



H₂O DOWN BELOW

Overview

A well is a man-made hole dug in the ground from which water can be withdrawn. Wells are dug in the Earth until they reach a zone of sand, gravel, or rock that is saturated with water. These zones are called aquifers. Wells work because water will flow from soaked sand, gravel, or rocks into holes. Sometimes electric pumps are used to pump water up the well.

Objectives

- Students will be able to explain, orally or in writing, how water gets into an aquifer, demonstrate, orally or in writing, an understanding of how wells pump water from the ground, and give an oral or written definition of the new terms: aquifer, groundwater, and well.

Completion Time

45 minutes (to complete all activities)

Materials

1. Clear plastic cups (1 per student)
2. Drinking straws (1 per student)
3. Chipped ice
4. Lemonade or juice drink
5. Clear glass bowl
6. White aquarium gravel
7. Modeling clay
8. Water
9. Jar or bottle
10. Blue food coloring
11. Pump (from liquid soap bottle)
12. Aquifer diagram- (included)

Setting the Stage:

Review what happens in the water cycle. Place emphasis on the accumulation (runoff) step of the cycle. Remind the students that water from rain and melting snow trickles down into the ground and is trapped below the surface as groundwater.

Discussion:

As you may already know, the South/Central Texas environment generally does not receive a large amount of rainfall. Large areas of surface water (rivers, lakes, etc.) are hard to find. In fact the community of San Antonio receives most of its drinking water not from surface water, but from groundwater located hundreds of feet underground. Aquifers are replenished or recharged when precipitation accumulates in the ground creating groundwater supplies.

Advanced Preparation:

A. Collect materials for activities and demonstrations.

1. Fill a jar or bottle with water. (Size will depend on how large the glass bowl is.) Tint the water blue with food coloring (probably one drop). Set it aside.
2. Pat out a “pancake” of modeling clay. Size it to fit into the glass bowl with a good (but not necessarily tight) fit.

ACTIVITY

1. Pass out clear plastic cups and drinking straws to each student.
2. Tell students they are all going to make a model aquifer. Fill each cup with chips of ice. The ice represents rock and soil-like materials underground. Pour into each of their cups lemonade or juice drink. The drink represents groundwater. Explain that the cup and drink represent an aquifer and groundwater. The bottom of the cup is the layer of rock or soil that keeps the water from seeping down any further into the ground. The very top of the water is the water table, the top of the underground water layer.
3. Have students sip some of the liquid with their straws. Explain that they have just simulated a well by using their straw to “pump” the liquid from the aquifer. They have lowered the water table.
4. Ask what they would have to do to bring the water table back up to its original level (**A: Adding more liquid to rainfall, which replenishes or “recharges” groundwater.**)





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5. Show the students the aquifer diagram. As you point out the parts of the aquifer, including the water table and the wells, relate these to the drink cup model.
6. [TEACHER: Go back to the jar or bowl you prepared earlier and construct a more complicated aquifer model for the students to observe.
 - A. Use one glass bowl (instead of cups each student used before). As you layer materials in the bowl, talk to the students about what each one represents. (NOTE: Leave the aquifer diagram overhead up during this exercise.)
 - B. The bottom of the bowl is an impermeable layer (water cannot pass through it) just as impermeable layers of rock or clay are found underground.
 - C. Pour in a layer of aquarium gravel. This represents an aquifer much like the Edwards Aquifer located underneath San Antonio. Pour in some blue-tinted water. What kind of water is this?
(A: groundwater)
 - D. Place the pump from a liquid soap or other container into the gravel with the tube extending into the water.
 - E. Next, put on a layer of modeling clay overlying the limestone aquifer. Make sure to pack it around the pump tube creating a tight seal (also ensure the pump and tube are in a vertical position). Clay is impermeable, so the aquifer is trapped between two impermeable layers. Point out to the students that this is called a *confined aquifer* because the water is confined or held in place by two layers of impermeable materials.
 - F. Put in a layer of soil. This represents the land that exists on top of the aquifer where our neighborhoods and cities are built.
 - G. Tell the students that this model may be quite like the ground under their feet right now. Aquifers are present in many locations, although in some places they are deeper in the ground than in other places.
 - H. Ask the students what they think will happen if you work the pump. Let one of them try it while you hold it so the end of the tube stays above the lower modeling clay layer. Dispense some blue-tinted water into a cup.
 - I. Tell the students that this is much the way a well works. Remind them of the demonstration they completed using the drink cups. Point out the wells on the overhead or power point.

