

RAIN GARDEN MANUAL

for HOMEOWNERS

Protecting our water, one yard at a time



What is a Rain Garden?

A rain garden is an attractive, landscaped area planted with perennial native plants which don't mind getting "wet feet." They are beautiful gardens, built in depressions, which are designed to capture and filter storm water runoff from impervious surfaces around the home, such as rooftops and driveways.



The benefits of rain gardens are multiple and include their ability to perform the following functions:

- ☞ Help keep water clean by filtering storm water runoff before it enters local waterways.
- ☞ Help alleviate problems associated with flooding and drainage.
- ☞ Enhance the beauty of individual yards and communities.
- ☞ Provide habitat and food for wildlife including birds and butterflies.
- ☞ Recharge the ground water supply.

Why Do We Need Rain Gardens?

As development increases, there are more demands placed on our local environment. Impervious surfaces associated with development, such as rooftops, driveways and roads, are areas that shed rainwater. Construction activity on development sites usually compacts the soil, limiting the ground's capacity to absorb water. Taken together, these factors reduce the ability of our landscape to absorb and filter storm water.

Impervious surfaces can negatively affect our environment as they increase storm water runoff. Consequently they increase the chance for pollution to enter our waterways through our storm drainage systems, including sewers and open ditches, which flow untreated to our streams and lakes. The type of pollution that results from storm water runoff is called nonpoint source pollution. Studies by the United States Environmental Protection Agency (USEPA) have shown that a substantial amount of the pollution in our streams, rivers and lakes is carried there by runoff from our own yards and gardens. Some of the more common nonpoint source pollutants include fertilizers, pesticides, pet wastes, grass clippings and yard debris. An easy way to help keep these pollutants out of our local waterways is to install a rain garden!

Installing Your Own Rain Garden

Installing a rain garden can be a fairly simple process, involving a shovel and a bit of physical energy. This manual will guide you through the process of building a rain garden on your property.

The size and style of your garden will depend on a number of factors including: the size of your yard, whether you are trying to create a formal or informal looking garden, and the amount of money you want to spend. *Remember, you can never have a rain garden that is too large or too small!* Any size rain garden can contribute to solving local water quality problems and will be a beautiful addition to your property!



Milkweed is a popular rain garden plant species because of its ability to tolerate wet soil conditions. Here, one is visited by a female monarch butterfly.

RAIN GARDEN Q & A

Is a rain garden a pond?

Rain gardens are not ponds. If properly designed, they should hold water for a maximum of 48 hours.

Will a rain garden attract mosquitos?

No! A common misconception of any water feature near the house is that it will attract mosquitos. Mosquitos need standing water for 7-12 days to complete their life cycle. A properly installed rain garden should not hold water long enough for mosquito larvae to complete their life cycle. Rain gardens also have the advantage of attracting dragonflies, which are predators of mosquitos. In short, a rain garden will not make a mosquito problem worse, and could possibly improve it by helping to eliminate standing water.

Are rain gardens hard to maintain?

No! That is the beauty of using native plants in your rain garden! Native plants are well adapted to their natural surroundings and do not require fertilizers or pesticides.

Is a rain garden expensive?

It doesn't have to be. If you purchase plants, and do the work yourself, the cost will be about \$3 to \$5 per square foot. If you hire a landscape consultant to design, construct, select and install plants, the cost will increase to about \$10 to \$15 per square foot.



Placing and Sizing Your Rain Garden

This section of the manual covers rain garden planning basics -- where to put the garden and how large it should be based on your soil type, slope, and drainage area. Following the instructions in this section will help ensure your rain garden is successful. There is a rain garden worksheet on page 18 where you can perform and record your calculations.

Finding the Right Location for Your Rain Garden

Rain gardens can be placed near your home to catch runoff from your roof, or farther out in your lawn to collect surface water draining across your property. Do a bit of rainy day sleuthing to discover the drainage pattern on your property. Find out where runoff flows and locate areas where water collects. Typically, the largest sources of runoff are rooftops, paved surfaces, slopes, and compacted soils.

