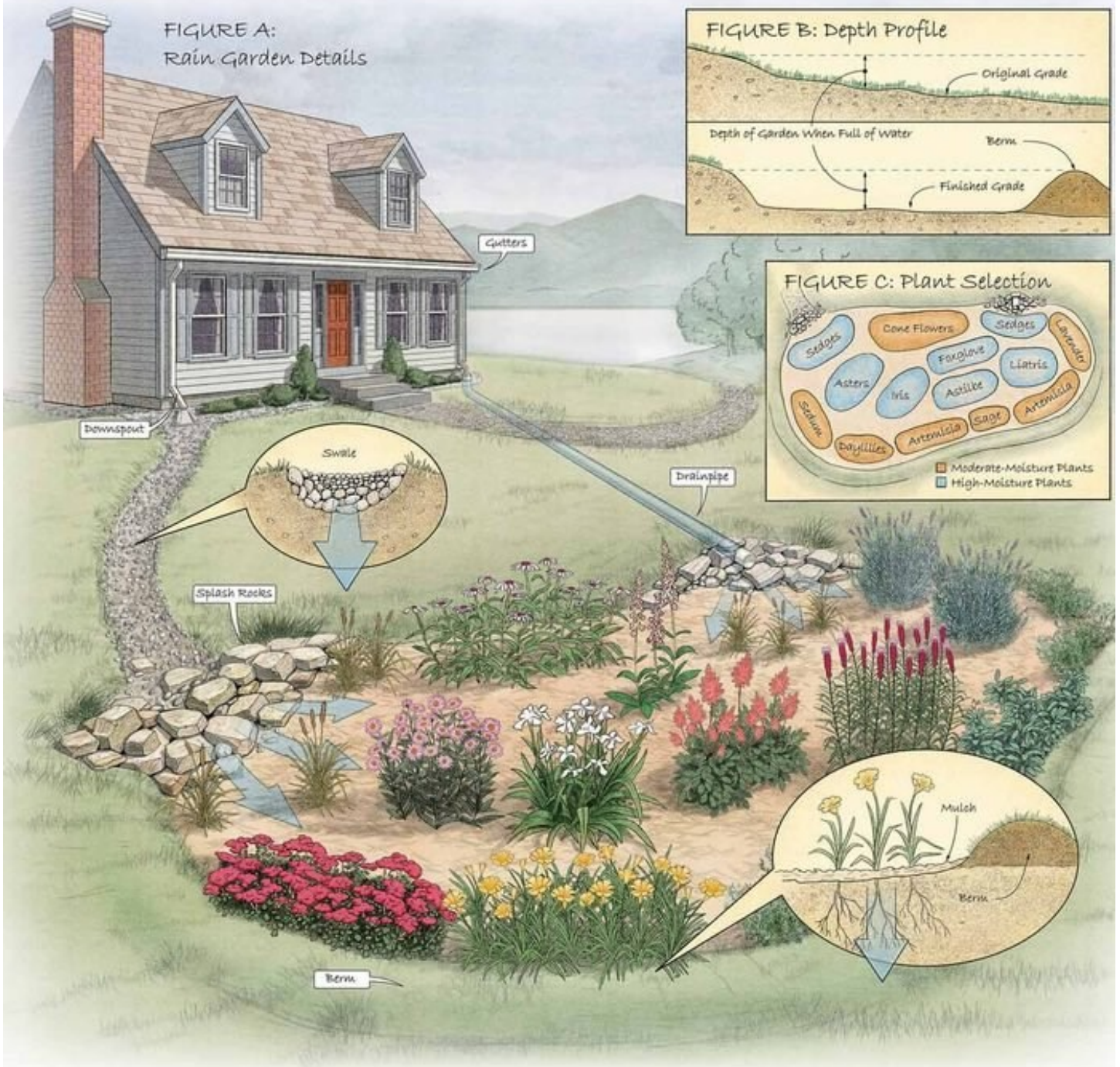


Rain Gardens

A How-To Manual for Homeowners





Hesperaloe parviflora, Red Yucca's towering stalks add a dark pink hue to the garden.

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Rain Gardens

A How-To Manual for Homeowners

Your Personal Contribution to Cleaner Water!

An underutilized rebate offered by the City of Prescott is the Homeowner Rain Garden. City water customers can receive \$3.00 per square foot for each rain garden basin footprint. The rain garden must be a minimum size of 50 square feet and capture 400 square feet of rainwater from the roof. A good rule of thumb to follow, for example, is if the amount of rainwater from the roof is 700 square feet, then the area of the rain garden should measure at least 70 square feet, or 10%. A 165 square foot rain garden will provide a rebate of \$495. You may make it larger if you wish, but bear in mind that the maximum award is \$500.

