn.”

HAPPY GARDENING!

Why are rain gardens important?

As cities and suburbs continue to displace forests, wetlands, and open spaces, increased stormwater runoff from impervious (non-absorptive) surfaces, such as roofs and pavement, has become problematic. Stormwater runoff increases flooding and carries pollutants from streets, parking lots and lawns into local lakes and streams. Local municipalities are challenged to fund costly stormwater treatment facilities in order to clean the water. This “personal pollution” from our lawns and property contributes to the pollution of local waterways.

Rain gardens can help improve the quality of our local waters and the environmental health of our communities by reducing the amount of stormwater leaving our yards. While an individual rain garden may seem like a small thing, collectively several rain gardens can produce substantial neighborhood and community environmental benefits.

Facts about rain gardens

- » Rain gardens increase the amount of water that filters into the ground, recharging the groundwater supplies from which we draw our drinking water.
- » Rain gardens help provide protection from flooding and aid in solving drainage problems.
- » Rain gardens help protect our streams, lakes and rivers from pollutants such as lawn fertilizers, pesticides, oil and other substances that wash off lawns, roofs, and paved areas that are carried in stormwater. The rain garden can collect and filter most of these pollutants, protecting and cleaning the water.
- » Rain gardens help protect structures and other vegetation in your yard from flowing water.
- » Rain gardens enhance the beauty of yards and neighborhoods.
- » Rain gardens provide valuable habitats for birds, butterflies and many beneficial insects.
- » Rain gardens are fairly simple to build and yield lots of benefits.

“Rain gardens increase the amount of water that filters into the ground, recharging the groundwater supplies from which we draw our drinking water.”

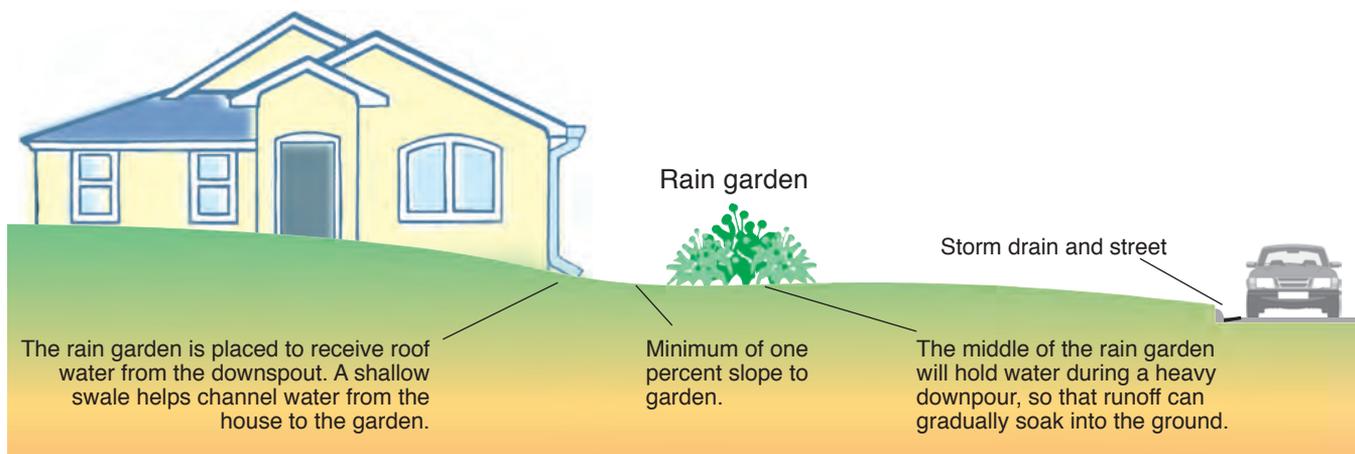


Illustration by M. Balingit

Rain garden FAQs

Does a rain garden form a pond?

NO. The rainwater should soak into the ground and be utilized by the vegetation so that the garden is dry between rainfalls. (Note: Some rain gardens can be designed to include a permanent pond, but that type of rain garden is not addressed in this publication.)

Will a rain garden provide a breeding ground for mosquitoes?

NO, the opposite. Mosquitoes need several days to lay and hatch eggs. Standing water in the garden should last for only a few hours after most storms. Mosquitoes are more likely to lay eggs in birdbaths, plant pots, and old tires than in a rain garden. Also, rain gardens attract dragonflies, and dragonflies eat mosquitoes.

Does a rain garden require a lot of maintenance?

NO. Rain gardens can be maintained with little effort once the plants are established. As with any garden, some weeding and watering will be necessary in the first two years and perhaps some thinning in later years as plants mature.

Is a rain garden expensive?

It doesn't have to be. The cost is site specific and will vary depending on who does the work and what plants you select. To keep costs down you can invite family and friends to help build the garden or start with smaller planted areas.



STEP ONE

Siting and Sizing the Rain Garden

This section covers rain garden placement, size, depth, length, width, soils and slopes. The best way to ensure a successful rain garden project is to follow the instructions in this section.

Where should the garden be located?

Home rain gardens can be located ten or more feet away from the house to catch roof runoff, or further out in the lawn to collect water from the lawn, roof and driveway. When considering placement of your rain garden, think about how the garden can be integrated into existing landscaping. Also, pay attention to views from inside the house as well as those throughout the landscape. Determine how far away or how close you want your rain garden to be to outdoor gathering areas. For example, why not locate it near a porch or patio where you can enjoy the colors and fragrances?

To help you decide where to place your rain garden, consider these points:

- » The garden should be at least 10 feet from the house so that infiltrating water doesn't seep into the foundation (see **Figure 1** below).
- » Do not place the garden directly over a septic system or drainfield.
- » The goal of a rain garden is to encourage additional water infiltration. Wet patches in your yard may already be retaining water. You may want to add rain garden plants to that area and choose an additional location for your rain garden.
- » It is better to build the garden in full or partial sun. For a list of plants appropriate for shade and sun, please see **Appendix A**.
- » Be careful not to put your rain garden directly under a large tree.
- » Digging will be much easier if you choose a more level or gently sloped part of the yard. Slope is discussed later in this section.
- » See **Figure 2**, next page, for ideas on siting the rain garden.

FIGURE 1. Rain gardens should be at least 10 feet from the house, on a gentle slope that catches water from the downspout.