Some helpful tips are listed below to help you determine the best location for your rain garden:

- ☞ Rain gardens should be a minimum of ten (10) feet from your home and your neighbors' homes, to prevent damage from water seepage.
- ☞ Rain gardens should not be placed over or near the drain field of a septic system.
- ☞ Because these areas are already poorly drained, rain gardens should not be placed in an area of your yard where water collects. They should be placed up-slope of these areas to reduce the amount of water that flows into them.
- ☞ Rain gardens should not be placed within existing drainage ways such as swales and ditches.
- ☞ Sunny or partly sunny locations are best for rain gardens, but shade gardens are possible.
- ☞ Rain gardens should be integrated with your landscape. They can have a formal or informal look based on your preference.
- ☞ Rain gardens should not be installed under large trees. Trees have extensive root systems that may be damaged in the rain garden excavation process. In addition, they may not be able to adapt to the extra moisture being held by your rain garden.
- ☞ Check with your local building department before installing your rain garden as some of the installation requirements may conflict with local ordinances or zoning regulations.
- ☞ Make yourself aware of underground service lines or utilities. Remember to "Call before you dig!" 1-800-362-2764 for underground utilities and 1-800-925-0988 for oil and gas lines.

How Large Should Your Rain Garden Be?

Your rain garden can be any size. The *ideal* situation is to create a rain garden that will absorb all the rain that would normally flow away from your home. However, a typical residential rain garden is usually between 100 and 300 square feet.

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

- ☞ The depth of the garden
- ☞ The amount of runoff from the roof and/or lawn that will drain to the garden
- ☞ The type of soil in the garden

This information, along with the size factor from the tables on page 8 will help you determine the surface area of your rain garden.



Rattlesnake Master is a unique plant species for your rain garden because of its ability to attract a variety of pollinators. Here, it is visited by a Summer Azure.

HISTORY OF THE RAIN GARDEN

Rain gardens were first used in Maryland in the early 1990s to address nonpoint source pollution threatening the Chesapeake Bay. The rain garden was developed based on the idea of the bioretention basin. Initially designed as a Best Management Practice (BMP) to minimize the impacts of development and storm water runoff, bioretention basins are depressions which collect and hold storm water runoff. Slowing the flow of surface runoff allows time for pollution to settle out of the water before it continues to the nearest river or lake.

While bioretention basins are primarily used to contain water from a substantial drainage area, rain gardens are designed for use on smaller, residential lots. This gives home owners the ability to reduce the amount of storm water runoff that flows from their yards.

DETERMINING THE DEPTH OF YOUR RAIN GARDEN

1. Set one stake at the uphill side of your rain garden and another stake at the downhill side.
2. Tie a string at ground level to the uphill stake.
3. Secure the other end of the string to the downhill stake, ensuring that the string is level.
4. Measure the width (in inches) between the two stakes. Next, measure the height (in inches) between the ground and the string of the downhill stake.
5. Divide the height by the width and multiply the result by 100. This will give you the percentage slope of the area where you wish to build your rain garden.
6. Record your percentage slope on line 1 of the worksheet, p. 18.
7. Find your percentage slope in the box below and determine the depth of your rain garden. Record that depth on line 2 of the worksheet, p. 18.

Slope	Depth
< 4%	3 to 5 inches
5% - 7%	6 to 7 inches
8% - 12%	8 inches maximum

Rain Garden Depth and Slope

The slope of your land will greatly influence the depth of your rain garden. The ideal depth of a rain garden is between four (4) and eight (8) inches deep. A rain garden that is less than four inches deep will need to be larger in size to provide enough capacity to store water from heavy rains. However, a rain garden that is deeper than eight inches might hold water for too long. In general, slopes over 12% are not suitable for rain gardens. Installing a rain garden in a flatter part of your yard will reduce the amount of preparation needed to build your rain garden. To determine the depth of your rain garden, use the guidelines in the sidebar to the left.

Directing Water to Your Rain Garden

There are several options for directing roof water to your rain garden. You can simply disconnect a downspout near the ground and reroute it to your rain garden. Rerouting the water from your downspout can be accomplished by creating a grassy swale, a rock-lined channel, or by extending the downspout across your lawn. Another option is to run a PVC pipe underground from your downspout to the rain garden. To slow the velocity of the routed rain water and prevent erosion, you may need to install landscape fabric, rocks or bricks at the outlet of the pipe.



Additionally, you may also want to install a rain barrel at your downspout to capture roof runoff for use in your rain garden or other parts of your yard. The overflow from the rain barrel can be directed into your rain garden by way of a grassy swale, rock lined channel or a drip hose.

Rain barrels can also be used to collect roof runoff. Water from the barrel can be used to water plants throughout your yard and overflow can be directed into your rain garden.

Determining the Drainage Area of Your Rain Garden

Since you have determined the depth of your rain garden, the next step will be to calculate the area draining into your garden. The guidelines listed below will help you make the best possible estimate of your drainage area. (If you know the area of the roof that will be draining into your rain garden, disregard the guidelines below and enter your roof drainage area on line 5 of the worksheet, p. 18.)

