WaterVentures

Florida's Learning Lab

Crystal Springs Foundation

Zephyrhills SINCE 1964 BRAND
100% NATURAL FLORIDA SPRING WATER
FOSTERING THE NEXT GENERATION OF WATER STEWARDS.

PUBLIX SUPER MARKETS CHARITIES

EDUCATIONAL EXHIBIT PACKET

FCAT Practice Questions

FCAT Writing Prompts

Florida Animal and Plant Reference Sheets

Attachments

Aquifer Poster can be found at
http://www.swfwmd.state.fl.us/publications/files/poster_aquifer.pdf
Watershed Poster can be found at
http://www.swfwmd.state.fl.us/publications/files/poster_watershed.pdf
Polluted Runoff Poster can be found at
http://www.swfwmd.state.fl.us/publications/files/poster_polluted_runoff.pdf
Hydrologic Cycle Poster can be found at
http://www.swfwmd.state.fl.us/publications/files/hydrocycletoon.pdf

How to Use this Packet

This packet has been designed as a supplement to the WaterVentures experience. WaterVentures has provided the Sunshine State Standards that pertain to the Pre/Post-exhibit Activities as well as the Interior/ Exterior Truck science stations.

We ask that you have your students take the Pre-test prior to any field trip preparations. After your WaterVentures experience we ask that you take the Post-test and submit your data to WaterVentures. This data will be collected as a means of measuring the WaterVentures exhibits as well as the Pre/Post-exhibit Materials.

The Pre-exhibit Activities are designed to be completed prior to your visit. It is not required for you to complete all activities; however we would appreciate any preparation you are able to provide to your students prior to your visit.

After your visit to the WaterVentures exhibit you may utilize the Post-exhibit Activities for your students. These activities are designed to supplement your experience and reiterate the topics that are covered in WaterVentures, Florida's Learning Lab.

We hope that you find these materials useful and enjoy your time with WaterVentures!

SUNSHINE STATE STANDARDS

Pre/ Post-exhibit Activities:

LA.3-5.1.6.1: The student will use new vocabulary that is introduced and taught directly.

SC.3.L.15.1: Classify animals into major groups(mammals, birds, reptiles, amphibians, fish arthropods, vertebrates and invertebrates, those having birth and those which lay eggs) according to their physical characteristics and behaviors.

SC.4.E.6.3: Recognize that humans need resources found on Earth and that these are either renewable or nonrenewable

SC.4.E.6.6: Identify resources available in Florida (water, phosphate, oil, limestone, silicon, wind and solar energy).

SC.5.E.7.2: Recognize that the ocean is an integral part of the water cycle and is connected to all of Earth's water reservoirs via evaporation and precipitation processes.

SC.4.N.1.1: Raise questions about the natural world, use appropriate reference materials that support understanding to obtain information (identifying the source), conduct both individual and team investigations through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.

SC.4.P.10.4: Describe how moving water and air are sources of energy and can be used to move things.

SC.4.P.8.2: Identify properties and common uses of water in each of its states.

SC.5.N.1.1: Define a problem, use appropriate reference materials to support scientific understanding, plan, and carry out scientific investigations of various types such as: systematic observations, experiments requiring the identification of variables, collecting and organizing data, interpreting data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

SC.5.P.8.2: Investigate and identify materials that will dissolve in water and those that will not and identify the conclusions that will speed up or slow down the dissolving process.

SC.6.N.1.1: Define a problem from the sixth grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

SC.6.N.1.4: Discuss, compare, and negotiate methods used, results obtained, and explanations among groups of students conducting the same investigations.

SC.7.E.6.6: Identify the impact that humans have had on Earth, such as deforestation, urbanization, desertification, erosion, air and water quality, changing the flow of water.

SC.7.N.1.1: Define a problem from the seventh grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

Interior/ Exterior Truck Exhibits:

SC.3.E.6.1: Demonstrate that radiant energy from the sun can heat objects and when the sun is not present, heat may be lost.

SC.3.L.14.1: Describe structures in plants and their roles in food production, support, water and nutrient transport, and reproduction.

SC.3.L.17.2: Recognize that plants use energy from the sun, air and water to make their own food.

SC.3.N.1.1: Raise questions about the natural world, investigate them individually and in teams through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.

SC.3.N.1.6: Infer based on observation.

SC.3.N.3.2: Recognize that scientists use models to help understand and explain how things work.

SC.3.N.3.3: Recognize that all models are approximations of natural phenomena; as such, they do not perfectly account for all observations.

SC.3.P.8.3: Compare materials and objects according to properties such as size, shape, color, texture, and hardness.

SC.3.P.9.1: Describe the changes water undergoes when it changes state through heating and cooling by using familiar scientific terms such as melting, freezing, boiling, evaporation, and condensation.

SC.4.E.6.3: Recognize that humans need resources found on Earth and that these are either renewable or nonrenewable.

SC.4.E.6.6: Identify resources available in Florida (water, phosphate, oil, limestone, silicon, wind and solar energy).

SC.4.L.17.4: Recognize ways plants and animals, including humans, can impact the environment.

SC.4.N.1.3: Explain that science does not always follow a rigidly defined method ("the scientific method") but that science does involve the use of observations and empirical evidence.

SC.4.N.1.4: Attempt reasonable answers to scientific questions and cite evidence in support.

SC.4.N.3.1: Explain that models can be three dimensional, two dimensional, an explanation in your mind, or a computer model.

SC.4.P.10.4: Describe how moving water and air are sources of energy and can be used to move things.

SC.5.E.7.2: Recognize that the ocean is an integral part of the water cycle and is connected to all of Earth's water reservoirs via evaporation and precipitation processes.

SC.5.E.7.5: Recognize that some of the weather-related difference, such as temperature and humidity, are found among different environments, such as swamps, deserts, and mountains.

SC.5.P.10.2: Investigate and explain that energy has the ability to cause motion or create change.

SC.5.P.8.1: Compare and contrast the basic properties of solids, liquids, and gases such as mass, volume, color, texture, and temperature.

SC.5.P.9.1: Investigate and describe that many physical and chemical changes are affected by temperature.

SS.4.C.2.1: Discuss public issues in Florida that impact the daily lives of its citizens.

Pre/ Post Test

Please submit this pre/post-test to your students prior to your visit with WaterVentures and then please have your students retake the pre/post-test after your visit with WaterVentures.

The pre/post-test can be given online via SurveyMonkey by visiting
http://www.waterventures.us/teacher-resources/pre-post-visit-materials/
Links for each school are posted one week prior to your scheduled visit.

Please read the following questions and circle the best answer.

1. A layer beneath Florida made of caves and rocks that holds fresh water is called a(an) _____.
    a. River
    b. Ocean
    c. Clouds
    d. Aquifer

2. Which part of the water cycle describes how water seeps down through the layers of the ground into the aquifer?
    a. Percolation
    b. Evaporation
    c. Condensation
    d. Precipitation

3. What is a watershed?
    a. A building where water is cleaned
    b. Water that is stored under the ground
    c. An area of land that rain water flows over
    d. Rocks made of fossilized sea creatures

4. If the polar ice melted, what would happen to the sea level around Florida?
    a. Nothing, it would stay the same
    b. Sea level would go up
    c. Sea level would go down
    d. All the water would evaporate

5. What type of rock makes up our aquifer and the bedrock of Florida?
    a. Limestone
    b. Sandstone

c. Granite
d. Shale

6. Plants and the layers of the earth help clean our fresh water. These natural resources are also known as nature's _____.
    a. Water Cycles
    b. Filters
    c. Energies
    d. Food Webs

7. All of the water on Earth is connected.
    a. True
    b. False

8. What are some ways that humans can positively impact their watershed?
    a. Reduce, reuse and recycle
    b. Conserve water
    c. Plant trees
    d. All of the above

9. Which of the following demonstrates water conservation?
    a. Taking a long shower
    b. Washing your fruits and vegetables under running water
    c. Cleaning your driveway with a hose
    d. Turning the water off when you are brushing your teeth

10. What type of water is found in streams, rivers, lakes and springs?
    a. Fresh water
    b. Salt water

Pre/ Post Test Answer Key

1. D
2. A
3. C
4. B
5. A
6. B
7. A
8. D
9. D
10. A

Pre/Post Exhibit Data Submission Form

Date of visit	
School name	
Teacher name	
Number of students taking the Pre-test and Number taking Post-test	
Pre-test average percentage *	
Post-test average percentage *	

- Scoring all tests, adding up all scores, and dividing by the number of students that took the test will obtain an average percentage.

Please cut and paste the following chart into an email and send to helen@waterventures.us upon the completion of our visit!

Thank you!

Pre-Exhibit Activities

Water – A Limited Resource

Purpose:

We all use water every day of our lives. Water is used to manufacture almost everything we use during the day. In this lesson, students will investigate an imaginary small town and all the businesses in it, and try to determine which businesses use the most water.

Vocabulary

Water quality	Conservation
Watershed	Water cycle
Groundwater	Percolation
Runoff	Filtration
Pollution	Sewage

Objective:

Students will investigate how multiple users of water resources can affect water quality and quantity.
Students will examine the complexities of providing water for all water users.

