POLLINATOR PARTNERSHIP

Protect their lives. Preserve ours.

# CREATING RAIN GARDENS FOR POLLINATORS ON WORKING LAND

**What are rain gardens?**

A rain garden is a shallow, vegetated basin that is designed to temporarily capture and process water from impervious surfaces, like roofs, feedlots, farm lanes, and other high-traffic areas. These functional and beautiful gardens incorporate a variety of native plants that thrive in moist soils and can tolerate periodic flooding. The deep roots of these plants help support beneficial soil organisms and create channels through which water can travel and percolate into the ground. Through this process, rain gardens can increase groundwater infiltration and filter contaminants from water before it is released into local ground or surface waters. When a diversity of flowering and butterfly host plants are included in their design, they can also serve as an important lifeline for pollinators and other wildlife. Not only can rain gardens help control flooding and runoff; on farms they can also help producers manage water from barns, compacted areas, or access roads - making them a valuable tool for reducing erosion and nutrient loss while enhancing nearby pollinator habitat.

**Components of a Rain Garden**

Each part of the garden plays an important role:

- **Inflow:** The entry point where rainwater from roofs, driveways, or other impervious surfaces is directed into the garden
- **Basin:** The shallow, planted depression that temporarily holds and filters stormwater through soil and plant roots
- **Berm:** A raised edge, often made of soil, on the downhill side of the garden that helps contain and slow the flow of water within the basin
- **Outflow:** A controlled outlet that allows excess water to safely exit the garden once it reaches capacity, preventing erosion or flooding

Together, these components allow rain gardens to manage stormwater naturally while creating habitat for pollinators and other wildlife.

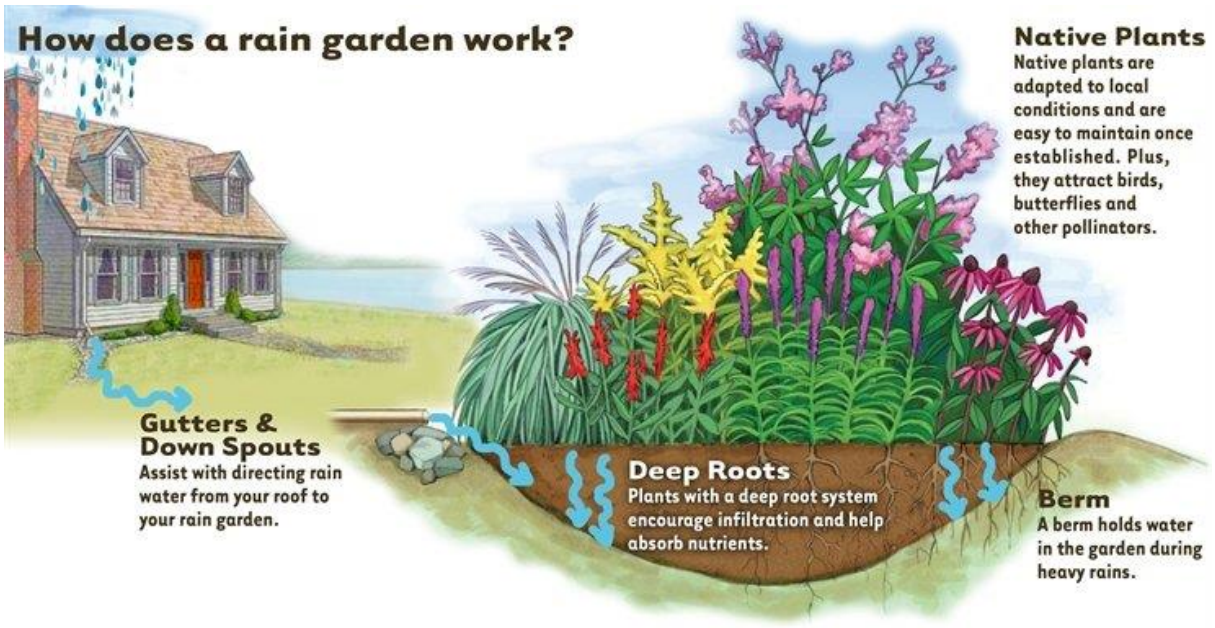



Image Credit: Tip of the Mitt Watershed Council

**Site and Sizing**

Locate rain gardens at least 10 feet away from buildings and property lines. Avoid utility lines, leach beds, existing swales or ditches, and mature trees. Rain gardens are most effective when placed near impervious surfaces that will send water its way. In agricultural settings, rain gardens are best placed downslope from compacted soil and nutrient dense areas to help increase infiltration and reduce surface water runoff.

