EPA ENVIRONMENTAL EDUCATION

AQUIFER IN A CUP (AQUIFER ON THE GO)

BACKGROUND: Many communities obtain their drinking water from underground sources called **aquifers**. Water suppliers or utility officials drill wells through soil and rock into aquifers to supply the public with drinking water. Homeowners who cannot obtain drinking water from a public water supply have private wells that tap the groundwater supply. Unfortunately, groundwater can become contaminated by improper use or disposal of harmful chemicals such as lawn care products and household cleaners. These chemicals can percolate down through the soil and rock into an aquifer—and eventually into the wells. Such contamination can pose a significant threat to human health. The measures that must be taken by well owners and operators to either protect or clean up contaminated aquifers are quite costly.

NOTE: This demonstration should follow a class discussion on potential sources of pollution to drinking water supplies.

OBJECTIVE: To illustrate how water is stored in an aquifer, how groundwater can become contaminated, and how this contamination ends up in a drinking water source. Ultimately, students should get a clear understanding of how careless use and disposal of harmful contaminants above the ground can potentially end up in the drinking water below the ground. This particular experiment can be done by each student at his or her work station.

MATERIALS NEEDED PER STUDENT:

1 clear plastic cup that is 2 3/4" deep x 3 1/4" wide
1 piece of modeling clay or floral clay that will allow a 2" flat pancake to be made by each student for his/her cup

White play sand that will measure 1/4" in the bottom of each student's cup
Aquarium gravel (natural color if possible) or small pebbles (approximately ½ cup per student)
(Hint: As many small rocks may have a powdery residue on them, you may wish to rinse and dry them on a clean towel prior to use. It is best if they do not make the water cloudy.)

Red food coloring
1 bucket of clean water and a **small cup** to dip water from bucket

PROCEDURE:

1. Pour 1/4" of white sand into the bottom of each cup, completely covering the bottom of the container. Pour water into the sand, wetting it completely (there should be no standing water on top of sand). Let students see how the water is absorbed in the sand, but remains around the sand particles as it is stored in the ground and ultimately in the aquifer.

2. Have each student flatten the modeling clay (like a pancake) and cover ½ of the sand with the clay (students should press the clay to one side of the container to seal off that side). The clay represents a **"confining layer"** that keeps water from passing through it. Pour a small amount of water onto the clay. Let the students see how the water remains on top of the clay, only flowing into the sand below in areas that the clay does not cover.

3. Use the aquarium rocks to form the next layer of earth. Place the rocks over the sand and clay, covering the entire container. To one side of the cup, have students slope the rocks, forming a high hill and a valley (see illustration below). Explain to the students that these layers represent some of the many layers contained in the earth's surface. Now pour water into your aquifer until the water in the valley is even with your hill. Students will see the water stored around the rocks. Explain that these rocks are porous, allowing storage of water within the pores and openings between them. They will also notice a **"surface"** supply of water (a small lake) has formed. This will give students a view of the ground and surface water supplies, both of which can be used for drinking water purposes.

4. Put a few drops of the food coloring on top of the rock hill as close to the inside wall of the cup as possible. Explain to the students that people often use old wells to dispose of farm chemicals, trash, and used motor oils, and that other activities above their aquifer can impact their drinking water. Students will see that the color spreads not only through the rocks but also to the surface water and into the white sand at the bottom of their cups. This is one way pollution can spread through the aquifer over time.

FOLLOW-UP:

Discuss with students other activities that could pollute their aquifer. Ask students to locate activities around the school or their own homes that could pollute their drinking water sources if not properly maintained. Allow students to drain off the water in their cups and carry home their containers to refill with water, showing their parents surface water, groundwater, and how pollution activity above the aquifer can affect all of the water. Students should discuss with parents what steps they can take as a household to prevent water pollution.