HOW-TO GUIDE: Rainfall Runoff Demonstration

This demonstration will show how different types of land cover determine how much runoff is generated from a rainstorm. Total time for the demonstration is about 20-30 minutes.

MATERIALS NEEDED
(Total cost ~$20-30 if all supplies need to be purchased)

- 2 paint trays and plastic liners (at least a 9" tray)
- Roll of hardware cloth (i.e. wire mesh), 1/4", cut to fit one tray*
- Ceramic floor tile(s) (at least 6"x6")
- Piece of grass/sod (about 8"x8")** OR potting soil (about 10 cups)
- 1 plastic watering can
- 1 meauring cup
- 1 timer/stopwatch

* Have an adult do this part because the cut mesh is sharp
** Contact a local sod farm to purchase one roll of sod for just a few dollars, or see if they have small scraps to use (available during growing season)

Step 1

Line each paint tray with a plastic liner. Fill each with the following:

- Tray 1: Lay the tile at the top of the tray
- Tray 2: Lay the piece of wire mesh on the tray. Fold the mesh up just before the paint reservoir to hold the sloped material (soil/sod) from washing into the reservoir.

Tray 1

Tray 2

Step 2

For tray 2, you can use either grass/sod OR compact soil to demonstrate a vegetation surface.

- Grass/sod: lay a piece roughly 8"x8" on top of the wire mesh (if needed, use some soil beneath to stabilize).
- Soil: compact roughly 10 cups of soil on top of the wire mesh only (the rolled up mesh should hold soil back from paint reservoir).

Grass/sod

Compact soil

Step 3

Using the measuring cup, fill the watering can with 16 oz. of water to pour over tray 1 (you will repeat this for tray 2).

Step 4

Pour 16 oz. of water over each surface and take note of the following:

- Using your timer, how long does it take the water to flow over, into, or through each surface (try to be consistent in your pouring rate)?
- Did more water run off into the paint reservoir from the tile or vegetation surface (optional: pour water back in measuring cup for exact amount)?

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Why Do hard, smooth surfaces like the tile produce more runoff?

Smooth, hard surfaces such as concrete and asphalt (like the tile demonstration), which roads and buildings are made from, do not allow water to seep into them because they are compact and have no free air space for the water to enter. Therefore, water runs over them faster and less water is absorbed.

Green spaces like this rain garden help reduce the amount of runoff during a rain event.

Soil and vegetation surfaces allow water to move through them because there is air space between particles of soil and roots of plants. Therefore, these surfaces absorb some of the water and the flow of water over these surfaces is slower.

Runoff on bare soil or vegetation will vary by vegetation and soil type, and whether the soil was wet or dry beforehand. The rate of rainfall can also affect the amount of runoff.

- Wet soil: more rainfall turns into runoff because less can be absorbed by the already saturated surface.
- Very dry, compact soil: it can act like a smooth, hard surface and generate more runoff. Very dry, compact soil behaves this way

because there is very little air space between grains of soil that rainfall can enter.
- Fast, heavy rain: most likely will produce more runoff because it falls too fast for the ground to absorb it.

Adding permeable space to concrete, like these blocks of brick pavers, can increase the amount of rainfall that is absorbed by the ground, helping to reduce runoff.

How does this relate to climate and weather?

In the future, rainfall is expected to become heavier and fall over shorter periods of time. In between rainfall events, soils are expected to dry out and become more compact because rainfall will occur less often. This will result in more runoff, which affects crop and vegetation growth, along with ground water supplies (since less will be absorbed directly into the ground). In addition, it can also create flooding issues, especially in urban areas where concrete makes up a lot of the land surface.

Photos courtesy of Illinois-Indiana Sea Grant