Rain Gardens 101
Exercise Packet

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Impervious Surface Calculation Exercise

LOT: 70' x 110'

LEGEND
- ROOF RIDGE
- DOWNSPOUT
- PROPERTY LINE

1 square = 1 ft
Impervious Surface Calculation Exercise

In this exercise you will learn how to:

a) Determine the amount of impervious surface on a property
b) Calculate the number and size of rain gardens needed to manage the runoff from those impervious surfaces

Step 1: Calculate square feet of impervious area(s) on the lot

Buildings

a) Label the downspouts (e.g. house 1, house 2, garage 1, etc)
b) Determine areas that drain to each downspout. Calculate the length and width of each area to determine the area of roof flowing to each downspout. Fill in the tables below.

**Example:** Downspout 1 (labeled H1): 30 length (ft) x 12 width (ft) = 360 sq ft

<table>
<thead>
<tr>
<th>DOWNSPOUT</th>
<th>LENGTH (ft)</th>
<th>WIDTH (ft)</th>
<th>AREA (sq ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>30</td>
<td>X 12</td>
<td>= 360</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Garage

<table>
<thead>
<tr>
<th>DOWNSPOUT</th>
<th>LENGTH (ft)</th>
<th>WIDTH (ft)</th>
<th>AREA (sq ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Other impervious surfaces

Calculate the area of other impervious surfaces on your property like driveways, walkways, sidewalks, etc. Fill in the table below and calculate the total area for each impervious surface.

<table>
<thead>
<tr>
<th>ZONE (e.g. driveway, sidewalk, etc)</th>
<th>LENGTH (ft)</th>
<th>WIDTH (ft)</th>
<th>AREA (sq ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>X</td>
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<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Step 2: Calculate total rain garden area needed.

Now that you know how much impervious surface you have, you can determine which impervious surfaces you want to manage with each rain garden.

While it is recommended that you capture as much runoff as you can, it may not be possible to capture the runoff of all the impervious surfaces on your lot (e.g.: if the driveway drains to the street, it would be difficult to divert that water into a rain garden).

a) Where are the obvious places to locate rain gardens on the property? Draw them in.
b) Label each rain garden (e.g. rain garden 1, rain garden 2, etc.).
c) Determine which impervious surface areas can be directed to each rain garden (write the information in the tables on the following page).
d) Add up the “areas” to get a subtotal.
e) To determine the size of each rain garden, multiply the subtotal by the sizing factor. The sizing factor is based on a combination of local rainfall patterns and soil infiltration rates. In most situations, a sizing factor of 0.10 will be sufficient.
Example: Rain Garden 1

<table>
<thead>
<tr>
<th>DOWNSPOUT/ZONE</th>
<th>AREA (sq ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>360</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>SUB TOTAL:</td>
<td>360</td>
</tr>
<tr>
<td>SIZING FACTOR:</td>
<td>0.10</td>
</tr>
<tr>
<td>TOTAL AREA OR RAIN GARDEN 1:</td>
<td>36</td>
</tr>
</tbody>
</table>

Rain Garden 2

<table>
<thead>
<tr>
<th>DOWNSPOUT/ZONE</th>
<th>AREA (sq ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>SUB TOTAL:</td>
<td></td>
</tr>
<tr>
<td>SIZING FACTOR:</td>
<td>0.10</td>
</tr>
<tr>
<td>TOTAL AREA OR RAIN GARDEN 2:</td>
<td></td>
</tr>
</tbody>
</table>

Rain Garden 3

<table>
<thead>
<tr>
<th>DOWNSPOUT/ZONE</th>
<th>AREA (sq ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>SUB TOTAL:</td>
<td></td>
</tr>
<tr>
<td>SIZING FACTOR:</td>
<td>0.10</td>
</tr>
<tr>
<td>TOTAL AREA OR RAIN GARDEN 3:</td>
<td></td>
</tr>
</tbody>
</table>

Rain Garden 4

<table>
<thead>
<tr>
<th>DOWNSPOUT/ZONE</th>
<th>AREA (sq ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>SUB TOTAL:</td>
<td></td>
</tr>
<tr>
<td>SIZING FACTOR:</td>
<td>0.10</td>
</tr>
<tr>
<td>TOTAL AREA OR RAIN GARDEN 4:</td>
<td></td>
</tr>
</tbody>
</table>

**Step 3: Determine the dimensions of each rain garden.**
What dimensions should be used to build each rain garden? Use the results from Step 2 to guide you.

a) Transfer the results from Step 2 to the table below.

b) See the placement guidelines below to ensure you locate your rain garden the recommended distances from buildings, property lines, etc. These are critical as you design the shape of each rain garden.

