Stormwater Management in Your Backyard
Rain Garden Site Visit Worksheet (Pre-Installation)

RAIN GARDEN GOALS

1. Drainage Goals:

2. Aesthetic Goals:

3. Budget Maximum:

RAIN GARDEN DESIGN STEPS

Things to Remember

☐ Call NJ One Call (1-800-272-1000) for a utility mark-out.

☐ Rain gardens are considered landscaping practices unless more than 5,000 square feet of soil is disturbed (requires a permit from a Soil Conservation District).

☐ Do not put rain garden in places where the water already ponds or the lawn is always soggy.

☐ Do not put rain garden in former sites of built-in pools or parking lots.

☐ Place in full or partial sunlight as a first option.

☐ Select a flat part of the yard for easier digging as a first option.

☐ Avoid large tree roots.
Step 1: Determine Drainage Area

What areas do you want to capture stormwater from?

<table>
<thead>
<tr>
<th>Drainage Area</th>
<th>Area (Square Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof top</td>
<td></td>
</tr>
<tr>
<td>Driveway/Parking Lot</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL DRAINAGE (SQUARE FEET)**

**JUST IN CASE…**
- **Square/Rectangle**: Length (measured in feet) x Width (measured in feet) = Area (square feet)
- **Triangle**: [Base (measured in feet) x Height (measured in feet)] / 2 = Area (square feet)

**EXAMPLES...**

<table>
<thead>
<tr>
<th>Square/Rectangle: Width=8’</th>
<th>Length=12’</th>
<th>12’ x 8’ = 96 ft²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triangle:</td>
<td>Height=12’</td>
<td>Base=8’</td>
</tr>
<tr>
<td></td>
<td>[8’ x 12’] / 2 = 48 ft²</td>
<td></td>
</tr>
</tbody>
</table>

Step 2: Determine Location

**A. Slope**

To determine the slope of the rain garden location, the string should be tied to the base of the uphill stake then tied to the downhill stake at the same level, as shown in Figure 1 below.

Figure 1: Measuring Slope (Credit: University of Wisconsin)
To calculate the percent slope, divide the height by the width, which should both be in feet. Multiply this number by 100 to obtain the percent slope.

<table>
<thead>
<tr>
<th>Measurement (Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
</tr>
<tr>
<td>Height</td>
</tr>
<tr>
<td>PERCENT SLOPE</td>
</tr>
</tbody>
</table>

**JUST IN CASE...**

12 inches = 1 foot

\[
\text{Percent Slope} = \left( \frac{\text{Height (measured in feet)}}{\text{Width (measured in feet)}} \right) \times 100
\]

**EXAMPLE...**

\[
[0.5'/10'] \times 100 = 5 \%
\]

**B. Criteria**

Does location meet the following criteria?

- ☐ Rain garden at least 10’ from building
- ☐ Rain garden is not over utilities (already called NJ One Call)
- ☐ Rain garden is at least 25’ from a septic tank or field
- ☐ Rain garden is uphill or level with a septic tank
- ☐ Slope is less than 12% (12’ height over 100’ length)
- ☐ Seasonably high water table is at least 2 feet from the proposed bottom of rain garden depression.

**Step 3: Analyze Soil and Determine Amendments**

**A. Soil Texture**

Test more than one area of potential rain garden location. Take soil sample 6” below the proposed rain garden depth. Have a soil test done by Rutgers Soil Testing Lab (http://njaes.rutgers.edu/soiltestinglab/) or refer to the Cornell Cooperative Extension Soil Texture Fact Sheet in combination with the Soil Type Test worksheet.
**Stormwater Management in Your Backyard**

**Rain Garden Site Visit Worksheet (Pre-Installation)**

<table>
<thead>
<tr>
<th>Class</th>
<th>Texture</th>
<th>Recommended Amendments</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Sandy</td>
<td>Compost helpful, but not required</td>
</tr>
<tr>
<td>B</td>
<td>Silt loam/Loam</td>
<td>Add 1”-2” concrete or bank-run sand</td>
</tr>
<tr>
<td>C</td>
<td>Sandy clay/Loam</td>
<td>Add 2”-4” concrete or bank-run sand</td>
</tr>
<tr>
<td>D</td>
<td>Clayey</td>
<td>Add 2”-4” concrete or bank-run sand</td>
</tr>
</tbody>
</table>