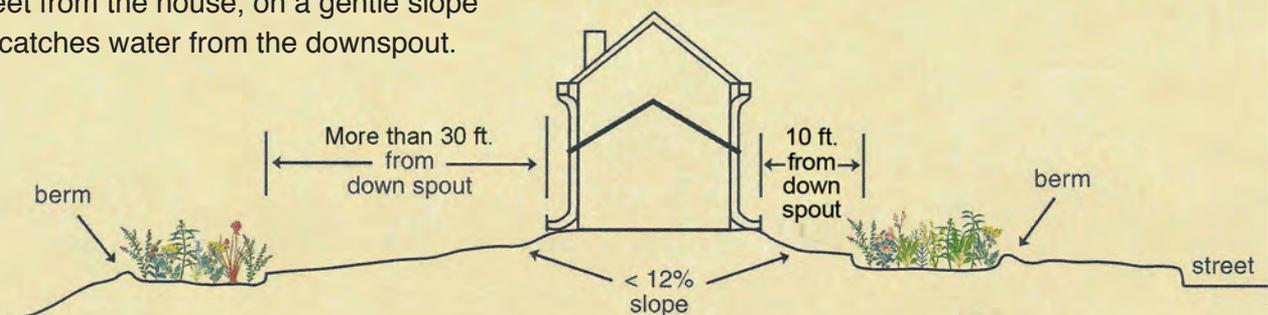


Figure 1 source: University of Wisconsin Extension Service

What size and shape should the garden be?

The size of your rain garden will depend on the following factors:

- » What type of soil do you have?
- » How much roof and/or lawn will drain to the garden?
- » How deep will the rain garden be?

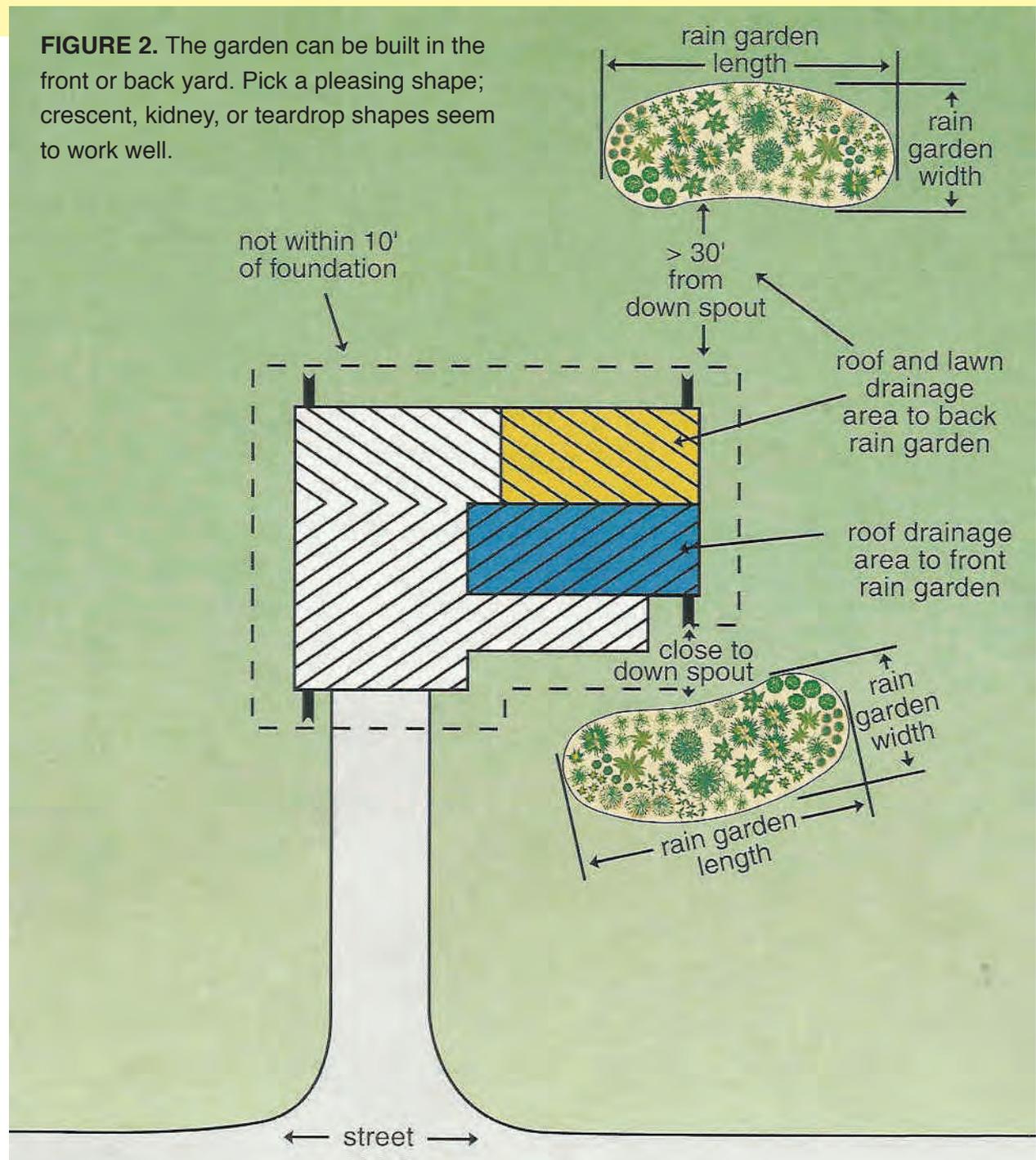


Figure 2 source: University of Wisconsin Extension Service

What type of soil makes up your rain garden site?

It is very important to identify your soil type: sandy, silty, or clay. Sandy soils provide the fastest infiltration; clay soils have the slowest. Since clay soils take longer to absorb water, rain gardens in clay soils must be larger than rain gardens in sandy or silty soils. If the soil feels gritty and coarse, you probably have sandy soil. If your soil is smooth, but not sticky, you have silty soil. If it is very sticky and clumpy, you probably have clay soil.

Refer to **APPENDIX B** for two simple soil tests to determine your soil type. If you have questions about your soil, call the Leon County Agricultural Extension Office at **850-606-5202**.

How large is the area draining to your rain garden?

In choosing your rain garden site, determine the size of the area draining into the garden. The larger the drainage area, the larger the size of the rain garden. There is a little guesswork in determining the size of a drainage area, especially if a large part of the lawn is uphill from the proposed garden site. Use the suggestions below to estimate the drainage area. See **Example** next page.



For rain gardens located 10 to 30 feet from a downspout:

- 1** When the rain garden is closer to the house, almost all of the water will come from the roof and downspout. Walk around the house and estimate what percent of the roof feeds to that downspout. Many houses have four downspouts, each taking about 25 percent of the roof's runoff.
- 2** Next, to determine the size of your roof, find your home's footprint: the area (square footage) of the first floor. If you don't already know it, use a tape measure to find your home's length and width. Multiply the length and width together to find the approximate square footage (area) of your roof. You don't have to be exact, just get a good idea of the size of your roof.
- 3** Finally, multiply the approximate roof area by that part (percentage) of the roof that feeds to the downspout draining to the rain garden (Step 1). This is the roof area that drains to the rain garden.

For rain gardens more than 30 feet from the downspout:

- 1** If there is a significant area of lawn uphill that also will drain to the rain garden, this lawn area should be added to the roof drainage area. First, determine the roof drainage area using Steps 1-3 for a rain garden 10-30 feet from the downspout.
- 2** Next, find the area of the lawn that will drain to the rain garden. Stand where your garden will be and look up toward the house. Identify the part of the lawn sloping into the rain garden.
- 3** Measure the length and width of the uphill lawn. Multiply these two figures to find the lawn area in square feet.
- 4** Add the lawn area to the roof drainage area to find the total drainage area that will be directed to your rain garden. If your patio or driveway also drains to the rain garden, be sure to measure them as well and add that square footage to your total area.

