



# How to Build a Rain Garden

Homeowners in many parts of the country are catching on to rain gardens – landscaped areas planted with wild flowers and other native vegetation that soak up rain water, coming from a roof, driveway or other impervious surface. In a storm, the rain garden fills with a few inches of water which slowly filters into the ground rather than running off into storm drains. Compared to a conventional patch of lawn, a rain garden allows about *30% more water to soak into the ground.*

## Why are rain gardens important?

As cities and suburbs grow and replace forests and agricultural land, increased stormwater runoff from impervious surfaces becomes a problem. Stormwater runoff from developed areas increases flooding, carries pollutants from streets, parking lots and even lawns into local streams and lakes, and leads to costly municipal improvements in stormwater treatment plants.

By reducing stormwater runoff, rain gardens can play a valuable part in changing these trends. While one individual rain garden may seem like a small thing, collectively they produce substantial neighborhood and community environmental benefits. Rain gardens work for us in several ways:

- ☆ Increasing the amount of water that filters into the ground, recharging local and regional aquifers;
- ☆ Helping protect communities from flooding and drainage problems;
- ☆ Helping protect streams and lakes from pollutants carried by urban storm water – lawn fertilizers and pesticides, oil and other fluids that leak from cars, and numerous harmful substances that wash off roofs and paved areas;
- ☆ Enhancing the beauty of yards and neighborhoods;
- ☆ Providing valuable habitat for birds, butterflies and many beneficial insects.

## Frequently asked questions

### Does a rain garden form a pond?

Not unless you plan it that way. Normally, rain water will soak in so the rain garden is dry between rainfalls. However, some rain gardens can be designed to include a permanent pond, although that type of rain garden is not addressed here.

### Are they a breeding ground for mosquitoes?

No. Mosquitoes need 7 to 12 days to lay and hatch eggs, and standing water in the rain garden will last for a few hours after most storms. Mosquitoes are more likely to lay their eggs in bird baths, storm sewers, and lawns than in a sunny rain garden. Also rain gardens attract dragonflies, which eat mosquitoes!

### Do they require a lot of maintenance?

Rain gardens can be maintained with little effort once the plants are established. Some weeding and watering will be needed for the first two years, and perhaps some thinning will also be needed in later years as the plants mature.

### **Is a rain garden expensive?**

It doesn't have to be. Family and a few friends can provide the labor. The main cost will be purchasing rock if that is used in the rain garden and in purchasing the plants. These costs can be minimized by using rocks and plants that might already exist in your yard, taking advantage of fall sales, or using rocks and plants from your neighbor's yard (with your neighbor's permission, of course!).

## **Designing your Rain Garden**

While rain gardens are a highly functional way to help protect water quality, they should still be an attractive part of your yard and neighborhood. Think of the rain garden in the context of your home's overall landscape design. Here are a few tips:

- ☆ When choosing plants for the garden, it's important to consider the height of each plant, its bloom time, color, and 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 rain garden looking interesting even when few flowers are in bloom.
- ☆ When laying plants out, randomly clump individual species in groups of 3 to 7 plants to provide a bold statement of color. 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 plants. This allows necessary root competition that permits 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 create a thick underground root matrix that keeps the entire plant community in balance. In fact, 80% of the plant mass in native prairie communities is underground. Once the rain garden has matured and your sedges, rushes and grasses have established a deep, thick root system and weeds will naturally decline.
- ☆ Consider enhancing the rain garden by using local or existing stone, ornamental fences, trails and garden benches. This will help give the new garden an intentional and cohesive look that the neighbors will appreciate.

## **Planning Your Rain Garden**

### **1. Where should the rain garden go?**

Home rain gardens can be in one of two places – near the house to catch only roof runoff or farther out in the lawn to collect water from the roof and other hard surfaces, and the lawn. To help decide where to put a rain garden, consider these points:

- ☆ Carefully consider how the rain garden can be integrated into existing and future landscaping. Pay attention to views from inside the house as well as those throughout the landscape.
- ☆ The rain garden should be at least 10 feet from the house so infiltrating water doesn't seep into the foundation.
- ☆ Determine how far or how close you want your rain garden to outdoor gathering spaces or other play areas. Why not locate it near a patio where you can take advantage of the colors and fragrances for hours on end!
- ☆ Do not place the rain garden directly over a septic system.
- ☆ It is better to build the rain garden in full or partial sun, not directly under a big tree.
- ☆ Putting the rain garden in a flatter part of the yard will make digging much easier. For example, a rain garden 10 feet wide on a 10% slope must be 12 inches deep at the top end to be level...unless you import topsoil or use the cut-and-fill method.

## 2. How big should the rain garden be?

The surface area of the rain garden can be almost any size, but time and cost will be important considerations for this decision. However, any reasonably sized rain garden will provide some stormwater runoff control.

