SAVE ME! SAVE ME!

BENCHMARK and TASKS

SC.D. 2.2.1 The student knows that reusing, recycling, and reducing the use of natural resources improve and protect the quality of life.

- The student creates a model of the Floridan Aquifer to illustrate how growth and development affect the water supply.
- The student assesses how our lives are affected by the water cycle and creates a plan to conserve water.

KEY QUESTIONS

How is water stored in an aquifer?
How can groundwater become contaminated?

BACKGROUND INFORMATION

Florida, a peninsula, is surrounded by water, a precious **resource**, but most of it is salty. We can remove the salt through desalination, but the process is very, very expensive. Only three percent of the world's water is drinkable, so it is important that we conserve as much water as we can. In Florida, we are truly connected to the **water cycle** through rainfall. This rainfall replenishes the Floridan Aquifer and supplies all of our drinking water.

The water cycle begins with water falling from the clouds to the ground in the form of precipitation. When the water reaches the ground, some of it will run into lakes, ponds, or other reservoirs. A reservoir is a place where water collects. Some of the rainwater will sink into the earth until it reaches a natural underground storage area called an aquifer. Florida has five main aquifers, which serve nearly all of the state's water needs. The largest, the Floridan Aquifer, underlies just about all of Florida. This aquifer averages 1,000 feet thick. It took form over 60 million to 70 million years as the skeletons and shells of sea life died and stacked up. Eventually, sands and clay from northern mountains washed downstream into Florida, covering up the dead sea life. The animal remains formed layers of limestone.

Water percolates down and seeps into the pores of the limestone like water soaks into a sponge. The top of the water is called the water table and the water that fills the empty spaces and cracks is called ground water. Water stored in the aquifer is sent through underground pipes to our homes to provide our drinking water. Some people are concerned, however, that Florida's growth is depleting our water supply. With growing numbers of people and buildings, we are decreasing the amount of water that makes it into the aquifer.

MATERIALS

Per group

3-4 ounces of aquarium gravel
1 small piece of clay
sand to cover the bottom of the cup
1 clear, plastic cup
water
food coloring

Per group (continued)

masking tape
1 small piece of nylon stocking
1 drinking straw

Per student
1 cup of drinking water

Per teacher
1 cookie sheet or tray
cardboard cut into various shapes/sizes
1 Styrofoam cup
1 push pin
sponges cut to cover the cookie sheet

TEACHING TIPS

1. The St. Johns River Water Management District is a good contact for resources and information. Their program is called *Water Ways*. The address is:
   Division of Public Information
   St. Johns River Water Management District
   P.O. Box 1429
   Palatka, Florida 32178-1429
2. *The Orlando Sentinel* published an informative 12-part series in 2002 called "Florida's Water Crisis." The series may be available online at www.orlandosentinel.com.
3. Before class, fill the film canisters with sand and gravel for each group.

ENGAGE

Make sure each student has a cup of water to drink. Have students drink the water. Ask: *Where do we get our water?*

EXPLORE (Part 1)

1. Explain to students that they will be making a model of the Floridan Aquifer.
2. Students should tape a small piece of nylon stocking to the bottom of the straw. This will act as a screen. Next, the straw should be taped to one side of the cup so that it does not touch the bottom. The straw represents a well.
3. Have students pour sand into the bottom of the cup, completely covering the bottom until it is about ¼ of an inch high. Students should then pour water over the sand, wetting it completely, but leaving no standing water on top. Students should observe how the water is absorbed into the sand but remains around the sand particles as it is stored in the ground and ultimately in the aquifer.
4. Students should flatten the clay like a pancake and cover ½ of the sand, pressing the clay to one side of the container to seal off that side. The clay represents a confining layer that keeps water from passing through it. Ask students to pour a small amount of water onto the clay. Have students observe how the water remains on top of the clay, only flowing into the sand below in areas that the clay does not cover.
5. Students should use the aquarium rocks to form the next layer of earth. Have them place the rocks over the sand and clay, covering the entire container. On one side of the cup, have students slope the rocks forming a high hill.
6. Have students model a rainstorm by gently pouring water into the "aquifer." Have students pour water into the aquifer model until just the hill is above water. Students will see the water trickle into the spaces between the rocks. Tell students that this process is called percolation. Explain that the rocks are porous, allowing the storage of water within the pores and openings between them. They will also notice a surface supply of water (a small lake) has formed. This will give students a view of both the ground and surface water supplies. Tell students that this is our source of water. We take the water given to us through the water cycle, process it, and use it as our drinking water.

