

Lesson # 2: Groundwater Movement and Soils

Through the activities below, students will learn how different types of soils and soil structure influence groundwater movement. Students will begin to understand how groundwater can become polluted.

Activity # 1: “Sand, Gravel & Clay Soils & Groundwater Movement”

Teacher Preparation: *Obtain 3 clear plastic containers or cut the tops off of clear plastic pop bottles. Fill one container with sand, the other with gravel and the final container with clay.*

Allow the students to feel each soil type and look at each container of soil. Have students discuss the differences they see between the 3 soils.

Student Discussion Questions:

1. What do you notice about the size of the particles of sand, gravel & clay? Which has the largest particles? The smallest?
2. Ask students what is between the soil particles (spaces). Tell them that the “spaces” between the particles refers to the POROSITY of the soil. Which soil has the largest and smallest spaces?
3. Ask students which soil would allow water to move through the quickest and explain why. Tell them that the term used to describe the rate or speed at which water moves through the soil is called PERMEABILITY. Explain the relationship between porosity and permeability (larger or smaller spaces between the particles of soil results in a faster or slower movement of water through the soil).
4. If you were to construct a well into an aquifer, which of the 3 soils would you choose. Why? (Answer: Gravel. More water can be stored between the large pores and it would be easiest for a well to pump water from a gravel aquifer with large pore spacing.)
5. Which soil type could help protect or limit contaminants found on the land surface from entering the water table and groundwater aquifers? (Answer: Clay. Clay soils due to their small particle size and spacing can help limit contaminants from entering groundwater. Clay soils can serve as a barrier and help protect groundwater aquifers.)

Activity # 2: “Groundwater Movement “(See Attachment)

The attachment describes another interactive way to involve and explain to students the relationship between soil particle size and groundwater movement. Select 2 students to be water molecules. Have the rest of the class mimic the characteristics and soil spacing of sand, gravel & clay. For student discussion questions, refer to the questions under Activity #1.

Activity #3: “Groundwater Movement Experiment” (See Attachment)

The 2nd page of the attachment describes a simple but effective way for students to see the rate of water movement through the different soils of gravel, sand and clay. Place cheesecloth in the bottom of 3 funnels. Fill each of the 3 funnels with sand, gravel & clay. Place funnels in clear container so the funnel is situated off the bottom of the beaker or container. Have your students record the results. For student discussion questions, refer to the questions under Activity #1 .

Key Terms:

1. **Porosity**: The property of being porous and having pores.

In the activities, we are referring to the “pore spacing” between various types of soils. Large soil particles have larger spaces between them. The more “porous” the material, the more quickly water moves through the soil.

2. **Permeability**: The property of a membrane or material that permits a substance to pass through it.

The activities have shown pore spacing and particle size directly relates to the speed and rate which water can move through soils. Porosity and Permeability work together in that large pore spacing results in a higher permeability rate and more rapid movement of water through the soil.

Water Cycle Resources: Expanded explanations of terms and information on other components of the water cycle can be found at:

<http://ga.water.usgs.gov/edu/dictionary.html>

<http://ga.water.usgs.gov/edu/watercyclesummary.html>