

SOLVING FLORIDA'S WATER PUZZLE

A Water Resources

MYSTERY

Southwest Florida
Water Management District

WATERMATTERS.ORG • 1-800-423-1476

Teacher's Guide

Dear Teacher:

Welcome to a water resources mystery! This teacher's guide has been developed by the Southwest Florida Water Management District (SWFWMD) to use in conjunction with the *Solving Florida's Water Puzzle* booklet. The purpose of the booklet is to educate students, residents and visitors about water conservation and water resources issues, and to encourage protection of our water resources.

Solving Florida's Water Puzzle is targeted for students in grades 6–8 to increase their awareness and respect for our valuable water resources. The booklet is correlated to grades 6–8 of the Next Generation Sunshine State Standards and the Common Core State Standards. It includes a variety of nonfiction articles, quizzes, projects, problem-solving activities, games and websites to explore. All the information and activities are designed to teach students about water conservation, our current water conditions and alternative sources of water supply. In addition, we have included a Water Mystery Challenge in this teacher's guide that contains items similar to those students could expect to find on the FCAT.

Many other free materials are available from the SWFWMD and can be ordered online at WaterMatters.org/publications/. We also offer water resources workshops for teachers. For additional information, please contact the Public Affairs Bureau of the SWFWMD at (352) 796-7211, or at 1-800-423-1476 (FL only), ext. 4757. Visit the SWFWMD's website at WaterMatters.org/education to learn about more resources for teachers.

Water Mystery Guide

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Teacher Information

The following tips are provided to help you guide your students through the *Solving Florida's Water Puzzle* booklet and teacher's guide.

For each clue, make copies of the "Water in Action" activity found in this teacher's guide. Read and discuss the clue presented in the booklet with your students. Assign the "Don't Be Clueless — Piece It Together" activities at the end of each clue. Have students complete the "Water in Action" and the "Water Quest" activities found in this teacher's guide. Discuss the "Water Point." For the "Water Application," have students write about how they can use what they learned about water from the clue. In the booklet, be sure to have students complete "Check Your Facts" before moving on to the next clue.

Water Mystery Challenge (pages 15 and 16 of this teacher's guide)

Items included in the Water Mystery Challenge are similar to those presented on the Florida Comprehensive Assessment Test (FCAT).

Multiple choice answers: 1-a, 2-c, 3-c, 4-d, 5-c, 6-a, 7-b, 8-b, 9-c, 10-d

Answers to extended-response items:

Question 1:

Responses will vary. Student should be able to demonstrate an understanding of how the future of Florida's water resources depends on human actions.

Score 2 points if... The response indicates that the student has a thorough understanding of how the future of Florida's water resources depends on human actions.

Score 1 point if... The response indicates that the student has partial understanding of how the future of Florida's water resources depends on human actions.

Score 0 points if... The response is inaccurate, confused or irrelevant.

Question 2:

Responses will vary. Student should be able to demonstrate an understanding of ways to spread the water conservation message.

Score 2 points if... The response indicates that the student has a thorough understanding of ways to spread the water conservation message.

Score 1 point if... The response indicates that the student has partial understanding of ways to spread the water conservation message.

Score 0 points if... The response is inaccurate, confused or irrelevant.

Water Quest Answers

Clue 1 (p. 5) Shaded areas of circle should indicate 97% salt water, 2% frozen fresh water and 1% fresh water.

Clue 2 (p. 7)

Public Supply/ Domestic Self-Supply	197 mgd
Agriculture.....	8 mgd
Industrial/Commercial/ Mining/Dewatering	12 mgd
Recreational/Aesthetic.....	36 mgd
Total.....	253 mgd

Clue 3 (p. 9) The amount of water used on the yard per week is 840 gallons.

Clue 4 (p. 11) The amount that is in the storage system is $\frac{1}{2}$.

Clue 5 (p. 13) The total amount of water wasted was 144 gallons.