Why are rain gardens important? As cities grow and replace agricultural land, increased stormwater runoff from impervious surfaces becomes a problem. Stormwater runoff from developed areas increases flooding, and carries pollutants from streets, parking lots and lawns into local streams and lakes. By reducing stormwater runoff, rain gardens can play a valuable part in changing these trends. While an individual garden may seem like a small contribution, 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 stormwater – 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.

Guidelines specific to the City of Prescott are found at the end of this How-To Manual. Applicants must contact the Public Works Department prior to starting the project.

The number to call is Kay Sydow at (928) 777 1645.

Kniphofia uvaria, Red Hot Poker, is a striking addition to the garden.



Frequently Asked Questions

When is the best time to dig a rain garden?

In the springtime, when it is easier to dig, and when the plants are more likely to thrive.

Does a rain garden form a pond?

No. The rainwater will soak in so the rain garden is dry between rainfalls.

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 a bird bath, storm sewer, or yard, 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 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 from a nursery. Even this cost can be minimized by using native plants that might be found in a neighbor's yard who is willing to share. And a maximum \$500 rebate goes a long way toward recouping your investment!



Parthenocissus inserta, Boston Ivy, makes a pretty groundcover

Before You Begin

- Observe how water moves across your property following a heavy storm. This will help you to choose an appropriate location. Don't pick a spot where rainwater ponds.
- Call 811, or log into www.arizona811.com to find out if there are any utilities in the area where you plan to dig.
- Perform a Perc test, using the worksheet provided at the end of this manual, to ensure project location and soil type are suitable. Sandy soils provide the greatest infiltration; silty soils less so, but are still doable. Clay soils should be avoided, but once removed, you may bring in topsoil.
- Draw a rough site plan. (This may have to be modified later, and that's OK.) Include an invoice of proposed native, low water use plants. You may wish to add decorative stone, ornamental fence, or a garden bench. The link to the Prescott Active Management Area list of approved plants can be found [here](#).
- Schedule an on-site meeting before construction begins. Submit the Preapplication paperwork to water.smart@prescott-az.gov.

Useful Tools to Have on Hand

tape measure



shovels



trowels



wooden stakes
(at least 2 ft long)



string



rakes



carpenters level



plywood board
(for leveling)

