Lesson 4

Water Wheres

Where does our drinking water come from?
How is water stored?
What type of soil is best suited to contain water?

GOAL To understand that different soils determine the type of storage that is best suited for water.

OBJECTIVES Students will:

- ✓ identify types of water storage areas
- ✓ understand that different soil materials affect permeability of soil
- ✓ determine best soil material for water storage
- ✓ identify difference between reservoir and aquifer

MATERIALS **gravel, sand, clay, three plastic containers, stop watch or second hand on watch, soda bottle, pump spray, straw, rocks, piece of nylon, rubber band**

CORE CURRICULUM CONTENT STANDARDS

- **Science 1(2,7), 7(4,5), 8(6 - 8)**
- **Social Studies 12(5,7)**
- **Arts 6(2)**

VOCABULARY **gravel, sand, clay, aquifer, reservoir, well, permeate**

PROCEDURES

1. Students brainstorm ideas about the source of their drinking water. Have them think about where their water comes from. Identify possible sources for them (*wells, ground water, reservoirs, aquifers*). Explain that drinking water may be stored in a variety of ways. Sometimes water is stored in man-made lakes, called *reservoirs* or underground.
2. Reservoirs are artificial lakes that collect and store water. Dams prevent the flow of water and establish collection basins.
3. An underground spring or storage area is called an *aquifer*. Water is stored in pores and spaces of rocks and gravel. Wells are holes that can be drilled into the aquifer and through which water may be pumped out to the surface. Rain can eventually recharge or add water to the aquifer. Pose the question, “What happens if water is pumped out of the more quickly than it is put in by rain?”
4. Explain that water moves through different materials at different rates of time. For example, water moves through gravel faster than sand and through sand faster than clay. Tell students that they will become soil scientists and test different materials.

5. Have students test different materials to determine how quickly or slowly water is absorbed into soil materials. Place equal amounts of gravel, sand, and clay in three different containers. Pour the same quantity of water into containers and note how quickly (or slowly) the water is absorbed.
6. Based on test results, have students answer following questions:
   - What type of rock materials would be best suited for an aquifer, the best storage capacity for groundwater? (Answer: *gravel – to allow for free flowing of the water)*
   - If you were to drill a well for water, what type of material would be the easiest to drill through? (Answer: *sand – have students experiment by pushing toothpicks through soil)*
   - If they were lining the bottom of a new reservoir, what would be the best material to use? What type of material would be difficult for water to permeate? (Answer: c*lay- have students feel different soil textures with hands to determine which soil is more packed together)*
7. Students or student groups are now prepared to create a flow model that demonstrates the pumping action of a well. Cut a liter bottle in half. Fill one-third with rocks or gravel. Secure a piece of nylon over the bottom end of a pump sprayer with a rubber band.
8. Place pump sprayer into rocks and fill with sand two inches from top.
9. Insert straw into the sand just inside the wall of the container and opposite the pump sprayer.
10. Add water to container, observing how the water affects the water table. This demonstrates the action of wells utilizing groundwater.
11. Use the pump sprayer to withdraw water. Observe the flow of water and drop in water level (around the well) when the water is being pumped out. The water will gradually fill back in once the pumping stops. Record observations.
12. Discuss with students how the well eventually fills up again (*more water added through sprayer or precipitation).*

EXTENSIONS

1. Spill a pollutant (food coloring) into well on top of the sand. Use the pump and observe the reaction of the pollutant.
2. Spray water on top of the sand and observe what happens to the pollutant.
3. Make the same model well with different types of material (ie. silt).
4. Have students place the pollutant through the straw. Spray water and observe what happens.

RESOURCES

Haskin, Kathleen M. Claryville, 1995, *The Ways of the Watersheds: An Educators Guide to the Environmental and Cultural Dynamics of New York City's Water Supplies*, NY: The Frost Valley YMCA

GLOSSARY

aquifer - an underground layer of earth, gravel or porous stone that yields or holds water
clay - a fine-grained, firm earthy material that is plastic when wet and hardens when heated, and widely used in making bricks, tiles, and pottery
gravel - a mixture of rock fragments or pebbles
permeate - to spread or flow throughout; pervade
reservoir - a natural or artificial pond or lake used for the storage and regulation of water
sand - small, loose grains of worn or disintegrated rocks
well - a deep hole or shaft sunk into the earth to obtain water, oil, gas or brine