NEW HAMPSHIRE

Sizing Guide for Rain Barrels, Dry Wells, and Rain Gardens

Use this guide to complete the calculations needed to properly size dry wells, rain barrels, and rain gardens to capture the desired volume of stormwater.

MATERIAL LIST
• Measuring tape
• Yard stick or ruler
• Calculator

CALCULATE RUNOFF VOLUME

Determine the volume of stormwater to be directed to each stormwater practice:

a. Calculate the square footage of the drainage area:
   DRAINAGE AREA LENGTH (ft) × DRAINAGE AREA WIDTH (ft) = DRAINAGE AREA (ft²)

b. If multiple drainage areas will be directed to the same stormwater practice, calculate the square footage of each drainage area, then add them together:
   DRAINAGE AREA-1 (ft²) + DRAINAGE AREA-2 (ft²) = DRAINAGE AREA-total (ft²)

c. Calculate the volume of stormwater from the drainage area for a 1-inch storm*:
   DRAINAGE AREA-total (ft²) × 1 inch × (1 ft/12 inches) = STORMWATER VOLUME (ft³)

   *If you have space to accommodate a larger storm, simply increase the 1-inch value and keep the rest of the calculation the same. If you only have room for a smaller volume, decrease the 1-inch value.

RAIN BARREL

Determine the number of rain barrels that you need to store the stormwater volume from a 1-inch storm. The rain barrel volume capacity is different for each barrel. Check the manufacturer or label to obtain capacity information.

a) Convert stormwater volume in ft³ to gallons. Conversion: 1 ft³ = 7.48 gallons:
   STORMWATER VOLUME (ft³) × 7.48 = STORMWATER VOLUME (gallons)

b) Calculate the number of rain barrels you need based on the stormwater volume:
   STORMWATER VOLUME (gallons) ÷ RAIN BARREL VOLUME CAPACITY (gallons) = NUMBER OF RAIN BARRELS

   NOTE: If designing for a 1-inch storm event results in too many barrels, designing for smaller storms will still provide benefits in stormwater pollution reduction and water conservation.
**DRY WELL**

**CHOOSE ONE OF THE FOLLOWING OPTIONS:**

1. Determine the surface area needed to accommodate your volume using a standard 3’ depth:
   a) Calculate the surface area (in ft$^2$) of your dry well:
   
   \[ \text{STORMWATER VOLUME (ft}^3\text{)} \div 3 \text{ feet (dry well depth)} = \text{DRY WELL AREA (ft}^2\text{)} \]
   
   b) Look for any limitations on size or dimensions posed by the desired dry well location. Measure the available length or width of your dry well to determine shape and configuration.
   
   Example: The stormwater volume is 33ft$^3$: \( \frac{33\text{ft}^3}{3\text{ft}} = 11\text{ft}^2 \). The surface area of the dry well needs to be 11ft$^2$. Look at the site constraints (if any) and determine the best shape and configuration of the dry well that totals approximately 11ft$^2$ of surface area (3’ x 4’ or 2’ x 6’, etc.)

2. Determine the depth of your dry well if you have a limited area with which to work:
   a) Calculate the area:
   
   \[ \text{LENGTH (ft)} \times \text{WIDTH (ft)} = \text{AREA (ft}^2\text{)} \]
   
   b) Divide the volume by the area to get the needed depth:
   
   \[ \text{STORMWATER VOLUME (ft}^3\text{)} \div \text{AREA (ft}^2\text{)} = \text{DEPTH (ft)} \]
   
   Example: The area you have to work with is 5’ by 3’ and the stormwater volume is 55 ft$^3$. Area: 5’ x 3’ = 15 ft$^2$. Depth: \( \frac{55\text{ft}^3}{15\text{ft}^2} = 3.66 \) feet.

