

# WaterWeb

current water info for schools

A publication of the Southwest Florida Water Management District in conjunction with the Charlotte Harbor Environmental Center, Inc.



## The WaterWeb Query

### QUESTION:

How do we get ground water out of the ground?

### ANSWER:

Wells are used to remove ground water from aquifers. A well is a hole that is drilled into the aquifer. A pipe and pump are used to draw the ground water to the surface. Wells, which may exist in different sizes, supply water to cities, homes and farms.

## Ground Water

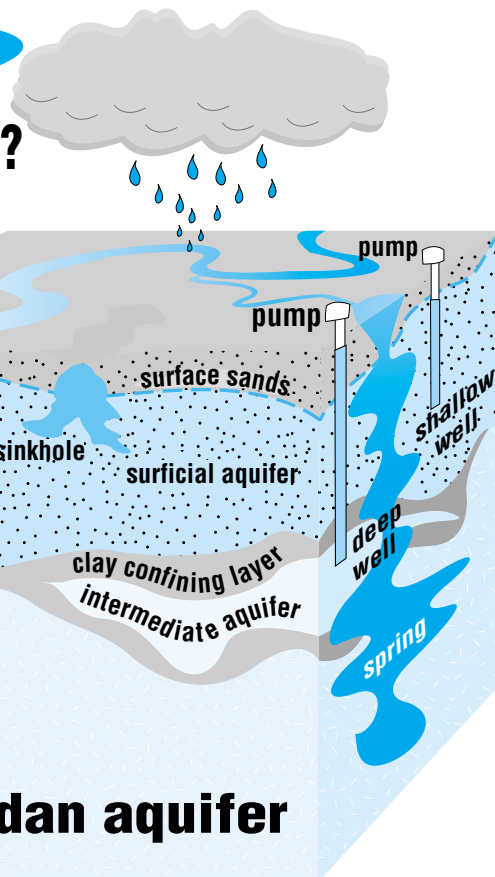
### What do we know about it?

It may seem obvious that ground water is water found in the ground, but how does water get underground? Let's take a closer look at Florida for the answer to this question and more.

Ground water is an important part of the water cycle. It begins as precipitation that gradually soaks into the ground, beneath the Earth's surface.

The ground water is stored in underground areas called aquifers. The water in the aquifers may move into surface water bodies such as lakes, streams and rivers, or it may be pumped out of wells (see WaterWeb Query). As water reaches the surface, some of it will evaporate and move up into the clouds where it will return to the ground in the form of precipitation. This never-ending water cycle continues to repeat itself over and over again.

Florida is part of a coastal plain. It is a relatively low-lying, flat land with sand covering most of its surface. Under this surface are the loosely packed sediments and layers of calcium-rich limestone and



## Floridan aquifer

dolomite that make up the aquifers. Ground water may be found in the spaces between these sponge-like layers of rock and sand. Although some areas of Florida receive drinking water from surface waters such as streams and rivers, most of Florida's population depends on ground water.

*This issue of WaterWeb focuses on ground water. All of the articles and activities are designed to help you learn more about ground water in our area and to have fun at the same time. Don't forget to try making a model of a sinkhole. It's awesome!*

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# Florida's Aquifers

## Do You Know Where Your Drinking Water Comes From?

Excerpted from *Florida Water*, Spring/Summer 1997

Most of the state's drinking water comes from aquifers, which are pockets in the layers of rock beneath the Earth's surface. The Floridan aquifer—the largest and deepest aquifer—is primarily made up of limestone (calcium carbonate), dolomite (calcium magnesium carbonate) and limestone-dolomite mixtures. The aquifer holds water like a sponge. The many holes in the rock allow water to move freely through it. The aquifer is kept in place below the ground's surface by a confining layer of clay.

About 60 percent of the state's population relies on the Floridan aquifer for drinking water. The Floridan aquifer stretches for 82,000 square miles beneath Florida and parts of Alabama, Georgia and South Carolina (see map).