Grade Level
4th -7th grade

NGSSS
SC.4.N.1.1, SC.5.N.1.1, SC.6.N.1.1, SC.6.N.1.4, SC.7.N.1.1

Length
45 minutes

Materials
Paper
Pencil/pens
Large bucket (Should be able to hold several gallons of water.)
5 large graduated cylinders or similar containers
5 different sized sponges

Background:

Only 1% of the Earth's total water supply is available for use. That 1% is not just for humans, but also for animals, plants, and every natural biologic process on the planet. So how do humans use water resources? Here are percentages of water use by industry; thermoelectric generation (producing electricity with heat) 47%, irrigation (agriculture) 34%, public supply (stored water) 9%, industrial 6%, mining 1%, livestock 1%, domestic (in homes) 1%, commercial uses 1%. Clearly it is extremely important that corporations conserve as much water as possible. Let's take a look at local corporations and determine the amount of water usage based on the type of corporation.

Procedure:

1. Show students the map of Waterville (see below). Ask them what is similar about Waterville and their own town. List similarities on the board.
2. Ask students to list how the people who live and work in each of the buildings on the map might use water. On the board, list each building and the ways the students think water is used in that building.
3. Ask students to rank the building according to how much water each one might use in a year. 1 being the building that would use the most and 5 being the one that uses the least.

4. Share the statistics in the background section with students, explaining each one with an example from your own town or state. Let students revise their list with this new information. Compile the students lists into a class list that will be used for the next activity.
5. Explain to students that they are going to simulate water usage of the different buildings in Waterville. A sponge will represent each of the buildings. The biggest sponge is the biggest water user; the smallest is the smallest water user. Students should form 5 lines, like spokes on a wheel, with the main reservoir (large bucket of water) at the center and the buildings (smaller buckets or graduated cylinders) at the end of each line. Pass out the different size sponges to the 5 students closest to the reservoir.
6. When the teacher say go, those students should soak their sponges in the water, then pass it down their line. The student at the end by the building should squeeze out the water into their container and pass the sponge back to the reservoir.
7. Continue until the largest water users container is mostly full, and then call Stop.
8. Have students bring their building containers to the reservoir and compare the amount of water in each container.
9. Return half of the water from each container back to the reservoir; this represents water that can be returned to ponds, streams and other recharge areas. Ask students "Is there any change in the water quality?" They may notice that the water is dirtier now than when they started, ask why. This represents pollution and run off.
10. Repeat as many times as you like. Allow students to make changes to the sponges or their arrangement that may conserve water.

Discussion:

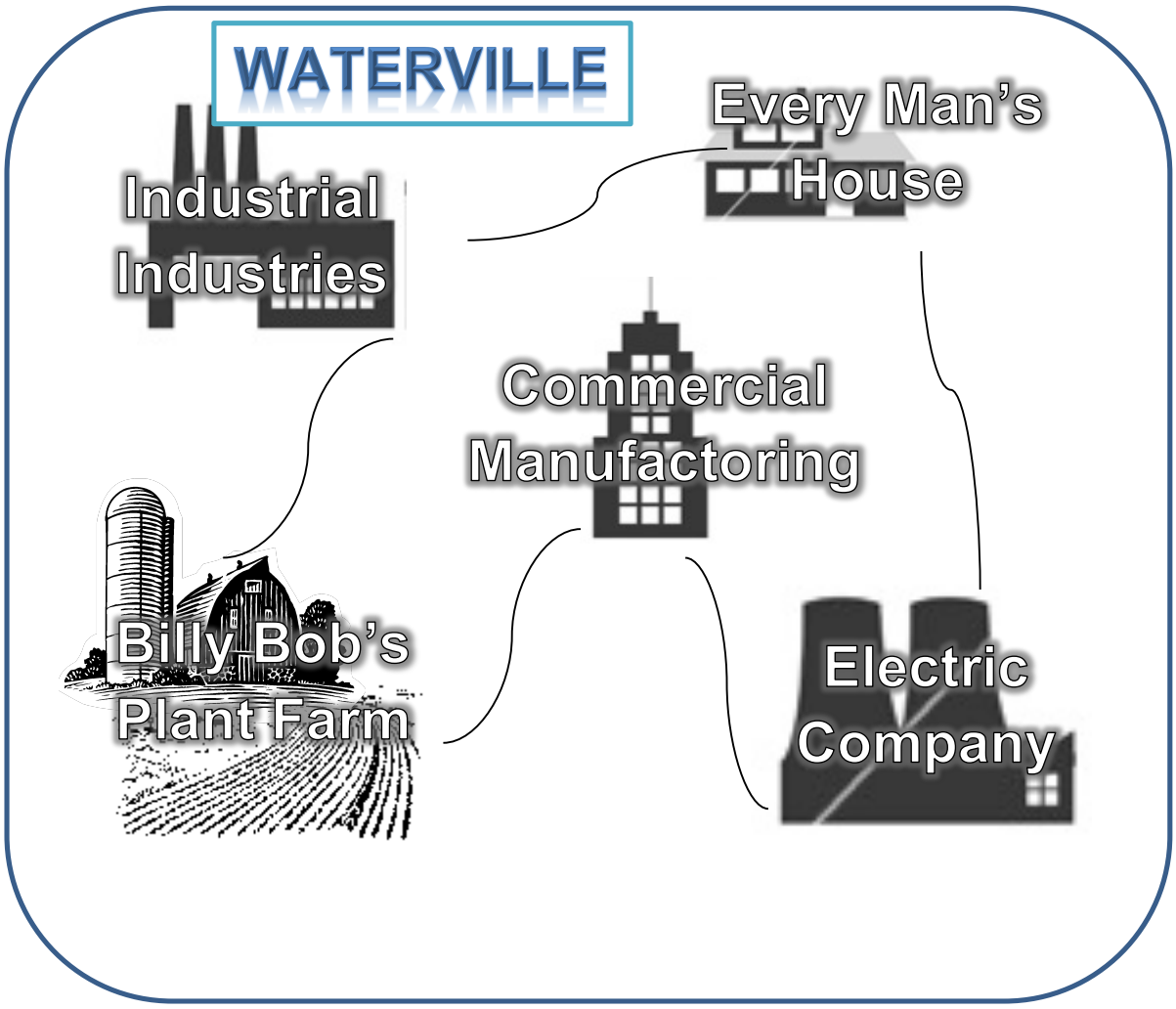
What changes did the students make to conserve water in the activity? What would these changes represent in the real world?

Assessment:

Have students brainstorm business and companies in their community that would be similar to those in Waterville. How would they rank those businesses and companies in terms of water use? Have students contact the companies and businesses to ask about their water usage and any conservation efforts that they make.

Resources:

Environmental Protection Agency
www.epa.gov
United States Geological Survey
www.water.usgs.gov
Department of Environmental Protection
www.dep.state.fl.us


WATERVILLE
Every Man's House
Industrial Industries
Commercial Manufactoring
Billy Bob's Plant Farm
Electric Company

What's the Difference?

Purpose:

Florida is famous for its diverse wetland habitats. Each habitat is unique in the way it functions, the way it forms, and the animals that live there. While they are very different they also have similarities. This lesson will allow students to learn about the different wetland habitats, then compare and contrast them.

Vocabulary

Wetland	Runoff
Marsh	Spring
Habitat	Estuary
Everglades	Restoration
Native	Exotic

Objective:

Students will be able to state the differences and similarities between wetland habitats in Florida.
Students will create group posters about different wetland habitats in Florida.

Grade Level
4th -7th grade

NGSSS
SC.4.E.6.3, SC.4.E.6.6, SC.4.N.1.1, SC.5.N.1.1, SC.6.N.1.1, SC.6.N.1.4, SC.7.N.1.1 LA.3-5.1.6.1

Length
1 hour

Materials
Chart paper, poster board, or large pieces of paper (1 per group)
Markers, colored pencils
Computer access or reference materials

Background:

Living in Florida, most people are very familiar with beaches and what scientists call coastal habitat. But there are many other types of wetland habitats that are vital to Florida's ecosystem. Wetland systems are responsible for cleaning surface water, recharging ground water, and providing habitat for countless species of wildlife. Historically, people have looked at wetlands as wasted space because you could not build, raise cattle, or grow food on them. These "swamps" would often be drained and altered to make them more accessible for the industries that humans were interested in. There is no better example of this than The Everglades. Large portions of the everglades were drained to make room for agriculture. In recent years, people have seen the negative impact this has had on Florida and the largest wetland restoration project in the world is underway to restore the Everglades to their original glory.

Procedure:

1. List these terms on the board: Freshwater Marsh, Cypress Swamp, Saltwater Marsh and Coastal Marsh. Ask students what they think these terms refer to. They are all wetland habitats that are

important to Florida. If you would prefer to work in smaller groups there are other wetlands that can be used.