**RAIN GARDEN**

1. Determine the infiltration rate and soil type in the area where the rain garden will be located using a simple perc test and a soil ribbon test. Rain gardens should only be built on soils that will drain within 24 hours. Dig a narrow hole about 12” deep. Fill the hole with water and let it drain. This will saturate the soil. Fill the hole again. Follow step a. or b. below.
   a. Measure from the top of the hole to the top of the water. Measure again in 15 minutes. Multiply the difference by four to get the infiltration rate in inches per hour. If the soil will infiltrate at least 1/2” in one hour, it is suitable for a rain garden.
   b. Cover the hole (for safety) and check back 24 hours later. If the hole has drained, the soil is suitable for a rain garden.

<table>
<thead>
<tr>
<th>Table 1. Soil Perc &amp; Ribbon Test</th>
<th>example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Simple Perc Test</strong></td>
<td></td>
</tr>
<tr>
<td>Starting water level (inches)</td>
<td>2.5 (from top)</td>
</tr>
<tr>
<td>Ending water level after 15 minutes (inches)</td>
<td>7.0 (from top)</td>
</tr>
<tr>
<td>Difference multiplied by 4 (in/hr)</td>
<td>4.5 x 4 = 18”/hr</td>
</tr>
<tr>
<td><strong>Soil Ribbon test</strong></td>
<td></td>
</tr>
<tr>
<td>Ribbon length (inches)</td>
<td>No ribbon = Sand</td>
</tr>
<tr>
<td></td>
<td>Weak ribbon &lt;1.5” = Silt</td>
</tr>
<tr>
<td></td>
<td>Strong ribbon &gt;1.5” = Clay</td>
</tr>
</tbody>
</table>
2. Determine the slope of the land where the rain garden will be located. Slopes should be less than 12%. (Slope (%) = (rise ÷ run) x 100)

3. Use the slope to determine the corresponding rain garden ponding depth in Table 2. The ponding depth is the distance between the top of the mulch layer and the top of the berm after the rain garden has been built.

4. Match the ponding depth to the appropriate soil type in Table 2 to determine the rain garden size factor.

5. Use the equation below to calculate the rain garden area in square feet. You can configure the shape and dimensions to best suit the site as long as it meets the total rain garden square footage.

\[
\text{RAIN GARDEN SIZE FACTOR} \times \text{DRAINAGE AREA (ft}^2\text{)} = \text{RAIN GARDEN AREA (ft}^2\text{)}
\]

6. Consider the berm height when designing the rain garden on a slope. The berm should be no more than 12” tall in order to blend with the surrounding landscape and be easier to maintain. This can limit the length of the rain garden down the slope. The table below shows the recommended rain garden length based upon the slope of the land where the rain garden will be located.

<table>
<thead>
<tr>
<th>Slope</th>
<th>12%</th>
<th>11%</th>
<th>10%</th>
<th>9%</th>
<th>8%</th>
<th>7%</th>
<th>6%</th>
<th>5%</th>
<th>4%</th>
<th>3%</th>
<th>2%</th>
<th>1%</th>
<th>0%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rain Garden no longer than</td>
<td>8.5’</td>
<td>9’</td>
<td>10’</td>
<td>11’</td>
<td>12.5’</td>
<td>14.5’</td>
<td>16.5’</td>
<td>20’</td>
<td>25’</td>
<td>33.5’</td>
<td>50’</td>
<td>100’</td>
<td>NA</td>
</tr>
</tbody>
</table>

7. It is recommended to create a planting bed between 6” and 12” deep and to topcoat with 2” of mulch. Therefore, add 8 to 14 inches to the ponding depth to determine the total depth to dig.

Example: A proposed rain garden location has a slope of 6% with silty soils. In Table 2, a 6% slope corresponds to 6-7 inch ponding depth. For silty soils, this result in a rain garden size factor of 0.25. The drainage area is 300 ft². Using the calculation in Step 5, the rain garden area should be:

\[
0.25 \times 300 \text{ ft}^2 = 75 \text{ ft}^2.
\]