EXAMPLE

Calculating the roof area draining to your rain garden

Your house is 60 feet long x 40 feet wide.

To calculate the roof area, multiply $60 \times 40 = 2,400$.

Your roof area is 2,400 square feet.

You estimate that a certain downspout collects water from 25 percent of the 2,400 square foot roof. To calculate the drainage area, multiply $2,400 \times 0.25 = 600$ square feet.

A 600 square foot portion of the roof drains into the rain garden.

NOTE: If your lawn is sloped, also note the Example on page 11.



How deep should the rain garden be?

A typical rain garden is between 4 and 8 inches deep. A rain garden deeper than 8 inches may pond with water too long, resembling a hole in the ground, and possibly create a safety hazard for anyone who accidentally steps into it. Additionally, a garden less than 4 inches deep will require a large surface area to contain water runoff generated from heavier rainstorms.

No matter the depth of the garden, the goal is to level the ground surface of the garden. Digging a very shallow rain garden on a steep lawn will require bringing in extra topsoil to raise the downhill border of the garden to the same height as the uphill part of the garden. As your slope gets steeper, it is easier to dig the garden a little deeper, to level the ground surface, than to bring in extra soil.

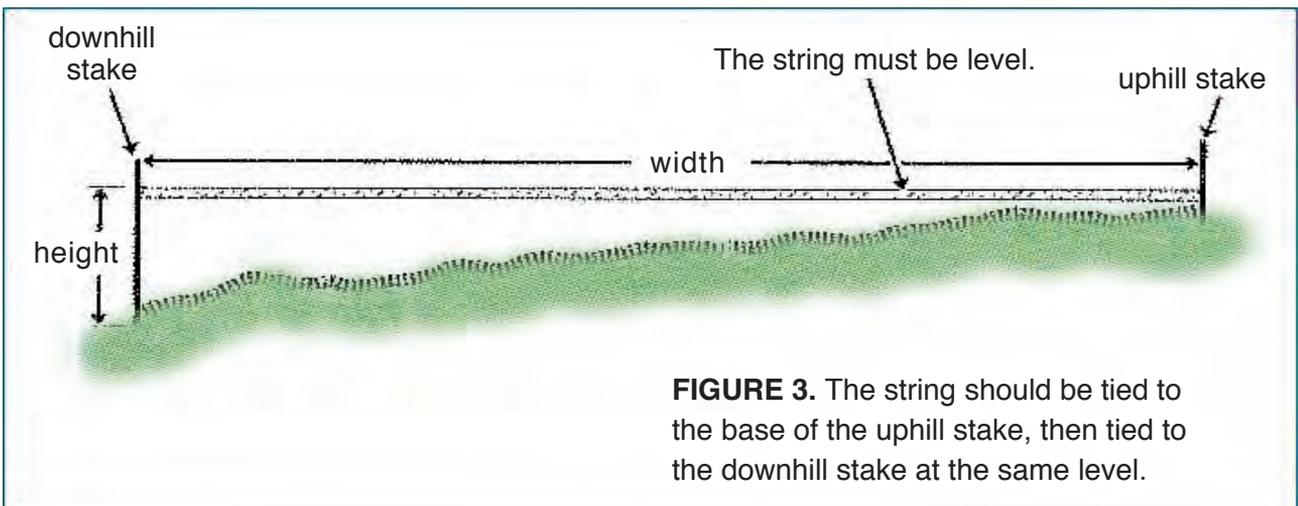


Figure 3 source: University of Wisconsin Extension Service

MATERIALS LIST
 String and ruler
 Carpenter's level
 or string level
 Two wooden stakes
 Calculator (optional)

Finding the slope of your yard

(See Figure 3, preceding page.) The slope of the lawn should determine the depth of the garden. Follow these six steps to find the slope of your lawn.

- 1 Pound one stake into the ground at the uphill end of your rain garden site, and pound a second stake in at the downhill end, about 15 feet away.
- 2 Tie a string to the bottom of the uphill stake and run the string horizontally across the garden site to the downhill stake.
- 3 Using a carpenter's or string level, make the string level and tie the string to the downhill stake at that height.
- 4 Measure along the string between the two stakes for the horizontal width.
- 5 Now measure the vertical height on the downhill stake between the ground and the string.
- 6 Divide the vertical height by the horizontal width and multiply the result by 100 to find the lawn's percent slope (see **Example** below). If the slope is more than 12 percent, it's best to find a more gently sloped site, or talk to a professional landscaper.

EXAMPLE

How to Calculate Slope and Depth

The horizontal distance of the string between the stakes is 180 inches. The string's vertical height on the downhill stake is 9 inches. Divide the height by the (horizontal) distance between stakes and multiply by 100 to find your lawn's percentage slope.

$$\frac{9 \text{ inch height}}{180 \text{ inch width}} = \frac{1}{20} = 0.05$$

$$0.05 \times 100 = 5 \text{ percent slope}$$

PERCENT of your slope	Recommended DEPTH
Less than 5 percent	5 inches deep
5 to 7 percent	6 to 7 inches deep
7 to 12 percent	about 8 inches deep

Using the slope of your lawn, select the depth of the rain garden, e.g., based on a 5 percent slope, build the rain garden 6 to 7 inches deep.

How much land should the rain garden take?

The surface area or square footage of the rain garden can be almost any size, but time and cost will always be important considerations in sizing decisions. Any reasonably sized garden will capture some stormwater runoff, and every bit you capture helps.

A typical residential rain garden ranges from 100 to 300 square feet. Gardens smaller than 100 square feet will limit the number of plants you can plant. The larger the rain garden, the more opportunity you have to plant a variety of plants. A large garden of more than 300 square feet will take longer to dig and will be more difficult to make level.

The sizing guidelines described in this manual are based on a goal of controlling 100 percent of the runoff from your determined drainage area for the average rainfall, while keeping the rain garden size reasonable. A goal of retaining all of the water that falls on your roof, yard and driveway helps compensate for any error that may creep into the design and construction of the project.

If you follow the guidelines presented in this manual and decide the calculated surface area is just too large, it is perfectly okay to make the garden smaller or create a series of rain gardens. The rain garden can be up to 30 percent smaller and still control up to 90 percent of the annual runoff. On the other hand, it is fine to make the garden bigger than the guidelines indicate. Any actions you take will help reach the ultimate goal of slowing the flow and reducing the amount of water that drains from your property.

Now that you have estimated the drainage area, soil type and depth for your garden, use Table 1 or 2 (next page) to help determine the garden's surface area. Use Table 1 if the garden is 10 to 30 feet from the downspout; use Table 2 if it is more than 30 feet from the downspout. Next, follow the steps below to size the garden.

