

Teacher's Notes

Travel Underground with Water !

Groundwater is the portion of water beneath the surface of the earth. It is stored in spaces and cracks between grains of sand, gravel and rocks. Rainfall is the main source of fresh groundwater. It may enter the ground where it falls, or it may collect in lakes or rivers and then seep into the ground.

Two characteristics that affect the movement of groundwater are *porosity* and *permeability*. *Porosity* is the amount of water that a material can hold in its pores. *Permeability* is the ability of a material to let water pass through its pores. The layers of sand, gravel or rock that contain water is called an *aquifer*.

Water is always moving. In order to move, it must be able to flow through spaces between sand, gravel and rock underground. If water was not able to move through these spaces, then the water cycle would be "clogged" because the water underground would not be recharging streams, rivers, lakes and oceans. This does not happen because materials underground let water pass through their pore spaces.

Earth materials plays an important role in the water cycle because they allow water to filter through their layers. Water movement underground can be very slow or very fast depending on the type of earth material. Rocks and gravel have large pore spaces. They can hold a lot of water (large porosity) and allow large amounts of water pass through their pores. Water takes a long time to filter through clay because its grains are so close together that there is almost no space for the water to be stored or to pass through. Water can move as fast as 15 meters per day in coarse gravel but in clay it can take up to 500 years to move the same distance!

Different earth materials determine how quickly contaminants such as septic tank seepage, spilled chemicals or leaking gasoline will move through the ground layers. By knowing the type of earth materials present, we can estimate how long it will take for a particular contaminant to reach the groundwater reservoirs.



Travel Underground with Water

Overview of Activity:

Students investigate different earth materials, observing and comparing the rate at which water moves through each material.

Outcomes:

- Describe different earth materials found underground.
- Observe the filtration rates of different earth materials.
- Compare observations and draw conclusions.

Purpose:

Students investigate the texture and grain size of various earth materials found underground and experiment to determine how quickly water filters through each. This activity is an introduction to groundwater issues.

Materials Needed:

5 plastic containers (e.g. yogurt)
5 small trays
water (5 cups)
scissors
soil; sand; gravel; school yard sediment;
clay

Procedure:

1. Poke small holes into the bottom of 5 plastic containers
2. Fill each about half full with a different earth material (soil, gravel, sand, clay, school yard sediment)
3. Place small trays beneath each container. These trays will be used to catch the water as it filters through.
4. Use Activity 1a to help students closely observe and describe each earth material. Use Activity 1b to help students observe filtration rates of each earth material.



Teacher Discussion Questions:

1. What colour is each materials?
2. Does the materials run smoothly through your finger?
3. Which material has the largest grains?
4. Which material has the smallest grains?
5. Does the materials stick together when you squeeze it in your hand?
6. Where can we find this material?
7. In nature, is there water near this earth material?
8. Which material do you think will let water pass through it quickly?

Observations:

See Activity Sheet 1, 2 and 3

Conclusions:

Students investigate different earth materials, comparing the texture and grain size of each. They conclude that water filters through sand and gravel very quickly. Soil and school yard sediment take longer, while clay takes the longest to filter through.

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Activity Sheet 1a

A) Take a good look at the grain size, colour and shape of each earth materials. Describe each below:

Type of Earth Material	Grain Size	Colour	Which has largest grains?	Which will water pass through most quickly?
School Yard Sediment				
Sand				
Potting Soil				
Gravel / Rocks				
Clay				

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Activity Sheet 1b

B) Observe and record the filtration time of each earth material. Has the grain size, shape and colour of each material changed? Compare Activity Sheet 1a with this chart. How do your results compare?

Type of Earth Material	Grain Size	Colour	Filtration ranking: Which will water pass through most quickly?
School Yard Sediment			
Sand			
Potting Soil			
Gravel / Rocks			
Clay			

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Travel Underground with Water - Worksheet 2 and 3

Porosity Puzzler
Worksheet 2

Permeability Puzzler
Worksheet 3

Travel Underground with Water ! Activity Sheet 1a

A) Take a good look at the grain size, shape and colour of each earth material. Describe each below:

Type of Earth Material	Grain Size	Colour	Which has largest grains?	Filtration Ranking: Which will water pass through most quickly? Rank 1-5 (1+
School Yard Sediment				
Sand				
Potting Soil				
Gravel / Rocks				
Clay				

