

## ACTIVITY: Build Your Own Aquifer

### BACKGROUND INFORMATION

In Florida, most communities get their drinking water from the underground water source called the Floridan Aquifer. The aquifer is comprised primarily of limestone that holds and stores water in small holes and spaces much like a sponge. The Floridan Aquifer extends underground for hundreds of miles and it's estimated that it stores more than two quadrillion gallons of water!

Water in the aquifer flows underground and some of it is pumped out for drinking and in some places it comes up from the ground to form springs. The same water that we pump up from the ground to use for drinking water is the same water that comes out of springs.

Water companies drill wells into the underground aquifer to supply us with drinking water. Homeowners who cannot get drinking water from a public water supply have private wells that pump water from the aquifer.

Unfortunately, groundwater can become polluted by pesticides and fertilizers used for lawns, golf courses and farm crops, oils and chemicals that wash onto the land from roads and parking lots, and other pollutants. These chemicals can



soak into the ground when it rains and "percolate" down through the soil and rock into the aquifer; this may harm our drinking water and the water that flows from the springs that we swim in.

### OBJECTIVE:

To illustrate how water is stored underground in the aquifer and how groundwater can become contaminated. Ultimately, students should understand basic concepts of the Water Cycle and how the aquifer represents a part of the water cycle. Younger students should have a basic understanding of the water cycle in order to fully understand the aquifer and its connection to the water cycle.

**GRADE LEVEL**  
**3-5**

### Sunshine State Standards:

#### SCIENCE:

##### Processes that Shape the Earth

###### Standard 1:

The student recognizes that processes in the lithosphere, atmosphere, hydrosphere, and biosphere interact to shape the Earth. (SC.D.1.2)

##### Force and Motion

###### Standard 2:

The student understands the need for protection of the natural systems on Earth. (SC.D.2.2)

#### SOCIAL STUDIES:

##### People, Places, and Environments

###### Standard 2:

The student understands the interactions of people and the physical environment. (SS.B.2.2)

*"... groundwater can become contaminated by pesticides and fertilizers used for lawns, golf courses and farm crops, oils and chemicals from roads and parking lots, and other pollutants."*

## ACTIVITY

**1.** View the illustration in this document. On one side of the container about 2/3 of the way down on the long side, place the drinking water straw, allowing approximately 1/8" clearance from the bottom of the container. Fasten the straw directly against the side of the container with a piece of tape. Explain to the class that this will represent two separate well functions later in the presentation (if not placed at this time, sand will clog the opening). Place a 1/8" - 1/4" shim under the "grass" end of the aquifer to create a slight slope toward the straw (too much of a slope will cause the water to run and pool at one end).

**2.** Pour a layer of white sand completely covering the bottom of the container, making it approximately 1 1/2" deep. Pour some water into the sand, wetting it completely, but there should be no standing water on top of the 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. Explain that the Floridan Aquifer is not, in fact, sand but hard porous limestone with many holes, crevices and large caverns storing water.

**3.** Flatten the modeling clay (like a pancake) and cover half 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 that the clay does not cover.

**4.** Use the aquarium rocks to form the next layer of earth. Place a 1" layer of rocks over the sand and clay, covering the entire container. To one side of the container, slope the rocks, forming a high hill and valley (see illustration). Now pour water into your aquifer until the water in the valley is above the sand layer but below the surface of the rock layer (Explain the concepts of porosity and permeability and how they determine how water moves through the aquifer).

**5.** Next, place the small piece of green felt or cotton cloth on top of the hill. If possible, use a little clay to securely fasten it to the sides of the container it reaches. (It's important that water and the "pollutants" be able to leach through the cloth or felt easily).

**6.** Sprinkle some of the cocoa or drink mix on top of the hill, explaining to students that it represents excessive use of lawn fertilizers and pesticides that can pollute the aquifer.

**7.** Put a few drops of the food coloring onto the rocks near the straw, explaining to students that people often dump chemicals, trash, and used motor oils on the land. Students will see that it colors the sand in the bottom of the container. This is one way that pollution can spread through the aquifer over time.