Placement guidelines:
- 6 feet from a building with a basement
- 5 feet from the property line

c) Use the table below to decide how long and wide you want to design each rain garden. In some cases the dimensions of your rain garden will be constrained by property lines, proximity to a basement, etc.

<table>
<thead>
<tr>
<th>RAIN GARDEN</th>
<th>Total Rain Garden Area (sq ft)</th>
<th>LENGTH (ft)</th>
<th>WIDTH (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rain Garden 1</td>
<td></td>
<td>=</td>
<td>=</td>
</tr>
<tr>
<td>Rain Garden 2</td>
<td></td>
<td>=</td>
<td>=</td>
</tr>
<tr>
<td>Rain Garden 3</td>
<td></td>
<td>=</td>
<td>=</td>
</tr>
<tr>
<td>Rain Garden 4</td>
<td></td>
<td>=</td>
<td>=</td>
</tr>
</tbody>
</table>

**Congratulations! Now you know how many rain gardens are needed, where to build them, and what size they should be!!**
Sunny Rain Garden
Rain garden plant placement exercise

Now it’s your turn to design a planting plan for a rain garden!

Decide which plants to include, where to plant them, and how many to include.

Instructions:
1. Consider which plants you like and where to put those plants based on their moisture tolerance from the options below.

2. Draw a symbol (circle, square, etc.) to represent each plant on the template to the right. Work in pencil so you can adjust as needed.

Taper-tipped rush, Juncus acuminatus
Type: Evergreen Perennial
Zone: Base
Height: 36”
Spacing: 36”
Light: ◇

Dagger-leaf Rush, Juncus ensifolius
Type: Evergreen Perennial
Zone: Base
Height: 36”
Spacing: 24”
Light: ◇

Oregon iris, Iris tenax
Type: Perennial
Zone: Base, Slope
Height: 12”
Spacing: 12”
Light: ◇

Western Columbine, Aquilegia formosa
Type: Perennial
Zone: Slope
Height: 12-36”
Spacing: 24”
Light: ◇

Snowberry, Symphoricarpos albus
Type: Deciduous Shrub
Zone: Upland
Height: 6’
Spacing: 4’
Light: ◇

Red-flowering currant, Ribes sanguineum
Type: Deciduous Shrub
Zone: Upland
Height: 10’
Spacing: 7’
Light: ◇

Lupine, Lupinus sp.
Type: Deciduous (varies by species)
Zone: Slope, Upland
Height: 36”
Spacing: 18”
Light: ◇

Cascara, Frangula purshiana
Type: Deciduous Tree
Zone: Upland
Height: 15-20’
Spacing: 15’
Light: ◇

Taper-tipped rush photo: Robert H. Mohlenbrock, hosted by the USDA-NRCS PLANTS Database / USDA SCS. 1989
Shady Rain Garden

Rain gardens 101: Exercise Packet

Now it’s your turn to design a planting plan for a rain garden!

Decide which plants to include, where to plant them, and how many to include.

Instructions:
1. Consider which plants you like and where to put those plants based on their moisture tolerance from the eight below.
2. Draw a symbol (circle, square, etc.) to represent each plant on the template to the right. Work in pencil so you can adjust as needed.