**NOTE:** Use sand with a mixture of grain sizes. Do not use mason or ball field sand.

\[
\frac{\text{inches of sand}}{12} \times \left(\frac{\text{Rain garden surface area in square feet}}{27}\right) = \text{Cubic yards}
\]

**B. Percolation Test**

When you conduct a site visit, a percolation test can be used to check the drainage in a potential rain garden site. This is helpful in determining what, if any, soil amendments are needed for your rain garden. Follow the steps below.

**Percolation Test Steps:**

1. Dig a hole 12” deep by 6” in diameter.
2. Fill hole with water and let stand until all the water has drained into the ground (this will give you saturated soil conditions).
3. Refill the empty hole with water again. Measure the depth of the water with a ruler. Record depth in the table below.
4. Check the depth of water with a ruler every hour for at least 4 hours. Record depths for each hour in the table below.
5. Calculate the percolation rate (how many inches of water drained per hour).

<table>
<thead>
<tr>
<th>Time</th>
<th>Depth (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 hour (before walking away)</td>
<td></td>
</tr>
<tr>
<td>1st hour</td>
<td></td>
</tr>
<tr>
<td>2nd hour</td>
<td></td>
</tr>
<tr>
<td>3rd hour</td>
<td></td>
</tr>
<tr>
<td>4th hour</td>
<td></td>
</tr>
</tbody>
</table>

**PERCOLATION RATE (INCHES/HOUR)**

**JUST IN CASE...**

[Depth at 0 hour (inches) - Depth at 4\textsuperscript{th} hour (inches)]/4 hours = Percolation Rate (inches/hour)

**EXAMPLE...**

\[
\frac{10” - 6.5”}{4 \text{ hours}} = 0.875”/\text{hour}
\]
Interpreting the Percolation Rate Results:

A rate of one inch per hour to one and a half inches per hour is considered ideal for a rain garden. For rates above one inch per hour, consider decreasing the depth of the rain garden is space permits. If the water does not drain in 24 hours, the site is not appropriate for a rain garden and the soil will need to be amended.

NOTE: Sometimes the percolation test gives you a false reading of the soil conditions of a site. For example, if a percolation test is done during drought conditions, the water in the soil may drain very quickly. A rainy season may later reveal that the soil is very clayey and that the water will not percolate through. These situations can be corrected by auguring holes in the rain garden and filling the holes with coarse sand to help with percolation.

C. Soil Compaction (Optional)

Conduct wire flag test (poke wire flag in ground)

☐ Easily penetrates 6”-8” or more
☐ Compacted, difficult to insert

Step 4: Determine Rain Garden Depth and Size

A. Depth

The depth of the rain garden depends upon the percent slope (calculated in Step 2). Use the table below to determine the typical depth of the rain garden.

<table>
<thead>
<tr>
<th>Percent Slope</th>
<th>Typical Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 4%</td>
<td>3”-5”</td>
</tr>
<tr>
<td>5% - 7%</td>
<td>6”-7”</td>
</tr>
<tr>
<td>8% - 12%</td>
<td>8” maximum depth</td>
</tr>
<tr>
<td>&gt; 12%</td>
<td>Consider another location</td>
</tr>
</tbody>
</table>

NOTE: Rain gardens poor percolation rates will be shallower with a larger surface area since they percolate slowly.

B. Size

The size of the rain garden is based upon the drainage area (calculated in Step 1). Rain gardens with clay soils are shallower, so they will have a larger surface area. These are guidelines, not absolutes.
Stormwater Management in Your Backyard
Rain Garden Site Visit Worksheet (Pre-Installation)