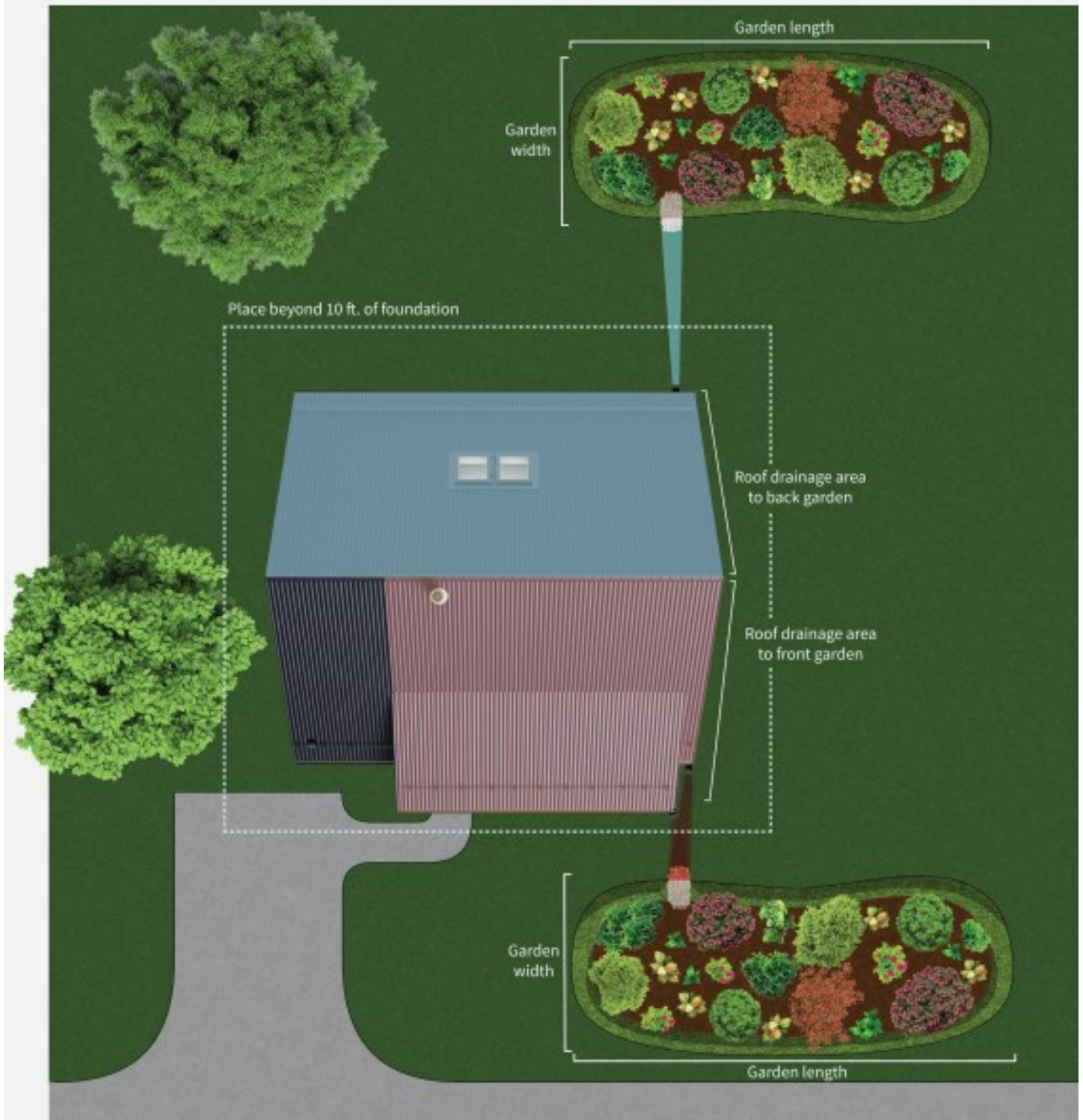


Step 1 Sizing and Siting the Rain Garden

This section of the manual covers rain garden basics—where to put the rain garden, how big to make it, how deep to dig it, and what kind of soils and slope are best.

Figure 1.

Displayed below is an example of two rain gardens placed in front and back of a property, highlighting the rain runoff areas on the roof. Pick a pleasing shape for the rain garden, like crescent, kidney, or teardrop shapes.