**8.** Fill the spray bottle with water. Make it "rain" on top of the hill and over the aquifer. Quickly students will see the cocoa or drink mix (pesticide/fertilizer) seep down through the cloth and also wash into the groundwater supply.

**9.** Take another look at the well you contaminated. The pollution has probably spread farther. 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 that a well would pump for them to drink. (At the beginning of the project, you should pump clean water with the sprayer to show that it isn't contaminated; spray onto a white paper towel to show the difference between clean and contaminated water).

**Have students talk about the types of pollutants that might be put on the land or wash off of road surfaces. Ask them to identify ideas to limit the amount of these pollutants. Have students explain or predict how the model would respond if the layer of clay covered the entire container.**

## GRADE LEVEL 3-5

**TIME:** 30 minutes

### MATERIALS:

- 1 - 6" x 8" clear plastic container that is at least 6-8" deep (small aquarium works best)
- 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 (Tip: Rinse gravel before using.)
- 1 drinking water straw
- 1 plastic spray bottle (stem should be clear and narrow enough to fit into the straw)
- 1 small piece (3" x 5") of green felt or cotton cloth
- 1/4 cup of powdered cocoa or grape drink mix
- Red food coloring
- 1 container of clean water
- Scotch tape

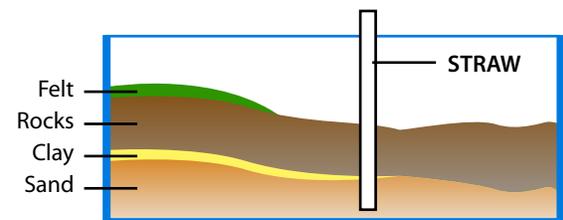
### ADVANCE PREPARATION

Have students view the interactive presentation "**Anatomy of a Spring:**

### The Journey of Water"

<[www.FloridaSprings.org](http://www.FloridaSprings.org)> which explains the Water Cycle, how water flows from the Aquifer to the Springs and how human activities impact the aquifer and springs.

**This activity can also be used to demonstrate what happens when too much water is removed from the aquifer.**



Side View Of Container

## **ALTERNATIVE ACTIVITY:**

**If you are teaching students about the water cycle and the aquifer, try this simple activity to illustrate the characteristics of the aquifer.**

**1)** Get a large shop or cleaning sponge and place it in a shallow pan. For best results, the sponge should be about 3 inches in thickness. Pan should be on a very slight tilt. Explain to the students that the sponge represents the limestone aquifer, and while the aquifer is not soft like a sponge, it is "porous" with many holes and crevasses through which water flows.

**2)** Take a glass of clear water, which represents rain, and pour it slowly onto the sponge. Ask students to explain what they see. Prompt them to observe that while some of the water is flowing through and out of the sponge, the sponge is storing some of the water much like the underground aquifer. Tell them that the water flowing out of the sponge could represent water that may flow to springs or be pumped for drinking water. Squeeze the water from the sponge back into the container to illustrate how the sponge holds the water.

**3)** Next take a packet of grape drink mix and spread it onto the sponge. Tell the students that the grape drink mix represents pollutants like automotive oil that was dumped on the land or fertilizer spread on the lawn. Now slowly pour water onto the drink mix on the sponge. Ask students to describe what they see. Help them understand that like the drink mix on the sponge, pollutants get washed into the aquifer. While the sand and underground layers may filter and hold some of the pollutants, many of the pollutants can enter our drinking water and the springs.

## **EXTENSIONS:**

**1)** Have students identify sources that could pollute the aquifer in their community. (This might include fertilizers in their own yards, local athletic fields or golf courses, farms and ranches, or runoff from parking lots).

**2)** Have students create posters including art or photographs illustrating sources of pollutants to the aquifer.

**3)** Visit a local spring State Park to give students the opportunity to look into the "window" of the aquifer. Use the trip to illustrate how pollutants introduced in the spring's recharge area and aquifer can harm the springs.