Rain Garden Sizing Table
Based on New Jersey Water Quality Design Storm

<table>
<thead>
<tr>
<th>Drainage Area (square feet)</th>
<th>Size of 3” Deep Rain Garden (square feet)</th>
<th>Size of 6” Deep Rain Garden (square feet)</th>
<th>Size of 8” Deep Rain Garden (square feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 ft²</td>
<td>200 ft²</td>
<td>100 ft²</td>
<td>75 ft²</td>
</tr>
<tr>
<td>750 ft²</td>
<td>300 ft²</td>
<td>150 ft²</td>
<td>112 ft²</td>
</tr>
<tr>
<td>1000 ft²</td>
<td>400 ft²</td>
<td>200 ft²</td>
<td>149 ft²</td>
</tr>
<tr>
<td>1500 ft²</td>
<td>600 ft²</td>
<td>300 ft²</td>
<td>224 ft²</td>
</tr>
<tr>
<td>2000 ft²</td>
<td>800 ft²</td>
<td>400 ft²</td>
<td>299 ft²</td>
</tr>
</tbody>
</table>

1 New Jersey’s Water Quality Design Storm is 1.25” of rain over a period of 2 hours.

JUST IN CASE...

\[
\frac{\text{Drainage Area (square feet) } \times \text{ NJ Water Quality Design Storm (feet)}}{\text{Depth (feet)}} = \text{Size of Rain Garden (square feet)}
\]

EXAMPLE...

\[
\frac{500 \text{ ft}^2 \times 0.1'}{0.25'} = 200 \text{ ft}^2
\]

REMEMBER TO CONVERT TO FEET...

- NJ’s Water Quality Design Storm = 1.25” = 0.1’
  - 3” = 0.25’
  - 6” = 0.50’
  - 8” = 0.67’

Step 5: Determine Inlet

How will water enter the rain garden?

<table>
<thead>
<tr>
<th>Method</th>
<th>Materials; Size (length, width, diameter, quantity)</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Extended downspout/gutter</td>
<td></td>
</tr>
<tr>
<td>☐ Buried downspout or drain tile</td>
<td></td>
</tr>
<tr>
<td>☐ Stone or concrete spillway</td>
<td></td>
</tr>
<tr>
<td>☐ Across lawn via a gradual slope</td>
<td></td>
</tr>
<tr>
<td>☐ Vegetated or stone-lined swale</td>
<td></td>
</tr>
<tr>
<td>☐ Diversion berm along the bottom of slope</td>
<td></td>
</tr>
<tr>
<td>☐ Paved surface</td>
<td></td>
</tr>
<tr>
<td>☐ Other:</td>
<td></td>
</tr>
</tbody>
</table>
# Stormwater Management in Your Backyard

## Rain Garden Site Visit Worksheet (Pre-Installation)

<table>
<thead>
<tr>
<th>Erosion Potential</th>
<th>Materials and Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Velocity and erosion should not be a problem</td>
<td></td>
</tr>
<tr>
<td>□ Erosion possible, address this with:</td>
<td></td>
</tr>
<tr>
<td>□ Grading</td>
<td></td>
</tr>
<tr>
<td>□ Rocks or obstructions to slow flow</td>
<td></td>
</tr>
<tr>
<td>□ Rocks to stabilize</td>
<td></td>
</tr>
<tr>
<td>□ Erosion control blanket</td>
<td></td>
</tr>
</tbody>
</table>

Refer to New Jersey’s Erosion and Sediment Control Standards obtained from your local Soil Conservation District.

## Step 6: Determine Overflow

Does overflow meet the following criteria?

- □ Overflow is away from buildings
- □ Berm higher near building
- □ Overflow sheets over lawn or garden
- □ Overflow sheets over driveway or walkway
- □ Flows onto street
- □ Other:

## Step 7: Summarize Rain Garden Design

<table>
<thead>
<tr>
<th>Soil Amendments (Step 3)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth (Step 4A)</td>
<td></td>
</tr>
<tr>
<td>Size (Step 4B)</td>
<td></td>
</tr>
<tr>
<td>Materials Needed (Step 5)</td>
<td></td>
</tr>
</tbody>
</table>
Step 1: Utility Mark-out

Call NJ One Call (1-800-272-1000) for utility mark-out. Before calling, mark out the area you plan to dig with white mark-out paint. After the utilities come out, they will place flags where the utilities are located. The marks/flags indicate the following utilities:

- Red - Electric
- Yellow - Gas, Oil, Steam
- Orange - Communications, CATV
- Blue - Water
- Green - Sewer
Step 2: Mark and Dig Rain Garden

A. Soil Removal Method

How are you going to remove the soil?