2. Discuss with students the word Swamp. Today, most "swamps" are referred to as wetlands or marshes because these terms have a better connotation then "swamp". Because of this, when they are doing their research they may find what is called a freshwater marsh on one website and called a freshwater wetland or swamp on another.
3. Divide your class into groups, one group for each wetland you would like them to research. Allow groups to research their assigned wetland with the goal of creating a poster about their wetland. Their research and poster should include, but not be limited to: animals found in that habitat, how the water gets into that wetland, how the water leaves the wetland, what the water is like in that wetland (salt/fresh, color, temperature, etc.), large or famous wetlands of that type in Florida, and what protection is there to save those wetlands.
4. Once the posters are done, let each group present their poster to the class. This can be simply by standing up and reading the information, or if there is time, let them be creative about the presentation. Some examples include, a skit like a travel agent trying to get people to visit, or as an animal that lives in the wetland describing their life and habitat.
5. After the presentations, display the posters and ask groups to compare their wetland to the others presented. What was similar between the wetlands and what was different? Make a list of similarities and differences on the board. The goal of this discussion should be that no wetland is more important than another, they are all related to each other, and they all play a role in the larger story of Florida.
6. Arrange the posters in the order you would find them is you started in the middle of Florida and moved toward the coast.

Assessment

As a class, make a large mural that incorporates all the wetlands.

Resources

Everglades Restoration Project
http://www.evergladesplan.org/
Types of wetlands in Florida
http://www.defenders.org/wildlife_and_habitat/habitat/wetlands.php
Types of wetlands in Florida
http://www.floridasnature.com/florida_habitats.htm

Water, Water Everywhere

Purpose:

Most students don't think about the water that comes out of the faucet, fresh water is delivered when they turn on the faucet. This lesson will help students understand the amount of water on Earth that is available to humans is minimal compared to the total amount on the planet.

Objective:

Students will create a visual representation of the amount of water available for humans on the Earth.
Students will explain why water is limited but renewable resources are not.

Background:

Over 70% of our Earth's surface is covered by water; we should really call our planet "Ocean" instead of "Earth". Although water is seemingly abundant, the real issue is the amount of fresh water available. 97.5% of all water on Earth is salt water, leaving only 2.5% as fresh water. Nearly 80% of that fresh water is frozen in the Earth's icecaps. Less than 1% of the world's fresh water (~0.003% of all water on earth) is accessible for direct human uses. This is the water found in lakes, rivers, reservoirs and those underground sources that are shallow enough to be tapped at an affordable cost. Only this 1% is regularly renewed by rain and snowfall, and is therefore available on a sustainable basis.

Procedure:

1. Ask students to estimate how much of Earth's surface is covered with water. Draw a pie chart on the board and fill it in according to student's response.
2. With a different color marker, fill in the correct answer of 70% of the Earth's surface is covered in water. Ask students if all the water on the Earth is the same? No it

Vocabulary

Desalination	Potable
Freshwater	Saltwater
Proportion	Sustainable
Water Cycle	Conservation
Estimate	Limited Resource

Grade Level
4th -7th grade

NGSSS
SC.4.N.1.1, SC.5.N.1.1, SC.6.N.1.1, SC.6.N.1.4, SC.7.N.1.1

Length
1 hour

Materials
Bag of black beans
Bag of red beans
Paper Plates
Water
Globe or world map
1000 ml beaker
100 ml graduated cylinders
Small dish
Salt
Freezer or ice bucket
Eyedropper or glass stirring rod
Small metal bucket

is not, some is salt water and some is freshwater. Students may also use locations or states of matter to distinguish between types of water, but keep them focused on salt and fresh water as the difference as that is relevant for this lesson.

3. Place students in pairs or small groups. Give each group of students 100 black beans, 100 red beans and a paper plate. Tell students that the black beans represent fresh water, the red beans represent salt water, and the plate is all the water on the Earth.
4. Tell students that at the end of the lesson they will need 100 beans on the plate to represent 100% of the water on Earth. Ask groups to place the number of black bean on the plate that will represent the proportion of water on Earth that is fresh water available for human use, and to do the same for the red beans that represent salt water.
5. When all groups have 100 beans on their plate, go around the room and ask groups to share how many of each color they put on the plate and why.
6. Share the statistics from the background section of the lesson. And ask the students to revise their proportions with this new information.
7. Optional Demo: Show the class a liter (1000 ml) of water and tell them it represents all the water on Earth.
8. Ask where most of the water on Earth is located. (Refer to a globe or map). Pour 30 ml of the water into a 100 ml graduated cylinder. This represents Earth's fresh water, nearly 3 percent of the total. Put salt into the remaining 970 ml to simulate water found in oceans, unsuitable for human consumption.
9. Ask students what is at the Earth's poles. Almost 80 percent of Earth's freshwater is frozen in ice caps and glaciers. Pour 6 ml of fresh water into a small dish or cylinder and place the other 24 ml in a nearby freezer or ice bucket. The water in the dish (around 0.6 percent of the total) represents non-frozen freshwater. Only about 1.5 ml of this water is surface water. The rest is underground.
10. Use an eyedropper or a glass-stirring rod to remove a single drop of water (0.003 ml). Release this one-drop into a small metal bucket. Make sure the students are very quiet so they can hear the sound of the drop hitting the bottom of the bucket. This represents clean, freshwater that is not polluted or otherwise available for use, about 0.003 percent of the total. This precious drop must be managed properly.

Discussion

Discuss the results of the demonstration. At this point many students will conclude that a very small amount of water is available to humans. Ask students to compare their initial estimate to the actual percentage of water available. Ask students if enough water is currently available for people. Yes, there is but we need to manage the available water very carefully. How can water usage be managed? No new water can ever be made – it is all a part of the water cycle. Discuss ways of treating saltwater for drinking (i.e. desalination).

Assessment

Have students research the different ways of treating saltwater for human use (i.e. desalination). Discuss the best methods. Which produces the most freshwater? Which methods are the most economical? Which leaves behind the smallest carbon footprint?

Resources

Environmental Protection Agency
www.epa.gov
United States Geological Survey
www.water.usgs.gov
Department of Environmental Protection
www.dep.state.fl.us

Spring Vacation

Purpose:

Florida's springs are a vital and undervalued resource. Through this lesson, students will learn about several different aspects of springs. They will research the benefits humans get from springs, why springs are important to the animals that live there, and what is being done to protect the water.

Objective:

Students will research a Florida Spring.
Students will create a travel brochure with facts about the spring they researched.
Students will present their spring brochure to the class.

Background:

Many people visit Florida for our beaches or our many theme parks. Only those people "in the know" come to Florida for our other natural gems, our windows to the aquifer. Florida is estimated to have over 700 springs and yet most people never see any while they are visiting our state. On one hand this is a good thing, the less people that visit springs, the less impact we have on this natural resource. On the other hand, the more people who enjoy our springs, the more people who will be willing to protect and conserve them for future generations.

Vocabulary

Karst	Limestone
Erosion	Recreation
Resource	Spring
Aquifer	Spring vent

Grade Level
4th -7th grade

NGSSS
SC.4.P.10.4 SC.4.P.8.2
SC.5.P.8.2 SC.7.E.6.6

Length
1-2 hours

Materials
Computer access for student groups
Word processing program for students to design brochures
Printer

Procedure:

1. Write the word spring on the board. Ask students "What do you know about this?" Answers should range from seasons of the year, to Slinkies. If students don't bring up springs as a water source, steer them in that direction through open-ended questions.
2. Ask students to come up with a definition of what a freshwater spring is. The definition from US Geological Survey is
   "A spring is a water resource formed when the side of a hill, a valley bottom or other excavation intersects a flowing body of ground water at or below the local water table, below which the subsurface material is saturated with water. A spring is the result of an aquifer being filled to the point that the water overflows onto the land surface."
   http://ga.water.usgs.gov/edu/watercyclesprings.html

