

Hazardous Waste in Our Groundwater

Activity

(Modified from EPA's "(Hazardous) Waste Not" in *The Quest for Less**, page 65,
by Kay Frank, SWI, on 6/14/04)

(* *Quest for Less* is a curriculum guide available for free download at
www.epa.gov/epaoswer/osw/kids/quest/index.htm)

OBJECTIVE: Students build individual models in cups to demonstrate pollution of groundwater by hazardous waste.

GROUP SIZE: 1 to 100 students

GRADE LEVEL: 3rd - 6th, younger with extra adult supervision

TIME FRAME: 40 minutes

VOCABULARY: Surface water, Groundwater, Water Table, Hazardous Waste, Aquifer

BACKGROUND:

Nationwide, over half the population depends on water from underground for their household water supply. Water held between soil particles and in pore spaces and fractures in rock underground is called groundwater. The boundary between a completely saturated ground layer and the unsaturated layer above it is called the water table. If a water-saturated zone below the water table yields enough water to pump out, it is known as an aquifer. Water moves through sand, soil, or rock, but is blocked by clay.

Pollutants in the air or on the land surface can be dissolved and carried by rainfall and surface water as it recharges the groundwater. That is how pollution which occurs at the surface can end up in our well water. And since groundwater can discharge into our lakes and streams, pollution that gets to groundwater can also affect those water bodies.

MATERIALS:

- Handout of "What's Going on Underground" or picture on board -(see Attachment)
- 1/4" to 1/2" gravel (available at local concrete company) ($\frac{1}{2}$ cup per student)
- clean sand (1/4 cup per student)
- clear plastic cups, one per student
- Modeling clay or Play dough (half inch X half inch X half inch per student)
- Water
- 16 or 24 oz plastic containers (yogurt, cottage cheese, etc.)
(Put 3 on each table, 1 for sand, 1 for gravel, and 1 for water.)
- Spoons (1 per table) to ladle water
- Dye (diluted food color) in squirt bottle, labeled "pollution" - (I like red...)
- optional, if students want to take models home:
aluminum foil and rubber bands to make covers, markers for names

PREPARATION:

Cover tables with plastic.

Put a rag on each table for spills.

Set up 3 containers (sand, gravel, water) and 1 spoon on each table.

Have cups and pieces of clay ready for each student.

Put diagram of "What's Going on Underground?" on board. (See Attachment.)

PROCEDURE:

1. "What is solid waste? Give me some examples."

(soda cans, plastic bottles, diaper, newspaper, etc.)

"Some kinds of waste are dangerous. Can you think of some?"

(I actually show empty containers, but OK to just mention - used motor oil, gasoline, antifreeze, bug spray, fertilizer, paint, bleach, cleaner, solvents, photo chemicals, pool chemicals, etc.; also industrial chemicals from factories)

"These are called hazardous wastes".

2. "Where does trash go?"

(trash can - dumpster - trash hauler - landfill)

(Describe a landfill, with clay liner in bottom.)

3. "What's going on underground?"

Draw on board or pass out handouts. Show surface water, groundwater, water table, aquifer, well.

Describe how groundwater is in crevices between particles of soil or sand or gravel.

"Where does it come from?" (rain)

"How do we get it out?" (pump it from wells)

4. "Now you're going to make a model of your backyard."

"Take a cup. Fill it 1/3 full of gravel. Dump out pile of gravel in front of you."

"Scoop out 1/4 inch of sand in bottom of cup."

"Put 1 to 2 spoonfuls of water in cup to moisten sand. No extra."

"Where is the water?" (It is still in the cup, but stored in the ground, in the spaces between the sand grains.)

5. "Take a piece of clay. Flatten it to make a circle the size of the cup. Then

take a little piece out of it, so it looks like a cookie with a bite taken out. Place over the sand in the cup, sealing the sides, but leaving an opening to the sand layer."

6. "Add gravel over the clay layer."

"This is the surface of the ground in your backyard."

"Put 2 to 3 more spoonfuls of water in the cup, almost to the top of the gravel layer."

"A well could pump drinking water from the sand (aquifer) layer or from the gravel (aquifer) layer."

7. "A factory has been built next to you. It makes useful "widgets", but the process produces a hazardous waste chemical liquid (show bottle of dye - labeled "pollution"), which they just dump on the surface of the ground. Of course, nowadays there are regulations so a factory can't do this."

8. Squirt a few drops of the dye into each student's backyard cup.
"What happened to the groundwater you were going to drink?"
9. Discuss how easy it is for our water to become polluted. Explain that we have strict rules on how to get rid of hazardous wastes.
10. "So what should we do with our own household hazardous wastes?"
(Use it up. Share with a friend. Recycle oil or antifreeze or paint. Save it for a special HHW collection.)

ASSESSMENT and ENRICHMENT: See original "Quest for Less" guide, page 67.

ATTACHMENTS: "What's Going On Underground?"
Photo of Polluted Backyard