For all Rain Gardens

- ☞ In order to estimate the size of your roof, you will need to measure the footprint, or the outside dimension of your home. Your home's footprint will be relatively equal to the area of your roof which can be determined by multiplying the width of your home (in feet) by its length (in feet). Record your home's footprint on line 3 of the worksheet, p. 18.
- ☞ Count the number of downspouts on your home. Record the number of downspouts on line 4 of the worksheet, p. 18.
- ☞ To estimate the roof drainage area, divide your home footprint (line 3 of the rain garden worksheet) by the number of downspouts (line 4 of the rain garden worksheet). Next, multiply this result by the number of downspouts directed to your garden. Record your answer on line 5 of the worksheet, p. 18.
- ☞ If your rain garden is within 30 feet of your downspout, enter 0 on line 6 of your worksheet, p. 18. If your rain garden is greater than 30 feet from your downspout, you will need to perform the additional calculations listed below.

Rain Gardens more than 30 feet from a downspout

- ☞ To find the area of lawn that will drain to your garden, stand where your rain garden will be and determine how much of your lawn will drain into your rain garden.
- ☞ Measure the length (in feet) and width (in feet) of the lawn that will be draining into your rain garden, and multiply them together to find the lawn area. Record your lawn area on line 6 of the worksheet, page 18.
- ☞ Add the lawn area to the roof drainage area to determine the total drainage area and record your answer on line 7 of the rain garden worksheet, page 18.

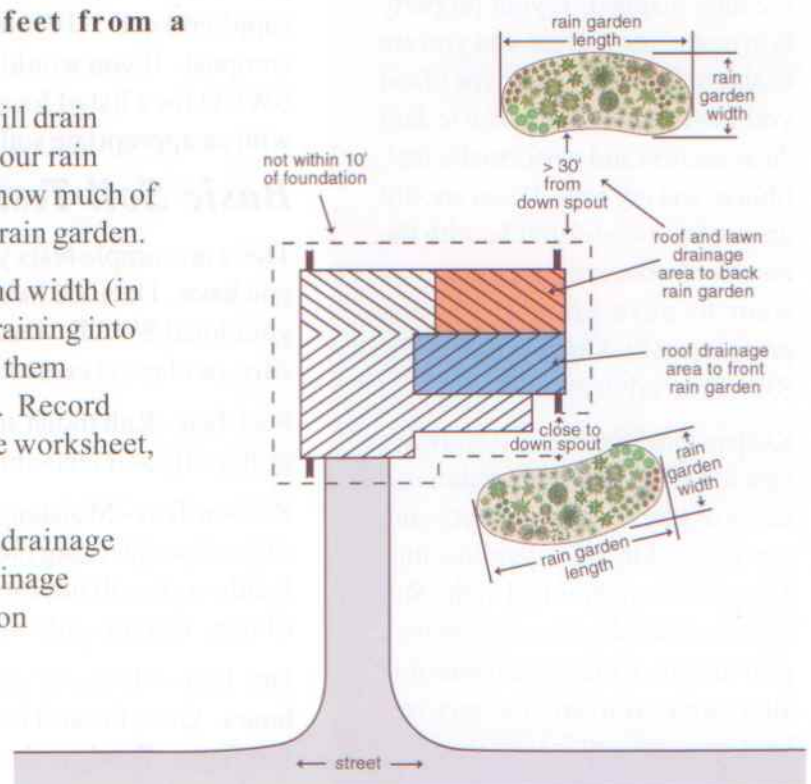


Figure 1 - Rain gardens can be placed near your home or further out in your yard.

FURTHER RESEARCHING YOUR SOIL TYPE

The best place to begin researching your soil is to contact your local Soil and Water Conservation District (SWCD). Your local SWCD can provide you with the Natural Resources Conservation Service (NRCS) "Soil Interpretation Table." This table summarizes soil attributes related to the official soil survey such as: how acidic a soil is (pH), how fast water moves through the soil (saturated hydraulic conductivity), depth to bedrock, clay and any other restrictive layers, and high water tables. Your local SWCD can also provide you with soil survey maps.

If you find more than one type of soil on your property, choose your soil type based on the actual location of your rain garden. Unfortunately, especially in urban areas, not all soils are fully mapped. If your property is in one of these areas and you are unable to determine what type of soil you have, refer to the *Basic Soil Tests* section and perform the feel, ribbon, and dry tests. If you are still unsure or uncomfortable with the results of your soil tests you may want to have your soil tested professionally. Contact your local SWCD for advice.