In urban or small-scale agricultural settings, a single rain garden is generally about the size of a parking space or smaller. To handle larger volumes of water, a series of rain gardens can also be utilized. Water can be guided to the garden through above-ground channels, underground pipes, or other engineered conveyances, which also makes it possible to connect multiple rain gardens in series to manage runoff more effectively across the farm. While rain gardens can be *shaped* to suit the landscape (e.g. round, square, or kidney bean, etc.), the *size* should be determined by the soil type, basin depth, and volume of runoff it is intended to hold. See the "calculating size" section below for more information on how to gauge the optimal size for your rain garden project.

**Depth and Slope**

The depth of a rain garden is primarily determined by the slope of the ground and the soil type in the area. Steeper slopes will require deeper basins to effectively capture and slow runoff, while flatter areas can use shallower designs. The soil's texture and natural drainage capacity influence how quickly water infiltrates. Clay soils drain more slowly and may require deeper basins or soil amendments to allow sufficient storage time, whereas sandy soils drain more quickly and can accommodate shallower basins.

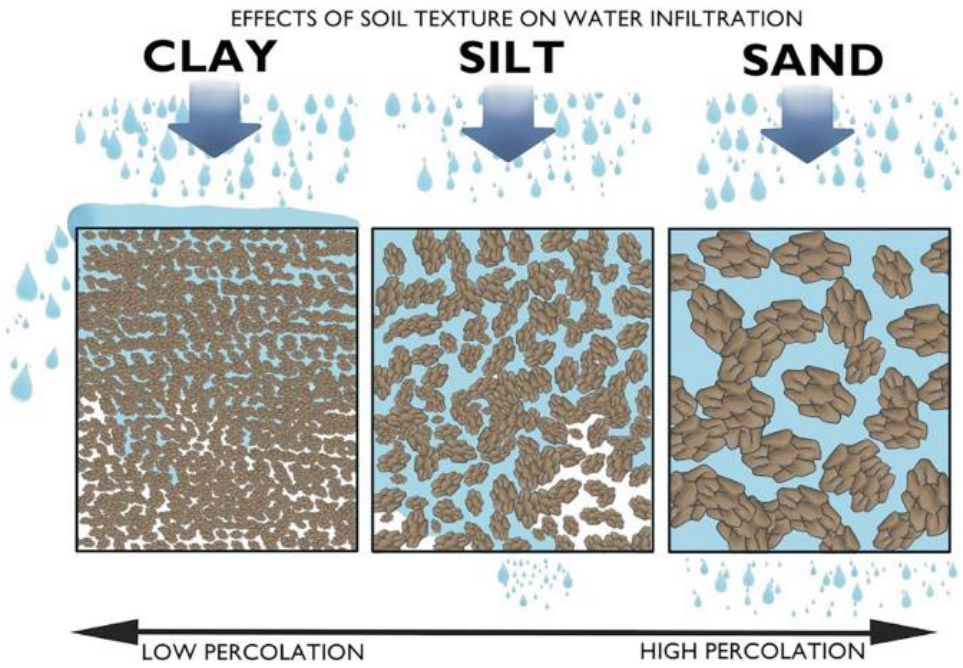



Image Credit: Anna Paltseva, the Urban Soil Guide

Rain gardens are not ponds; they are designed to hold water temporarily. Properly designed, a rain garden should hold water for no longer than 48 hours following a rainfall event. This temporary storage allows water to slowly infiltrate while limiting standing water that could attract mosquitoes.

After the basin has been dug and the berm constructed, the basin can be partially backfilled with compost or a mix of compost and coarse sand or loamy topsoil, particularly if you have fine clay or poorly drained soils. This organic layer improves soil structure, increases porosity, and enhances water infiltration. On sandy soils, it helps retain moisture and nutrients for plants. The compost also supports healthy soil organisms, which play a key role in filtering and breaking down nutrients and pollutants before water reaches nearby streams, ponds, or groundwater. A general recommendation is to add approximately one cubic yard of combined sand and compost per 100 square feet of rain garden, creating roughly a three-inch amendment layer.

## Calculating Size

Properly sizing a rain garden is an important step in making sure it functions effectively on your farm. The size of the garden is based on the amount of runoff it will receive, which depends on factors like the drainage area, soil type, slope, and how water flows from nearby buildings or compacted areas. Taking the time to calculate the right size helps ensure the rain garden can capture and infiltrate runoff without overflowing or causing erosion. Use the steps below to walk through the calculation process and determine the appropriate size for your site.