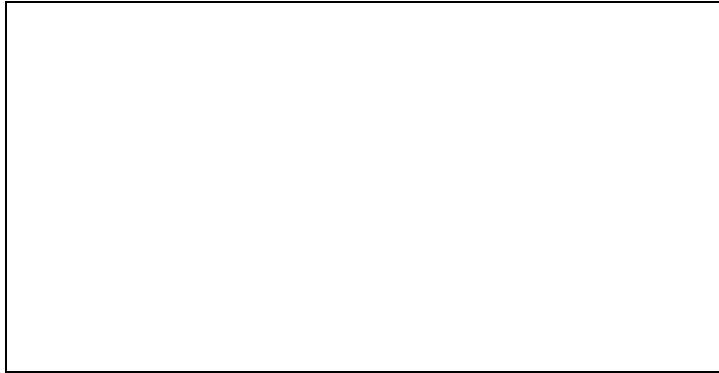


Travel Underground with Water
Worksheet 2

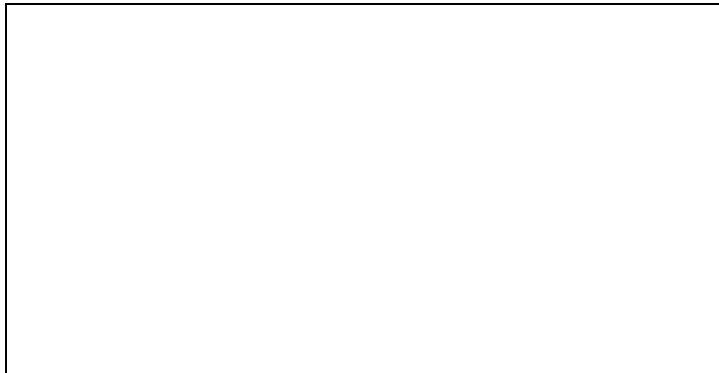
Porosity Puzzler

Colour the spaces between the particles to see which soil has larger pore spaces. Which soil will let water pass through it more quickly? Why?

1.



2.



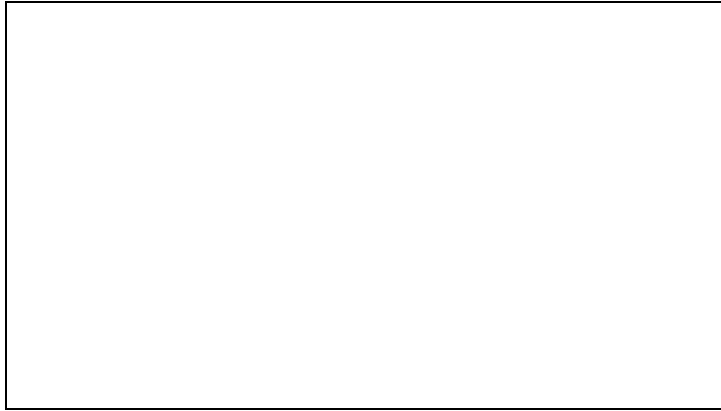
Taken from The Water Sourcebook, Nebraska Water Environment Association p.4-27, 1995

Travel Underground with Water
Worksheet 3

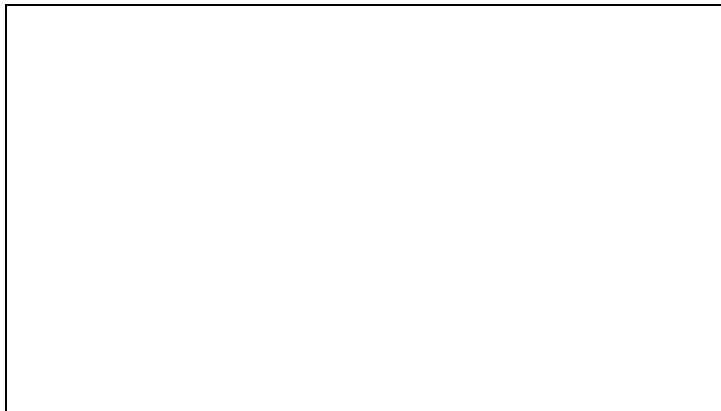
Permeability Puzzler

Follow the mazes below. Show the path of water through each maze. Which one allows water to flow more freely?

1.



2.



Taken from The Water Sourcebook, Nebraska Water Environmental Association p.4-28, 1995