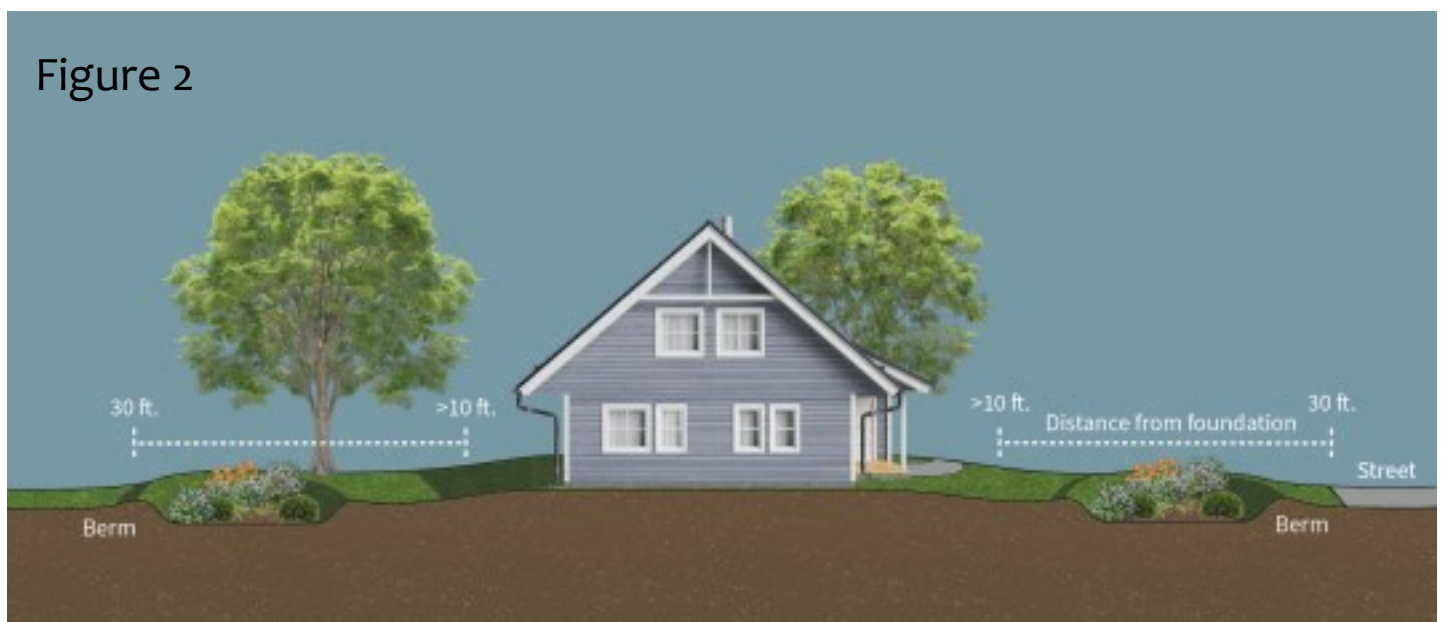


Where should the rain garden go?

- ◆ The rain garden should be at least 10 feet from the house so infiltrating water doesn't seep into the foundation. (Figure 2)
- ◆ It should be at least 5 feet from a septic system, and at least 8 feet from a well.
- ◆ Do not place the raingarden over a sewer lateral or buried utilities. (Call 811 first!)
- ◆ 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 under a big tree, where roots make it difficult to dig or can cause damage to a favorite tree.
- ◆ Putting the rain garden in a flatter part of the yard will make digging much easier. If the location has a slope greater than 12%, it's best to pick a different area of the yard.

How big should the rain garden be?

A typical rain garden ranges from 100 to 300 square feet. A rain garden smaller than 100 square feet doesn't provide much variety in plant color, while a rain garden larger than 300 square feet takes more time to dig, is harder to make level, and could negatively impact your budget.



How big is the roof area draining from the downspout?

1. Walk around your house and count the number of downspouts. Refer to the chart below to calculate what percentage of the roof's rainwater is captured by the number of downspouts.

# of downspouts	Percentage of rainwater capture, estimated
2	50
3	33
4	25

2. Find your home's footprint. Use a tape measure to find the length and width of the first floor. Multiply the two together to find the approximate area of your roof.
3. Finally, multiply the roof area by the percent of the roof that feeds to the rain garden downspout. This is the roof drainage area.

EXAMPLE

Your home is 60 feet by 40 feet, so the roof area is 2400 square feet. Based on the number of downspouts from the table above, use either 50%, 33% or 25% to estimate the downspout drainage area. This example uses 4 downspouts, or 25%.

Roof Area: 60 feet by 40 feet = 2400 square feet

Drainage Area: 2400 square feet x 0.25 = 600 square feet

Rain Gardens within 30 feet of the Downspout

When the rain garden is close to the house, that is, within 30 feet of the downspout, almost all the water will come from the downspout. No adjustment is necessary.

Rain Gardens beyond 30 feet of the Downspout

A rain garden greater than 30 feet from the downspout needs to consider the yard runoff area. For example, a rain garden 40 feet from the downspout, multiplied by the width of the yard, approximately 20 feet, results in an additional 800 square feet.

EXAMPLE

Drainage area = 600 square feet

Lawn area = 20 feet x 40 feet = 800 square feet.

Total Drainage Area = 800 + 600 = 1,400 square feet.

If your yard is rocky or sparsely vegetated, you can ignore this second example.

How deep should the Rain Garden be?