- 1** To find the **size factor** for the soil type and rain garden depth, refer to Table 1 or 2.
- 2** Multiply the size factor by the drainage area you calculated above. This number is the recommended rain garden area.
- 3** If the recommended garden surface area is much more than 300 square feet, distribute the area requirement into two or more smaller rain gardens.

Choose a size that is best for your yard. Remember that these are only guidelines. The size of the garden also depends on how much room you have in your yard, how much runoff you wish to contain and how much you want to spend.



EXAMPLE

How to determine the surface area of the garden (using both slope and area drainage calculations where appropriate)

Your lawn has a 5 percent slope, so you will have a 6-inch deep rain garden. Your lawn is silty and your rain garden is 10 to 30 feet from the downspout. By referring to Table 1, you see that a size factor of 0.25 is recommended. You multiply the downspout drainage area*, 600 square feet (from Example 2), by 0.25 to find the recommended rain garden area: 150 square feet.

$$600 \text{ square feet} \times 0.25 \text{ (Table 1)} = 150 \text{ square feet}$$

*If your drainage area includes an area of lawn or driveway, etc., as well as roof downspout, remember to use the total drainage area in your calculations.

TABLE 1

Size factor for rain gardens less than 30 feet from the downspout

(Depth)	5 inches	6–7 inches	8 inches
SANDY SOIL	0.19	0.15	0.08
SILTY SOIL	0.34	0.25	0.16
CLAY SOIL	0.43	0.32	0.20

TABLE 2

Size factor for rain gardens more than 30 feet from the downspout

Size factor for all depths

SANDY SOIL	0.3
SILTY SOIL	0.06
CLAY SOIL	0.10

Tables 1 and 2 source: University of Wisconsin Extension Service



How long and wide should the rain garden be?

Before building the rain garden, think about how it will catch water. Runoff will flow out of a downspout and should spread evenly across the entire uphill (top) border of the garden. The base of the garden must be as level as possible so water doesn't pool at one end or spill out before it has a chance to infiltrate (**Figure 4**).

The longer side of the garden should face uphill—that is, the top edge of the garden should be perpendicular to the slope and the downspout. This way the garden catches as much water as possible. Still, the garden should be wide enough for the water to spread evenly over the whole bottom surface and provide enough space to plant a variety of plants.

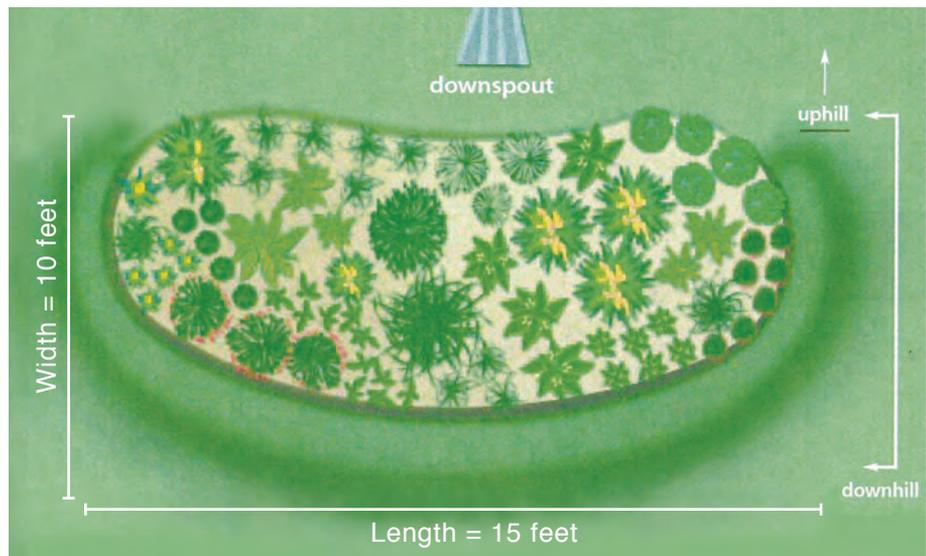


Figure 4 source: University of Wisconsin Extension Service

FIGURE 4. The top of the downhill part of the berm should come up to the same elevation as the entry to the rain garden at the uphill end.

A good rule of thumb is that the rain garden should be much longer than it is wide.

When deciding the width of the garden, remember the slope of the lawn. Wide rain gardens and those on steep slopes will need to be dug deeper at the top end in order to be level. If the garden is too wide, you may need to bring in additional soil to fill in the downhill portion of the rain garden to make it level. Experience shows that making a rain garden about 10 feet wide is a good compromise between the effect of slope and how deep the garden should be.

The rain garden's maximum width should be about 15 feet, especially for lawns with more than an 8 percent slope. See the **Example** below.

EXAMPLE

How to determine the length of the garden

1. Choose a rain garden width suitable for your lawn and landscaping—for example, ten feet.
2. Divide the square footage of your garden by its width to find your garden's length.

You want a rain garden that is 10 feet wide, so divide 150 square feet (page 13 Example) by the 10-foot width to calculate your rain garden's length.

The length in this example is 15 feet.

STEP TWO

Building the Rain Garden

Now that the size and place for the rain garden are set, it's time to get a shovel and start digging. Working alone, it will take approximately six hours to dig an average-sized garden. If you make it a family project, it will go much faster, possibly only an hour or two.

REMEMBER TO CALL BEFORE YOU DIG!

It is very frustrating to cut through an underground wire or cable, and it will really slow your project. Florida law requires that you call before you dig to ensure proper work coordination and to prevent damage to underground facilities. You will need to call 1-800-432-4770, two full business days before you start your project. You can also visit the Call Sunshine web site at <http://callsunshine.com>.

If you are building the garden into an existing lawn, you can reduce your digging time by removing the sod first. Sod is easy to remove with a square shovel and should be useful elsewhere. Also, the best time to build the garden is in the fall. It's easier to dig, and the plants are more likely to thrive.



MATERIALS LIST

Tape measure
Shovels, rakes and trowels
Carpenter's level
Wooden stakes (at least 2 feet long)
Garden hose
One 6 ft. 2x4 board
Plants and mulch

