

ENVIRONMENTAL EDUCATION

BUILD YOUR OWN AQUIFER

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 for the groundwater contained therein to supply the public with drinking water. Home owners who cannot obtain their drinking water from a public water supply, will have their own private wells drilled on their property to tap this supply. Unfortunately, the groundwater can become contaminated by harmful chemicals, such as lawn care products and cleaners that were used or disposed of improperly after use or any number of other pollutants. These chemicals can percolate down through the soil and rock and into the aquifer - and eventually the well. 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 the drinking water well. 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.

MATERIALS NEEDED:

- 1 6" x 8" clear plastic container that is at least 6-8" deep (shoe box or small aquarium)
- 1 lb. of modeling clay or floral clay
- 2 lbs. of white play sand
- 2 lbs. of aquarium gravel (natural color if possible) or small pebbles
(As any small rocks may have a powdery residue on them, you may wish to rinse them and dry on a clean towel prior to use. It is best if they do not add cloudiness to water.)
- 1 drinking water straw
- 1 plastic spray bottle (be sure the stem that extends into the bottle is clear)
- 1 small piece (3 x 5) of green felt
- 1/4 cup of powdered cocoa
- red food coloring
- 1 bucket of clean water and small cup to dip water from bucket
- scotch tape

PROCEDURE:

1. To one side of the container place the small drinking water straw, allowing approximately 1/8 of an inch clearance with the bottom of the container. Fasten the straw directly against to the long side of the container with a piece of tape. Explain to the students that this will represent two separate well functions later in presentation (if not placed at this time, sand will clog the opening).
2. Pour a layer of white sand completely covering the bottom of the clear plastic container, making it approximately 1 1/2" deep. Pour water into the sand, wetting it completely, but 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.
3. Flatten the modeling clay (like a pancake) and cover 1/2 of the sand with the clay (try to press the clay into the three sides of the container in the area covered). 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 not covered by the clay.
4. 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 your container, slope the rocks, forming a high hill and a valley (see illustration below). Now pour water into your aquifer until the water in the valley is even with your hill. Let students see the water around the rocks that is stored within the aquifer. They will also notice a "surface" supply of water (a small lake) has formed. This will give them a view of both the ground and surface water supplies which can be used for drinking water purposes.
5. Next, place the small piece of green felt on top of the hill. If possible, use a little clay to securely fasten it to the sides of the container it reaches.
6. Using the cocoa, sprinkle some on top of the hill, while explaining to students that the cocoa represents improper use of lawn chemicals or fertilizers, etc.
7. Use the food coloring and put a few drops into the straw, explaining to students that often old wells are used to dispose of farm chemicals, trash and used motor oils. They will see that it will color the sand in the bottom of the container. This is one way pollution can spread through out the aquifer over time.
8. Fill the spray bottle with water. Now make it rain on top of the hill and over the cocoa. Quickly students will see the cocoa (fertilizer/pesticide) seep down through the felt and also wash into the surface water supply.
9. Take another look at the well you contaminated. The pollution has probably spread further. Now remove the top of the spray bottle and insert the stem into the straw, depress the trigger to pull up the water from the well. (Water will be colored and "polluted.") Explain that this is the same water a drinking water well will draw up for them to drink.