Keep in mind that while it is always best to build your rain garden in a sandy or silty soil versus clayey soil, conditions don't always allow this. The soil mix mentioned in the *Soil Type and Garden Size* section may provide you with the best possible alternative to overcome any soil limitations present in your yard.

Soil Type and Garden Size

Now that you have determined how deep your rain garden should be, you will need to figure out what type of soil you have in order to determine its appropriate size.

The type of soil you have will affect the movement of water through the soil profile. Therefore, the size of your rain garden will be determined by how quickly water is able to percolate or move through the soil profile. There may be restrictive soil features below your rain garden that prevent it from functioning properly. Reference the *Further Researching Your Soil Type* sidebar to the left to find out where to obtain more information about your soil.

In general, soil textures in Northeastern Ohio range from clayey to sandy. If your soil profile is sandy (coarse textured soils), you may be able to simply loosen the soil and improve it with some yard waste compost to prepare your rain garden for planting. Silty soils (intermediate textured soils) drain better than clayey soils (fine textured soils), but both types may need help to function properly.

There may be extra considerations in planning and building rain gardens containing silty, clayey or compacted soils. These soils reduce the ability of rain water to percolate. Consequently, an increase in the size of your rain garden and/or the complete replacement of soil can help combat the slow percolation problem. A recommended soil mix is 50-60% sand, 30-40% loamy topsoil (which can be purchased from local garden stores or landscape suppliers) and 5-10% organic matter derived from yard waste compost. If you would like a more exact soil mix, contact your local SWCD for a list of local suppliers who will be able to provide you with an appropriate soil mix.

Basic Soil Tests

There are simple tests you can perform to figure out what type of soil you have. Detailed information on these soil tests is available through your local SWCD. Once you've determined your soil type, (sandy, silty, or clayey) enter it on line 8 of the rain garden worksheet, p. 18.

Feel Test - Rub moist soil between your finger tips. Sandy soil feels gritty, silty soil feels smooth, and clayey soils feel sticky.

Ribbon Test - Moisten soil to a putty like consistency. Make a soil ribbon by squeezing the moist soil between your thumb and forefinger. Sandy soils will not form a ribbon. Silty soils will make a short, weak ribbon. Clayey soils will form a long, strong ribbon.

Dry Test - Mold soil into a ball and allow it to air dry for several hours. Once the soil is dry, crush it between your thumb and forefinger. Sandy soils will crumble easily while silty soils will be moderately resistant and firm. Clayey soils will be very difficult, if not impossible, to crush.

Determining the Size of Your Rain Garden

The general ratio of drainage area to rain garden area is 5:1 for a well drained, sandy soil profile. For example, if you had 500 square feet of drainage area, you would build a 100 square foot rain garden. Tables 1 and 2 below will give you a rain garden size factor which will help you determine the appropriate size of your rain garden. If you already know that you have compacted, clayey or otherwise poorly draining soils, a drainage area to rain garden area of 3:1 or 2:1 for building your rain garden will result in better success.

- ☞ Select the appropriate size factor table for your existing soil. Table 1 is for rain gardens less than 30 feet from your downspout. Table 2 is for rain gardens more than 30 feet from your downspout.
- ☞ Use your soil type (line 8 of the rain garden worksheet) and rain garden depth (line 2 of the rain garden worksheet) to select the appropriate size factor. Record your answer on line 9 of the worksheet, p. 18.
- ☞ Next, multiply the size factor by your total drainage area (line 7). This gives you the recommended area of your rain garden. Record this number on line 10 of the worksheet, p. 18.
- ☞ If the recommended rain garden area is more than 300 square feet, it is recommended that you divide your rain garden into a couple of smaller gardens.

Rain Garden Size Factor Table 1

(less than 30 feet from downspout)

	3-5 in.	5-7 in.	8 in.
Sandy Soil	.19	.15	.08
Silty Soil	.34	.25	.16
Clayey Soil	.43	.32	.20

Rain Garden Size Factor Table 2

(more than 30 feet from downspout)

	Size factor for all depths
Sandy Soil	0.03
Silty Soil	0.06
Clayey Soil	0.10



This rain garden features the following fall species: Wild Bergamot, Brown-eyed Susan, Aster, Beardtongue, and Obedient Plant.

Determining the Shape of Your Rain Garden

After you have determined the general size of your rain garden, you will need to choose a shape that will best integrate with your landscape.

