- Faster snow melt on permeable pavement and drains, reducing winter ice hazards, deicing salt use, and snow removal costs.

Another way to improve your drainage area is to divert flows away from impervious surfaces. This is known as non-rooftop disconnection. Simply direct flow from impervious surfaces onto vegetated areas, where it can soak into or filter over the ground. This will disconnect these surfaces from the storm drain system, reducing runoff volume and pollutants delivered to waterways.

Non-rooftop disconnection is commonly applied to smaller or narrower impervious areas like driveways, open section roads, and small parking lots and depends on several site conditions (e.g., permeable flow path length, soils, slopes, compaction) to function well.

Consider how you can improve your drainage area as you work through the following calculations that will help determine your rain garden's size.

3. Dimensions

To determine the dimensions of your rain garden, you'll need to do a little math to assess the following:

3a. Drainage area
3b. Ponding depth
3c. Rain garden area
3d. Width and length

3a. *Calculate drainage area*

The following five steps will help you determine your drainage area.

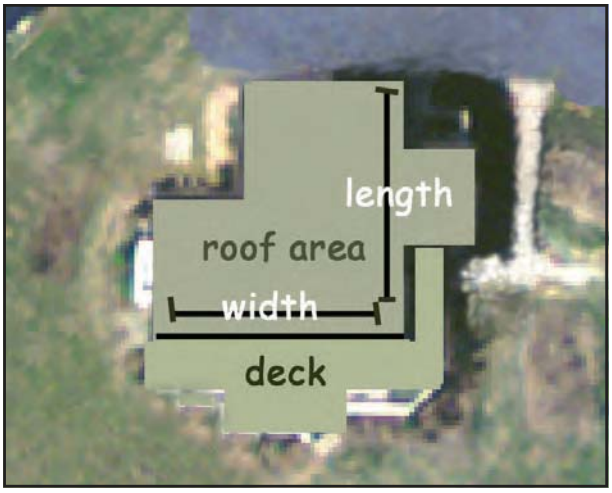

Figure 14. In the example above, the roof is about 60 feet by 40 feet. The total roof area is 2,400 ft².

Figure 15. In the example above, about 25% of the total roof area feeds water to the downspout.

1. Estimate the total roof area (in square feet), **roof area=length x width** (figure 14).
2. Estimate the percentage of roof feeding the downspout (figure 15).
1. The roof drainage area (RDA) equals the total roof area multiplied by the percentage of roof feeding a downspout (see sample calculation below).

   RDA = (40' x 60') x 25%
   RDA = 2,400 ft^2 x 25%
   RDA = 600 ft^2

4. Calculate the ground surface area draining to the site by multiplying its length and width.

ESD Criteria # 7. Target rainfall

During the project planning and preliminary design, site soils and proposed imperviousness are used to determine target rainfall for sizing ESD practices to mimic wooded conditions (refer to page 15).

ESD Criteria # 8. Drainage Area

A rain garden's drainage area serving a single lot in a residential subdivision shall be 2,000 ft^2 or less. The maximum drainage area for all other applications shall be 10,000 ft^2. Micro-bioretention or bioretention should be considered when these requirements are exceeded.

ESD Criteria # 9. Topography

Rain gardens require relatively flat slopes (<5%) to accommodate runoff filtering through the system. Some design modifications can address this constraint through the use of infiltration berms, terracing, and timber or block retaining walls on moderate slopes.

ESD Criteria # 10. Treatment

The surface area of rain gardens shall be at least 2% of the contributing drainage area. The rainfall target value shall be applied to the contributing drainage area (refer to page 15). Temporary storage of the runoff volume may be provided above the facility with a surface ponding depth of 6 inches or less (see figure 11 on page 8) .

Be sure to include all impervious surfaces that drain to your garden. Break the total area into rectangles for easy calculations.

5. The sum of the ground surface area and roof drainage area equals the total drainage area.

3a. Your drainage area is _____ ft^2.

3b. *Determine ponding depth & slope*

Your rain garden's surface ponding depth, as shown in figure 11 on page 8, depends on your site's slope. To determine your slope, you will need a level and to do a little math. Read all of the instructions below before beginning. Figure 16 may also help you visualize the instructions below.

1. Securely drive a stake on the uphill side near the mid-point of the garden's top edge. Drive a second stake just past the downhill edge of the site. The downhill stake must be tall enough to tie the string in the next step.
2. Tie stretchy string near the bottom of the uphill stake. The string should not touch the ground or other objects. Using a string level or carpenter's level, level the string from the uphill stake to the downhill stake.
3. Measure the string's length (in inches) between the stakes.
4. Measure the height (in inches) of the downhill stake from the string to the ground.
5. To calculate the slope of your site, divide the height by the