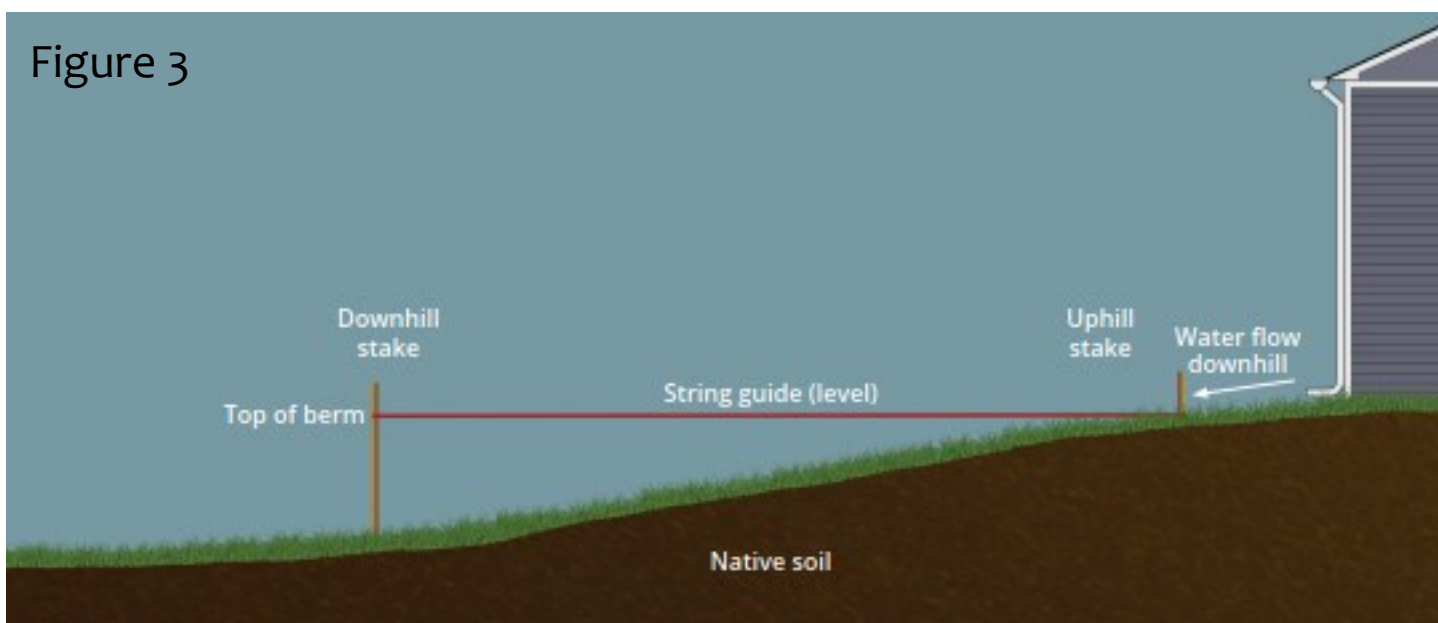
A typical rain garden is between four and eight inches deep. A rain garden more than eight inches deep might pond water too long, look like a hole in the ground, and present a tripping hazard for somebody stepping into it. A rain garden less than three inches deep will need a significantly larger amount of surface area to provide enough water storage to infiltrate the 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 extra topsoil to bring the downslope part of the garden up to the same height as the up-slope part of the garden. As the slope gets deeper, it is easier to dig the rain garden a little deeper to make it level.

Finding the slope

The slope of the yard should determine the depth of the rain garden. Find the slope of your yard by following these steps. (See Figure 3)

1. 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 at least 15 feet apart.
2. Tie a string to the bottom of the uphill stake and run the string to the downhill stake.
3. Using a string level or a carpenter's level, make the string horizontal and tie the string to the downhill stake at that height.
4. Measure the width, in inches, between the two stakes.



EXAMPLE

You measure the length of the string between the stakes; it is 180 inches long. The level string is tied to the downhill stake 9 inches above the ground. Divide the height by the width to find the lawn's percent slope, then multiply by 100.

$$\frac{\text{height}}{\text{width}} \times 100 = \% \text{ slope} \qquad \frac{9 \text{ inches}}{180 \text{ inches}} \times 100 = 5\% \text{ slope}$$

Using the slope of the yard, 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 ran garden.

If the slope is between 5 and 7%, it is easiest to build one 6 to 7 inches deep.

If the slope is between 8 and 12%, it is easiest to build one 8 inches deep.

So, in this example, dig the rain garden 6 inches deep.

How long and how wide should the rain garden be?

The longer side of the rain garden should face upslope; that is, the length of the rain garden should be perpendicular to the slope and the downspout. This way the garden catches as much water as possible. However, the rain garden should still be wide enough for water to spread evenly over the whole bottom and to provide the space for 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.

To capture 600 square feet of roof runoff, the rain garden should be approximately 150 square feet.

EXAMPLE

If you want a 10-foot wide rain garden:

$$\frac{\text{Rain garden area, sf}}{\text{width}} = \text{length} \qquad \frac{150 \text{ sf}}{10} = 15$$

TIP: If you are siting your rain garden into an existing lawn, an environmentally friendly approach is to place black plastic over the lawn until the grass dies.

Step 2 Building the Rain Garden

Digging the Rain Garden

Start by laying a string around the perimeter of the garden. The berm will go outside the string.