- ☆ A typical residential rain garden ranges from 100 to 300 square feet. Rain gardens can be smaller than 100 square feet, but very small gardens will have little plant variety. Rain gardens that are larger than 300 square feet take a lot more time to dig, are more difficult to make level, and could be hard on your budget.
- ☆ The size of the rain garden will depend on:
  - a. **...how deep the garden will be;**

A typical rain garden is between 4" and 8" deep. One more than 8" deep might allow water to stand too long, look like a hole in the ground, and present a hazard for someone stepping into it. A rain garden less than 4" deep will need an excessive amount of surface area to provide enough water storage to handle the runoff from larger storms. No matter what the depth of the rain garden, the goal is to keep it level. Digging a very shallow rain garden on a steep slope will require bringing in extra topsoil to raise the down-slope side of the garden to the same height as the up-slope side. The slope of the yard should determine the depth of the rain garden. Here's how to find the slope of your lawn.

    - ✓ Pound one stake in at the uphill end of your rain garden site and pound another stake in about 15' away at the downhill end.
    - ✓ Tie a string to the bottom of the uphill stake and run the string to the downhill stake.
    - ✓ Using a string level or carpenter's level, level the string and tie it to the downhill stake.
    - ✓ Measure the distance between the two stakes (the width).
    - ✓ Next measure the distance on the downhill stake between the ground and string (the height).
    - ✓ Divide the height by the width and multiply this by 100 to find the percent slope. If this is more than 12%, it's best to find another, less steep site or talk to a professional landscaper.

- ✓ Using this percentage, select the depth of your rain garden from the following options:
  - If the slope is less than 4%, it is easiest to build a 3" to 5" deep rain garden.
  - If the slope is between 5% and 7%, it is easiest to build a 6" to 7" deep rain garden.
  - If the slope is between 8% and 12%, it is easiest to build a garden about 8" deep.

**b. ...what type of soils the garden will be planted in;**

After choosing the depth of your rain garden, identify the soil type – sand, loam, or clay. Sandy soils have the fastest infiltration, clay soils have the slowest, and loamy soils are in the middle. Since clay soils take longer to absorb water, rain gardens in clay soil must be bigger than rain gardens in sandy or loamy soil.

- ☆ If the soil feels very gritty and coarse, you probably have sandy soil.
- ☆ If your soil is smooth but not sticky, you probably have loamy soil.
- ☆ If it is very sticky and clumpy, you probably have clay soil.

**c. ...how big is the roof and/or driveway that will drain into the garden;**

The next step in choosing your rain garden size is to find the area that will drain to the rain garden...the drainage area. As the size of the drainage area increases so should the size of the rain garden. There is some guesswork in determining the size of a drainage area, especially if there is a lawn up-slope from the proposed rain garden site. Use the suggestions below to estimate the drainage area without spending a lot of time.

- ✓ *For a rain garden that will be less than 30 feet from the downspout*
  - When the rain garden is close to the house, almost all water will come from a roof downspout. Walk around the house and estimate what percent of the roof feeds to that downspout. For example, if your house has four downspouts, each takes about 25% of the roof's runoff.
  - Next find your home's footprint, the area of the foundation. Use a tape measure to find your house's length and width. Then multiply the two together to find the approximate area of your roof.
  - Finally, multiply the roof area by the percent of the roof that feeds to the rain garden downspout (25% if there are 4 downspouts). This is the roof drainage area.
- ✓ *For a rain garden that will be more than 30 feet from the downspout*
  - Find the roof drainage area for your rain garden using the same steps as for a rain garden less than 30' from the downspout (see above).
  - If a significant area of the yard is uphill from the rain garden, this area will also drain into it. In this case, calculate the yard drainage area and add it to the roof drainage area by following these steps.
    - Stand where your rain garden will be and identify the parts of the yard sloping into it that will drain into it.
    - Measure the length and width of that uphill yard, and multiply them together to find the yard drainage area.
  - Add the yard drainage area to the roof drainage area to find the total drainage area.

☆ Having estimated the drainage area, soil type, and depth for your rain garden, use Table 1 (if the rain garden is less than 30' from the downspout), or Table 2 (if it is more than 30' from the downspout). Follow the directions below to determine the surface area of your rain garden.

**Table 1 Rain gardens less than 30 feet from downspout.**

	<u>Size Factor</u>		
	3-5 in. deep	6-7 in. deep	8 in. deep
Sandy soil	0.19	0.15	0.08
Loamy soil	0.34	0.25	0.16
Clay soil	0.43	0.32	0.20