FIGURE 5. Where to dig and where to put the soil you've dug

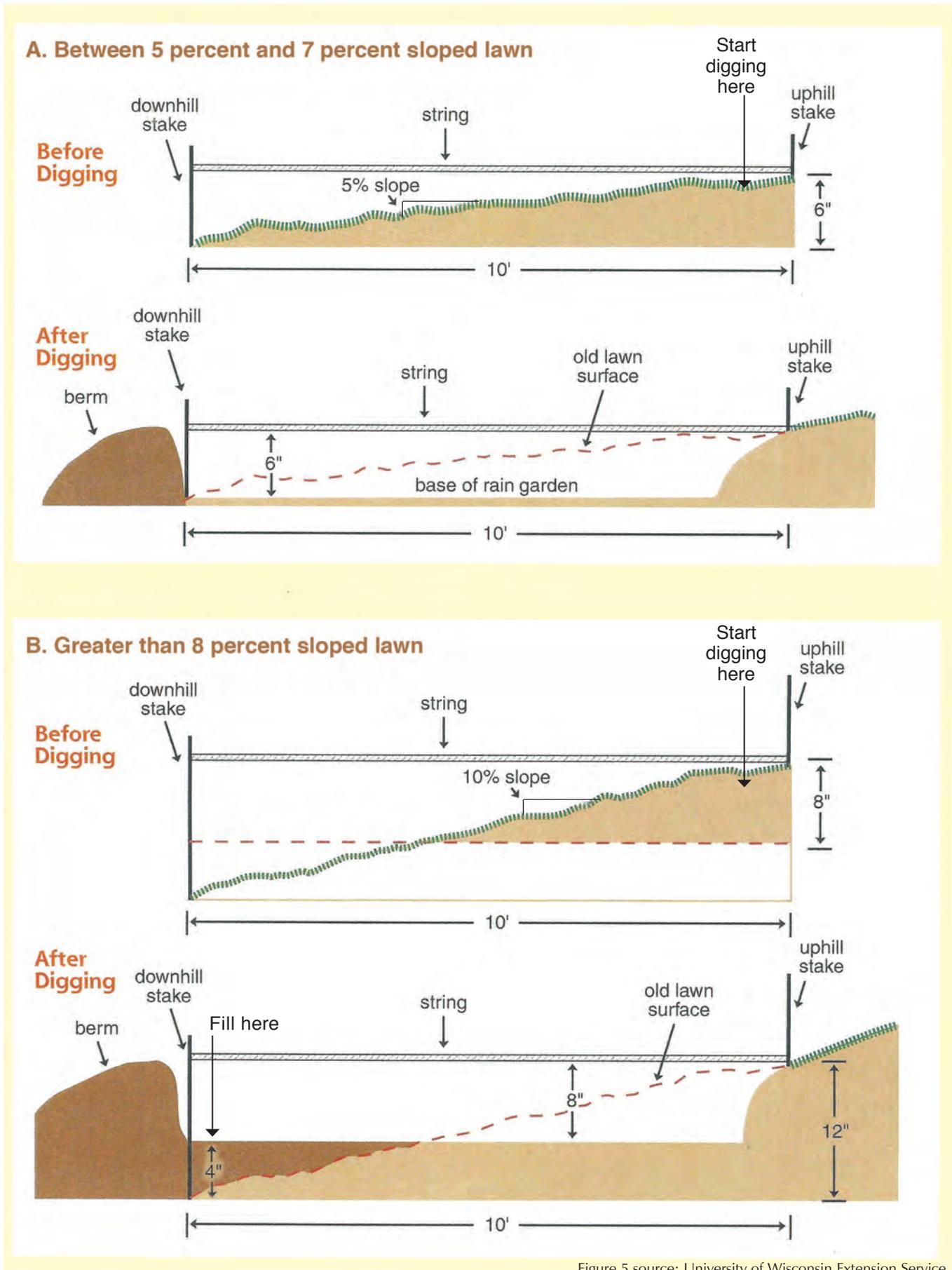


Figure 5 source: University of Wisconsin Extension Service

Digging the rain garden

- 1** While digging the garden to the correct depth, heap the soil around the edge to form a berm—a low dirt “wall” around three sides of the garden that keeps the water in during a storm. On a steeper lawn, the lower part of the garden can be filled in with some soil from the uphill half. Extra soil might need to be brought in for the berm.
- 2** Create the shape of your rain garden by laying a garden hose in the pattern that you wish to use. Remember that the berm will go outside the hose. Next, put stakes along the uphill and downhill sides, lining them up so that each uphill stake has a stake directly downhill. Place a stake every five feet along the length of the garden.
- 3** Begin at one end of the garden and tie a string to the uphill stake at ground level. Tie it to the stake directly downhill so that the string is level. Work in five-foot-wide sections, with only one string at a time. Otherwise the strings will become obstacles.
- 4** Start digging at the uphill side of the string. Measure down from the string and dig until you reach the depth you want the garden to be. If the garden will be four inches deep, then dig four inches down from the string. Refer to **Figure 5** (page 16) and **Step 6** (below) for guidance.
- 5** If the lawn is almost flat, you will be digging at the same depth throughout the garden and using the soil for the berm. If the lawn is steeper, the high end of the garden will need to be dug out noticeably more than the low end, and some of the soil from the upper end can be used to fill in the lower end to make the garden level. Continue digging and filling one section at a time across the length of your garden until it is as level as possible.
- 6** In any garden, compost will help the plants become established, and now is the time to mix in compost. A roto-tiller can make mixing much easier, but it is not necessary. If you do add compost, dig the garden one or two inches deeper than planned. Then add one to two inches of compost.



Leveling the rain garden

One way to check the level of the garden is to just “eyeball” it. For more accuracy, follow these steps:

- 1 When the whole area has been excavated to about the right depth, lay the 2x4 board in the garden with the carpenter’s level sitting on top. Find the spots that aren’t flat. Fill in the low places and dig out the high places.
- 2 Move the board to different places and different directions, filling and digging as necessary to make the surface level.
- 3 Once the garden is as level as you can make it, rake the soil smooth.

Building the rain garden berm

Water flowing into the garden will naturally try to escape over the downhill edge. A berm is critical to help hold the water inside the garden. See **Figure 5**, page 16, and **Figure 6**, right.

The berm is a “wall” across the lower border and along the sides of the garden. The berm will need to be the highest at the downhill edge and should be as high as, or slightly higher than, the uphill edge. Moving along the sides up toward the front (top) edge of the garden, the berm will gradually become lower and finally taper off by the time it reaches the top of the garden.

On a more gradual slope there should be plenty of soil from excavating the garden to use for a berm. On a steeper slope, most of the soil from the uphill part of the garden will be used to fill the downhill half and additional soil may have to be brought in for the berm. After shaping the berm into a smooth ridge about a foot across, tamp it down to compact the soil. It is important to



FIGURE 6. A berm is critical to help hold the water inside the rain garden.

have a strong, well-compacted berm, so tamp hard. The berm should have very gently sloping sides; this helps to smoothly integrate the garden with the surrounding lawn and also makes the berm much less susceptible to erosion.

To prevent erosion, cover the berm with mulch, lay sod, or plant a ground cover. You can also use straw or erosion control matting to protect the berm while the grass becomes established. If you don’t want to lay sod or mulch over the berm, you can also plant drought tolerant vegetation or winterize the berm with rye grass.

STEP THREE

Planting and Maintenance

Planting the rain garden is the fun part! Lists of suggested plants are included in **Appendix A**. Use these for ideas, but don't be afraid to be creative. There is no single best way to plant a garden. Anyone who has ever done any gardening will have no problem planting a rain garden. What follows are a few basic reminders.