The Floridan is a confined artesian aquifer. This means its contents are under pressure and flow freely when there is a way for



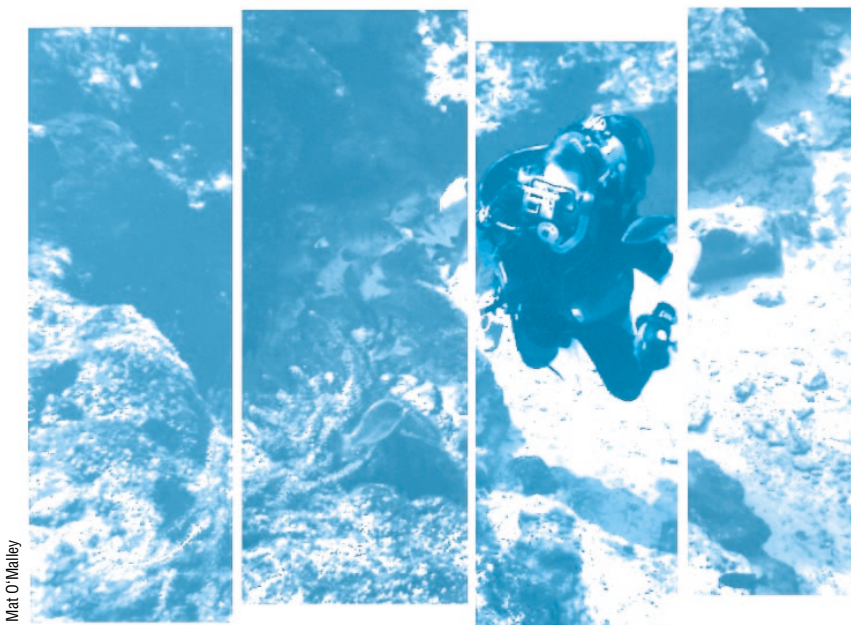
the water to escape; for instance, through an artesian well.

Throughout central Florida, the aquifer system is about 100 to 200 feet beneath the surface, and is found close to the surface in the west-coastal and north-central Florida areas. This means that your geographic location determines how deep your well must be to get water.

In general, the water that comes from the deeper aquifers is considered better than the water that comes from shallow aquifers because those closer to the surface are more susceptible to contamination.

Springs are places where the aquifer's waters escape their deep holding place, forcefully gushing clear liquid toward the Earth's surface. These are places for scuba divers to find adventure (see photo below). Springs coming from the aquifer system also feed rivers. When the aquifer's water becomes part of the surface water, it provides an area for water-skiing, fishing and other forms of recreation.

The Floridan aquifer is one of Florida's most important natural resources. What we do today, may impact tomorrow's drinking water.



Mat O'Malley

# The Floridan Aquifer's Awesome Facts

It stretches 82,000 square miles beneath Florida and parts of Alabama, Georgia and South Carolina.

It is the deepest aquifer in Florida and has an average thickness of 1,000 feet, but is known to be 3,500 feet thick in southwest Florida.

It contains an estimated 1 quadrillion (1,000,000,000,000,000) gallons of fresh water.



It is replenished in a natural process called recharge, which occurs when water seeps through the soil down into the aquifer's limestone layer for storage.

It is made up primarily of limestone rock, which acts as a sponge to hold water. The holes in the rock allow the water to flow freely through it.

Scientists believe water was deposited in the aquifer through rain some 30,000 to 50,000 years ago.

Rocks that make up the aquifer are easily dissolved by acidic rainwater. This can cause cave systems and sinkholes to form.

## Extended Activities



1. Quiz your classmates! Use a stack of 10 index cards and develop TRUE and FALSE statements about the Floridan aquifer. For each card, write a statement on one side of the card and the word TRUE or FALSE on the other side. Ask a classmate to read each statement and provide the correct answer. Score one point for each correct answer.
2. Ready for a research project? Use a search engine on the Internet and surf a variety of sites for additional information about the Floridan aquifer. Share your findings with your class.