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.) On a steeper yard, the lower part of the rain garden can be filled in with soil from the uphill half; extra soil may be needed to complete the berm. The berm should be no higher than 6 inches above the garden. (Figure 4)

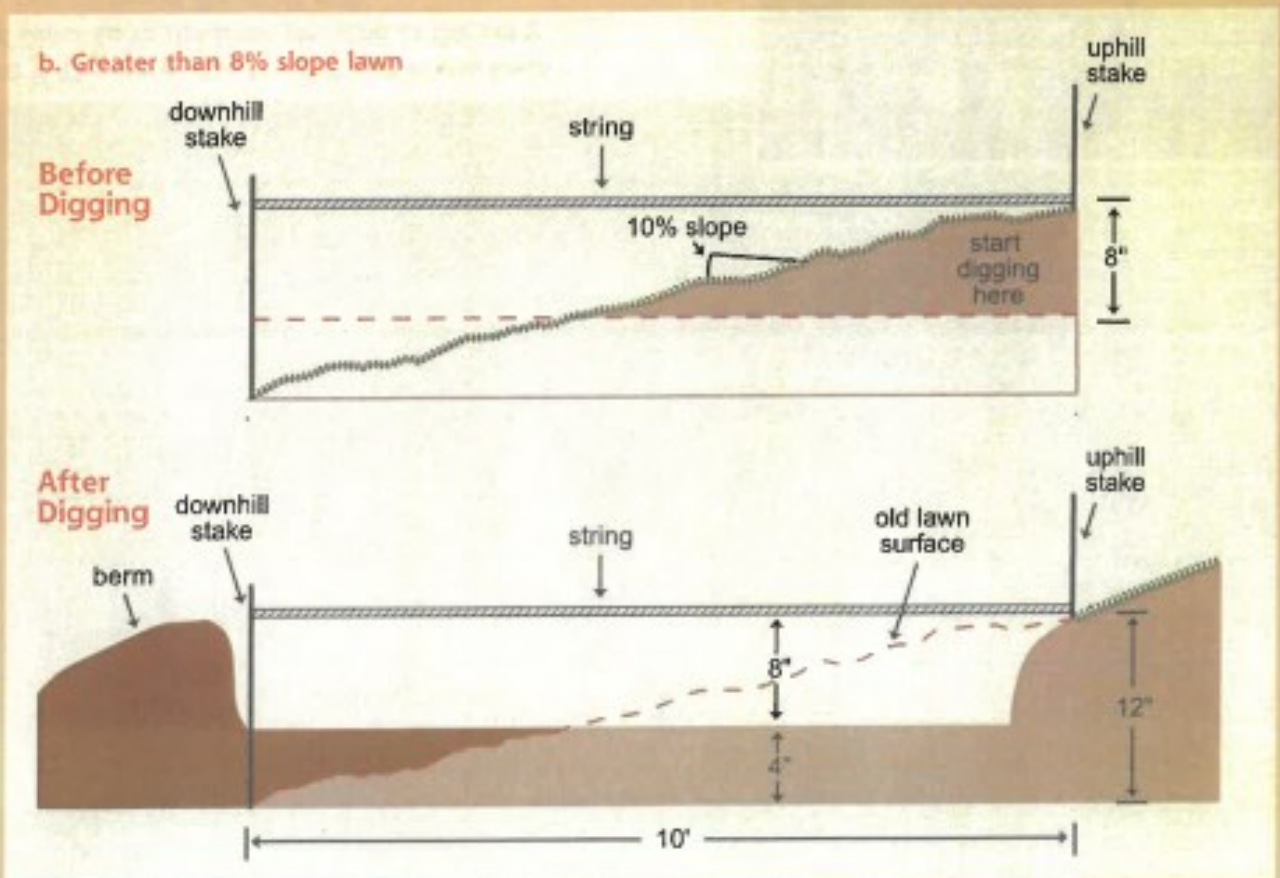
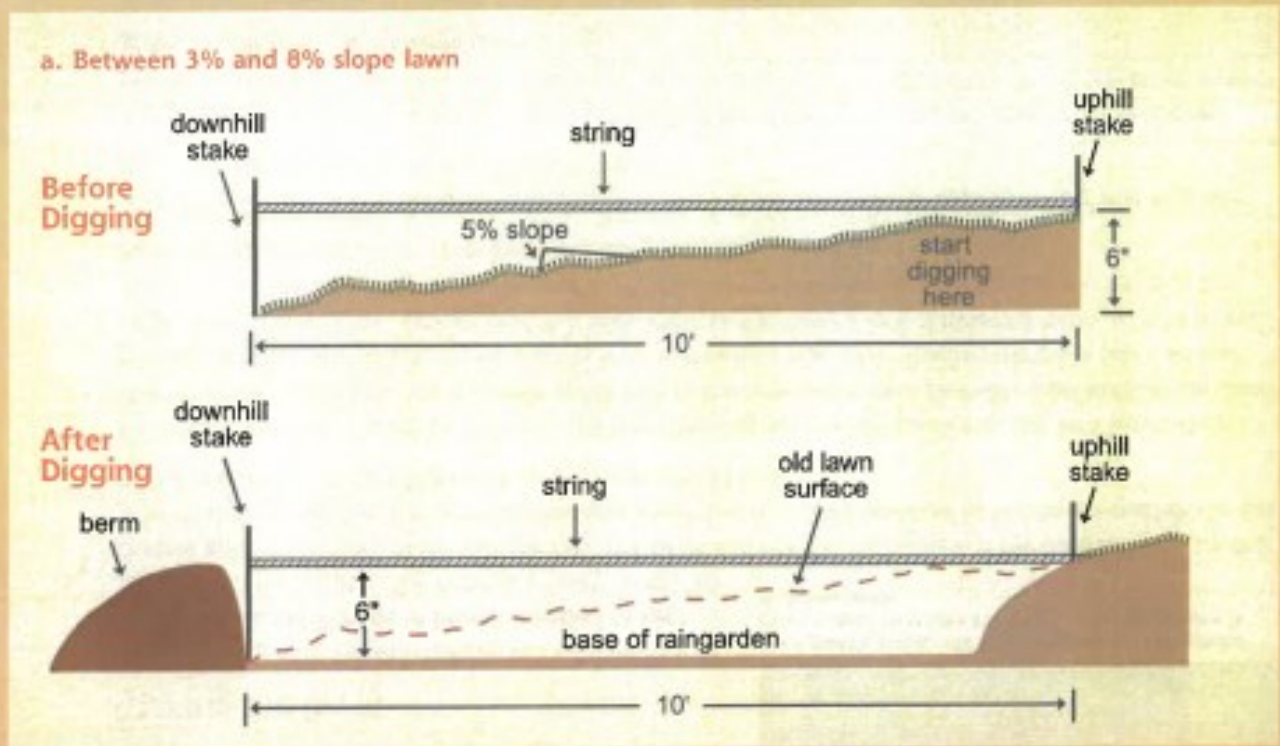
When the whole area has been dug out to the right depth, replace it with fill material. The recommended mix for the fill material is 65% sand, 20% topsoil, and 15% compost. The amount needed will depend on the depth of the hole.