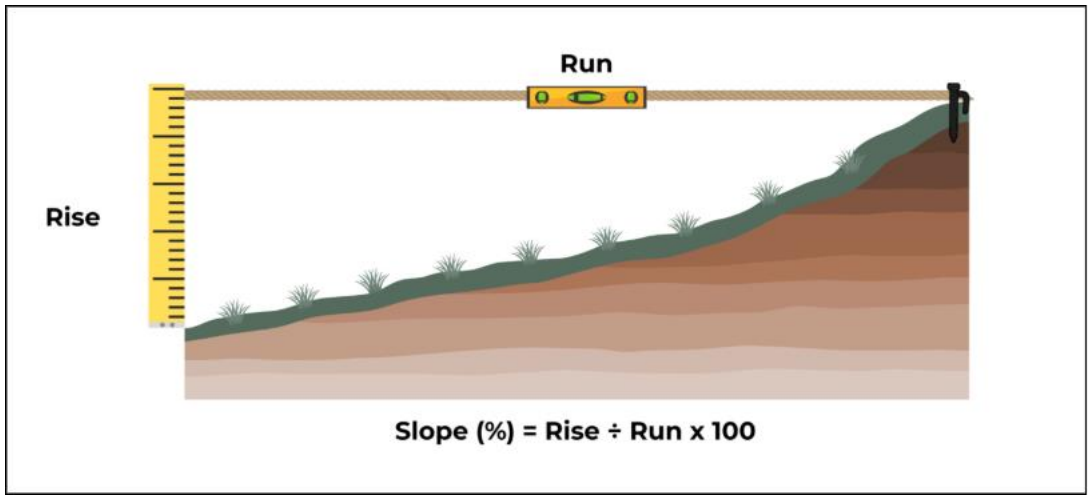
The size of the rain garden depends on depth, drainage area, and soil type. Follow Steps 1-5 to help calculate your rain garden size.

> *Note: Certain soil types, like clayey soils, may require amendments that change their classifications and the following calculations. To understand what types of soil may need amending refer above or contact a P2 Partner Biologist for further assistance.

### Step 1: Determine Rain Garden Depth

- What is slope?
    - Slope is the change in elevation given between two points, commonly expressed as a percentage (%). Slope is calculated by dividing the change in elevation (Rise) by the horizontal distance (Run) and then multiplied by 100 to get a percent.

- How can I measure slope at home?
    - Step 1: At the uphill end of the site, attach a measured string (e.g. 10ft) to a stake at ground level (this is the Run).
    - Step 2: Walk downhill to the end of the string.
    - Step 3: Stretch the line tightly and attach a string/line level (or have an additional person hold a level on top of the string).
    - Step 4: Once the line is level, measure the vertical distance or height from the ground at the downhill section (this is the Rise).
        - Run: _____ft
        - Rise: _____ft
        - Slope (%) = [Rise (_____) ÷ Run (_____)] x 100
        - For example, if the Rise is 0.5 ft, and the Run is 10 ft, the site has a slope of 5%.




- Web Soil Survey for Slope Estimates
    - Web Soil Survey can provide information on soil properties and qualities for each soil map unit, which also includes a slope range. For example, the slope range is 0-3% for Lima Silt Loam.
    - *Note: Web Soil Survey slope estimates refer only to undisturbed soils, disturbances and local inclusions can cause the actual site slope to differ from the WSS estimate.

| Measured Slope of Site | Depth Needed for Rain Garden |
|---|---|
| <4% | 3-5 inches |
| 5-7% | 6-7 inches |
| 8-12% | Max of 8 inches |

- My slope: _____%
- Rain Garden Depth Needed: _____ inches

**Step 2: Calculate Drainage Area**

- The drainage area is the square footage of the impervious surfaces (e.g., roof, driveway, etc.) that will drain into the rain garden. Drainage area is calculated by multiplying the length by the width of the impervious surface.
    - Length:_____ft
    - Width:_____ft
    - Impervious Surface Area (Length x Width): _____ft²