Search for

“Floridan aquifer”

**Search**

# Florida's Karst Terrain

*Much of Florida's landscape is made up of "karst" terrain. A karst terrain is a land surface produced by water dissolving the bedrock. It is often characterized by the existence of sinkholes and springs.*

*Let's take a closer look at each of these formations.*



Jim Phillips

### Springs

A spring is a place where ground water that is under pressure discharges through a natural opening in the Earth's surface. Springs are common in Florida because of the karst terrain. Florida has more than 300 recognized springs and many of them have become popular tourist attractions. Try to locate a few of these springs on a map of Florida.



Tony Gilboy

### Sinkholes

A sinkhole may develop when underground limestone erodes and dissolves from acidic water. As rain falls through the atmosphere, it forms a weak carbonic acid. As this ground water moves or percolates through the soil, it becomes even more acidic. This acidic water slowly dissolves limestone, especially along fractures and weak layers. The erosion can cause cavities into which the overlying sediments may collapse. When this happens, a sinkhole may occur. Have you ever seen a sinkhole? If so, where was it located and how big was it?

## It's Your Turn

# Don't Be a Groundwater Polluter!

It's easy to see how surface water becomes polluted, but what about ground water? Surface lakes, streams and rivers become damaged when pollutants are either tossed into them or flow into them from other bodies of water. Do you think that water under the Earth's surface is protected from stormwater runoff or contaminants? Unfortunately, pollutants such as pesticides and fertilizers, septic tank seepage, stormwater runoff and materials from landfills and abandoned wells can soak into the groundwater supply.

Consider your own neighborhood. Are lawn and garden areas being sprayed frequently with pesticides and herbicides? Are the trees and bushes that make up the pretty landscape getting regular doses of fertilizer? The result is that many of these chemicals will eventually seep into the ground, as well as into the ground water. Can you think of ways to keep this from happening?

In past years, people often discarded motor oil and other hazardous materials directly into the ground. Florida's sandy soils caused these contaminants to soak very quickly into the ground water. Septic tanks that were not well maintained also contributed to pollutants

entering the groundwater supply. Currently, septic tanks are more likely to be properly maintained to keep them working well, and new tanks are being installed with larger, higher drain fields to keep the contents from entering the water table too quickly. Education and the responsible actions of citizens and businesses are making a difference in the quality of ground water.

Stormwater runoff can have damaging effects on ground water. Water from rainfall can carry greases, auto exhaust, oils and other waste products to swales or other low-lying areas. As storm water soaks into the sandy ground, it affects the quality of ground water. Fortunately, we are taking steps to improve the situation. Future development of communities and road systems now includes plans for controlled management of stormwater runoff.

New regulations for construction and maintenance of solid waste landfills will help improve the environment for groundwater quality. Old landfills are being examined and plans to clean up possible contamination are under way in many communities. Government agencies offer programs for plugging abandoned wells so that contaminants cannot directly enter groundwater areas.

**It's up to all of us not to be groundwater polluters!**

## Career Focus

*The Southwest Florida Water Management District (District) is one of five regional agencies in Florida directed by state law to preserve and protect water resources within its region. For this issue on ground water, our WaterWeb interview is with Roberta Starks, an environmental scientist at the District who is actively involved in a water quality monitoring program.*

**WaterWeb: What is a water quality monitoring program?**

**Ms. Starks:**

The primary goal of the Water Quality Monitoring Program (WQMP) is to monitor the water quality of the major aquifers and surface water bodies within the 16 counties of the Southwest Florida Water Management District. Aquifer-monitoring efforts include the collection of water samples from wells, and surface-water monitoring includes the collection of water samples from lakes, streams and rivers. Data from these monitoring programs are used to detect changes in water quality associated with pollutants such as fertilizers and pesticides, and saltwater intrusion.

