



Sponge and Bucket – Soil Water Movement

Sponges for Soil Properties; Sponge and Bucket; and How Soil Acts as a Water and Sponge websites

[Video demonstration - Kris Systems](#)

Introduction:

Water movement in soils is dictated by the amount, size, and continuity of soil pores or soil structure. The larger number and size of pores as well as continuous linkage between pores allows water on the surface to rapidly enter the soil. However, if pore size and number is too large, such as in very rocky or sandy soils, the water flows rapidly through the soil resulting in droughty conditions. Therefore, it is highly desirable for soil to have a balance between enough pore space to allow rapid water infiltration to prevent ponding but not so much pore space to result in little water retention for plant growth.

Materials:

- Buckets or similar containers
- Sponges – use sponges of similar sizes (cut if necessary) but with differing amounts or sizes of openings
- Water
- Food coloring, optional
- Graduated cylinder or measuring cup, optional
- Balance, optional

Method:

1. Discuss how the structure of the soil is similar to the structure of soil with pore spaces and solid spaces (created by soil aggregates, minerals, organic matter, and other soil particles). Show how different sponges differ in the amounts and sizes of pores and how this impacts water movement.
2. Dip sponge in bucket and allow it to get saturated. Show how the sponges differ in getting wet.
3. Pull sponge out of water and let drip
4. Once at 'field capacity' or it stops dripping, squeeze to release plant available water and collect in an empty container. (Optional) Measure the amount of water with a graduated cylinder or measuring cup.
5. Sponge is still wet indicating unavailable water
6. (Optional) Weigh the wet sponge and let it dry at room temperature over the next several days. Weighing daily. When the weight no longer changes, the sponge is completely dry. Subtract the dry weight from the initial weight giving the weight of

unavailable water. This may be converted to volume based on 1 gram equaling 1 milliliter of water.

Observations:

1. Observe how much water comes out of the sponge after removing it from the water and letting it drip.
2. Observe how much water comes out of the sponge with squeezing.
3. (Optional) Measure the amount of unavailable water.

What is happening:

1. Differing amounts of pore space will impact water movement.
2. The water that drips out of the sponge is considered to be gravitational water and is water that moves into and out of the large pore space between aggregates, root channels, earthworm casts, etc. due to gravity.
3. The water that is squeezed out of the sponge is water within the smaller pores between aggregates and other soil components. This water is available to the plants with some exertion of energy.
4. The water that is in the wet sponge is plant unavailable, because it would take too much energy to remove it from within the fine pores and aggregates where it is cohesively bound.