There are a few things to keep in mind when determining the shape of your rain garden. *The longer side of the garden should run perpendicular to the flow of water (along the contour). This is also referred to as the width.* This will maximize the amount of water your garden will be able to intercept.

In addition, the garden needs to be wide enough for the water to spread evenly over the whole garden. A good rule of thumb is that your rain garden should be twice as wide as long. See Figure 4 on page 12 for further clarification.

RAIN GARDEN TOOLBOX

Before you start you may want to have these basic tools handy!

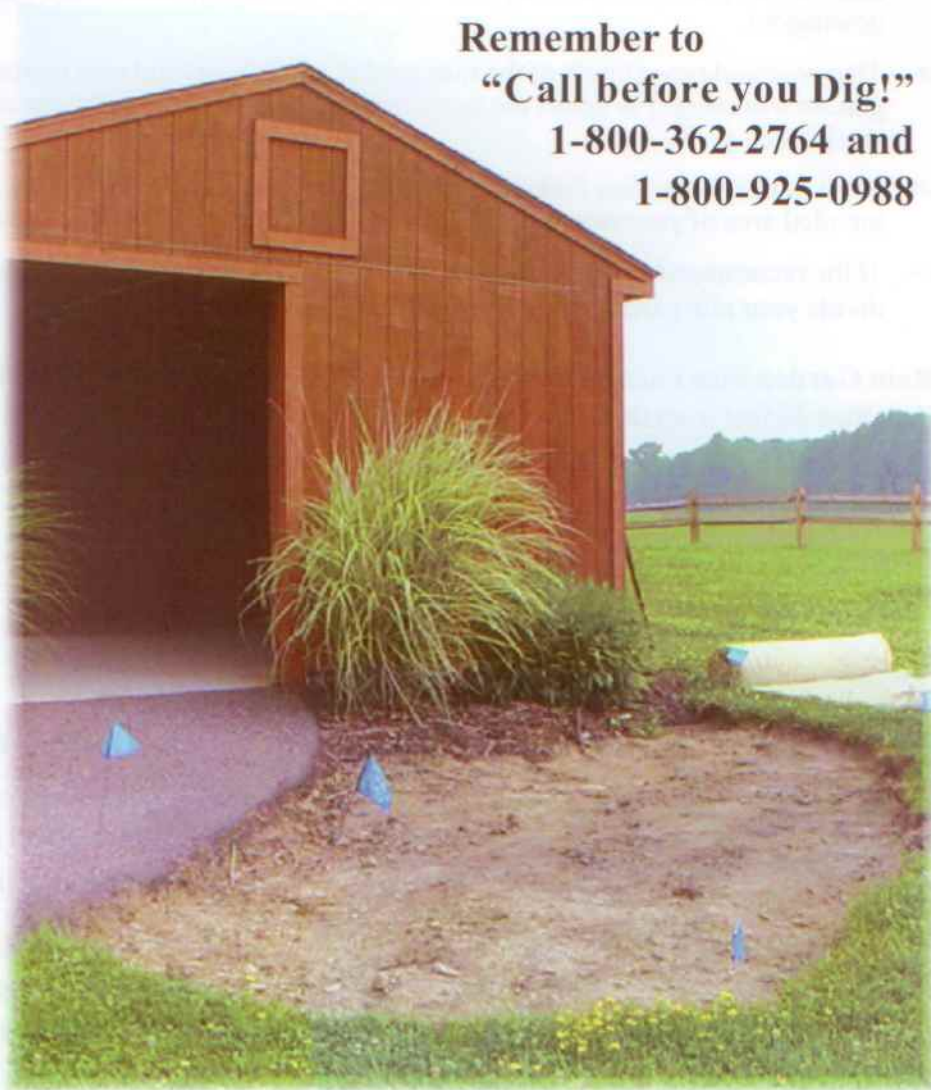
- Tape measure
- Shovel
- Rake
- Carpenter's level
- Wooden stakes or marking flags
- String
- Trowel
- Hand tamp
- Flat board, at least six feet long (optional)
- Small backhoe (optional)



Building Your Rain Garden

By now you should have determined where to build your rain garden and how big it will be, so it's time to start digging! This section of the manual will guide you through the process of properly excavating and leveling your rain garden.

Remember to
"Call before you Dig!"
1-800-362-2764 and
1-800-925-0988



Preparing the Site

Are you building your rain garden in your existing lawn? Your digging time can be reduced by killing the grass first. There are a variety of herbicides available that can be used. However, covering the lawn with black plastic, several layers of newspaper, or carpet squares to block sunlight is just as effective at killing grass and is much more environmentally friendly.