Planting the garden

- 1** Select one or more types of plants that have a well established root system. Nursery-propagated plants are best, and three or four types of plants should be enough.
- 2** Try to have at least a rough plan for where each plant will be placed. Lay out the plants as planned, keeping appropriate distances between plants.
- 3** Dig each hole twice as wide as the plant and deep enough to keep the crown of the plant level with the existing grade (just as it was in the cell pack or container). Make sure the crown is level and then fill the hole and firmly tap around the roots to eliminate air pockets.
- 4** Apply mulch evenly over the bed, about two inches thick.
- 5** Place plant labels next to each individual grouping. This will help identify your young plants from non-desirable species (weeds) when you weed the garden.
- 6** Be sure to water the garden immediately after planting, and continue to water several times a week (unless it rains) until the plants become established. As a general rule, plants need one inch of water per week. Use a simple rain gauge to measure the amount of water the plants are receiving. Once the plants begin to thrive on their own, you only need to water during dry periods.



Maintaining your rain garden

Weeding will probably be necessary for the first year or two, as with any new garden. Remove by hand only those plants you are certain are weeds. Try to take the weeds out roots and all. Weeds may not be a problem in the second season, depending on the variety and tenacity of the type of weeds present. By year three and beyond, your rain garden plants will begin to mature and will

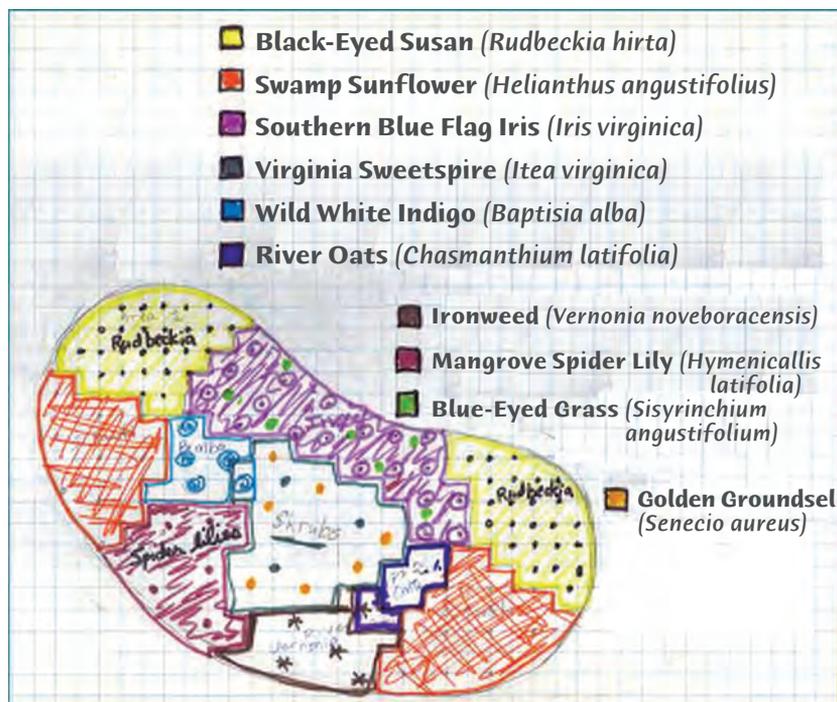
out-compete the weeds, although weeding isolated patches might still be needed occasionally.

After each growing season, the stems and seed heads can be left on for winter interest, wildlife cover, bird food and reseeding. Once spring arrives and new growth is 4 to 6 inches tall, cut back all tattered plants.

HELPFUL TIPS

Rain Garden Design and Planting

- » While rain gardens offer a highly functional way to help protect water quality and prevent flooding, they are also gardens and should become an attractive part of your yard and neighborhood. Think of the rain garden in the context of your home's overall landscape design.
- » When choosing plants for the garden, it's important to consider the height of each plant, bloom time and color, and the garden's overall texture. Use plants that bloom at different times to create a long flowering season. Mix heights, shapes and textures to give the garden depth and dimension. This will keep the garden looking interesting even when few flowers are in bloom. Native plants make good choices because they are accustomed to the regional climate and rainfall patterns and will easily acclimate to the rain garden.
- » When laying out plants, randomly clump individual species in groups of three to seven plants to provide a bolder statement of color. Use odd numbers when determining how many to plant in a mass. Make sure to repeat these individual groupings to create repetition and cohesion in a planting.
- » Try incorporating a diverse mixture of sedges, rushes and grasses with your flowering species. This creates necessary root competition that will allow plants to follow their normal growth patterns and not outgrow or out-compete other species. In natural areas, a diversity of plant types not only adds beauty, but also creates a thick underground root matrix that keeps the entire plant community in balance. Once the rain garden has matured and your plants have established a deep, thick root system, there will be little change in species from year to year and weeds will naturally decline.
- » **Don't forget to mulch.** Composted yard debris and leaves are best. Mulch helps keep your soil moist, suppresses weed growth, stabilizes soil temperatures, and reduces erosion and soil compaction.
- » Finally, consider enhancing the garden by using local stone, ornamental fencing, garden benches or additional flower plantings. This will help give the new garden an intentional and cohesive look and provide a finished appearance that the neighbors will appreciate.



Source: Pam Sawyer, TAPP Master Gardener



APPENDICES: PLANT LISTS and SOIL TESTS



APPENDIX A: SUGGESTED PLANTS FOR YOUR RAIN GARDEN

GROUND COVERS and PERENNIALS

NAME	TYPE	LIGHT REQ.	BLOOM SEASON	BLOOM COLOR	HEIGHT	MOISTURE REQ.	COMMENTS and reference source
Firewheel <i>Caillardia pulchella</i>	annual	full sun	summer	yellow to red	1–2 feet	needs good drainage, drought tolerant	Excellent for hot, dry sites, reseeds, blue-green foliage (IFAS, Florida)
Sand Cordgrass <i>Spartina bakeri</i>	perennial	full sun	N/A	N/A	4–6 feet	moist soil, drought tolerant	Large bunch forming grass, green in summer and browner in winter, grows best in moist sandy soils (Floridata)
Swamp Sunflower <i>Helianthus angustifolius</i>	perennial	full sun	fall	very showy, yellow fall flower	2–6 feet	moist soil, watering during drought	Its native habitat is flatwoods, bogs, marshes, disturbed areas and secondary woods. Moist site; spreads vegetatively (IFAS, Florida)
Wild White Indigo <i>Baptisia alba</i>	perennial	full to part sun	spring and summer	white	Up to 4 feet	drought tolerant, regular watering	Grows into a bushy shape like a shrub, takes several years to get established (Floridata)
Joe Pye Weed <i>Eupatorium fistulosum</i>	perennial	part sun	fall	white, pink or purple	3–10 feet	needs water to be in full bloom, drought tolerant	Drought tolerant, it grows faster in more shady environment. <i>Eupatorium purpureum</i> is more common in northern environments. (Floridata)
Blazing Star <i>Liatris spp.</i>	perennial	part sun	fall	mauve, pink, white	2–5 feet	drought resistance, minimal watering	(IFAS and www.illinoiswildflowers.info/prairie/plantx/igh_blazingstarx.htm)
Rain-Lily <i>Zephyranthes spp.</i>	perennial	part sun	spring to late summer	varies	one-half to 1 foot	high drought tolerance	(IFAS)
Violets <i>Viola spp.</i>	perennial	part sun	early spring	white, blue, purple	4–8 inches	water when dry	(www.gardenersnet.com/flower/violet.htm)
Black-Eyed Susan <i>Rudbeckia hirta</i>	annual, biennial, or perennial	sun to part shade	summer	yellow to yellow-orange	up to 3 feet	drought tolerant, regular watering	Helpful in erosion control (www.Easylivingwildflowers.com)
Blue-Eyed Grass <i>Sisyrinchium angustifolium</i>	perennial	sun to part shade	spring	white, blue, violet	1.5 ft. to 2 feet	prefers moist soil	To maintain vigorous and healthy plant, it should be divided every 2-3 years. (botany.wisc.edu)
Canna Lily <i>Canna spp.</i>	perennial	sun to part shade	varies	red, pink, yellow, striped, and variations	Up to 4 feet	regular watering, suffers during dry periods	(Floridata)
Cardinal Flower <i>Lobelia cardinalis</i>	perennial	sun to part shade	spring to fall	bright red	1–3 feet	requires moist soil	Flood tolerant, not drought tolerant (Floridata)