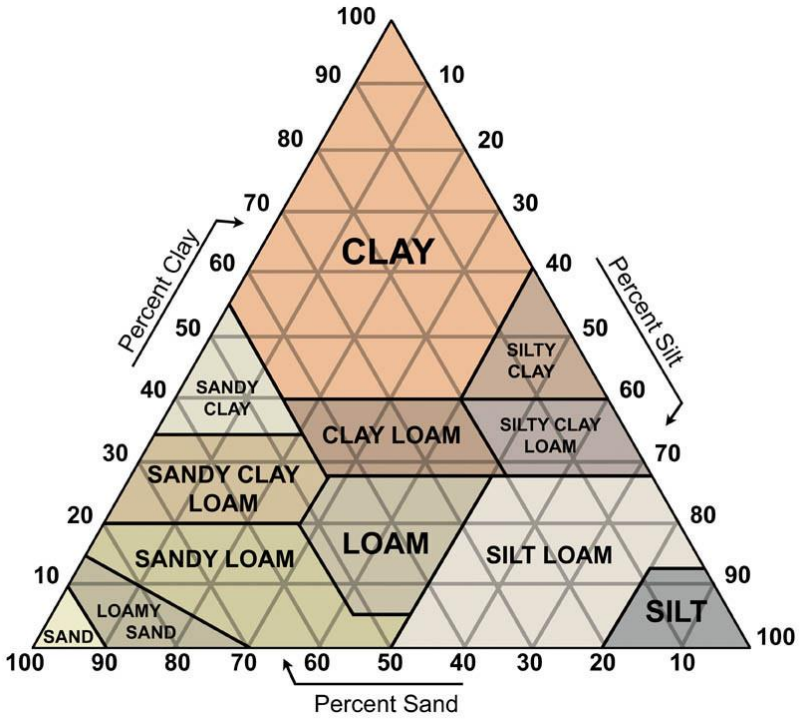
- If roof has more than one downspout (skip this step if you only have 1 downspout coming off your roof or if the impervious surface is not a roof):
    - Number of downspouts on roof: _____
    - Downspouts draining to garden: _____
    - Adjusted Drainage Area: Impervious Surface Area (_____) / Number of Downspouts (_____) x Number of Downspouts Draining to Garden (_____)

- If your garden is more than 30ft away from the impervious surface, calculate the additional lawn or area that will also drain into the rain garden.
    - Length: _____ft
    - Width: _____ft
    - Additional Area (Length x Width): _____ft²
    - Total Drainage Area: Impervious Surface Area (_____ ft²) + Additional Area (_____ft²) = _____ft2

**Step 3: Determine Soil Type**

- Soil type can be determined through a simple soil test, commonly available through your county conservation office or land grant university. You can also find out more about expected soil properties like texture, ponding and other properties by viewing soil maps on USDA's Web Soil Survey or by using this guide to estimate for yourself: Texture By Feel Procedure.
    - Sandy Soil
    - Silty Soil
    - Clayey Soil

My soil type: _____




**Step 4: Rain Garden Size Factor**

- After determining your soil type, use the following chart to find the appropriate rain garden size factor, which will be needed for calculating the rain garden size.

| Rain Garden Size Factor | | | | | |
|---|---|---|---|---|---|
| Raingardens <30 ft from the impervious surface | | | | | Raingardens >30 ft from the impervious surface |
| Soil Type | 3-5 inches | 5-7 inches | 8 inches | | Size Factor for All Depths |
| Sandy Soil | 0.19 | 0.15 | 0.08 | | 0.03 |
| Silty Soil | 0.34 | 0.25 | 0.16 | | 0.06 |
| Clayey Soil | 0.43 | 0.32 | 0.20 | | 1.10 |

- Rain garden size factor for my site: _____

**Step 5: Calculate the Rain Garden Size**

- Once you have followed the steps above, you are finally ready to calculate the size of your rain garden! Use the following scenarios to help you calculate the rain garden size:
    - **Scenario A**: **Non-roof Impervious Surface, Rain Garden <30ft from Impervious Surface**
        - Rain Garden Size = Total Impervious Surface Area (_____) x Size Factor (_____)

    - **Scenario B: Roof with 1 Downspout, Rain Garden <30ft from Impervious Surface**
        - Rain Garden Size = Drainage Area (_____) x Rain Garden Size Factor (_____)

    - **Scenario C: Roof with Multiple Downspouts, <30ft from Impervious Surface**
        - Rain Garden Size = [Impervious Surface Area (_____) / Number of Downspouts (_____) x Number of Downspouts Draining to Garden (_____)] x Rain Garden Size Factor (_____)

    - **Scenario D: Rain Garden is >30ft from Impervious Surface**
        - Rain Garden Size = [Impervious Surface Area (_____) + Additional Area (_____)] x Rain Garden Size Factor (_____)

**Constructing the Rain Garden**

Once you have determined the size and location of your rain garden, it is a good idea to double check that you aren't too close to any foundations, tree roots, or utility lines. Call your state's "Call Before You Dig" helpline to check for any underground pipes or utilities that could be damaged during rain garden construction.

