DAY THREE

OVERVIEW OR SUMMARY OF LESSON

The initial portion of this day may be allotted to completing group presentations on the properties of water. The second part is devoted to studying the relationship between ground water and surface water. Group experiments reveal how ground and surface water interact; how depletion of one affects the other; how different soil types can affect the relationship between the two; and how pollution can migrate through water sources.

PROCEDURES

1. If necessary, complete group presentations and journal entries from Day Two.

2. Refer back to the study of availability of water on earth and the rope measurements. Point out the section of rope which represents ground water. Explain that this water represents the most important source of water for most of our everyday uses, especially in a semi-arid environment like New Mexico. This is because most towns and cities, as well as home wells, draw from ground water.

3. In groups, students will perform the task found in Handout #5 "Ground water and Surface Water." Have them record the results in their journals.

4. Discuss with the class the relationship between ground and surface water.
Conclude by having students draw a picture (again in their journals) showing the relationship between the two. They should also demonstrate (either through words, a picture or diagram) what happens if either ground or surface water is greatly depleted.

ALTERNATIVE OR SUPPLEMENTAL ACTIVITIES

1. The above experiment could be replaced by a transparency describing the interaction of ground and surface water. Groups could then make hypotheses about what would happen in cases similar to those in the experiment. Each hypothesis could be graphically illustrated on an overhead transparency with colored pens.

2. What is the source of the water at your school? Have students trace the source of the water and make connections between ground and surface water in your area. For instance, if your water comes from a municipal well, how does that source interact with surface water? If the well is near a river, the well will eventually draw surface water from the river. The ground water will be replenished by the surface water as long as the well is not overused. Have students speculate as to how contamination from many sources could enter the well serving your school.

3. After students have defined terms in their groups, ask them to create a riddle to describe each definition -- e.g., It is underground but acts as a storage shed. What is it?

CONTENT DISCUSSION

During discussion of the relationship between surface water and ground water, make sure that student definitions of ground water, surface water, depletion, recharge, and water table are realistic and accurate. Also introduce the terms aquifer and fossil aquifer.

Many people believe that ground water refers to a series of underground rivers. However, in most cases water collects in aquifers--filling the gaps between particles of soil, sand or gravel. Rainfall, snowmelt, or surface water flowing over the aquifer can seep down and recharge the aquifer.

Over thousands of years, a certain amount of water may slowly seep deep into the earth forming fossil aquifers. Fossil aquifers differ from regular aquifers in that they are not readily recharged--due to the length of time it takes to refill them. If fossil aquifers are tapped for human needs, it is likely to be a one-time deal. A fossil aquifer, once depleted, may not be recharged for subsequent generations. An example of a fossil aquifer is the Ogallala Aquifer that extends into northeastern New Mexico. After years of excess pumping, farmers are having to drill deeper wells or restrict use as water levels fall.

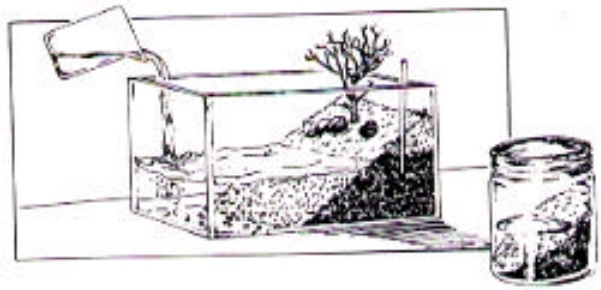
Several layers of ground water or aquifers may lie a few feet -- or several hundreds of feet -- beneath the surface of the land. The location and size of an aquifer depends on the permeability of the surrounding rocks and soil. Water seeping downward slows as permeability decreases. When water reaches a layer of rock that is essentially impermeable, it comes to rest in deep (or fossil) aquifers. Some western cities and agricultural zones are tapping into fossil aquifers as relatively cheap (if impermanent) sources of water.

Handout #5

GROUND WATER AND SURFACE WATER

Materials Needed

Large glass jar or small aquarium
Paper straw or cardboard tube
Gravel
Small tree branches, grasses



Record this experiment in your journals, emphasizing the results and your answers to the following questions:

Step One:
Place gravel in two-thirds of the container, sloping at about a 45 angle. In the area without gravel (the pond), add enough water to cover about half of the gravel slope. Add trees and grass to the dry side of the gravel.

Step Two:
Describe what you have observed. What do you think is the relationship between the water in the pond and what is below the dry gravel?

Step Three:
Drill a "well" by placing the straw or tube into the dry gravel. (To make sure the well reaches the water under the gravel, remove the tube and check to see if the end is dry or wet.)

Step Four:
What would happen to the water level under the dry gravel if someone sucked up on the tube? How do you think that would effect the water level in the pond next to the gravel? What might this tell you about what happens when well drilling pumps too much water out of the ground?

Step Five:
Pour more water into the pond. What natural phenomenon does this represent? Pour more water on the dry gravel side. What does this water represent? What might happen if you replaced the gravel with clay and repeated this step? Would the results be the same? Discuss this with your group.

Step Six:
Pour some food coloring or dye into the pond water. After several minutes, examine the bottom of your well. Is there any trace of color there? What does this tell you about water pollution?

Step Seven:
Decide with your group on a definition for each of the following terms: * *Surface water* *Ground water * Recharge of ground water *Water table * Depletion of ground water*