

# 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, mainly from the roof of a house or other building. The rain garden fills with a few inches of water after a storm and the water slowly filters into the ground rather than running off to a storm drain. 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 storm water runoff from impervious surfaces becomes a problem. Storm water 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 storm water treatment structures.

By reducing storm water runoff, rain gardens can be a valuable part of changing these trends. While an 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, which recharges 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?**

**No.** The rain water will soak in so the rain 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).

**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 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 after the plants are established. Some weeding and watering will be needed in the first two years, and perhaps some thinning in later years as the plants mature.**

**Is a rain garden expensive?**

**It doesn't have to be. A family and a few friends can provide the labor. The main cost will be purchasing the plants, and even this cost can be minimized by using some native plants that might already exist in the yard or in a neighbor's yard.**

## Designing your Rain Garden

While rain gardens are a highly functional way to help protect water quality, they are also gardens and should 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 native plants for the garden, it is important to consider the height of each plant, bloom time and color, and its 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 wildflowers are in bloom.
- ✓ When laying plants out, randomly clump individual species in groups of 3 to 7 plants to provide a bolder statement of color. Make sure to repeat these individual groupings to create repetition and cohesion in a planting. This will provide a more traditional formal look to the planting.
- ✓ Try incorporating a diverse mixture of sedges, rushes, and grasses with your flowering plants. 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 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, there will be less change in species location from year to year, 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 and provide a feeling of neatness that the neighbors will appreciate.

## Planning Your Rain Garden

### 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 on the lawn to collect water from the lawn and roof. 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.
- ☆ Don't put the rain garden in a part of the yard where water already ponds. The goal of a rain garden is to encourage infiltration, and your yard's wet patches show where infiltration is slow.
- ☆ 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 to be level, unless you import topsoil or use cut and fill.

### 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 this decision. Any reasonably sized rain garden will provide some storm water runoff control.
- ☆ A typical residential rain garden ranges from 100 to 300 square feet. However, 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:
  1. **How deep the garden will be**

A typical rain garden is between four and eight inches deep. A rain garden more than eight inches deep might pond water too long, look like a hole in the ground, and present a hazard for someone stepping into it. A rain garden much less than four inches deep will need an excessive amount of surface area to provide enough water storage to infiltrate larger storms.

No matter what the depth of the rain garden, the goal is to keep the garden level. Digging a very shallow rain garden on a steep lawn will require bringing in extra topsoil to bring the downslope side of the garden up to the same height as the up-slope side. The slope of the yard should determine the depth of the rain garden. Find the slope of your lawn by following these steps.

- ✓ Pound one stake in at the uphill end of your rain garden site and pound the other stake in at the downhill end. The stakes should be about 15 feet apart.
- ✓ Tie a string to the bottom of the uphill stake and run the string to the downhill stake.
- ✓ Using a string level or the carpenter's level, make the string horizontal and tie the string to the downhill stake at that height.
- ✓ Measure the width (in inches) between the two stakes.
- ✓ Next measure the height (in inches) on the downhill stake between the ground and string.
- ✓ Divide the height by the width and multiply the result by 100 to find the lawn's percent slope. If the slope is more than 12%, it's best to find another site or talk to a professional landscaper.
- ✓ Using the slope of the lawn, select the depth of the rain garden from the following options:
  - If the slope is less than 4%, it is easiest to build a 3 to 5-inch deep rain garden.
  - If the slope is between 5 and 7%, it is easiest to build a 6 to 7-inch deep rain garden.
  - If the slope is between 8 and 12%, it is easiest to build one about 8 inches deep.

## **2. What type of soils the garden will be planted in**

After choosing a rain garden depth, identify the lawn's soil type as sand, Loam, or clay. Sandy soils have the fastest infiltration; clay soils have the slowest. 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 have loamy soil. If it is very sticky and clumpy, you probably have clay soil.

## **3. How much roof and/or yard will drain to the garden**

The next step in choosing your rain garden size is to find the area that will drain to the rain garden. 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 a large part of the lawn is up-slope from the proposed garden site. Use the suggestions below to estimate the drainage area without spending a lot of time.

✓ *Rain gardens less than 30 feet from the downspout*

- In this case, where the rain garden is close to the house, almost all water will come from the roof 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% of the roof's runoff.
- Next find your home's footprint, the area of the first floor. If you don't already know it, use a tape measure to find your house's length and width. 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. This is the roof drainage area.