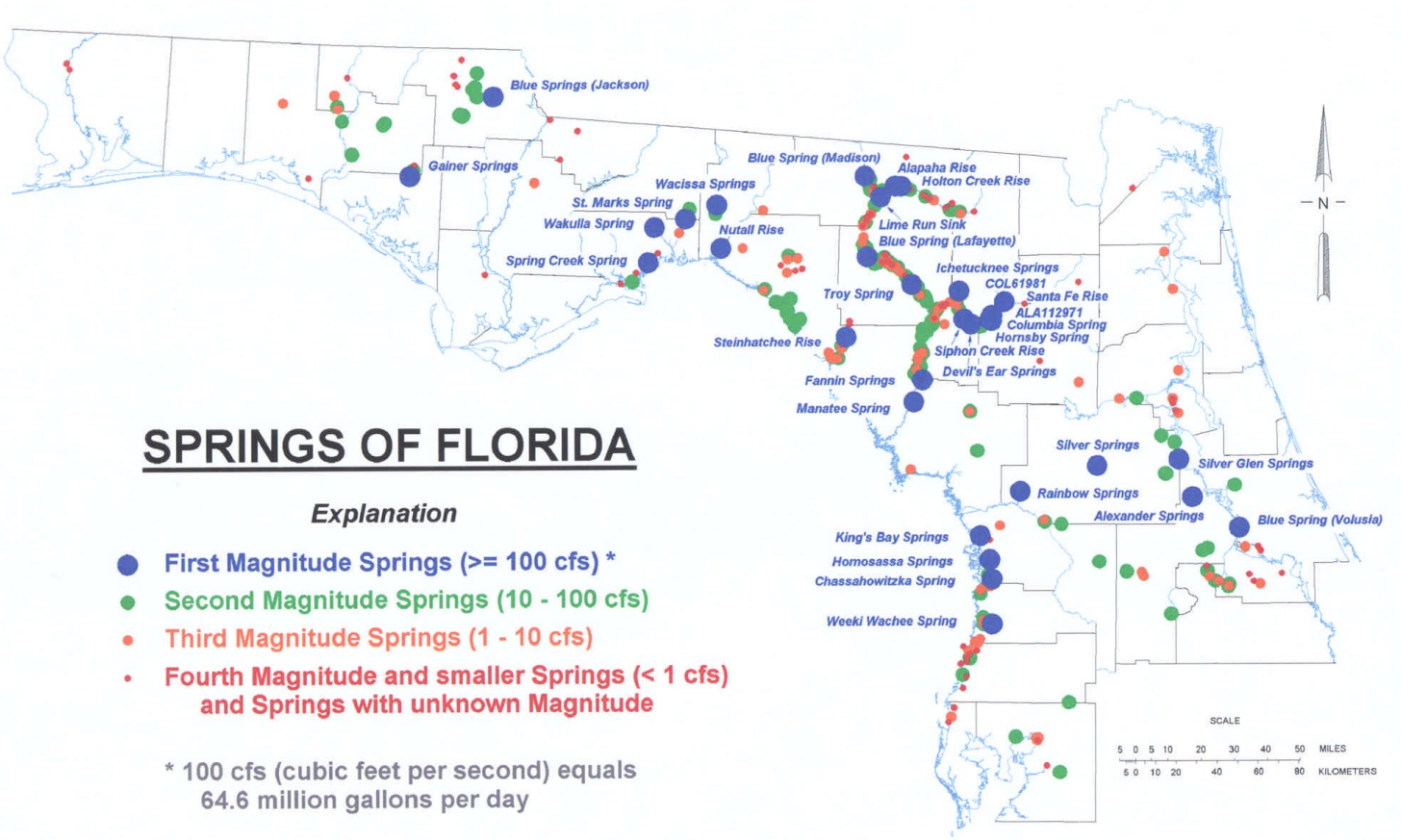
3. Your class definition should be simpler, but should focus on where spring water comes from.
4. Once you have a definition ask students if they have ever been to a spring or seen one. If anyone has, ask them what they remember, if no one has, have a picture of website available (see resources) for them to see and discuss.
5. Tell students they will be doing a research project on one of Florida's many freshwater springs. Then, after their research they will create a travel brochure to inform people about the spring and encourage conservation of the spring. As a class, create a list of topics that their research must cover. These topics may include but not limited to:
    - How the spring was named?
    - How the springs were formed?
    - What is the magnitude of the spring and what does it mean?
    - Is it public or privately owned?
    - What animals live in the spring?
    - How deep is the spring?
    - Has the springs been changed from its natural state?
    - Is there any interesting history of the spring?
    - How do humans use the spring today?
    - If the spring is associated with a river or lake?
    - Where is it located in Florida?
6. Once students are situated into groups at computers, lead them to http://www.dep.state.fl.us/geology/geologictopics/springs/bulletin66.htm or another website that lists several Florida Springs. This map from the DEP's Springs Task Force Report may also be helpful http://www.dep.state.fl.us/springs/reports/files/SpringsTaskForceReport.pdf p 14
7. Once they have gathered some research, direct students to the program you would like them to use to create their brochure. Common programs would be Microsoft Publisher, or Microsoft word. If printing is not an option, students can create their brochures without a computer on construction paper.
8. When brochures are complete, allow students to present their spring to the class, as if they were selling a vacation to the spring. What about the spring makes it worth visiting?

Assessment:

Evaluate student brochures. Did they include all the information you asked them to? Did they present their spring well? Was their information accurate?

Resources:

Department of Environmental Protection
http://www.dep.state.fl.us
US Geological Survey
www.usgs.gov/



http://www.dep.state.fl.us/springs/reports/files/SpringsTaskForceReport.pdf p 14

What is a Watershed?

Purpose:

Using a map, students will trace the flow of water at their school. They will mark high and low areas on their campus and predict how storm water flows across the campus. Students will identify places where pollution can be picked up by the storm water.

Objective:

Students will map where storm water flows on their school campus.
Students will understand how pollution can enter a watershed.

Background:

When it rains, where does the runoff water go? Does all the rain from your school campus drain to the same place? A watershed is an area where all the water runoff drains to the same place. Watersheds come in all shapes and sizes. Large watersheds can follow the path of an entire river. Small watersheds can be defined within larger watersheds, for example you can define the boundaries where runoff drains to a lake as a watershed, and that lake may be part of a larger watershed that drains into a river. Much of the water comes from rainfall and storm water runoff. The quality and quantity of storm water is affected by the alterations to the land--agriculture, roadways, urban development, and the activities of people within a watershed. Watersheds are usually separated from other watersheds by naturally elevated areas. In this lesson, students will be determining the mini-watersheds that exist on their school campus.

Vocabulary

Wetland	Runoff
Marsh	Spring
Habitat	Estuary
Everglades	Restoration
Native	Exotic
Pollution	Percolation
Watershed	Filtration

Point Source Pollution
Non-point source pollution
Retention Pond

Grade Level
4th -7th grade

NGSSS
SC.4.E.6.3, SC.4.E.6.6, SC.4.N.1.1, SC.5.N.1.1, SC.6.N.1.1, SC.6.N.1.4, SC.7.N.1.1, LA.3-5.1.6.1

Length
1 hour

Materials
Maps of school campus
Markers if students can write on the maps, post it notes if they cannot

Procedure:

1. As a class, create a definition for the term watershed. Water is a common term and students should be very familiar with it. When defining shed ask students to think of what the term means in terms of their pets, rather than storage buildings.
2. Ask students to think about their school in relation to a watershed. Is there a river or lake nearby whose watershed the school is a part of? Are there any mini-watersheds on the school campus?

3. Pass out maps of your school to students (individually or in small groups). Ask students to mark any places on the map where water collects after it rains. Also have them mark any storm drains they know of on the campus.
4. Next have students mark places on the map that they know are higher areas. These can be hills, parking lots, etc. Ask students to think about where the water goes after it rains, where it goes when it flows off of these high areas.
5. Now have students draw arrows from the high spots to the water bodies indicating which way the water will flow. Remind students that water running off of a hill may end up in more than one water body depending on which side of the hill it rolls down. Also, ask students if they know where the storm drains empty. If you do not know, ask whoever is in charge of facilities on your campus.
6. With another color marker or post it, have students mark where pollution may be introduced in the watershed.

Discussion:

Ask students how to reduce the amount of pollution that may affect your school watershed. How can pollution from your campus possibly affect the larger watershed that you are a part of? How does nature take care of natural pollution like animal waste and dead plants and animals, how does that get clean out of the water? The answer is wetlands and recharge areas. When your students have come to this conclusion ask, how could you change your campus layout to help nature filter the pollution? In other words, where could you place wetlands to help filter runoff and storm water?

Assessment:

Have students draw a map of their watershed that includes their house. Besides their house, include any waterways, ponds, lakes, and ditches in their drawing. Draw arrows to indicate the direction of water flow. Mark areas of higher elevation.

Resources:

Environmental Protection Agency
www.epa.gov
United States Geological Survey
www.water.usgs.gov
Southwest Florida Water Management District
www.swfwmd.state.fl.us
University of Florida – IFAS Extension
www.ifas.ufl.edu

How Long is That Going to be Here?

Purpose:
Florida's water resources are precious and need to be conserved. This lesson will help students understand that what they toss into their trashcan in their homes can impact both surface water and groundwater in Florida.

Objective:
Students will arrange items in order according to the time it takes them to degrade in a landfill.
Students will create a list of ways to reduce the amount of items sent to a landfill.

Background:
Garbage and landfills are as old as human civilization. Native American civilizations in Florida made mounds called middens; of shells from the oysters and mussels they ate. In recent history our garbage has become more and unhealthier for the Earth.
Most people don't think about their trash once it goes to the curb. How long will it last in a landfill? What harm can it do once it gets to the dump? Could some of that garbage be composted or recycled?

Procedure:
Before you begin:
Find out the address of the landfill nearest your town or school. Use Google maps or a similar program to locate the landfill. Zoom out on the map to find water bodies near the landfill. Have this available to be projected during the lesson or a print out of the map with water bodies available to show the students. Find out if this is where your schools garbage goes.

Vocabulary
Landfill	Biodegradable
Decay	Runoff pollution
Surface water	Ground water
Recycle	Degrade
Compost	

Grade Level
4th -7th grade

NGSSS
SC.4.P.10.4 SC.4.P.8.2
SC.5.P.8.2 SC.7.E.6.6

Length
1-2 hours

Materials
Paper
Pencils
Computer access (optional)
Pictures or examples of:
Paper towel, Aluminum can (empty)
Cigarette butt, Banana Peel, Plastic water bottle, Leather, Styrofoam cup, Newspaper, Plastic Bag, Glass Bottle, Plywood, Monofilament Fishing line
Apple Core

1. Display the items on the materials list or write the names of the items on the board. Ask students "What do all of these things have in common?" Accept all answers, and guide students to the conclusion that all of these items are things that may get thrown into the garbage.