Small-fruited bulrush, Scirpus microcarpus
Type: Evergreen Perennial
Zone: Base
Height: 36-48”
Spacing: 36”
Light: ☀️

Fringecup, Tellima grandiflora
Type: Perennial
Zone: Slope
Height: 12”
Spacing: 12”
Light: ☀️

Inside-out flower, Vancouveria hexandra
Type: Semi-evergreen Perennial
Zone: Slope, Upland
Height: 12”
Spacing: 12”
Light: ☁️

Sword fern, Polystichum munitum
Type: Evergreen fern
Zone: Slope, Upland
Height: 3’
Spacing: 3’
Light: ☀️

Creeping Oregon Grape, Mahonia repens
Type: Evergreen Groundcover
Zone: Slope, Upland
Height: 24”
Spacing: 24”
Light: ☁️

Evergreen Huckleberry, Vaccinium ovatum
Type: Evergreen shrub
Zone: Upland
Height: 5-9’
Spacing: 5’
Light: ☁️

Vine maple, Acer circinatum
Type: Deciduous Tree
Zone: Upland
Height: 15-20’
Spacing: 15-20’
Light: ☁️

Western Bleeding Heart, Dicentra formosa
Type: Perennial
Zone: Upland
Height: 24”
Spacing: 24”
Light: ☁️
Don’t Plant Weeds

What is a weed?
A weed is a plant that spreads quickly and tends to overgrow or out-compete more desirable plants.

Characteristics that allow weeds to spread quickly:
- They often produce lots of seeds that are easily transported by wind, water, people and animals.
- Their seed can sometimes survive for a very long time in the soil.
- Some invasive plants release chemicals from their roots that inhibit other, more desirable plants from growing.
- They often have mechanisms that allow them to spread easily, such as the ability to reproduce vegetatively (without seeds).

Why should you care?
Invasive plants crowd out other plants in your rain garden. They can spread to other landscapes and even into natural areas where they multiply, and disrupt the natural local ecology. **In doing so they:**
- Create more work for you.
- Compete with other plants for sun, water and nutrients.
- Decrease the diversity of plants, which reduces the variety of food, habitat and other benefits that a more diverse landscape provides.
- Increase the use of pesticides within our region.

Here’s how you can help:

Consult a Local Weeds List
As gardeners, we sometimes unknowingly move invasive plants to new places. Surprisingly, some invasive plants (and their relatives) are still available for purchase in stores and nurseries. Because of this, it is up to us to make sure we choose plants that are safe for this ecosystem. Always consult a local weeds list before selecting plants for your yard.

Your neighbors and local wildlife will thank you!

Plant native plants!
Consider using plants that are native to your area. Native plants offer many benefits that are good for both wildlife and people:
- Provide food and shelter for wildlife.
- Need less water when established.
- Don’t need toxic fertilizers or pesticides.
- They are already adapted to our climate.

Invasive or Aggressive Plants to Keep Out of a Rain Garden

- English Ivy
  **Hedera helix**
- Japanese Knotweed
  **Polygonum cuspidatum**
- Yellow-flag Iris
  **Iris pseudacorus**
- Vinca / Periwinkle
  **Vinca major and Vinca minor**
- Bamboo
  **numerous species**
- European Soft Rush
  **Juncus effusus v. effusus**
- Horsetail
  **Equisetum spp.**
- Money Plant
  **Lunaria annua**
- Purple Loosstrife
  **Lythrum salicaria**
- Bachelor’s Buttons
  **Centaurea cyanus**
- Poke Weed
  **Phytolacca americana**
- Arum
  **Arum italicum**
- Butterfly Bush
  **Buddleia davidii, B. variabilis**
- Creeping Jenny
  **Lysimachia nummularia**
- Chameleon Plant
  **Houttuynia cordata**
- Hawkweed
  **Hieracium Roribundum, H. aurantiacum**
- Herb Robert, Stinky Bob
  **Geranium robertianum**
- Bishop’s Weed, Goutweed
  **Aegopodium podagraria L.**

Don’t Plant Weeds

Rain Gardens 101: Exercise Packet
East Multnomah Soil & Water Conservation District

Bishop's Weed photo: Gregory Phillips / Wikimedia Commons / CC-BY-SA-3.0
The East Multnomah Soil and Water Conservation District (EMSWCD) is a unit of local government serving Multnomah County, east of the Willamette River. We work with residents, landowners, community groups, non-profit organizations and other government agencies on a voluntary basis to keep water clean, conserve water and keep soil healthy.

Learn more!
www.emswcd.org

Many thanks to Oregon State University (Extension and Sea Grant staff) for their contributions to the information contained in this packet.

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