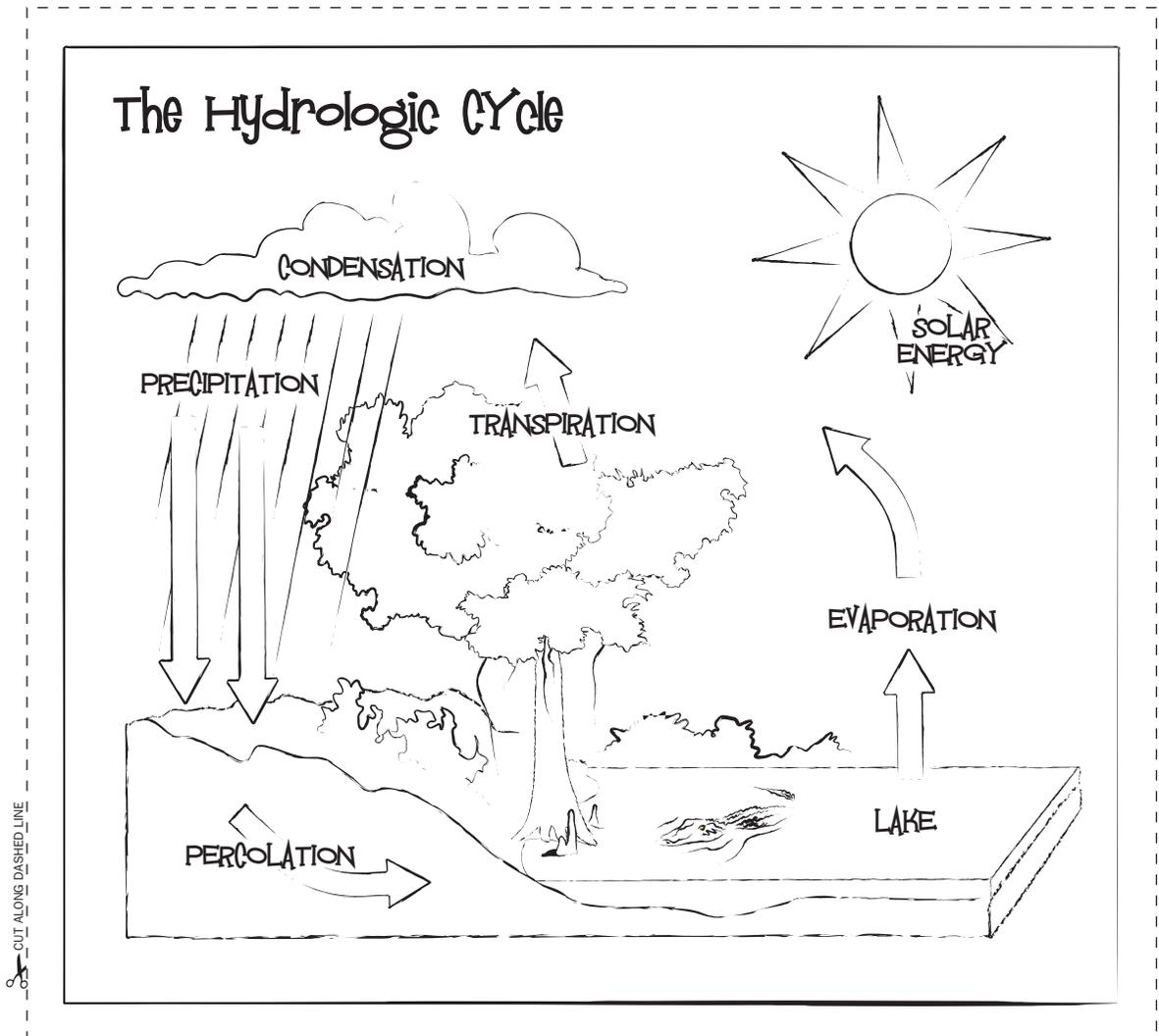


Discovering the Basics About Water

Water in Action: Capture the Water Cycle in a Bag

Background:

You have learned that water takes several paths as it moves through the environment. In this activity, you will capture the water cycle in a bag. The illustration below shows the hydrologic cycle in action and will be used in the project described on the next page.



Parts of the Hydrologic Cycle

evaporation	vapor created when the sun heats water in lakes, streams, rivers, oceans, puddles, etc.
transpiration	vapor created when plants and trees give off moisture
condensation	tiny droplets of water formed when water vapor rises into the air and cools
precipitation	moisture released from clouds in the form of rain, snow, hail, etc.
percolation	the downward movement of water through the ground

Materials:

- illustration of hydrologic cycle (page 4)
- scissors
- plastic quart-size sealable bag
- black permanent marker
- colored markers
- handful of small pebbles and gravel
- handful of soil
- tiny plants (optional)
- spray bottle of water

Directions:

1. Cut out the illustration of the hydrologic cycle and place it inside the bag.
2. Using a black permanent marker, trace the outline of the illustration onto the bag. Use colored markers to fill in the design as desired. Select a dark color to label the different parts of the cycle. When you have finished coloring, remove the picture from the bag.
3. Place a handful of small pebbles and gravel in the bottom of the bag to represent the aquifer.
4. Place a handful of soil on top of the pebbles and gravel.
5. Place a few tiny plants in the soil, if desired.
6. Gently spray water over the soil and rock mixture until it is moist.
7. Zip the bag shut and place it upright in an area that receives indirect sunlight.
8. After a few days, check to see if you have captured the water cycle!

WATER QUEST

Nearly three-fourths of the earth's surface is covered with water. Approximately 97% is salt water. Approximately 2% is fresh water that is frozen in glaciers. Of the remaining 1%, much of it is polluted or unavailable for use. Draw a circle and show the different types and percents of water on earth.

WATER POINT

Without the sun, the hydrologic cycle could never happen. It is the energy provided by the sun that causes water to move in a never-ending cycle through our environment.

WATER APPLICATION

Describe how you can use what you learned about water in this clue.



Surveying Our Current Conditions

Water in Action: Track Down Water Usage

Directions:

You have learned that water is used by a variety of groups. Each group uses water for different purposes. Read the list of water-user groups and discuss some general ways in which each group uses water. Then match the ways people use water with the appropriate water-user group.