2. Ask students "Where does you garbage go once the garbage truck has picked it up?" The correct answer will be either a landfill or an incinerator. This lesson focuses on landfills.
3. Show students the map of the landfill nearest your school. Explain that landfill usually work by digging large holes, piling the waste in the hole and covering it up to make hills. The holes are usually lined to help protect the environment, but things can go wrong with liners. Ask students "Is there any way that this landfill could affect the wetlands nearby?" Correct answers may include trash blowing away before it is buried, chemicals seeping into the ground through a tear in the liner, or runoff into lakes and rivers nearby.
4. Go back to the list of items in the materials list. Ask students to work with a partner and put the list in order from the item that would break down the fastest in a landfill to the on one that would take the longest to break down. When they have finished ask each pair for the item that would degrade fastest and the one that would take the longest. Make hash marks next to the list on the board to see class data. Show students the correct list, without times.
5. Once students have the correct list, ask them to pair up again and guess how long it takes each item to degrade in the landfill. When they have finished, go through the list and ask students for guesses and then reveal the true answer.

Discussion:

Ask students to brainstorm ways they can keep the items that take the longest to break down out of landfills, and in turn out of wetlands. This may include recycling, buying items with less packaging, or composting.

Assessment:

Have students create posters to display around school with information they learned to make others aware.

Resources:

http://www.greenlivingtips.com/articles/311/1/Waste-decomposition-rates.html

Correct order and time-Please note that many factors can affect how fast items break down, so times are approximate and may vary.

Paper towel	2-3 weeks
Banana Peel	2-5 weeks
Newspaper	6 weeks
Apple Core	2 months
Plywood	1-3 years
Cigarette Filter	1-5 years
Plastic bag	10-20 years
Leather	50 years
Styrofoam cup	50 years
Aluminum Can	80-200 years
Plastic water bottle	450 years
Monofilament Fishing line	600 years
Glass bottle	1,000,000 years

WATER'S JOURNEY

Purpose:

When you turn the faucet on, water comes out, but where does that water come from? Most students don't think about that. Living in Florida, we are dependent on groundwater for 90% of the water we use. In this lesson, students will define an aquifer; learn how it works, and what it does for our water

Objective:

Students will describe and draw a representation of the Floridan Aquifer.
Students will understand the importance of the Floridan Aquifer.

Background:

Aquifers are found under every continent and in places were humans can dig wells and are a huge source of drinking water. Because we cannot see aquifers, they are often taken for granted. In Florida, 90% of our potable water comes from the Floridan Aquifer system. This system starts in southern South Carolina, extends west into Mississippi and south under all of Florida, and most of it is easily accessible by drilling. It has only been in the last decade that people have started to study aquifers more closely. Scientists are now studying the impact that human activity is having on these delicate systems.
The best way to appreciate aquifers and their unique form and function is to dive right in! The film *Water's Journey: The Hidden Rivers of Florida* takes viewers on a journey with a pair of cave divers as they swim through underground passages that may have never been filmed or seen prior to this video.

Vocabulary

Aquifer	Hydrologic cycle
Karst topography	Sand
Limestone rock	Infiltration
Clay	Pollution
Filtration	Percolation

Grade Level
4th -7th grade

NGSSS
SC.3.L.15.1, SC.5.E.7.2, SC.4.N.1.1, SC.5.N.1.1, SC.6.N.1.1, SC.6.N.1.4, SC.7.N.1.1 LA.3-5.1.6.1

Length
1 hour

Materials
A copy of Water's Journey - The Hidden Rivers of Florida, this should be available through your school library or your local public library
Paper
Pencil
Crayons, markers, and/or colored pencils

Procedure:

1. As a class come up with a definition for the word aquifer. Ask students to think about the root aqui- and what that might refer to. Tell students that aquifers exist underground and there are very few places that an aquifer comes to the surface.
2. Ask students what kind of rock they think might make up the Florida Aquifer that is underneath all of Florida? Limestone rock is the main rock that makes up the Floridan Aquifer. Clay, dolomite, and other minerals are also present.

3. Once students understand that the aquifer is an underground holding tank where water collects after percolating through the ground and rock, have each student draw what they think the aquifer looks like underground.
4. Have students share their drawing and their rational for why they chose to draw the aquifer the way they did.
5. Show students a cross section graphic of the Floridan Aquifer provided at the bottom of the lesson (from the cave in the exhibit). Have student find similarities between the real image and the one they drew. Allow students time to add features to their drawing that were previously unknown to them.
6. Tell students they are going to be watching a documentary film called *Water's Journey: The Hidden Rivers of Florida.* Ask students what they think the film will be about from the title. Tell students while they are watching the film to write down 3 facts that they did not know and 3 things they did know that the video reinforced.
7. After the film, ask students if the class definition of an aquifer needs to be revised. If so, how? Have student share some of the facts they wrote down while watching the film.
8. Allow students to change their drawings of the aquifer now that they have seen the video.

Discussion:

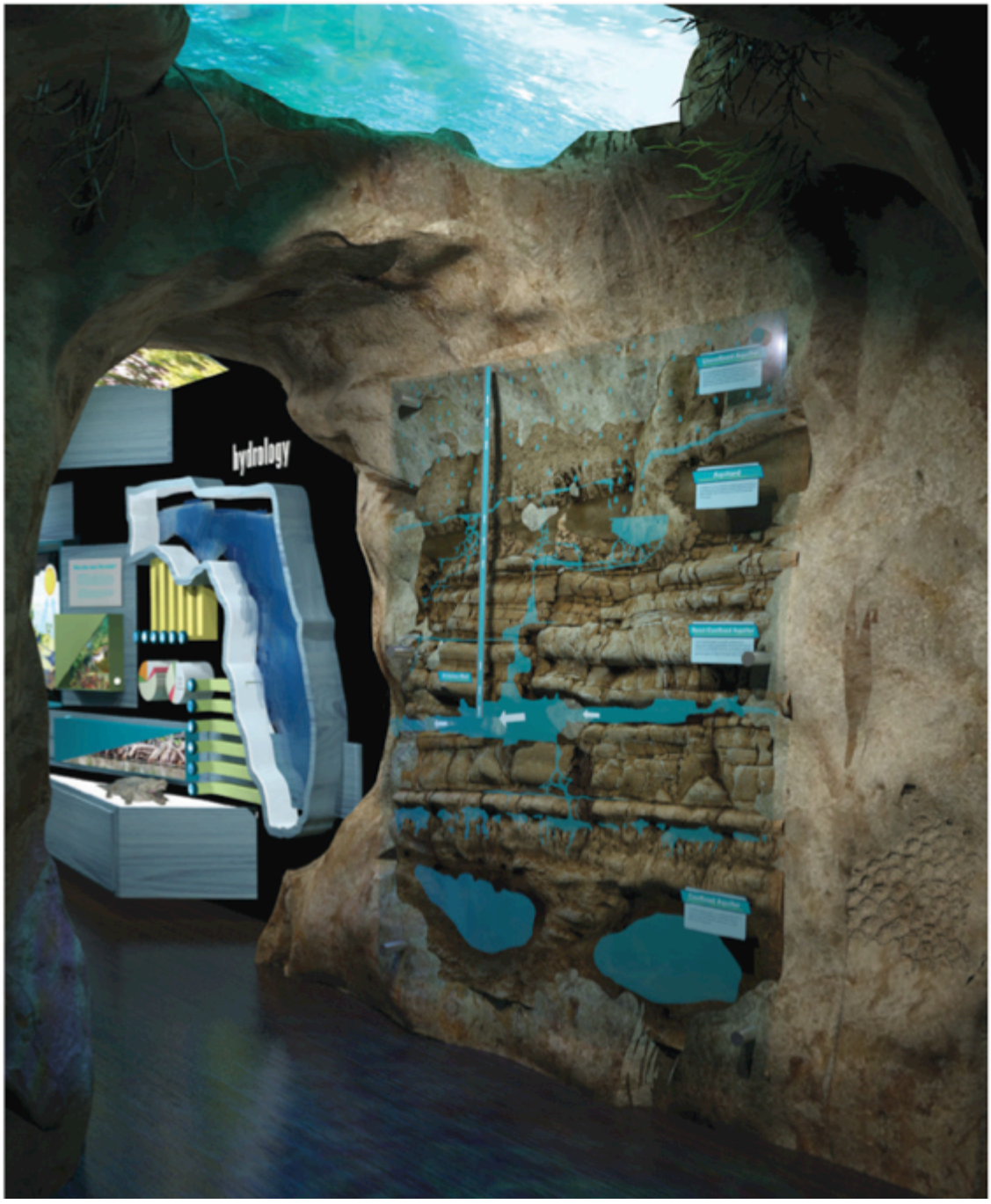
How has the student's view of where their water comes from changed from before the video to after? What impact do students have on the aquifer in their everyday lives? What can they do to protect the aquifer?

Assessment:

Replay the section of the film where the divers are under the golf course and homes nearby, but place the video on mute. Have students write the narration that would accompany this section of the film.

Resources:

Environmental Protection Agency
www.epa.gov
United States Geological Survey
www.water.usgs.gov
Department of Environmental Protection
www.dep.state.fl.us


hydrology

Around the World again, and Again, and Again

Purpose:

The water cycle is one of the most important cycles on Earth. It is responsible for our weather, and the cleaning of every drop of water on the Earth. Students need to understand the water cycle in order to understand how it moves through the habitats in Florida and around the world.

