

# Video Lesson Plan 1D —*Florida’s Aquifers: The Treasure Below*

## “Water and Earth in Balance”

**Subject/Grade Level:** Earth science and geology for grades 6–8

**Objective:** Students will learn how Earth’s geologic systems formed Florida’s geology over millions of years. Florida’s geology determines how our natural systems, such the aquifer systems, function today.

**Rationale:** Students need to understand how Earth’s and Florida’s natural processes and systems function over time. Students need to know how Florida’s geology influences the formation and operation of our aquifer and spring systems.

**Standards:**

- SC.6.E.6.1: Describe and give examples of ways in which Earth's surface is built up and torn down by physical and chemical weathering, erosion, and deposition.
- SC.7.E.6.2: Identify the patterns within the rock cycle and relate them to surface events (weathering and erosion) and subsurface events (plate tectonics and mountain building).
- SC.7.E.6.4: Explain and give examples of how physical evidence supports scientific theories that Earth has evolved over geologic time due to natural processes.
- SC.7.E.6.5: Explore the scientific theory of plate tectonics by describing how the movement of Earth's crustal plates causes both slow and rapid changes in Earth's surface, including volcanic eruptions, earthquakes, and mountain building.

**Time:** 45 minutes

**Materials:**

- *Florida’s Aquifers: The Treasure Below* video, (5 minutes, 35 seconds), from the *Your Water Resources* DVD, St. Johns River Water Management District, 2006, or available to download free at [www.sjrwmd.com/video/index.html](http://www.sjrwmd.com/video/index.html)
- DVD player
- Copies of the 10-question student page
- A double pan balance with weights or anything you could add/remove to demonstrate equilibrium and disturbing equilibrium
- Density experiment materials, one for each student group:
  - A one cup measure
  - A 1/4 cup measure
  - Eyedropper
  - Two eggs
  - Two clear, 16-ounce glasses of water
  - Salt
  - Food coloring

**Background/Links:**

- Discover more about the St. Johns River Water Management District and aquifers, in *Florida’s Aquifers: Our Most Precious Resource* brochure and the *Aquifer* poster, found at [www.sjrwmd.com](http://www.sjrwmd.com).
- Find related water activities, resources, and links for Project WET at [www.sjrwmd.com](http://www.sjrwmd.com).

**Lesson Plan**

**Pre-assessment:** (5 minutes) Have students answer these questions:

Why is it important for Florida residents to understand how the natural aquifer systems work?  
How could Florida residents disturb the equilibrium of this natural system?

**Engage:** a) (5 minutes) To illustrate balance or equilibrium, use a balancing scale. Using equal weights on each side of the scale, tell the students that when natural systems are in balance, the scale is at equilibrium. When too much of something is added or removed, however, the system is disturbed, or unbalanced, causing changes. Remove a weight

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so the balance is clearly unbalanced. Tell the students the DVD is about the natural systems of Earth, how Florida was formed, and the present natural systems of Florida. The DVD will show how these systems operate and how they can be disturbed. It is important for students to understand the word equilibrium.

b) (20 minutes) Complete the density experiment found at [www.teachervision.fen.com/oceanography/lesson-plan/2547.html](http://www.teachervision.fen.com/oceanography/lesson-plan/2547.html).

**Explore/Explain:** (8–10 minutes) Pass out copies of the STUDENT PAGE.

Watch the DVD, and instruct students to write down the answers to the questions. Warn them that the video goes fast so they need to pay close attention. Pause the DVD player for a short time every few minutes to allow students to write. Instruct them to label the layers of the aquifer and to write down the answers to the questions on the student page.

**Evaluate:** (5–10 minutes) After viewing the DVD, discuss with the students what they wrote for each question and clarify the answers. (See attached TEACHER PAGE.) The teacher may elect to show the DVD again and stop it at each question and answer.

**Extensions:**

- **Density:** Freshwater and salt water in the aquifer remain separate if not disturbed, because they have different densities. This DVD provides a good opportunity to teach or re-teach the concept of density. Teach density intuitively using styrofoam pieces and/or an old suitcase using directions found at
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- **Aquifer model:** Go to the St. Johns River Water Management District Web site at [www.sjrwmd.com/wav](http://www.sjrwmd.com/wav) and find the contact information for your county’s Watershed Action Volunteers (WAV) coordinator. Contact your WAV coordinator to schedule a demonstration of the aquifer model in your classroom. This working model shows the layers of the aquifer and how the aquifer system functions.
- **Project WET Curriculum and Activity Guide.** “The Great Stony Book” activity. To inquire about Project WET workshops, contact the Education section of the St. Johns River Water Management District Web site at [www.sjrwmd.com/education](http://www.sjrwmd.com/education).