Cutleaf Coneflower <i>Rudbeckia laciniata</i>	perennial	sun to part shade	summer	yellow	Up to 6 feet	regular watering, drought tolerant	(NRCS Plant Database, Davesgarden.com)
Dixie Blue Iris <i>Iris hexagona</i>	perennial	sun to part shade	spring and summer	blue to violet, white (rare)	Up to 3 feet	prefers moist soil	This plant can grow in standing water. (Floridata)
Goldenrod <i>Solidago spp.</i>	perennial	sun to part shade	fall	golden yellow	2–5 feet	regular watering, very drought tolerant	This plant will compete for nutrients in the soil. (Floridata)
Mangrove Spider Lily <i>Hymenocallis latifolia</i>	perennial	sun to part shade	summer	snow white	1–3 feet	high drought tolerance	(IFAS)
Meadow Beauty <i>Rhexia spp.</i>	perennial	sun to part shade	summer	pink, purple, yellow	1–2 feet	can grow in standing water	(coop.co.pinellas.fl.us/fyn/publications/K-AQUA.htm)
Muhly Grass <i>Muhlenbergia capillaris</i>	perennial	sun to part shade	late summer	purple haze	3 feet	needs very little watering	Drought tolerant (Floridata)
Soft Rush <i>Juncus effusus</i>	perennial	sun to part shade	summer	green-brown flowers	2–5 feet	drought tolerant, and can grow in water	(Floridata)
Southern Blue Flag Iris <i>Iris virginica</i>	perennial	sun to part shade	late spring and summer	purple	3–7 feet	grows in shallow water	Moderate drought tolerance (USDA NRCS Plant Database, IFAS)
Milkweed <i>Asclepias perennis</i>	perennial	sun to part shade	throughout year	white, near white	1.5–2 feet	requires consistently moist soil	(Davesgarden.com)
Tickseed <i>Coreopsis nudata</i>	perennial	sun to part shade	spring	pink	2–4 feet	prefers moist site	(IFAS)
Cinnamon Fern <i>Osmunda cinnamomea</i>	perennial	shade to part shade	N/A	N/A	3 – 5 ft.	requires frequent watering	Prefers shade, however, with plenty of water, this plant can survive in full sun. (Floridata)
Jack-in-the-Pulpit <i>Arisaema triphyllum</i>	perennial	shade to part shade	spring	green to purple	1.5 feet	low drought tolerance	Red berries appear in the fall. (USDA NRCS Plant Database)
Royal Fern <i>Osmunda regalis</i>	perennial	shade to part shade	N/A	N/A	Up to 6 feet	low drought tolerance	(USDA NRCS Plant Database)
Common Lady Fern <i>Athyrium filix-femina</i>	perennial	shade to part shade	N/A	N/A	3 feet	low drought tolerance	(USDA NRCS Plant Database)
Southern Wood Fern <i>Dryopteris ludoviciana</i>	perennial	shade to part shade	N/A	N/A	3 feet	low drought tolerance	Considered a tropical fern (USDA NRCS Plant Database)
Little Brown Jug/Arrow Leaf Wild Ginger <i>Hexastylis arifolia</i>	perennial	shade to part shade	spring	brown, jug-shaped bloom	6 inches	low drought tolerance	When you crush the leaves, they smell like ginger. Threatened species (Floridata and www.briartech.com/earlyspring/ginger/gin.htm)
Wake Robin <i>Trillium spp.</i>	perennial	shade	early spring	greenish-maroon, brown or yellow	1 foot	prefers moist soil; drought tolerant	(Floridata and www.naturepark.com/trilinfo.htm)

APPENDIX A: SUGGESTED PLANTS FOR YOUR RAIN GARDEN

TREES and SHRUBS

NAME	TYPE	LIGHT REQ.	BLOOM SEASON	BLOOM COLOR	HEIGHT	MOISTURE REQ.	COMMENTS
Red Buckeye <i>Aesculus pavia</i>	shrub to small tree, deciduous	sun to part shade	spring	red	6–35 feet	moist to dry organic soils	Flowers attract hummingbirds.
River Birch <i>Betula nigra</i>	large tree, deciduous	sun to part shade	late winter to early spring	greenish, tiny	40–80 feet	moist	Heat-tolerant; fast-growing
Beautyberry <i>Calliandra americana</i>	small shrub, deciduous	sun to part shade	spring to summer	pale purple	4–8 feet	moist to dry	Colorful fruit; attracts bird
Buttonbush <i>Cephalanthus occidentalis</i>	large shrub, deciduous	sun to part shade	summer	white	6–20 feet	wet to moist	Very hardy
Eastern Redbud <i>Cercis canadensis</i>	small tree, deciduous	sun to part shade	early spring	pink	15–30 feet	moist to dry	Beautiful when flowering
Fringe Tree <i>Chionanthus virginicus</i>	small tree, deciduous	sun to part shade	spring	showy white clusters	15–30 feet	moist to dry	Beautiful when flowering; drought-tolerant
Sweet Pepperbush <i>Clethra alnifolia</i>	shrub, deciduous	sun to part shade	summer	white to pink	3–10 feet	moist to dry	Fragrant flowers attract butterflies; likes acid soils
Loblolly Bay <i>Gordonia lasianthus</i>	small tree, evergreen	sun to part shade	spring to summer	white	30–60 feet	wet to moist	Fragrant showy flowers; somewhat sensitive
Scarlet Hibiscus <i>Hibiscus coccineus</i>	herbaceous perennial	sun to part shade	summer	showy red	4–6 feet	wet to moist	Dies back in a cold winter
Rose Mallow <i>Hibiscus moscheutos</i>	herbaceous perennial	sun to part shade	summer	showy white with reddish center	3–6 feet	moist to wet	Dies back in a cold winter
Dahoon Holly <i>Ilex cassine</i>	small tree, evergreen	sun to part shade	spring	white	20–40 feet	wet to moist	Attractive fruit; erect shape suitable for small spaces; attracts birds
Virginia Sweetpire <i>Itea virginica</i>	small shrub, deciduous	sun to part shade	late spring to early summer	white	3–8 feet	moist to dry	Winter color Fragrant flowers
Spicebush <i>Lindera benzoin</i>	large shrub, deciduous	sun to part shade	late winter to early spring	yellow	15 feet	wet to moist	Fruit attracts birds
Sweetbay Magnolia <i>Magnolia virginiana</i>	small tree, evergreen	sun to part shade	spring to summer	showy white	25–60 feet	wet to moist	Attractive flowers and colorful fruit; acid soils