Use a 2 x 5 board with the carpenter’s level on top to make an even surface. Find the spots that aren’t flat. Fill in the low places and dig out the high places.



Achillea millefolium, Yellow Yarrow , lends perennial color

Figure 4 Where to dig and where to put the soil you've dug.





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.



On a gentle slope, soil from digging out the garden can be used to create the berm.

Making the BERM

Water flowing into the rain garden will naturally try to run off the downhill edge. A berm is needed to keep the water in the garden. The berm is a “wall” across the bottom and up the sides of the rain garden. The berm will need to be highest at the downhill side. Up the slopes of the rain garden, the berm will lower and gradually taper off by the time it reaches the top of the rain garden. (See Figure 5)

If your yard was flat, 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 was probably used to fill in the downhill half. This may necessitate bringing in soil from somewhere else.

After shaping the berm into a smooth ridge about a foot across, stomp on it. It is very important to have a well-compacted berm, so stomp hard. The berm should have very gently sloping sides; this helps smoothly integrate the rain garden with the surrounding lawn and makes the berm less susceptible to erosion.

Step 3 Planting and Maintaining the Rain Garden

Planting the rain garden is the fun part! Plants must be native to the Prescott Active Management Area. The link below will take you to the list:

([LINK TO ADWR LOW WATER USE PLANT LIST!](#))

There is also a beautifully illustrated book on the city website that includes many plant options that fulfill the requirements. The link to the Plant booklet is:

([LINK TO PLANT BOOKLET](#))

Fill material must be a mix of 65% sand, 20% topsoil, and 15% compost. The amount to use will depend on how deep you have dug the rain garden.

Choose plants that have a well established root system. Usually one or two-year-old plants will have root systems that are beginning to circle or get matted at the bottom of the container; these will work fine. Use only nursery-propagated plants; do not collect plants from the wild.