Objective:

Students will be able to name the phase changes water goes through in the water cycle.
Students will create a picture of the water cycle in their schoolyard or home.

Background:

The water cycle is the process in which the Earth cleans and recycles all the water on the planet. This process uses solar energy to change the state of water from solid to liquid to gas. These state changes and the interaction with plants, rocks, soil, and animals, combine to make the entire water cycle process. This process controls and drives the weather and recirculates all the water on the planet. This important process is subtle and often over looked in the grand scheme of things. But it is arguably the most important process on the planet.

Vocabulary

Evaporation	Condensation
Precipitation	Transportation
Percolation	Respiration
Absorption	Consumption
Water cycle	Run off

Grade Level
4th -7th grade

NGSSS
SC.4.E.6.3, SC.4.E.6.6, SC.4.N.1.1, SC.5.N.1.1, SC.6.N.1.1, SC.6.N.1.4, SC.7.N.1.1, LA.3-5.1.6.1

Length
1-2 hours

Materials
Construction paper
Markers/paint/colored pencils
Computer access (optional)

Procedure:

1. Ask students "Where do you see or use water in your everyday life?" Make a list of their responses. Continue the discussion with "Where else in the world is there water?" Add these places to the list.
2. Pick a place on the list and ask "So, where did the water in the pond behind school come from?" Lead students to answer all the places that may contribute to that water body. If it is a pond on your school property it may receive water from rain, runoff from fields, runoff from parking lots, runoff from roads, or neighborhood storm drains. If it is a river the water may come from runoff, rain, springs, small creeks, lakes, or industrial waste. Some research or a map will help you find water sources

3. Continue this discussion by asking questions about the places the water came from before the place you are taking about. For example, if you were discussing the pond behind your school, the next question may be "Ok, so some of the water in the pond comes from rain. Where did the rain come from? Clouds, ok, how did the rain get in the clouds?" Keep questioning your students until they get stumped.
4. Write 'Water Cycle' on the board. Ask students what a cycle is and then explain that the water cycle is how water moves from one place to another and from one state of matter into another. Ask students what the 3 states of matter are (solid, liquid, gas) and what we call water when it is in those states (ice, liquid water, steam or vapor). Write all those words on the board.
5. Have students draw a map of their neighborhood or school yard and label all the water on the drawing. After a few minutes, ask if they remembered clouds or rain? Ask if they remembered water fountains, pools, wells, or city water treatment plants if there is one near your town. What about water in plants and animals?
6. Next, have your students label the water on their drawing as solid, liquid, or gas.
7. On the board list the major phase changes in the water cycle, you can list as many as you have time to cover in class. There is evaporation, condensation, precipitation, transportation, percolation, respiration, absorption, and consumption. Ask the students if they recognize any of the words or any part of them. Have the students come up with definitions of the words you have listed. Write those definitions on the board or on chart paper so you can display them in the room after the lesson. From the definitions, ask students to draw arrows on their pictures and label them with these terms. (Optional: let students research these words on the internet and then come up with their own definitions.)
8. Display the drawings around the room.

Assessment:

Make a drawing of the water cycle that includes your entire county, country, state, or world.

Resources:

Environmental Protection Agency
www.epa.gov
United States Geological Survey
www.water.usgs.gov
Department of Environmental Protection
www.dep.state.fl.us

Post-Exhibit Activities

Classroom Water Use

Purpose:

Understanding where water comes from and how to protect it in natural settings is extremely important. It may be argued that knowing how much water you personally use every day is the best place to start when thinking about conservation.

Vocabulary

Conservation
Low Flow Fixtures
Consumption
Reclaimed water
Salinity
Recharge
Sustainable

Objective:

Students will be able to identify where and when water is used in daily life.
Students will be able to find ways to reduce their water consumption.
Students will be able to calculate the average amount of water used by their class per day.

Grade Level
4th -7th grade

NGSSS
SC.3.L.15.1, SC.5.E.7.2, SC.4.N.1.1, SC.5.N.1.1, SC.6.N.1.1, SC.6.N.1.4, SC.7.N.1.1
LA.3-5.1.6.1

Length
1 hour

Materials
Water use chart

Background:

Less than 1% of the world's fresh water (~0.003% of all water on earth) is accessible for direct human uses. This is the water found in lakes, rivers, reservoirs and those underground sources that are shallow enough to be tapped at an affordable cost. Only this amount is regularly renewed by rain and snowfall and is therefore available on a sustainable basis. The amount of water used in the home is a relatively small amount when compared to agriculture and other industries, but it is where the individual can have the biggest impact. Even small changes at home can lead to big changes in the world.

Procedure:

1. Ask students why water is important. There is no new water. All the water on Earth is the same water that has always been here. The Earth recycles it and it is our job to help keep the water clean and to conserve as much as possible.
2. Brainstorm as a class all the places water is used while at school. List these places on the board. Of those places listed, ask students which places would be easiest to collect data. For example, counting the number of toilet flushes is easy; the water used to wash lunchroom dishes is a significant use of water but would be very hard to calculate.
3. Once narrowed down to 5 or 6 water use sites at school, create a water use chart. There is an example at the bottom of the lesson.
4. As a class come up with ways to calculate data for the different water use sites you will be using. For example, if you are going to gather data about how much water is used when washing

hands, start counting when the water is turned on (1-1,000, 2-1,000, 3-1,000, etc.) until it is turned off and record.

5. Tell students they will each be charting their water use for 1 full school day. They should record on their water use chart as much data as they can.
6. Begin using the chart at the very beginning of a school day or from the end of class one day until the same class period the next day.
7. The following day, use these general amounts to figure out the averages:
    a. Average Toilet Flush (non conserving fixture) = 5 gallons
    b. Average kitchen faucet (non conserving fixture) = 4 gallons a minute
    c. Average yard watering (non conserving fixture) = 9 gallons per minute
8. Total all the seconds the students washed, convert to minutes and multiply by 4.
9. Total the toilets flushes and multiply by 5.
10. Discuss and share results. As a class, brainstorm ways to use less water. Repeat the process using some of their ideas and see if it makes a difference.

Discussion:

Did any of the changes you made or suggested making, make a difference? Why or why not? Find out if your school uses low flow toilets or water faucets. If they don't, how much difference would it make as far as conservation is concerned, to install them? Is the amount of water used by each student each day a significant amount or in the grand scheme of things is it so small it doesn't matter? Why is it important to make little changes, even if the gallons per day savings are not great?

Assessment:

Have students create a data sheet to measure water usage at their house. Record water usage for one week. A water use chart can be found on the SWFWMD website at http://www.swfwmd.state.fl.us/publications/files/daily_water_use.pdf.
Discuss ways of conserving water with family members.

Resources:

Environmental Protection Agency
www.epa.gov
United States Geological Survey
www.water.usgs.gov
Southwest Florida Water Management District
www.swfwmd.state.fl.us
University of Florida – IFAS Extension
www.ifas.ufl.edu

Go Water Drop, Go!

Purpose:

Now that the students have explored the AquaVentures exhibits and experienced the outdoor learning lab, they should have a pretty good understanding of the water cycle and why water is important to everyone in Florida and the world. This lesson will give students the opportunity to share what they learned with others in a fun way.

Objective:

Students will create a game based on the water cycle.

Background:

The water cycle is the driving force of weather on our planet. It is the process that recycles all the water on Earth. The process has many steps that involve everything from clouds to rocks and everything in between.

Vocabulary

Percolation Precipitation
Condensation Evaporation
Transpiration Water cycle
Hydrologic

Grade Level

4th -7th grade

NGSSS

SC.4.E.6.3, SC.4.E.6.6, SC.4.N.1.1, SC.5.N.1.1, SC.6.N.1.1, SC.6.N.1.4, SC.7.N.1.1, LA.3-5.1.6.1

Length

3-4 Hours

Materials

Construction paper
Markers/paint/colored pencils
Dice
Index cards
Other supplies students indicate they need for the game they design
Examples of board games, actual games or pictures

Procedure:

1. List the water cycle terms on the board; precipitation, percolation, transpiration, evaporation, condensation, and any others they have learned. Have students explain what each term means in terms of the water cycle.
2. As students "If you were going to teach another class about the water cycle, what would be the most important concepts you would teach them?" List student responses on the board.
3. Show students the game examples that you have. These should include some with dice, some with cards, some with spinners, and others. Explain that a good board game needs to have a goal, be a little challenging and relatively easy to play. Instruct students that in small groups they will be creating a board game that could be played by students in their grade or 1 grade above or below them. Show students the supplies available to them and instruct them that they can bring in other supplies from home if they wish.
4. Allow students as much time that is available. Games should include written instructions and all pieces needed to play.

Assessment:

When all games are finished, allow a day for students to move around the room and play each other's games. Make post-it notes available so students can leave constructive feedback on the games.

Resources:

Environmental Protection Agency
www.epa.gov
United States Geological Survey
www.water.usgs.gov
Southwest Florida Water Management District
www.swfwmd.state.fl.us
University of Florida – IFAS Extension
www.ifas.ufl.edu

I Ate an Aquifer!

Purpose:

Students will explore the parts of the Floridan Aquifer by creating a model. With their model, they will discover how pollution can enter the aquifer.

