



“Work that Well”

Objective:

Students will construct a model of a well to investigate how wells work. Students will discover what an aquifer is and define groundwater.

Grade Level

9th-12th

Time Frame

90 minutes

Learning Objectives	Vocabulary	Science TEKS	Materials
Students will: <ul style="list-style-type: none"> Discover how much water is used by individuals, agriculture and industry Discuss alternatives to excessive water use Discover sources of water 	<ul style="list-style-type: none"> <i>Aquifer</i> <i>Well</i> <i>Water table</i> <i>Saturated zone</i> 	<ul style="list-style-type: none"> Aquatic Science: 1A,2E,F,G,H,J,7A,B,C, 12B Earth & Space Sci: 12A, 13A, 15C Environmental Sci: 1A,B,2E,F,G,I,K,4C,5B,C,6A, 8A, 	<ul style="list-style-type: none"> Paper Pencil PVC pipe Five gallon bucket Window screen Coarse aquarium gravel Water Topsoil Thin rubber tube Siphon

Prior to activity

Organize workstations for student groups

Background

A common misconception about the structure of an aquifer is that they are a giant void, or empty space like a cave that stores water. An aquifer is more like a deep layer of sandy coarse soil with interstitial spaces that trap water. A great way to start a conversation is by asking the following question: How do water companies get water out of the sandy soil? To help understand this process you can build an aquifer in a bucket and siphon the water out mimicking the work done through a well.

Engage

Ask students how/who uses water in their community. Have students brainstorm the following (record their answers on the board):

- Which water user uses the largest amount of water?
- How can they reduce the amount of water used?
 - Policies
 - Newer technology
 - Conservation
- What are the different ways people can conserve water?

Explore

Students will use the following procedure to build a well and evaluate groundwater depletion.

- Cut a piece of ¾-inch PVC pipe that is just as long as the depths of a five gallon bucket.

2. Secure a piece of window screening on one end of the PVC pipe
3. Place the screen end of the PVC pipe into the bucket and hold the pipe vertically as you pour coarse aquarium gravel or other small landscaping rocks into the bucket. Be careful not to pour any rocks into the pipe. Leave about an inch of pipe sticking up above the gravel.
4. Pour water into the gravel filled bucket being careful to leave the water line below the gravel. Measure and record the amount of water you poured into the bucket.
5. Cover the top of the gravel with a layer of topsoil. Be careful not to get any dirt into the pipe sticking out of the gravel.
6. The water in the gravel should fill the pipe through the screened bottom. It should be level with the water table in the bucket.
7. Place the bucket on top of a table. Use a thin rubber tube to place into the pipe and siphon the water out into another container on the floor. Measure and record the amount of water you were able to siphon out.
8. The water level in the tube will drop as the water table level drops in the bucket.

Explain

A well is a hole drilled into the ground to access water contained in an aquifer. Water is pulled out of the ground using a pipe and a pump while a screen filters out unwanted particles that could clog the pipe. Wells come in different shapes and sizes, depending on the type of material the well is drilled into and how much water is being pumped out. The amount of water contained in an aquifer depends on the type of earth material that makes up the aquifer. Sandy material has the largest water retention while gravel has the least. Steps should always be taken to protect the aquifers where we are pumping groundwater.

Elaborate

Aquifers, or groundwater, are found under the earth's surface. Most groundwater comes from rain and melting snow soaking into the ground. Water fills the spaces between rocks and soils, making an aquifer. Aquifers are capable of absorbing, storing, and transmitting water. Some aquifers may cover hundreds of square miles and be hundreds of feet deep, while others may produce only small amounts of water each day. Any area of land through which water flows downward or laterally into an aquifer is called its recharge area. Aquifers are replenished by precipitation percolating through the soil and rock of their recharge areas. Groundwater moves through the recharge area, through the aquifer, and out to a discharge area (river, well, spring, stream, lake or ocean) as part of the water cycle.

Evaluate

1. What factor determines the volume of groundwater?
2. How are aquifers recharged?
3. Have students research the aquifers in their region.
 - a. Do these aquifers have any contamination issues?
 - b. What materials make up these aquifers?
 - c. How are these aquifers recharged?
 - d. How is the groundwater in these aquifers allocated between the states and countries that share it?

Glossary

1. Aquifer: Any geological formation containing or conducting ground water, especially one that supplies the water for wells, springs, etc.
2. Well: a hole drilled or bored into the earth to obtain water.

3. Water table (unsaturated zone): The area above the ground water where soil pores are not fully saturated, although some water may be present.
4. Saturated zone: Underground areas below the water table (unsaturated zone) where all open spaces are filled with water. Wells placed in this zone will be able to pump groundwater.