☐ Shovel
☐ Mini-backhoe
☐ Other:

B. Excess Soil Placement

Where are you going to put the excess soil?

☐ Use for berm around rain garden
☐ Use or store elsewhere on site
☐ Haul off site

NOTE: Be sure that the rain garden’s ponding area is flat and the slopes are gentle.

Step 3: Scarify and Add Soil Amendments

A. Scarify

Scarify (mix up) the bottom 6” to 12” of the rain garden with:

☐ Shovel
☐ Fork
☐ Tiller
☐ Other:

B. Add Soil Amendments

Incorporate soil amendments into the rain garden by:

☐ No amendments
☐ Turn into soil with shovel
☐ Till into soil
☐ Other:

NOTE: When adding soil amendments, you must incorporate. Do not create layers.

AVOID COMPACTING SOIL! Plan your work for the least amount of walking in the rain garden.
Step 4: Add Mulch

Apply an approximately 3” thick layer of triple-shredded hardwood mulch with no dye using the table below as a guide.

<table>
<thead>
<tr>
<th>Size of Rain Garden</th>
<th>Approximate Amount of Mulch</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 ft²</td>
<td>□ 0.50 yd³</td>
</tr>
<tr>
<td>100 ft²</td>
<td>□ 1.0 yd³</td>
</tr>
<tr>
<td>200 ft²</td>
<td>□ 2.0 yd³</td>
</tr>
</tbody>
</table>
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Rain Garden Site Visit Worksheet (Pre-Installation)

RAIN GARDEN PLANTING METHODS AND MATERIALS

**Step 1: Determine Design Elements**

**A. Style**

- Wild
- Naturalistic but not too wild
- Relatively formal
- Formal
- Other:

**B. Natives or Non-natives?**

- Natives only
- Mix of natives and non-natives
- Non-natives and cultivars only
- Other:

**C. Plant Type**

- Perennials
- Shrubs
- Trees
- Annuals
- Bulbs (upland area only)
- Other:

**D. Maximum Plant Height**

- Up to 2’
- Up to 3’
- Up to 5’
- Over 5’
- Other:
Step 2: Create Design

Figure 3: Rain Garden Cross-Section (Credit: University of Wisconsin)

- List plants to be used in ponding area
- List plants to be used in depression area
- List plants to be used in upland area
- Will plants be mixed or massed?
- Sketch rain garden design below:
Step 3: Determine Number of Plants

A. Spacing

<table>
<thead>
<tr>
<th>Plant Size</th>
<th>Typical Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plugs</td>
<td>12”-15”</td>
</tr>
<tr>
<td>2”-4” pots</td>
<td>15”-18”</td>
</tr>
<tr>
<td>≥ 6” pots</td>
<td>Depends on species</td>
</tr>
<tr>
<td>Trees and shrubs</td>
<td>Depends on species</td>
</tr>
</tbody>
</table>

Table 3A: Number of Plants Needed for 100 Square Foot Rain Garden

<table>
<thead>
<tr>
<th>Spacing</th>
<th>Number of Plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>12”</td>
<td>100</td>
</tr>
<tr>
<td>16”</td>
<td>56</td>
</tr>
<tr>
<td>18”</td>
<td>45</td>
</tr>
<tr>
<td>24”</td>
<td>25</td>
</tr>
<tr>
<td>48”</td>
<td>6</td>
</tr>
</tbody>
</table>

B. Number of Plants

Determine the number of plants for the rain garden by dividing the size of the rain garden (in square feet) by 100. Then, multiply this number by the number of plants recommended in Table 3A (determined from the plant size typical spacing).

JUST IN CASE...

[Size of Rain Garden (measured in square feet)/ 100] x Number of Plants (from Table 3A) = Total Number of Plants

EXAMPLE...

200 ft² Rain Garden with Plugs (12” Spacing)  
[200 ft² / 100] x 100 = 200 plants

200 ft² Rain Garden with 2”-4” Pots (18” Spacing)  
[200 ft² / 100] x 45 = 90 plants