**WaterWeb: What is your role in the program?**

**Ms. Starks:**

I am an Environmental Scientist with the WQMP, and I have a college degree in biology. My main role is to coordinate the sampling of our surface-water related projects. I am also responsible for data management and quality assurance and control. Quality assurance is a very important component of our program because the data that we collect must be accurate before it can be submitted to the public or used in reports. My duties also include managing projects that are under contract with the Florida Department of Environmental Protection (FDEP). This contract includes habitat assessments, which are done to establish the biological "health" of a stream or river system. I am also involved with report writing.

**WaterWeb: How would you describe a typical day?**

**Ms. Starks:**

The majority of time I spend in a typical day involves reformatting water quality and laboratory data, which have been collected from our sampling efforts. I also spend a good deal of time coordinating sampling projects among laboratories, other agencies and our field technicians.

**WaterWeb: What do you like most about your job?**

**Ms. Starks:**

When I was deciding what college degree to pursue, I wanted it to be something that would make me feel like I was making a positive contribution to the environment. My job has been very rewarding with respect to this. I also have the opportunity to work with professionals from other areas of expertise, which enhances my overall knowledge.

**WaterWeb: What advice would you give to someone interested in working in this field?**

**Ms. Starks:**

Take as many "hands-on" courses in high school and college as you can. What I mean by this is classes where you actually are out in the field using the equipment and collecting the data. Enjoy getting muddy and spending time with mosquitoes and alligators! Pay attention in chemistry class now because it will come back to haunt you later! Strong verbal and written communication skills are very important. Take a variety of classes to see what you are interested in most. There are some cool college degrees you can receive that will allow you to work in the areas that include biology, geology and engineering.



Nita Ostermann

For additional information about opportunities for working in the environment, be sure to check out these Web sites:

Southwest Florida Water Management District  
<http://www.swfwmd.state.fl.us>  
Click on Job Opportunities

Florida Department of Environmental Protection  
<http://www.dep.state.fl.us>  
Click on Job Opportunities

# Create Your Own Sinkhole

After you have read about sinkholes on page 4, try making one of your own!  
It's an interesting way to learn even more about how sinkholes can occur in our environment.

## Learning Goals

- To learn how sinkholes are formed
- To learn how sinkholes can affect us

## Subjects

- Science
- Social Studies
- The Arts

## Materials

- Empty aquarium or a deep, clear glass or plastic container
- Bag of soil
- Bag of coarse sand
- Spray bottle of water
- Small balloon
- Long hat pin
- Small model pieces to represent homes, trees, cars, farm animals, etc.