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#### TEACHER PAGE

Answer the questions about the history and geology of Florida using the information provided in the DVD.

1. What is an aquifer, and why is it important for Florida residents to understand how aquifers function? *An aquifer is a layer or layers of rock, shell, or sand in any combination that holds water. The aquifer systems are important because they are the main source of drinking water in Florida.*
2. What happens to the Floridan aquifer as it flows south? *It gets too salty for most uses by the time it reaches southern Florida.*
3. What is the tectonic theory of continental drift? *The tectonic plates, the major continents, and the surrounding seafloors of the earth move at a very slow rate and may, over millions of years, collide or move apart.*
4. How was Florida affected as the continental plates drifted apart? *Geologists theorize that the Florida peninsula was originally attached to the African plate and became attached to the North American plate during an ancient collision of the tectonic plates over 300 million years ago.*
5. How was the limestone that underlies Florida formed? How long did it take? *A sedimentary rock called limestone was formed over millions of years by the bodies of thousands of sea creatures, particularly those with shells, falling to the bottom of the ocean and then being compressed by many layers of sediment.*
6. What was the role of the Appalachian Mountains in forming the geology of the peninsula of Florida? *Approximately 30 million years ago, the Appalachian Mountains began to grow or be pushed upward, causing erosion. The material eroded, moved downhill by gravity, and redeposited over the submerged limestone base of the peninsula of Florida. These fine particles of eroded materials then formed a confining layer over the limestone that now keeps water in the aquifer.*
7. Although Florida was never covered by ice, the global ice ages did have an effect on Florida’s geology. How did the growing and receding of glacial ice during the ice ages affect Florida’s shorelines? *The growing and receding of the glaciers during the ice ages changed Florida’s shorelines, because during warmer periods, the ocean rose and eroded Florida’s shorelines. During the cooler periods, the ocean receded and eroded other shorelines. If you look at the cross-sectional diagram showing Orlando, Tampa, and Daytona Beach, you can see Florida’s ancient shorelines.*
8. What role did erosion take in forming the caves of Florida’s spring systems? *Over time, the water within the limestone layer traveled or moved over the limestone, eroding a system of holes and creating caves that filled with freshwater. These systems of holes and caves form our aquifer and spring systems.*
9. What determines whether rainwater will drain into a body of water, such as a lake or the ocean, or soak down into the aquifer? *Two factors affect where the rainwater will drain. One is gravity; water always flows downhill. The second is that rainwater can only move into the aquifer in areas where there is little or no confining layer.*
10. What is the name for the areas where water can soak down into the aquifer and refill it? *These areas with limited or no confining layers are called aquifer recharge areas.*
11. Why is salt water naturally found below freshwater in the aquifer? *The ocean covered Florida many times throughout history. Salt water was trapped in Florida’s rock formations, so it is found naturally in many areas. Salt water is denser than freshwater so the two remain separate as long as the aquifer is undisturbed.*
12. What is saltwater intrusion? *When too much freshwater is withdrawn from the aquifer, salt water can be drawn into the aquifer from the trapped salt water, the ocean, or Gulf of Mexico, making the water undrinkable. This process is called saltwater intrusion.*
13. How is saltwater intrusion related to population growth and development? *Saltwater intrusion increases when groundwater is consumed faster than it is replaced through the recharging process. In other words, the balance of the aquifer system is disturbed. For example, as many areas of Florida continue to develop and the population increases, so does the demand for freshwater, thus making saltwater intrusion more likely.*

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14. What is one of the most important ways to protect our water supply from saltwater intrusion? [One of the best ways to protect our drinking water is to conserve water.](#)

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### STUDENT PAGE

Name \_\_\_\_\_

Date: \_\_\_\_\_

Directions: Answer the following questions using information you learned watching the DVD.

1. What is an aquifer, and why is it important for residents of Florida to understand how aquifers work?
2. What happens to the Floridan aquifer as it flows south?
3. What is the tectonic theory of continental drift?
4. How was Florida affected as the continental plates drifted apart?
5. How was the limestone that underlies Florida formed? How long did it take?
6. What was the role of the Appalachian Mountains in forming the geology of the peninsula of Florida?
7. Although Florida was never covered by ice, the global ice ages did have an effect on Florida’s geology. How did the growing and receding of glacial ice during the ice ages affect Florida’s shorelines?
8. What role did erosion take in forming the caves of Florida’s spring systems?
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