Digging In!

Start by determining the perimeter of your garden. This can be done by placing stakes, flags, or a garden hose along the edge of where your rain garden will be. Doing this will give you a defined area in which to excavate.

Once you have defined the perimeter of your rain garden, you can start digging! Remove the sod from the whole area, including the berm. Also, make sure that your rain garden has a flat, level bottom.

If the lawn is almost flat, dig to approximately the same depth throughout the rain garden. If the lawn has a slope, the high end of the rain garden will need to be dug out. The excavated soil can then be used to build up the low end. Continue digging until your rain garden is nearly level and at the appropriate depth. See Figures 3a and 3b on page 11 for clarification.

While digging the rain garden to the right depth, place the excavated soil at the downhill edge to construct a berm. A berm is a low earthen mound surrounding three sides of the rain garden which helps hold water during a storm.



You can dig your rain garden by hand or use a backhoe. If you use a backhoe to dig your garden, avoid driving it on the garden site to minimize soil compaction.

LEVELING YOUR RAIN GARDEN

Rain gardens have a flat, level bottom so that water is evenly distributed throughout the garden allowing for maximum percolation. If rain gardens are bowl shaped, too much water will concentrate in one place and it will not function as intended.

One way to check if your rain garden is level is to visually assess it. To take a more accurate approach to leveling your rain garden, follow the steps listed below.

- When your rain garden is dug out to the appropriate depth, lay a board in the rain garden with the carpenter's level on it. Correct the spots that aren't level by adding soil to the low places and removing soil from the high places.
- Move the board to different places throughout the rain garden, filling and digging as necessary to level the surface.