## Activity

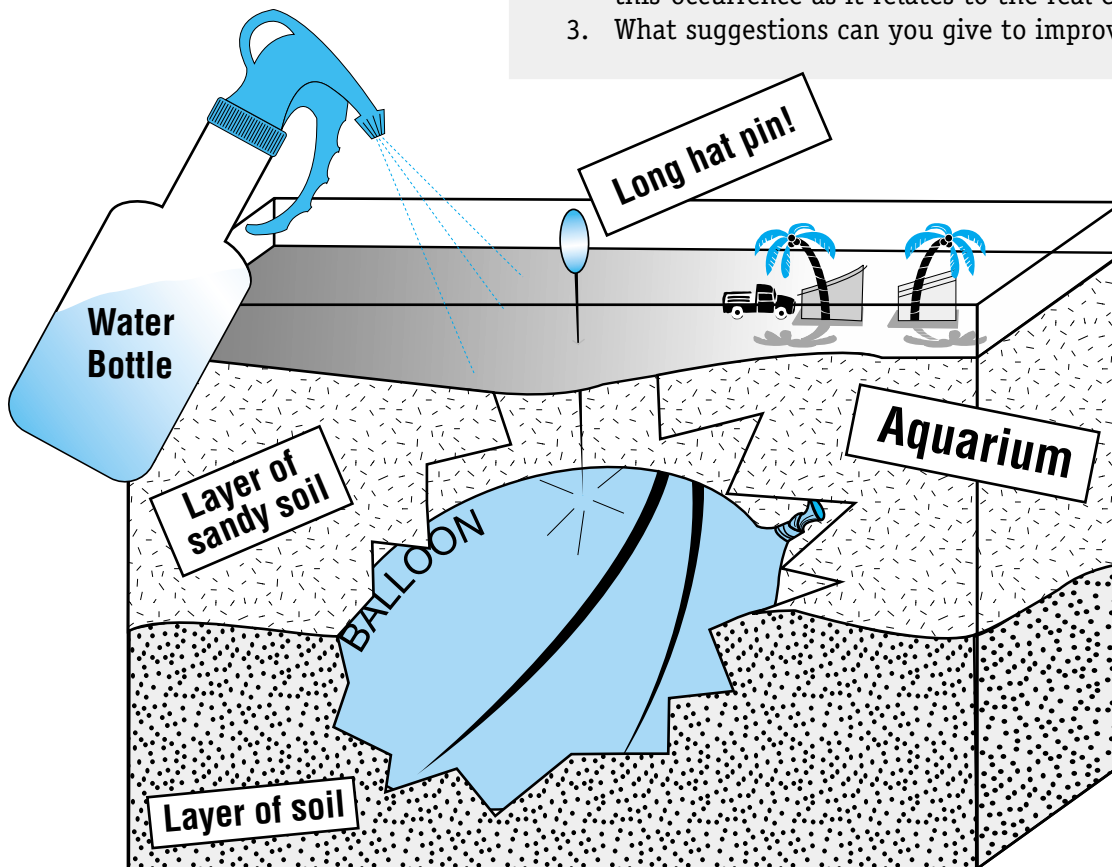
1. To set up the activity, place the container on a table. Fill the bottom third of the container with soil. Blow up a balloon, tie it and lay it on top of the soil.
2. Fill the container with slightly damp sand so that the balloon is completely covered.
3. Position small model pieces as desired to form a town or rural area.
4. Slowly pop the balloon. Observe the results. (If your sinkhole doesn't collapse on its own, spray water on the surface, simulating the effect of heavy rainfall.)

## Sunshine State Standards

*Science (6-8):* Processes that Shape the Earth, SC.D.1.3, SC.D.2.3; The Nature of Science, SC.H.1.3. *Social Studies (6-8):* People, Places and Environments, SS.B.1.3, SS.B.2.3. *The Arts (6-8):* Visual Arts, VA.A.1.3. *Science (9-12):* Processes that Shape the Earth, SC.D.2.4; The Nature of Science, SC.H.1.4, SC.H.2.4. *Social Studies (9-12):* People, Places and Environments, SS.B.2.4. *The Arts (9-12):* Visual Arts, VA.A.1.4.

## Discussion Questions

1. What happened to the surface when you popped the balloon?
2. What happened to the model pieces? How would you describe this occurrence as it relates to the real environment?
3. What suggestions can you give to improve this experiment?



**A sinkhole is...** a depression in the land surface formed either by the collapse of the roof of an underground cavern or channel or by dissolution of limestones or similar rocks near the surface. Sinkholes are a natural occurrence, taking thousands of years to form. Sinkholes occur throughout the Southwest Florida Water Management District (District), but are less likely to occur in the southern part of the District. In this area of the District, the limestone layer of the aquifer is covered by thicker layers of sand and clay than in areas farther north.