**Table 2 Rain gardens more than 30 feet from downspout.**

	<u>Size Factor</u> all depths
Sandy soil	0.03
Loamy soil	0.06
Clay soil	0.10

- ✓ First find the *size factor* for your soil type and rain garden depth.
  - ✓ Multiply the *size factor* by the drainage area calculated for your rain garden. This figure will be the recommended rain garden area for your garden.
  - ✓ If the recommended rain garden area is much more than 300 square feet, divide your planned rain garden into smaller ones.
- ☆ Determine how long and how wide the rain garden should be
- ✓ *Think about how the rain garden will catch water.* Runoff will flow out a downspout and should spread evenly across the entire length of the rain garden. It must be as level as possible so water doesn't pool at one end and spill out before it has a chance to infiltrate into the soil. The length of the rain garden should be perpendicular to any slope so the garden catches as much water as possible. However, it should be wide enough for the water to spread evenly over the whole bottom of the rain garden and provide enough space to include a variety of plants. A good rule of thumb is that the rain garden should be about twice as long as it is wide.
  - ✓ *Think about the slope of your yard.* Big rain gardens and rain gardens on steep slopes will need to be dug very deep at one side in order to be level. If the rain garden is large and on a slope, it may be necessary to bring in additional soil to fill the downhill side. Any rain garden should have a maximum width of about 15 feet, especially for yards with more than an 8% slope. To determine the length of the rain garden:
    - ✓ Look at the size and location of existing lawn and landscaping and decide how wide you want your rain garden to be.
    - ✓ Divide the total size of your rain garden (based on the drainage area calculation above) by the width you want to determine how long your rain garden should be.

## Building Your Rain Garden

Now that the size and location for the rain garden have been decided, it's time to get a shovel and start digging! Working alone, it will take about six hours to dig an average-size rain garden. If friends help it will go much faster, possibly taking only an hour or two. The following tools will help in building the rain garden. Some are optional.

- ✓ Tape measure
- ✓ Shovels
- ✓ Rakes
- ✓ Trowels
- ✓ Carpenter's level
- ✓ Wood stakes, at least 2 ft long
- ✓ String
- ✓ 2x4 board, at least 6 ft long (optional)
- ✓ Small backhoe with caterpillar treads (optional and only for BIG jobs)

## 1. Digging the rain garden

While digging the rain garden to the correct depth, heap the soil around the edges to create a *berm* (a low "wall" around three sides of the rain garden that will hold rain water). In steeper yards, the lower, downhill part of the rain garden can be filled in with soil from the uphill side; you may even need to bring extra soil in to make the berm high enough.

- ☆ Start by laying string around the perimeter of your rain garden. Keep moving it around until you are happy with the shape. Remember that the berm will go outside the string.
- ☆ Next, put stakes along the uphill and downhill sides, lining them up so that each uphill stake has a stake directly downhill. Place stakes every 5 feet along the length of the rain garden.
- ☆ Starting at one end of the rain garden, tie a string to the uphill stake at ground level. Then tie the string to the stake directly downhill from the uphill stake, and level the string is. Do the same every 5 feet at each set of stakes, one string at a time.
- ☆ Start digging at the uphill stake. Measure down from the string and dig until you reach the depth you want the rain garden to be. If the rain garden is to be 4" deep, then dig 4" down from the string on the uphill side.
- ☆ If your yard is almost flat, you will be digging at the same depth throughout the rain garden and using all the excess soil for the berm. However, if your yard is on a slope, you will need to dig more soil out of the high end of the rain garden than the low end, and some of the soil from the upper end may be needed to raise the soil level of the lower end.
- ☆ Continue digging and filling, one section at a time, across the length of your rain garden until it is as level as possible.
- ☆ In any garden, compost will help the plants become established and now is the time to mix it in. Dig the rain garden a bit deeper and add enough compost to bring the soil back up to the desired level. Using a rototiller can make mixing much easier, but isn't necessary.
- ☆ Make sure the water from the downspout will run into the garden by either digging a shallow *swale* or by attaching an extension to the downspout.

## 2. Making the Berm

Water flowing into the rain garden will naturally try to run off the downhill edge. A *berm* keeps the water in the garden, acting as a 'wall' across the bottom and sides of the rain garden.

- ☆ The berm will need to be highest at the downhill side, becoming lower on the sides and gradually taper off by the time it reaches the top of the rain garden.
- ☆ In a garden with a slight slope, there should be plenty of soil from digging out the rain garden to use for the berm. In a garden with a steeper slope, most of the soil from the uphill part of the rain garden will probably be used to fill in the downhill part, and additional soil may have to be brought in to form the berm.
- ☆ After shaping the berm into a smooth ridge about a foot across, compact the soil.
- ☆ The berm should have very gently sloping sides; this helps smoothly integrate the rain garden with the surrounding landscape and also makes the berm less susceptible to erosion.
- ☆ To further prevent erosion, cover the berm with mulch and drought-tolerant plants.

### 3. Planting the rain garden

- ☆ Select plants that have well established root systems. Plants in the pond area should be able to tolerate soggy conditions in winter and dry summers. Plants selected for the berm should be drought tolerant.
- ☆ Use only nursery-propagated plants; **do not collect plants from the wild.**
- ☆ Make sure to have a rough plan for where each plant will go based on mature height and color.
- ☆ Lay out the plants as planned keeping them in their containers until they are actually planted; this will prevent them from drying out before they get in the ground.
- ☆ Dig each hole twice as wide as the plant plug and deep enough to keep the crown of the young plant slightly above the existing grade.
- ☆ Make sure the crown of the plant is level and then fill the hole with soil and firmly tamp soil around the roots to avoid air pockets.
- ☆ Apply a 3"- 4" deep layer of mulch evenly over the bed but avoid burying the crowns of new transplants.
- ☆ Water immediately and continue to water regularly until plants are established (up to two years). Once your plants are established, you should not have to give your rain garden any summer water.