Objective:

Students will demonstrate how pollution can get into groundwater.
Students will understand how pumping can cause a decline in the water table and increased subsidence (sinking) of the land.
Students will understand the importance of the Floridan Aquifer

Background:

Aquifers are found under every continent on Earth. Aquifers are any place underground that can hold large quantities of water. They can be made of several different kinds of rock. People have tapped into ground water for centuries, it has only been recently that we have been able to see that effects of over pumping of aquifers. Aquifers are constantly being recharged by rain and surface water that percolates thorough the ground and into the aquifers. If people pump water out of aquifers faster than nature can recharge them it can lead wells drying, water quality diminishing, and negative effects on natural systems like springs.

Vocabulary

Aquifer	Watershed
Limestone rock	Groundwater
Clay	Sand
Well	Filtration
Infiltration	Percolation
Porous	Water table
Subsidence	Impermeable
Conservation	

Grade Level
4th -7th grade

NGSSS
SC.3.L.15.1, SC.5.E.7.2, SC.4.N.1.1, SC.5.N.1.1, SC.6.N.1.1, SC.6.N.1.4, SC.7.N.1.1 LA.3-5.1.6.1

Length
45 minutes

Materials
Clear drinking cups (12oz or bigger)
Crushed ice
Vanilla ice cream
Clear soda pop
Mini chocolate chips/crushed Cookies/graham crackers
Drinking straws
Food coloring

Procedure:

1. 1. Ask students to describe what the cut away diagram of the aquifer looked like as they walked through the cave portion of the exhibit. List their descriptions on the board. Get them to focus on the layers they say and where the water was in those layers.
2. List the ingredients, except the food coloring, for the edible aquifer on the board near the list of features the students remembered. Ask student what the different ingredients will represent in a model of the aquifer.

   Cup = confinement layer that keeps 2 aquifer systems separate

Crushed ice= rock layers
Vanilla ice cream = confinement layer that separates the aquifer from the surface
Clear soda = Ground water
Crushed cookies = top soil, in Florida sand layer
Straws = Wells for ground water withdrawal
Food coloring = Pollution

3. Have students draw what they think the completed aquifer model will look like including labels.
4. Pass out cups and fill them about halfway with the ice. Next add the soda so that it is level with the top of the ice.
5. Add the ice cream confining layer, this should cover all the ice and be packed tightly like clay.
6. Add a thin layer of the crushed cookies on top of the ice cream.
7. Ask students to drill a well in their aquifer with the straw, but no drinking yet. Place a few drops of food coloring on top of the cookies. Ask the students what the food coloring might represent. It is pollution.
8. Tell students to slowly begin to withdraw the soda from the aquifer. Ask them to focus on what happens to the topsoil and pollution as they withdraw from the aquifer. They should see the water table go down. They may also see sinkholes form as the ice cream caves into the ice, if it happens slowly it is a settling sinkhole, if it happens quickly it is a collapse sink hole. The food coloring maybe drawn through the topsoil cookies and confining layer ice cream, this may not be seen until the next step.
9. If time and supplies allow, add more clear soda. This represents recharge from rain or surface water. You can also simulate artificial recharge or injection wells by using a funnel and pouring the clear soda through the straw. This is a practice sometimes used near coastal areas to combat saltwater intrusion into the aquifer.
10. When time and supplies are exhausted, wrap up the simulation by recording all observations on the board. Have students make the connections between the model and the real world process for example, the ice cream and ice melting can be seen as erosion.

Discussion:

Review the layers of the aquifer with the students while they enjoy their tasty snack. Discuss the importance of the Floridan aquifer to Florida. Should people be allowed to "pull" as much water as they want from the Aquifer? Discuss water conservation techniques.

Assessment:

Have students draw the model, before and after water withdrawal, they just constructed and used, labeling all the parts with both the actual material (crushed cookie) and what it represented (top soil).

Resources:

Environmental Protection Agency
www.epa.gov
United States Geological Survey
www.water.usgs.gov
Southwest Florida Water Management District
www.swfwmd.state.fl.us
University of Florida – IFAS Extension
www.ifas.ufl.edu

In a Perfect World

Purpose:

Now that students have explored the AquaVentures exhibits and experienced the outdoor learning lab, they should have a pretty good understanding of Florida wetland habitats, how they are all connected, and what impact humans can have on those habitats. In this lesson, students will take their knowledge and apply it to a "perfect" Florida.

Vocabulary

Wetland
Impact
Filtration
Waste management
Sewage
Conservation

Objective:

Students will create a hypothetical perfect wetland habitat that incorporates humans and animals in an eco-friendly way.

Grade Level
4th -7th grade

NGSSS
SC.4.E.6.3, SC.4.E.6.6, SC.4.N.1.1, SC.5.N.1.1, SC.6.N.1.1, SC.6.N.1.4, SC.7.N.1.1, LA.3-5.1.6.1

Length
1-2 Hours

Materials
Construction paper
Markers/paint/colored pencils
Computer access (optional)
Picture of wetlands

Background:

It is easy to look around and point out all the things that humans have done to harm habitats. It is also easy to talk about the changes humans could make to improve habitats, but it is difficult to put those words into action. The inner workings of a community are much more complex then students realize. Garbage collection and disposal, medical waste, used oil from cars, potable water sources, sewage, and storm water runoff are all vital parts of a community. Students need to think about all of these things and more when creating their perfect Florida. They also need to remember the importance of wetlands and green space. Remember that wetlands can be any space where water is present part or all of the year. These areas provide the recharge space for the aquifer.

Procedure:

1. Ask students to name a wetland habitat (springs, estuaries, oceans, etc.) they saw or heard about in the AquaVentures exhibit. List their responses on the board. Ask students about the habitats they named, what makes them different, what makes they similar, why are each important. List responses on the board.
2. Instruct students that they will be imagining a perfect Florida community for this lesson. Ask them to imagine the perfect human community near a wetland. What things have to be present

in a community (waste disposal, shopping, schools, etc.)? What would it look like, where would these things be in the community? What plants and animals might be found there? How would the humans have to adapt to keep this "perfect" wetland perfect?

3. Have students draw their perfect wetland community. On the back of their drawing, or on a separate sheet of paper, have students write about their wetland, being sure to address those questions in step

Discussion:

What challenges did the students face when imagining a perfect community? Did they find they were missing vital pieces of a community?

Assessment:

Have students present their perfect wetland to the class.

Resources:

Environmental Protection Agency
www.epa.gov
United States Geological Survey
www.water.usgs.gov
Department of Environmental Protection
www.dep.state.fl.us

Stop the Runoff Pollution

Purpose:

Understanding the meaning of a watershed is one thing, but understanding how it works is a much bigger goal. In this lesson students will construct a model watershed and observe how water and pollution move through it.

Objective:

Students will define the word "watershed" and "runoff pollution".
Students will be able to identify ways to reduce the impact of runoff pollution.
Students will understand how wetlands "protect" watersheds.

Vocabulary

Watershed
Aquifer
Wetland
Contamination
Filtration
Point source pollution
Non-point source pollution
Runoff pollution

Grade Level

4th -7th grade

NGSSS

SC.3.L.15.1, SC.5.E.7.2, SC.4.N.1.1, SC.5.N.1.1, SC.6.N.1.1, SC.6.N.1.4, SC.7.N.1.1 LA.3-5.1.6.1

Length

1 Hour

Materials

Long shallow pan, with sides (cookie tray)
Wrinkled aluminum foil (enough to cover the tray)
Coco powder and/or colored drink mix
Squirt bottle
Green felt cut in to small strips or pieces (paper towel can be substituted)
Stickers to represent places in the watershed (cow sticker is cow farm, gold star is the dump, etc.)

Background:

Everyone is part of a watershed, no matter where you live, work or play. A watershed is not a building where we store water; rather it refers to the land that drains into a lake, river, ocean, groundwater, or other water body. Imagine you lived in a neighborhood near a lake. There is a very good chance that you are in that lakes watershed, meaning that when it rains at our house that water will eventually run into the lake, it may travel over ground or underground to get there, but it will eventually get there. Now imagine your lake drains into a river, no you are not only a part of the lakes watershed but part of the larger river watershed as well. So if you used ant killer on your yard one day and it rains the next, there is now a chance that the poison in the ant killer will be washed into the lake and eventually into the river. This kind of pollution is called run-off because it runs off the lands surface and into water bodies. If that ant killer can be traced straight back to your yard, it is called point-source pollution because the exact point where the pollution came from can be identified. If several neighborhoods are in the watershed and it cannot be determined exactly where the ant killer came from, it is called non-point source pollution because the exact place the pollution came from cannot be identified. Pollution happens with or without humans. Natural pollution might be things like animal waste, dead plants, or dead animals. Natural wetlands within watersheds provide a place for this

pollution to be filtered out before it enters a water body. If humans remove or alter wetlands, it can cause more pollution, natural or manmade, to enter water bodies.