7. Tell students that the food coloring represents pollution. Have students pour a few drops of food coloring into the straw, which represents an old well, and watch as it slowly pollutes the water supply. The color will spread not only through the rocks but also to the surface water and into the sand at the bottom. Explain that people often use old wells to dispose of farm chemicals, trash, and used motor oils.

EXPLAIN (Part 1)

Where do we get our water?
How are our lives affected by the water cycle? (The water cycle is essential for life. We're dependent on this cycle to recharge our fresh water aquifers.)
What might happen in the aquifer if we had a drought - a period of no rainfall?
(There would be less and less water. This is how a sinkhole occurs. During times of drought, underground water levels get too low and create hollows in the limestone. The ground then collapses and forms a sinkhole. A drought in 1981 caused a sinkhole ten stories deep in Winter Park. This sinkhole "swallowed" five cars, a truck, a house, half of a public swimming pool, and several businesses! A sinkhole in 2002 swallowed a portion of I-4, a major highway in Central Florida.)
How is an aquifer able to hold so much water? (The earth materials are porous and permeable, so the aquifer can store large amounts of water that can move through it fairly easily.)
How does pollution affect our water supply?
What can we, as individuals and as a community, do to protect our water supply?

EXPLORE (Part 2)

Tell students that Florida is growing every day - new neighborhoods, new buildings, new roads, new theme parks, and new schools. Some people see this as progress, yet many people do not. Why?

Teacher Demonstration

1. Lay the sponges on the cookie sheet to cover it completely.
2. Cover some of the sponges with cardboard pieces to represent schools, theme parks, buildings, neighborhoods, roads, and schools. Make sure that at least 75% of the area is covered.
3. Use a push pin to punch several holes in the bottom of the Styrofoam cup. Cover the holes with masking tape. Pour come water in the cup.
4. Hold the cup over the model and remove the tape, allowing the water to "rain" over the entire area.
5. Discuss what happens. (Some water will sit on top of the cardboard; some water will soak into the exposed sponges.)
6. Remove the cardboard.
7. Observe how the area under the schools, theme parks, buildings, neighborhoods, and roads is dry. Less water is getting into the aquifer. Instead of going into the aquifer, the water may collect on the road, for example, and cause flooding. Also, this unabsorbed water runs off into oceans, lakes, and streams. When the aquifer becomes depleted, this forces us to get our water from another source, such as the ocean, which is very expensive to desalinate.

EXPLAIN (Part 2)

How does the model show a reduction in the amount of water that gets into the Floridan Aquifer? (Too much building and development is preventing rainwater from entering the aquifer.)
Where does the water go when it does not pass into the aquifer? (Water that falls to earth as

precipitation may land on a body of surface water such as a lake or a river and go with the flow; it might run off the land into a nearby water body or storm drain; or it might seep into the ground.)
What other factors might influence the amount of water in an aquifer? (droughts, hurricanes, over-pumping by users)

EXTEND/APPLY

What would be the advantages of continuing to build? (More development would bring more money into our area.)
Do you think pollution increases as we build? Why or why not? (Yes, because more and more people create more and more pollution!)
In your opinion, are the advantages positive enough to outweigh the negative effects of depleting the Floridan Aquifer?
What ideas do you have for conserving our water supply?

EXTENSIONS

1. Have students research the Floridan Aquifer and discuss current steps that are being taken to conserve it.
2. Have students simulate a sinkhole. First, blow up a small balloon and place it in a plastic shoebox. Next, fill the shoebox with sand, making sure the balloon is covered. The balloon represents a hollow in the limestone. Then insert a needle through the sand and poke the balloon. The balloon will break causing a depression in the sand, thus resulting in a sinkhole.

ASSESSMENT

Students will complete a Multi-Flow Thinking Map showing the causes and effects of depleting water from the Floridan Aquifer.