✓ *Rain gardens more than 30 feet from the downspout*

- If there is a significant area of yard uphill that will also drain to the rain garden, add this area to the roof drainage area. First find the roof drainage area using the steps above for a rain garden less than 30' from the downspout.
- Next find the area of the yard that will drain to the rain garden. Stand where your rain garden will be and look up toward the house. Identify the part of the yard sloping into the rain garden.
- Measure the length and width of the uphill yard, and multiply them to find the area.
- Add the yard 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 or Table 2 to determine the rain garden's surface area. Use Table 1 if the rain garden is less than 30 feet from the downspout, and use Table 2 if it is more than 30 feet from the downspout.

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

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

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

	<b>Size Factor, for all depths</b>
<b>Sandy soil</b>	<b>0.03</b>
<b>Loamy soil</b>	<b>0.06</b>
<b>Clay soil</b>	<b>0.10</b>

- Find the size factor for the soil type and rain garden depth.
- Multiply the size factor by the drainage area. This number is the recommended rain garden area.
- If the recommended rain garden area is much more than 300 square feet, divide it into smaller rain gardens.

☆ Next, determine how long and how wide should the rain garden be

- Think about how it will catch water. Runoff will flow out of 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 over before it has a chance to infiltrate. The length of the rain garden should be perpendicular to the slope and the downspout so the garden catches as much water as possible. However, it should still be wide enough for the water to spread evenly over the whole bottom and to provide the space to plant a variety of plants. A good rule of thumb is that the rain garden should be about twice as long (perpendicular to the slope) as it is wide.
- Think about the slope of the yard. Wide rain gardens and rain gardens on steep slopes will need to be dug very deep at one end in order to be level. If the rain garden is too wide, it may be necessary to bring in additional soil to fill the downhill side. Experience shows that making a rain garden about 10 feet wide is a good compromise between the effect of slope and how deep the rain garden should be. Any rain garden should have a maximum width of about 15 feet, especially for yards with more than about an 8 percent slope. To determine the length of the rain garden:
  - ✓ Pick the best rain garden width for your lawn and landscaping.
  - ✓ Divide the size of your rain garden by the width to find your rain garden's length.

# Building Your 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 about six hours to dig an average-size rain garden. If friends help it will go much faster, possibly only an hour or two.

The following tools will help in building the rain garden. Some of the tools 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)

## Digging the rain garden

While digging the rain garden to the correct depth, heap the soil around the edge where the berm will be. (The berm is a low "wall" around three sides of the rain garden that holds the water in during a storm.) In a steeper yard the lower part of the rain garden can be filled in with soil from the uphill side; extra soil might also need to be brought in for the berm.

Start by laying string around the perimeter of your rain garden. 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 one stake every 5 feet along the length of the rain garden. Start at one end of the rain 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 5-foot-wide sections, with only one string at a time. Otherwise the strings will become an obstacle. Start digging at the uphill side of the string. Measure down from the string and dig until you reach the depth you want the rain garden to be.

If the rain garden will be four inches deep, then dig four inches down from the string. If the yard is almost flat, you will be digging at the same depth throughout the rain garden and using the soil for the berm. If the yard is steeper, the high end of the rain 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 in the lower end to make the rain garden level.

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 in compost if needed. Using a roto tiller can make mixing much easier, but isn't necessary. If you do add compost, dig the rain garden a bit deeper. To add two inches of compost, dig the rain garden one to two inches deeper than planned.

If the downspout is a few feet from the entry to the rain garden, make sure the water runs into the garden by either digging a shallow swale or attaching an extension to the downspout

## 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 up the sides of the rain garden. The berm will need to be highest at the downhill side, becoming lower up the sides and gradually taper off by the time it reaches the top of the rain garden.

On a flat slope there should be plenty of soil from digging out the rain garden to use for a berm. On 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. 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 prevent erosion, cover the berm with mulch and drought-tolerant plants from the lists provided.

## Planting the rain garden

- ☆ Select drought-tolerant plants that have a well established root system.
- ☆ Use only nursery-propagated plants; do not collect plants from the wild.
- ☆ Make sure to have at least a rough plan for where plants will be planted.
- ☆ Lay out the plants as planned keeping them in containers if possible until they are actually planted to 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 is level and then fill the hole and firmly tamp around the roots to avoid air pockets.
- ☆ Apply a 3" – 4" layer of mulch evenly over the bed but avoid burying the crowns of the new transplants.
- ☆ Water immediately after planting and continue to water regularly until plants are established. Once your plants are established, you should not have to give your rain garden any summer water.