WHERE TO DIG AND WHERE TO PUT THE SOIL YOU'VE DUG

Figure 3a - Between 3% and 8% slope lawn

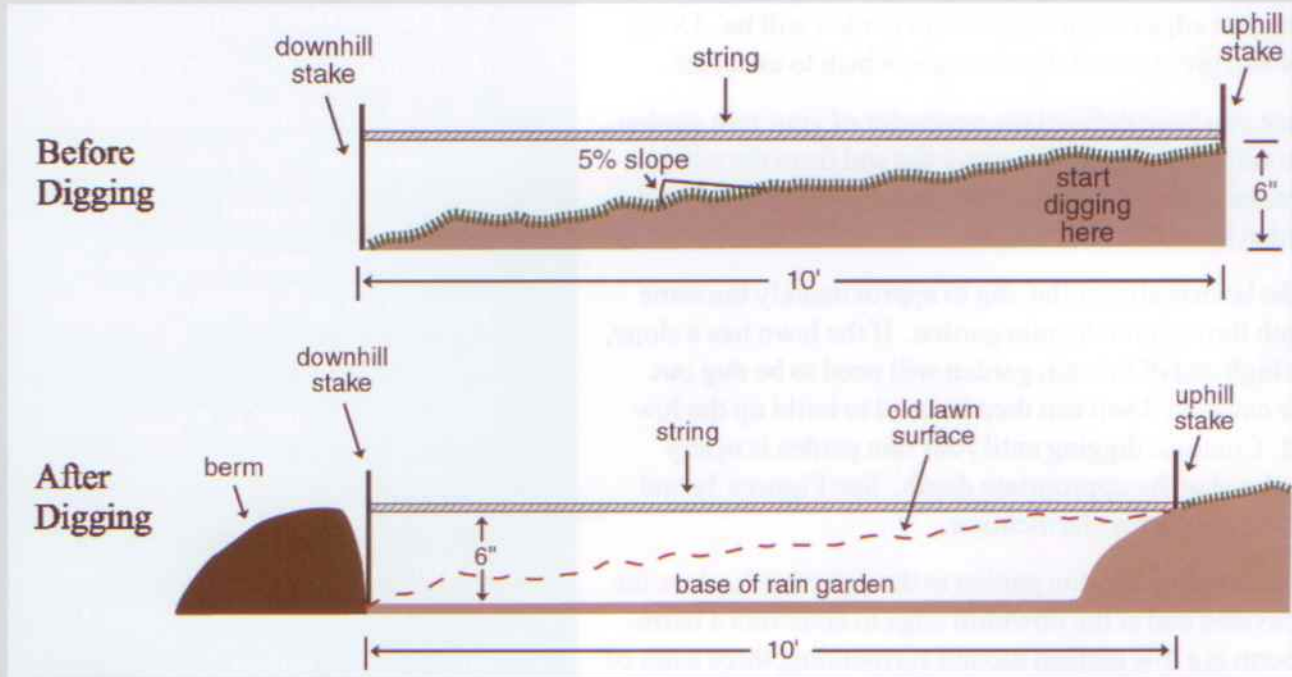
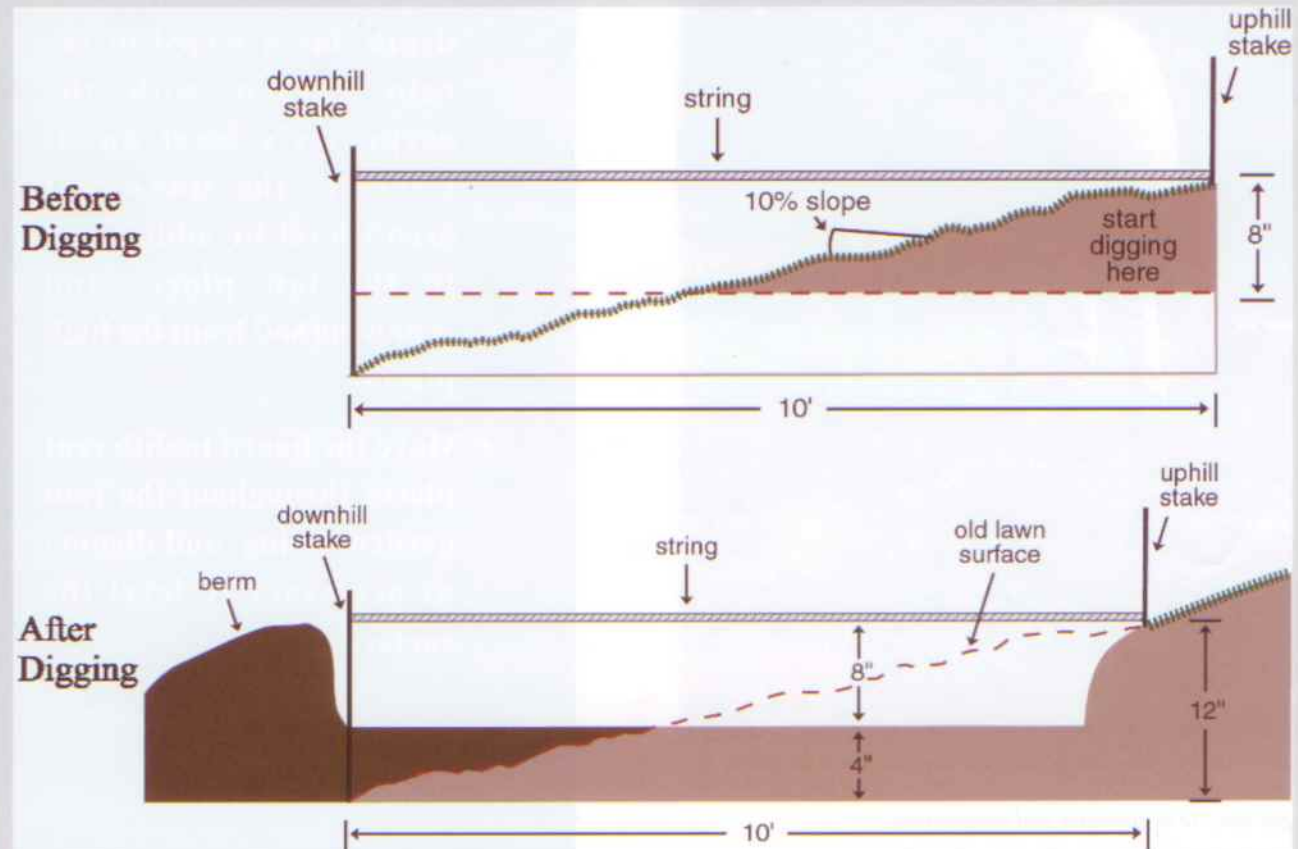