Southern Crab Apple <i>Malus augustifolia</i>	small tree, deciduous	sun to part shade	early spring	pink	15–25 feet	moist to dry	Fragrant flowers
Wax Myrtle <i>Myrica cerifera</i>	shrub to small tree, evergreen	sun to part shade	spring	tiny white	4–20 feet	wet to well-drained	Fast growing; good screen
Florida Azalea <i>Rhododendron austrinum</i>	shrub, deciduous	sun to part shade	spring	showy yellow	3–10 feet	wet to moist	Fragrant; acid soils
Pinxter Azalea <i>Rhododendron canescens</i>	shrub, deciduous	sun to part shade	spring	white to pink	10–15 feet	moist to dry	Fragrant; acid soils
Cabbage Palm <i>Sabal palmetto</i>	palm	sun to part shade	summer	white	20–60 feet	moist to dry	Fragrant flowers; very hardy
Bald Cypress <i>Taxodium distichum</i>	large tree, deciduous	sun to part shade	spring	greenish	50–80 feet	wet to dry	Stable and strong; good fall color
Winged Elm <i>Ulmus alata</i>	small tree, deciduous	sun to part shade	late winter	tiny reddish-green	40–70 feet	moist to dry	Delicate foliage; drought-tolerant
Possumhaw Viburnum <i>Viburnum nudum</i>	small tree, deciduous	sun to part shade	spring	tiny white	18 feet	wet to moist	Understory tree
Walter's Viburnum <i>Viburnum obovatum</i>	small tree, deciduous	sun to part shade	spring	tiny white	6–30 feet	wet to moist	Good screen; attracts birds
Bluebeech, Hornbeam <i>Carpinus caroliniana</i>	small tree, deciduous	shade to part shade	early spring	greenish, tiny	30 feet	moist	Deeply rippled sinewy trunk; smooth, blue-gray bark
Oakleaf Hydrangea <i>Hydrangea quercifolia</i>	small shrub, deciduous	shade to part shade	late spring to early summer	showy white to pink	4–8 feet	moist to dry	Rich acid soils, large flowers, nice fall color
Yaupon Holly <i>Ilex vomitoria</i>	large shrub to small tree, deciduous	shade to part shade	spring	tiny white	8–25 feet	wet to dry	Colorful fruit; attracts birds
Florida Anise <i>Illicium floridanum</i>	shrub, evergreen	shade to part shade	spring	maroon	6–20 feet	moist to wet	Licorice scent; good screen
Needle Palm <i>Rhapidophyllum hystrix</i>	shrub-like palm	shade to part shade	spring	tiny yellow or purple	3–8 feet	moist to dry	Very hardy
Snowbell <i>Styrax americanus</i>	shrub	shade to part shade	spring	white	6–10 feet	wet to moist	Acid soil
Swamp Azalea <i>Rhododendron serrulatum</i>	shrub, deciduous	part shade	summer	white to pink	9–16 feet	wet to moist	Fragrant; acid soils

NOTE: All plants were researched at: Nelson, G. (2003), *Florida's best native landscape plants*. University of Florida Press, Gainesville, FL; Rushing, F. (2005), *Tough plants for Florida gardens*. Cool Springs Press, Nashville, TN; Tobe, J. D., et al. (1998), *Florida wetland plants: an identification manual*. Florida Department of Environmental Protection, Tallahassee, FL; Haehle, R. G. and J. Brookwell (2004), *Native Florida plants*. Taylor Trade Publishing. New York; Godfrey, R.K. (1988), *Trees, shrubs, and woody vines of Northern Florida and adjacent Georgia and Alabama*. The University of Georgia Press, Athens, GA; www.floridata.com. In addition, the following contributed expertise: Dr. Pamela Hall, Plant Ecologist; Dr. Paul Elliott, Professor Emeritus from Florida State University and Master Gardener; John Cox, Tallahassee Stormwater Management Division; Pam Sawyer, Master Gardener; Dr. Ed Schroeder, Master Gardener; and Stan Rosenthal, Leon County Forester.

APPENDIX B: SOIL TESTS

Two simple soil tests to determine your soil type

PERCOLATION TEST

This simple procedure can determine your soil's porosity, or infiltration rate—how fast water drains into your soil.

- Remove both ends from a 46 oz. can (like a large juice can). Mark a line 2 inches from the bottom end.
- Pound the can 2 inches deep into the soil, so that the line is level with the ground's surface.
- Pour one quart of water into the can. Time how long it takes the water to drain into the soil.
- Refer to this table to determine your soil's porosity and drainage conditions.

DRAINAGE TIME	SOIL POROSITY	DRAINAGE CONDITIONS
Less than 2 minutes	Excellent percolation and air circulation	This soil offers the BEST drainage conditions for planting a rain garden.
2 to 8 minutes	Somewhat compact or dense soil	ACCEPTABLE drainage for a rain garden, but slower than in less compact soil.
More than 8 minutes	Overly compact or dense soil	Very slow, POOR drainage. This soil offers the most challenging conditions for a rain garden.



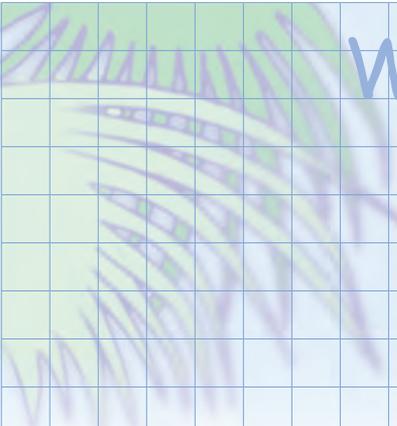
TEST FOR CLAY

The amount of clay in your soil can also affect drainage.

Take a handful of soil and dampen it with a few drops of water. After kneading the soil in your fingers, squeeze the soil into a ball. If it remains in a ball, then work the soil between your forefinger and thumb, squeezing it upward into a ribbon of uniform thickness. Allow the ribbon to emerge and extend over your forefinger until it breaks from its own weight. If the soil forms a ribbon more than an inch long before it breaks, and it also feels more smooth than gritty, the soil has too much clay for a rain garden. You should consider that the area will drain poorly and should plan for more permanent ponding or select a more porous site.



WORK SHEET



WORK SHEET