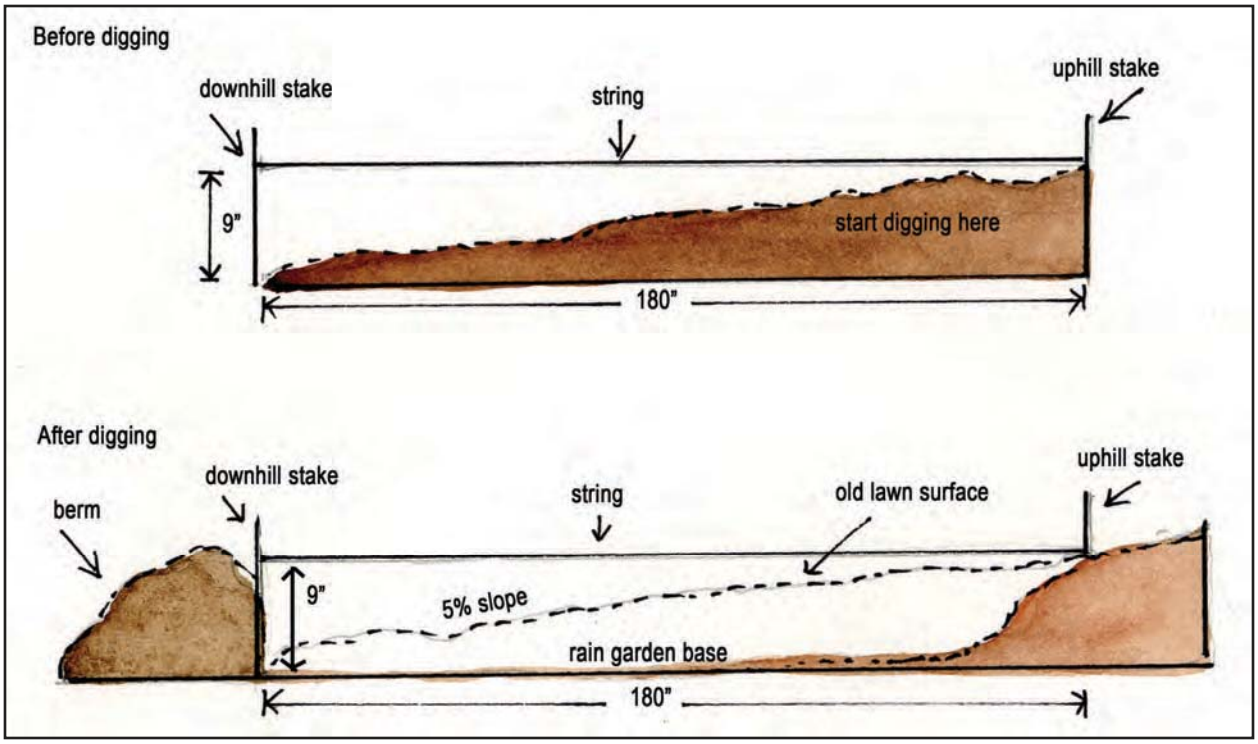

Figure 16: A rain garden with a 5% slope (shown above) should have a surface ponding depth of 5 inches (table 1 below). A surface ponding depth of 9 inches will allow for 3-4 inches of a topping layer.

string's length and multiply the result by 100. A sample calculation is provided below.

Slope % = (9"/180") x 100
Slope % = 0.05 x 100
Slope % = 5%

Slope: _____%

Use table 1 below to determine your garden's surface ponding depth. Add more depth, inch for inch, if you plan to spread mulch on the surface. If you have a more sloping site, you may need to remove or add soil to create a level base. Circle the proposed depth below.

Slope	Surface Ponding Depth
Less than 5%	5 inches deep
Equal to or greater than 5-7%	6-7 inches deep
Equal to or greater than 7-12%	~8 inches deep
Equal to or greater than 12%	Select another site or talk to a professional landscaper

Table 1. Slope and ponding depth reference table.

3b. Ponding depth: 5" 6-7" 8" (circle one)
add mulch layer (if any) _____ inches.

3c. *Determine rain garden area*

Use the sizing worksheet on the next page to determine your rain garden's area. If you decide that the area is too big consider breaking up the garden area into two or three smaller gardens. If you discover that your garden is too small to hold the amount of water flowing into it create an overflow area (e.g., with stone) to relieve excess water or create a system of interconnected rain gardens. More than one rain garden can be installed to better disperse and absorb runoff.

Rain Garden Sizing Worksheet

Insert your answers from the previous pages to determine your rain garden's dimensions.

- Garden's distance from impervious surface(s): _____ (page 6)
- Soil type: _____ (page 7)
- Shape: _____ (page 7)
- Drainage area: _____ ft^2 (page 12)
- Total surface ponding depth:_____ inches (page 13)
- The size factor is _____ (see table 2 below)

	Rain Garden Surface Ponding Depth				
Soil type	5"	6-7"	8"	All depths	
Sand	0.19	0.15	0.08	0.03	Size factor
Silt	0.34	0.25	0.16	0.06	
Clay	0.43	0.32	0.20	0.10	
	Less than 30 feet			More than 30 feet	
	Distance from downspout				

Table 2. In the table above, the size factor is determined by three items: the rain garden surface ponding depth, soil type, and distance from the downspout. To determine the size factor for your rain garden, locate the intersection of these three items in the table above. For example, a rain garden that has a surface ponding depth of six inches, contains sandy soils, and is less than 30 feet from a downspout has a size factor of 0.15. A rain gardens installed more than 30 feet away from a downspout and has sandy soils will have a size factor is 0.03 regardless of its surface ponding depth.

- Rain garden area = _____ ft^2

Rain garden area = drainage area x size factor

- Width = _____ feet (page 15)
- Length = _____ feet

$$\text{Length} = \frac{\text{Rain garden area}}{\text{width}}$$