# WaterWeb Crossword Puzzle

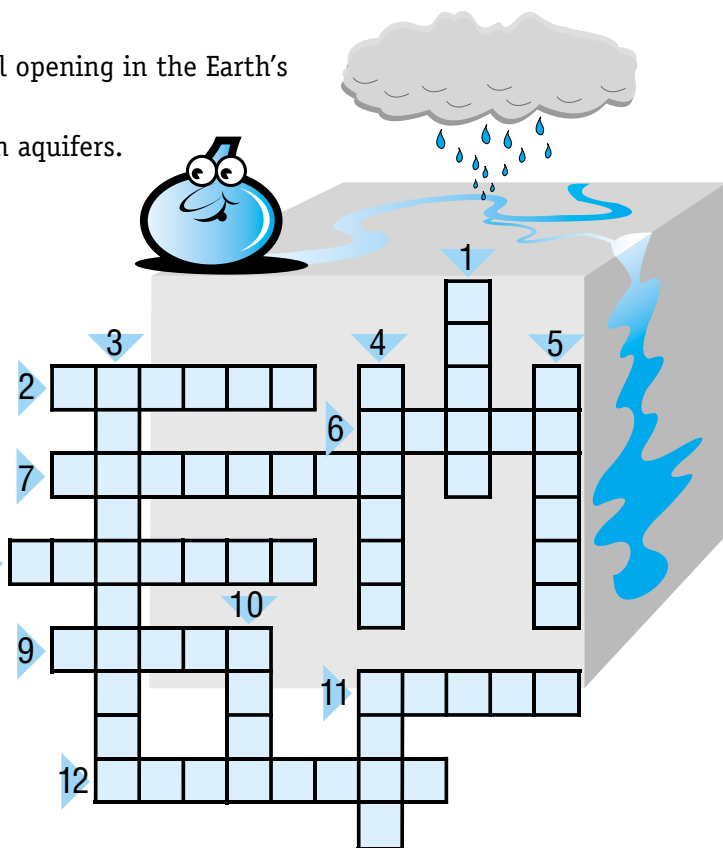
Sharpen your pencils... Complete each sentence with the correct word that fits in the puzzle.

**Across:**

2. A place where ground water discharges through a natural opening in the Earth's surface is called a \_\_\_\_\_.
6. Ground water may be found \_\_\_\_\_ the Earth's surface in aquifers.
7. The largest aquifer in Florida is the \_\_\_\_\_ aquifer.
8. An \_\_\_\_\_ can hold water like a sponge.
9. Sinkholes and springs are often part of a \_\_\_\_\_ terrain.
11. Most Floridians get their drinking \_\_\_\_\_ from aquifers.
12. A \_\_\_\_\_ may develop when underground limestone erodes and dissolves from acidic water.

**Down:**

1. Florida can be described as a low-lying, flat land with a \_\_\_\_\_ surface.
3. Materials that can damage the quality of ground water are called \_\_\_\_\_.
4. Stormwater \_\_\_\_\_ may contain many different kinds of pollutants.
5. Pesticides and fertilizers are examples of pollutants found in \_\_\_\_\_ water.
10. Seepage from a septic \_\_\_\_\_ can pollute ground water.
11. A hole drilled into the aquifer to withdraw ground water is called a \_\_\_\_\_.



# WaterWeb Scramble

Unscramble the letters to form words. Then use these words to complete the paragraph.

dnroug

trawe

lutlopers

Fidnalar

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

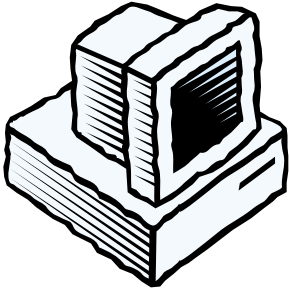
\_\_\_\_\_

It's up to us to protect the \_\_\_\_\_ water in the \_\_\_\_\_ aquifer.

Tell people you know about how important ground \_\_\_\_\_ is to our well-being.

Encourage them not to be groundwater \_\_\_\_\_.

## Sites for *WaterWeb* Readers to Explore



Are you interested in learning more about your ground water? Do you have a groundwater question? At the Web site listed below, you can learn more about ground water and even send an E-mail message. The Groundwater Foundation is dedicated to informing the public about ground water. After searching this site, try a few of the other sites that are linked to it.

<http://www.groundwater.org>

## Answers

Activities on page 7



## Word Scramble Answers



### Paragraph answer:

It's up to us to protect the ground water in the Floridan aquifer. Tell people you know about how important ground water is to our well-being. Encourage them not to be groundwater polluters.

## Credits

Southwest Florida  
Water Management District



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