Dig the basin three inches deeper than the depth you calculated. You can dig by hand or use a machine. All of the material that is removed from the basin can be utilized to build the berm. Remember to construct openings for the inflow and outflow. To prevent erosion at these entry and exit points, consider reinforcing them with rock, gravel, or other stabilization materials, and ensure water leaves the garden at a slow, controlled rate. When the berm is finished, the basin can be backfilled with three inches of compost. This will help the plants acclimate after installation. After planting, it is a good idea to mulch the area to control weeds until the plants are established.

Image Credit: Washington State University Extension

**Plant Selection**

Rain gardens function best when they are installed with plants native to the state or region where the rain garden is constructed. Native plants that are adapted to grow in and around wetlands, riparian areas, and wet meadows are especially well suited for these sites. Because rain gardens are bowl-shaped, moisture conditions vary across the basin. Plants along the edges are typically better suited to upland conditions, while species placed in the center should be adapted to wetter soils. It is important that the selected plants can thrive in wet conditions, but can also withstand dry periods once established. To adequately support pollinators, choose a variety of plants that bloom from spring through fall. Include a mix of plant types, such as forbs, shrubs, and graminoids (grasses, sedges, and rushes), to create a plant community that is structurally and biologically diverse, more resilient, and able to support the full lifecycles of many wildlife species.

Choosing the right mix of native grasses, sedges, and flowering plants is vital for an effective, high quality rain garden. To assist with this process, Pollinator Partnership's (P2) Find Your Roots tool can help you identify plants native to your ecoregion that will thrive under the conditions you are looking for and support local pollinators. For more in-depth planning assistance, reach out to one of P2's Partner Biologists who can help you select plants tailored to your site.

Image Credit: Washington State University Extension

**Management**

While native rain gardens are designed to be relatively low-maintenance once established, some routine management is needed to ensure they continue to function properly on farms and other working lands. Once installed, rain gardens should be monitored regularly for invasive or aggressive plant species, particularly during the first few growing seasons. On farms, invasive species can quickly spread from adjacent fields, ditches, or disturbed areas and outcompete desired native plants. Early detection and prompt management, such as hand pulling, targeted mowing, or other appropriate control methods, can help maintain plant diversity and ensure the rain garden continues to function effectively for water management, pollinators, and wildlife over the long term.

During the first few growing seasons, occasional watering may be necessary during extended dry periods to help plants become established. Over time, periodic mowing or cutting back, typically in late winter or early spring, can help maintain plant structure, limit woody encroachment, and promote healthy regrowth. It is also important to periodically inspect inflow and outflow points, berms, and the basin itself, particularly after heavy rain events, to check for sediment buildup, erosion, or damage from equipment or livestock. Removing accumulated sediment and repairing any erosion helps maintain infiltration capacity and ensures runoff from barns, lanes, and other compacted areas continues to be managed effectively.

Additionally, to protect the pollinators and other beneficial wildlife that use the rain garden, care should be taken to minimize pesticide drift or runoff near the site. With routine observation and light maintenance, rain gardens can provide long-term benefits for water management, pollinators, and overall farm resilience.

Image Credit: Tip of the Mitt Watershed Council

**Incorporation into Agricultural Systems**

Rain gardens are a scalable practice that can be adapted to fit almost any agricultural setting. With thoughtful design and a bit of engineering, the same principles and benefits of rain gardens can be utilized near barns, confined feeding operations, access lanes, feeding and watering zones, or other impervious surfaces across the farm. By reducing runoff, they help prevent erosion, limit nutrient and sediment loss, and protect nearby groundwater, streams, and ponds from contamination. When managed carefully, on-farm rain gardens can also provide valuable pollinator habitat; minimizing pesticide drift and runoff near these areas helps ensure they remain safe for pollinators and other beneficial insects. Rain gardens can further enhance the appearance and functionality of working land by complementing other conservation practices such as grassed waterways, filter strips, or dedicated pollinator habitat.

You don't have to do this alone! Technical assistance is available through a partnership with the Natural Resources Conservation Service (NRCS) to help landowners plan and install rain gardens and other voluntary conservation practices. The NRCS provides Farm Bill programs that can provide competitive cost-share funding opportunities to implement conservation practices such as the rain gardens and other practices on the farm.

Landowners interested in exploring options can contact their USDA Service Center, Soil and Water Conservation District, local NRCS field office or a P2 Partner Biologist.

Image Credit: Top Knoll Farm and Flowers