Procedure:

1. Ask students to remember everything they learned at the watershed table outside the AquaVentures truck. List these things on the board. As a class come up with a definition for a watershed.
2. Once the class has agreed on a definition, brainstorm some places near your school or in your community that might produce runoff pollution (i.e. cow pastures, garbage dumps, construction sites).
3. Set up the tray so it is at an angle facing the students (prop one end up on a stack of books). Wrinkle the aluminum foil and place it in the tray. Ask students how this might be a model of a watershed. Ask students to mark on the foil with permanent marker, where lakes might form or rivers flow.
4. Have students place the stickers on the foil in the places where they want farms, schools, dumps, construction sites, etc. to be. These places can come from your list of places that produce runoff.
5. Once the stickers are in place, sprinkle the coco powder or drink mix over the pollution sites. Ask students what this might represent.
6. Use the squirt bottle to make a rain shower, watch the pollution flow through the watershed. Where does it end up?
7. Spray until all the pollution is washed away and dump the water that collected at the bottom of the tray in the sink. Try not to alter the foil.
8. Ask students what is missing from the watershed. Lead them to the lack of plants, soil, or other textures that might slow down the water. In a real watershed these might be wetlands or other green spaces. Discuss how these types of places affect runoff pollution.
9. Give students strips of paper towel or felt. Ask what this might represent. These will act as wetlands and green spaces and should absorb pollution and clean the water. Allow students to place the wetlands and green spaces around their watershed. Are there better places to place them, or will they have the same effect no matter where they are?
10. Repeat the coco powder and cool aid procedure followed by the rain. Ask students to make observations about how the wetlands and green spaces changed the outcome.

Note: This can be done in small groups is you have enough supplies.

Discussion:

Discuss how well the "wetland" cleaned the pollution from the water. Ask the students if they can think of any other ways of cleaning the water. Discuss the prevention of pollution at the source.

Assessment:

Take the class on a hike around the school campus and record areas where pollution can enter the watershed. Is there any pollution present? What type (i.e. trash, oil from parking lot, sewage)? What can be done to eliminate the pollution?

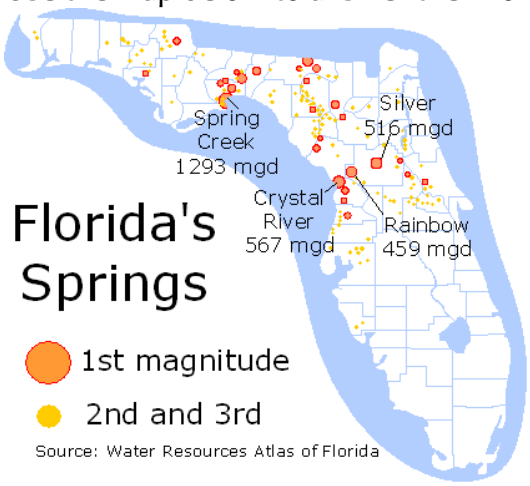
Resources:

Environmental Protection Agency
www.epa.gov
United States Geological Survey
www.water.usgs.gov
Southwest Florida Water Management District
www.swfwmd.state.fl.us
University of Florida – IFAS Extension
www.ifas.ufl.edu

FCAT Prompts and Questions

FCAT Practice Questions

Use the map below to answer the 2 following questions:



1. Sophia is studying springs in her science class. Her teacher asks "What percentage of springs are found in North Florida?" What would be the BEST answer?

a. 100%
b. 95%
c. 50%
d. 25%

2. Roberto found a map of Florida Springs. If the legend of the map is to scale, what could Roberto say about 1st magnitude springs?

a. 2nd and 3rd magnitude springs are less important than 1st magnitude springs.
b. Most 1st magnitude springs are located in South Florida.
c. There are more 1st magnitude springs in Florida than 2nd or 3rd magnitude.
d. 1st Magnitude springs are bigger in some way than 2nd or 3rd magnitude springs.

3. Molly was surprised to learn that animals played a role in the water cycle. Which of the following best describes the role of animals in the water cycle?

a. Animals bathe in water leaving oils behind making it harder for evaporation of occur.
b. Condensation of dew in the mornings on the fur of animals provides a significant amount of water to the water cycle.
c. Animals contribute to the water cycle through consumption, excretion, and respiration.
d. Fish filter water as it flows over their gills and are the only animals to contribute to the water cycle.

4. Which of the following is the best explanation of transpiration in the water cycle?

a. As plants exchange oxygen and carbon dioxide through their leaves they also release water vapor through a process known as transpiration.

b. Humans move water from one place to another through sprinklers, bottled water, and many other ways through a process known as transpiration.

c. When clouds form over one area then move to another area and rain through a process called transpiration.

d. When water sinks into the earth and moves in to groundwater systems through a process called transpiration.

5. Roberto is going to visit the Everglades this summer. He knows that the Everglades are made up of miles of wetlands. He also knows that humans have destroyed a big portion of the Everglades. Which of the following is the MOST important reason the Everglades is an important wetland system?

a. The Everglades provide fertile soil that is important for farming.

b. The Everglades is the only place in Florida that the Florida black bear can live.

c. The water in the Everglades is an important drinking water source for the people in South Florida.

d. The Everglades provides key habitat for several species and acts as a filter for the water that flows through it.

6. Trees are a dominant feature in most wetland systems. Which of the following is NOT a function of trees in a wetland system?

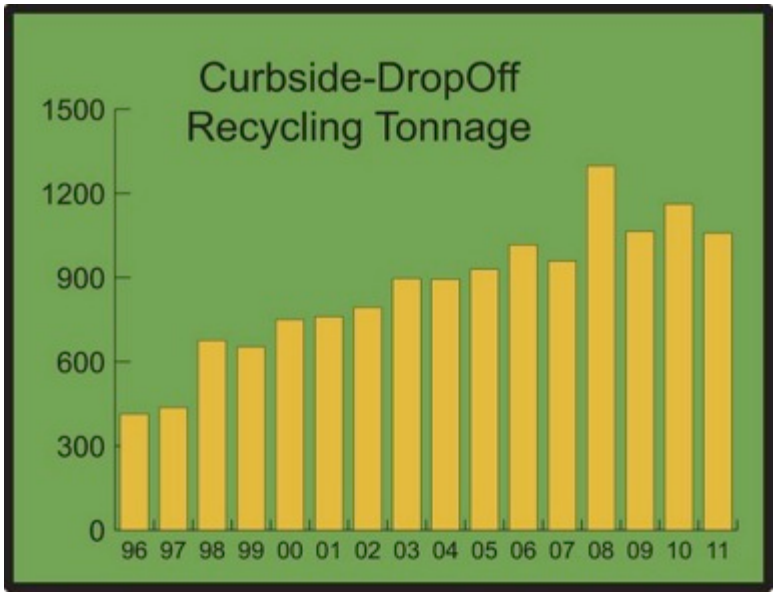
a. Trees provide habitat on the ground as well as in their branches for numerous species.

b. Hardwood trees like Cypress provide building materials for homes and industry.

c. Through the roots, trees absorb water, filter out nitrates and other impurities, and expel water through their leaves during transportation.

d. The roots of trees grow wide and help stop wetland soil from washing away during the wet seasons.

Use the graph to answer the following 2 questions:



7. The Generic county elementary school had a recycling program in 2008. How did the program effect the overall recycling in the county?

a. The program was not successful because people did less recycling in their homes.
b. Recycling in homes increased so the program had a positive effect on the county.
c. People in Generic County did not change how much they recycled at their homes so the school program had no effect.
d. The amount of recycled material collected at the school increased for that year, but there is no data showing how much was collected from homes.

8. Since the beginning of curbside home recycling, Generic County has seen an overall increase in recycling. What is the approximate increase in tons of recycled materials in the years 1996 and 2011?

a. About a 400 ton increase
b. About a 1000 ton increase
c. About a 600 ton increase
d. About a 1200 ton increase

FCAT Writing Prompts

Writing Prompt
The water cycle is responsible for most of the weather that happens on Earth. Think of a time that weather affected your life. Write a story about a time that weather impacted your life.

Writing Prompt
Tourists come to Florida for several reasons including our beaches, springs, and theme parks. Pretend that you are a travel agent selling a Florida vacation to someone who has never visited Florida. Now write to persuade that person to visit Florida.

Writing Prompt:
Protecting wetlands is important to every person who lives in Florida. Think of a time that you felt the need to help someone or something. Now write to explain what you helped (or wanted to help) and how you helped.

Miscellaneous Materials

Vocabulary List:

Absorption
Aquifer
Biodegradable
Clay
Compost
Condensation
Conservation
Consumption
Contamination
Decay
Degrade
Desalination
Erosion
Estimate
Estuary
Evaporation
Everglades
Exoskeleton
Exotic
Filtration
Fixtures
Fresh water
Groundwater
Habitat
Hydrologic cycle
Impact
Impermeable
Incursion
Infiltration
Karst
Karst topography
Landfill
Limestone rock
Limited resource
Low Flow
Marsh
Native
Nymph
Non-point source pollution
Percolation
Point source pollution
Pollution
Porous
Potable
Precipitation
Proportion
Recharge
Reclaimed water
Recreation
Recycle
Resource
Respiration
Restoration
Retention pond
Runoff pollution
Salinity
Salt water
Sand
Sewage
Spring
Spring vent
Subsidence
Surface water
Sustainable
Textiles
Transpiration
Transportation
Waste management
Water cycle
Water quality
Water table
Watershed
Watershed Runoff
Well
Wetland