Have a rough plan in mind for which plants go where. Lay out plants one foot apart, keeping them in the containers if possible until they are actually planted to prevent drying out.

Dig each hole twice as wide as the plant plug and deep enough to keep the crown of the young plant level with the existing grade (just as it was growing in the cell pack or container). Make sure the crown is level, and then fill the hole and firmly tamp around the roots to prevent air pockets.

Apply undyed mulch evenly over the bed approximately two to three inches thick, but avoid burying the crowns of the new transplants. Mulch can be obtained from the City of Prescott Transfer Station. Call (928) 777-1116 to check for availability.

Stick plant labels next to each grouping. This will help to identify the young plants from non-desirable species (weeds).

Water immediately after planting and continue to water twice a week until the plugs are established. (This may not be necessary during the rainy season.) Once the plants are established, you should not have to water.

If a downspout extension is needed, pvc pipe must be firmly attached and buried at a 1 to 2 degree downward slope away from the house. It should enter the garden above ground into the stone outfall protection area.



RAIN WATER HARVESTING APPLICATION

1. CONTACT INFORMATION

Name: _____

Email: _____

Project Address: _____ Zip Code: _____

Phone: _____ Utility Billing Account #: _____

2. PROJECT INFORMATION (estimates are OK)

Do-It-Yourself (DIY): _____ or Landscape Architect: _____

Roof drainage area: _____ square feet

Rain garden project area: _____ square feet

Cost: \$ _____

3. REQUIRED APPLICATION MATERIAL

Perc Test Worksheet; test rate: _____ inches per hour

Design Sketch illustrating all project requirements

Itemized invoice with receipts

Before Photos

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PERCOLATION TEST WORKSHEET

Name: _____

Project Address: _____

Overview:

A percolation test, or perc test, determines the speed that water drains from the soil at a site. If the soil does not drain within 36 hours, the project will not function properly. Sandy soils provide the best drainage, although silty soils may work almost as well. Clay soils should be avoided, but don't be deterred, as you can always purchase sandy soil from a local landscaping company.

Materials Needed:

digging tool, like a shovel or post-hole digger
 measuring tool, such as a yard stick or rule, and a reference stick
 water source, a hose or bucket of water
 worksheet and pencil

CAUTION: Know where your utilities are before you dig. Visit www.Arizona811.com at least two days in advance to have public utility lines marked prior to the perc test.

Step 1: Dig a hole 6 inches deep by 6 inches wide in the proposed rain garden location.

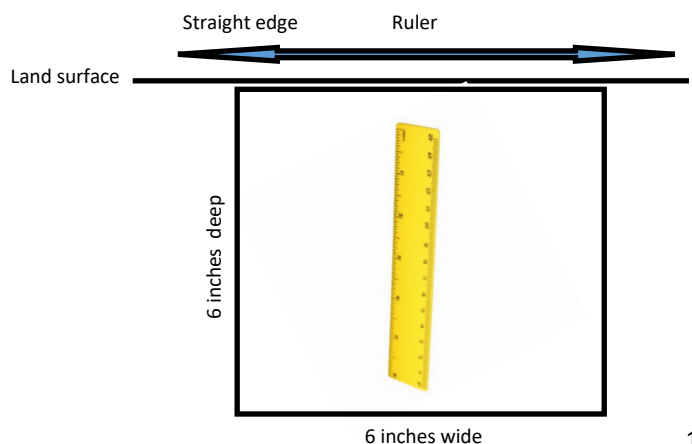
Step 2. Fill the hole with 6 inches of water and let it sit overnight. This saturates the soil and gives a more accurate test reading.

Step 3. Refill the hole with water the next day.

Step 4. Measure how much the water drops every hour. Lay a straight edge across the top of the hole. Then, use a tape measure to determine the water level.

PERC TEST RESULTS

Hour 1 _____ inches
 Hour 2 _____ inches
 Hour 3 _____ inches
 Hour 4 _____ inches
 Hour 5 _____ inches
 Hour 6 _____ inches



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DESIGN SKETCH REQUIREMENTS

The design sketch may be hand drawn or computer generated, but should illustrate all of the project specific requirements, such as:

- Homeowner's name, address, and utility billing account number;
- Location descriptions, such as front yard, back yard, alley, and street(s);
- Roof drainage area, and any other drainage that may impact the rain garden;
- Location of downspout and downspout extension;
- Rain garden dimensions;
- Outfall protection using large river rock to disburse the water; 3 square foot minimum.

