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Calculating your Stormwater Runoff

MATERIALS:

- Scale Map of property
- Ruler
- Calculator

Knowing how much water runs off or through your property is critical to design and implement any stormwater feature correctly. In order to calculate this volume you will need a scaled plat or drawing of your property with all impervious surfaces visible.

Let's get started!

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Calculating Stormwater (Runoff) Volume

Runoff is precipitation that flows over the land surface and is not absorbed into the ground. In urban areas runoff is high because impermeable surfaces like rooftops, paved roads and parking lots abound. This runoff moves quickly off site through stormwater drains that usually funnel directly to streams. This helps to eliminate standing water that can cause poor health conditions and roads stay clear during storms but it does not allow water to infiltrate into the water table. In other words, the water doesn't hang around long enough to water your vegetable garden. You can change that by implementing any of the many stormwater management techniques described in this guide, but how much water can you expect to harvest? In a given storm event the amount of runoff depends on many factors, making precise calculations complicated, but a rough estimate is easily obtained by using runoff coefficients. In this method, runoff is calculated by multiplying the surface area by a coefficient (Table 1) that estimates the conditions of the particular conditions. This is then multiplied by the depth of rainfall to obtain a volume of runoff. To make the calculation easier you can assume that rainfall depth comes in units of 1 (1in or 1cm etc.), that way you'll know, for instance, how much runoff you'll have per inch of rainfall.

Here's the equation:
Volume Runoff =
Surface Area x Runoff Coefficient x Rainfall Depth

Helpful Conversions

0.083 feet = 1 inch
0.01 meter = 1 cm
1 cubic foot = 7.48 gallons
1 cubic meter = 264.12 gallons

Table 1: Runoff Coeficients

Soil Groups A and B are sandier and Soil Groups C and D are more clayey. These soil classifications would be found in a county soil survey available at any Soil and Water Conservation District office or North Carolina Cooperative Extension center.

Land Use/Cover	Soil Group A	Soil Group B	Soil Group C	Soil Group D
100% impervious (parking lots, rooftops, paved sidewalks or patios)	0.98	0.98	0.98	0.98
Open space with grass cover <50%	0.68	0.79	0.86	0.89
Open space with grass cover 50% to 75%	0.49	0.69	0.79	0.84
Open space with grass cover >75%	0.39	0.61	0.74	0.80
Woods in fair hydrologic condition	0.36	0.60	0.73	0.79
Residential lot (1/4 acre)	0.61	0.75	0.83	0.87
Residential lot (1/2 acre)	0.54	0.70	0.80	0.85
Residential lot (1 acre)	0.51	0.68	0.79	0.84

(Table adapted from USDA-NRCS Curve Numbers, 1986)

Here's an example of how it works:

Step 1: Assess Site Conditions
In this example we will use a 200 ft^2 patio

Step 2: Obtain Runoff Coefficient
Using the provided table (Table 1), look up the runoff coefficient that most closely resembles your site. In this case it is 0.98.

Step 3: Do the Math
Volume Runoff = Surface Area x Runoff Coefficient x Rainfall Depth
Volume Runoff = 200ft^2 x 0.98 x 0.083ft = 16.3ft^3
Note: Make sure that "Surface Area" and "Rainfall Depth" are in the same units. It doesn't matter what you use, just stay consistent -- measurements in feet or meters are generally easiest.

Step 4: Convert if Necessary
Most people have trouble thinking about water volume in cubic feet so we will convert to gallons multiplying by 7.48gal/ft^3.
Volume Runoff = 16.3ft^3 x 7.48 gal/ft^3 = 121.7 gallons