Figure 3b - Between 8% and 12% slope lawn



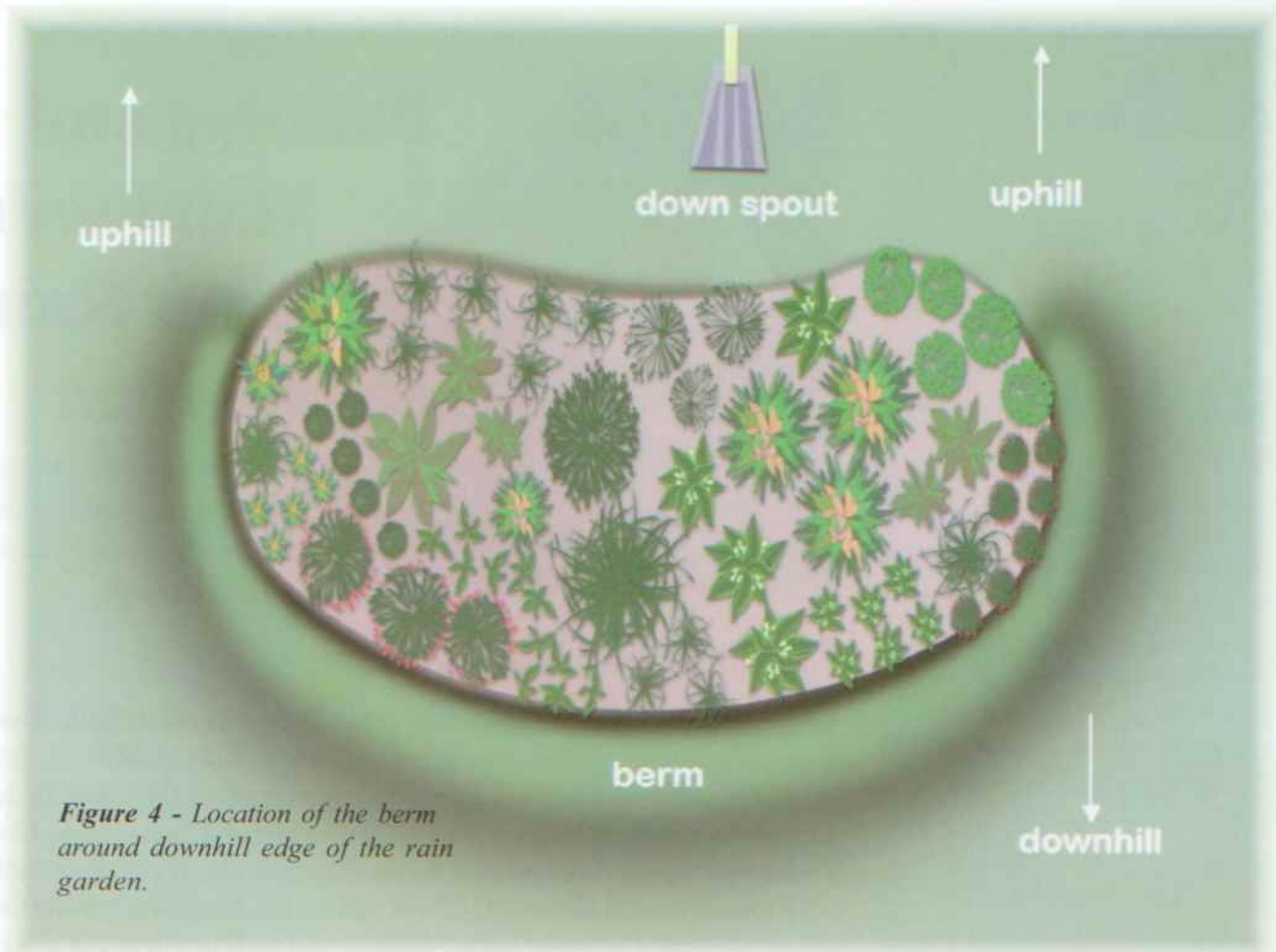


Figure 4 - Location of the berm around downhill edge of the rain garden.

Making the Berm

Water flowing into a rain garden will naturally escape from the downhill edge. A berm, which is a gentle rise along the bottom and sides of the rain garden, will help keep the water in the garden. The berm needs to be highest at the downhill side and gradually taper off around the sides.

There should be plenty of soil from digging out the rain garden to use for a berm. Roughen the existing soil surface before building the berm to strengthen and maximize contact between soil layers. Shape the gentle rise into a smooth, level ridge about a foot across and six inches high.

Ensure that it is well constructed by using a hand tamp to compact the soil.

The berm should have very gentle side slopes so that the rain garden smoothly integrates into the surrounding lawn.

To prevent erosion, cover the berm with mulch or grass.

For the best protection, use straw or erosion control matting to protect the berm while grass is taking root. If you do not want grass on the berm, you can also plant native species that are dry-tolerant.

In some areas, local permits may be required to build a berm or change the grade of your property. Please check with your community to ensure that your rain garden will comply with local regulations.



Erosion control matting made of coconut fiber is carefully placed along the berm to prevent erosion on the downhill side of the rain garden.

