Project-Based Learning: Design and Build a Rain Garden

Part 2: Rain Garden Design Process

Credit: Andrew Kahl, The Nature Conservancy
Rain Garden Design Process Overview: From Site Inventory to Installation
Conduct Site Inventory

The site inventory can be conducted on graph paper or on top of a Google map printout.
You will also calculate the volume of stormwater runoff from the catchment area (a roof, parking lot, etc.) in order to determine the size of the rain garden.
Develop Site Design & Garden Layout

Credit: Apiary Studio
Prepare Ground for Installation

Credit: Apiary Studio
Arrange Plants According to Design

Credit: Apiary Studio
Rain Garden After 12 Months of Growth

Credit: Apiary Studio
Rain Garden Design Process:
Calculate Catchment Area Runoff & Garden Size
Calculate the Volume of Stormwater

Determine surface area of rain collection (catchment) area. In this example, the catchment area is a roof, but it could be a parking area or other impervious surface.
Design Storm

A “design storm” is an industry standard that reflects the typical large rainstorm most regions receive, as well as an understanding that a rain garden is not meant to manage high volumes of rainfall.

For our purposes, the design storm is 1-inch of rain, which is equal to 0.083 feet of rain.
Calculate Volume of Stormwater (catchment area runoff)

\[ V = \text{volume of stormwater in cubic feet captured by rain garden during design storm} \]

\[ C = \text{catchment area in square feet} \]

\[ V = C \times \text{design storm volume in feet} \]

\[ V = C \times 0.083 \text{ feet} \]

*remember that 0.083 feet is the quantity of rain in our design storm because 1 inch = 0.083 feet*
Example: Calculate Volume of Stormwater

In a design storm, calculate the volume of stormwater collected by a roof that is 10 feet x 10 feet.

The catchment area of a 10 feet x 10 feet roof is 100 square feet.

For a design storm of 1 inch (0.083 feet) of rain, the volume calculation is:

\[ V = 100 \text{ square feet} \times 0.083 \text{ feet} \]

\[ V = 8.3 \text{ cubic feet} \]
Calculate Rain Garden Size

\[ O = \frac{\text{optimal rain garden size in square feet}}{\text{volume of stormwater captured by rain garden in design storm in cubic feet}} \]

\[ D = \text{ponding depth in feet} \]

\[ O = \frac{\_V\_}{D} \]
Ponding Depth

The ponding depth is the maximum amount of water stored above the soil surface. We will use a ponding depth of **six inches**, which allows a relatively small garden footprint and does not present a drowning hazard.
Example: Calculate Rain Garden Size

Find the rain garden size for a catchment area that will collect a total volume of 200 cubic feet of runoff. The ponding depth should be 6 inches.

The first step is to convert the ponding depth to feet to keep the units the same. 6 inches is the same as 0.5 feet.

\[ O = \frac{V}{D} \]

\[ O = \frac{200 \text{ cubic feet}}{0.5 \text{ feet}} = 400 \text{ square feet} \]
Same Volume, Different Configurations

Credit: Apiary Studio
Determine Locations of Rainwater Inlets/Outlets
Determine Potential Layouts Based on Volume Calculations and Inlet/Outlet Locations