

# How Does Groundwater Travel?: Demonstration

## Demonstration #2

The permeability of rock or soil is defined as its ability to transmit water or other liquids. Permeability depends on how well connected the pores are. The cups which contain sand and/or gravel will allow the water to pass through quickly while the cup with clay may not allow any water to pass through. Cups containing a mixture of soils will be less permeable than the cup of sand and/or gravel because the large pore spaces will be filled in by the smaller soil particles. Caution: Be sure to saturate the material in the cups and drain the cups before timing the results.

### For this demonstration you will need:

- 8 plastic cups                      \*sand                      \*soil                      \*clay                      \*gravel
- 8 plastic cups with holes in the bottom                      \*several stopwatches                      \*water
- large plastic tub to soak samples                      \*catch bucket for drainage

I. Using cups with holes in the bottom, fill each cup with a different earth material or mixture of materials as follows:

- |                            |   |
|----------------------------|---|
| Cup 1: clay                | Cup 2: sand                             |
| Cup 3: gravel              | Cup 4: soil                             |
| Cup 5: 1/2 gravel+1/2 sand | Cup 6: 1/2 soil + 1/2 gravel            |
| Cup 7: 1/2 soil + 1/2 sand | Cup 8: 1/3 soil + 1/3 gravel + 1/3 sand |

For each of the cups requiring a mixture (cups 5-8) the materials should be mixed thoroughly before they are put into the cup. Each cup should then be filled with the required material so that the level of the material is one inch from the lip of the cup. Identify each cup according to the material it contains.

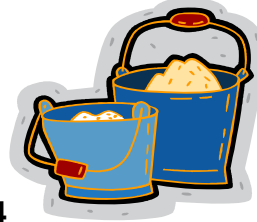
2. Place the samples in the large plastic tub and pour water into all of the samples until fully saturated. Samples will be saturated when the cup is lifted out of the tub and water drains from the bottom. Keep adding water until each sample is saturated.
3. Designate teams of two students; one to work the stopwatch and the other to pour. Instruct them in the following procedure. With one student ready with the stopwatch, have the other student quickly pour in one plastic cup of water. The student with the stopwatch should start the watch as soon as all the water has been poured in the cup and stop the watch when the first drop of water appears from the bottom of the cut. They should then record the times for each cup on their worksheet.

Your students should discover that the different sizes and shapes of the particles create different sized pore spaces. The permeability or the ease with which water passes through unconsolidated deposits like the ones in this demonstration is determined by the smallest of the gaps in a solid rock, however, water's ability to pass through depends on how well the pores are connected to each other.

## Groundwater Travel Worksheet

Cup Number	Contents	Time In Seconds (From sight of first drip)
1	Clay	
2	Sand	
3	Gravel	
4	Soil	
5	½ gravel/sand	
6	½ soil/gravel	
7	½ soil/sand	
8	1/3 soil/gravel/sand	

Cups can be pre-filled, and/or pre-saturated as time and age appropriateness allow. Bog personnel should be notified in advance of the group's requirements.



**EALR's: Science 1.1.1, 1.1.5, 1.2.1, 2.1.1, 2.1.4**  
**Communication 1.2.1**  
**Mathematics 2.2.1, 3.2.2, 4.1.1**  
**Writing 2.2.1**

## Groundwater Reflection Sheet

1. If you wanted the groundwater to flow like a stream, which cup would have the best materials?

Cup # \_\_\_\_\_

Why?

2. If you wanted the groundwater to stay in a pool or reservoir, which cup would have the best materials?

Cup # \_\_\_\_\_

Why?

3. Which cup represents the bog?

Cup # \_\_\_\_\_

Why?