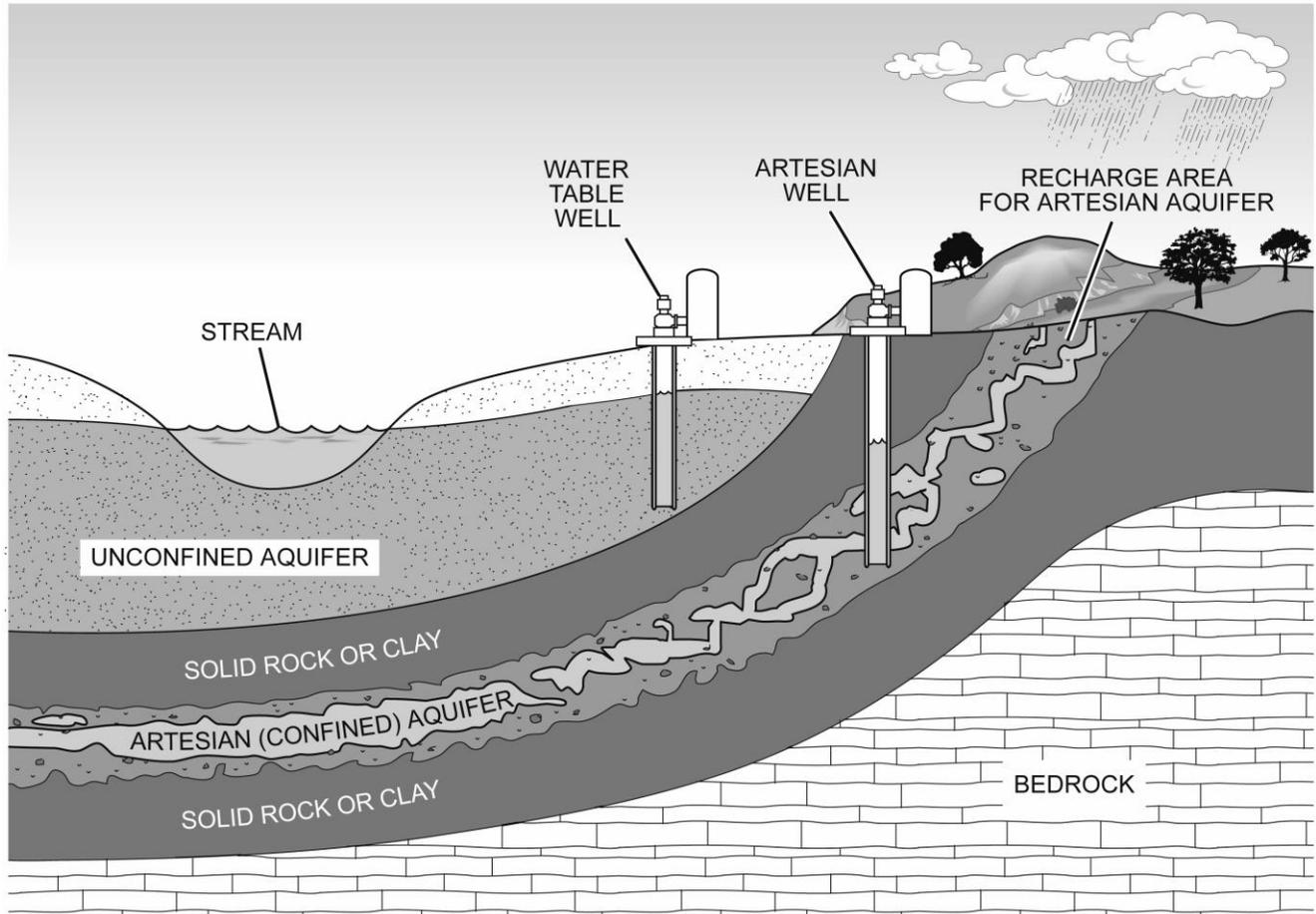
Follow-Up:

If time allows, discuss with the students how the Edwards Aquifer recharges.



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Aquifer Diagram





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Model Diagram

This is what your completed model should look like.