Water-User Groups

A. Public Supply/Domestic Self-Supply/Small Public Supply

Water is used in hospitals, schools and other public places, as well as in our homes.

B. Agriculture

Water is used to produce food and fiber products.

C. Industrial/Commercial/Mining/Dewatering

Water is used to process and manufacture goods. Also, water is used to extract and process raw materials.

D. Recreational

Businesses provide recreational activities for people to enjoy in and around water.

Ways People Use Water

- Machines using water to process raw materials.
- People using water in kitchen areas and bathrooms.
- Water theme parks using water to create fun activities.
- Residents using water to irrigate lawn and garden areas.
- Farmers using water to irrigate a variety of crops.
- Power plants using water to generate electricity.
- Ranchers providing drinking water for cattle and other animals.
- Golf courses using irrigation.

(Answers: C, A, D, A, B, C, B, D)



Investigating Water Conservation

Water in Action: Arrest Those Drips

Background:

A dripping faucet can waste a lot of water over time. In this experiment, you will determine how much water can be wasted when someone forgets to shut off a faucet completely. During the experiment, be sure to reuse the water for a tree or plant so YOU are not guilty of being a water waster!



Materials:

- bucket
- measuring cup
- pen/pencil
- faucet
- record sheet (below)

Directions:

1. Turn the faucet so it has a very slow drip.
2. Record the date and start time on the record sheet.
3. Place a bucket under the faucet.
4. After one hour, use the measuring cup to determine the amount of water collected.
5. Record your data.
6. Reuse the water by giving a drink to a plant or tree.
7. Repeat the experiment for longer periods of time and record your data.
8. Discuss the results of the experiment.

Questions:

1. How much water dripped after 1 hour?
2. How much water dripped after 8 hours?
3. How much water dripped after 24 hours?
4. What would be the estimated amount of water wasted after 1 week?

ARREST THOSE DRIPS				
Record sheet				
Date	Start Time	End Time	Time Lapsed	Amount of Water



searching for Alternative sources

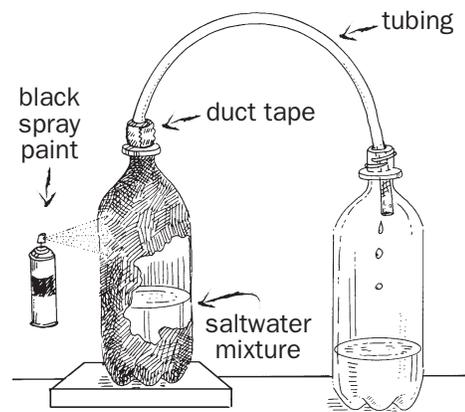
Water in Action: Demystify Desalination

Background:

You have learned about several alternative sources for water, including reservoirs and reclaimed water. Another alternative source is desalination. Desalination is a process that makes salty or brackish water drinkable by removing the salt. This activity shows you one example of how desalination works.

Materials:

- two 2-liter bottles
- black spray paint
- water
- pitcher
- salt
- one foot of 1/2" diameter clear plastic tubing
- duct tape



Directions:

1. Spray one of the bottles black.
2. Pour 1 quart of water in a pitcher and stir in 1/2 cup salt.
3. Pour the saltwater mixture into the black bottle.
4. Attach tubing to both bottles and secure with duct tape.
5. Set both bottles in a sunny window. Be sure to place the black bottle higher than the clear bottle.
6. Examine the bottles each day and take notes about any changes.
7. Answer the questions below and discuss the results.

How long did it take for water to move through the tube and into the clear bottle?

How long did it take for all the water to move into the clear bottle?

Describe the substance that remained in the black bottle.



Solving the Case Depends on Everyone

Water in Action: Create a Water Album

Background:

Now that you have learned how important protecting our water resources is for all of us, it's time for you to put your creative skills to work and make a water album. This is a project you can do by yourself, with your family or friends, or even with your entire class.

Materials:

- photo album or scrapbook containing several blank pages (or make your own)
- colored pens and markers
- pen/pencil
- writing paper
- a variety of items about water, including pictures, songs, advertisements, newspaper articles, poems, stories, conservation tips, pamphlets, drawings, etc.

Directions:

1. Look through your blank album to decide how much material will fit inside. Be sure to save space in the front of your album for the title and a table of contents. You may also want to save a few pages at the back for any items you decide to include later.
2. Make a list of the items you want to include.
3. Place your items in the album. Be sure to label them with titles, captions or descriptions to make them interesting.
4. Think of a good title and place it on the title page, along with some decoration.
5. Write your table of contents and insert it after the title page.
6. Share your album with others and spread the important messages about our water resources.



Water Mystery Challenge

Directions: This is your opportunity to demonstrate what you have learned about water conservation, our current water conditions and alternative sources. It is also an opportunity for you to practice answering questions similar to those found on the Florida Comprehensive Assessment Test. Do your best and meet the challenge!

For each multiple-choice item, select the best answer.

- While discovering a few basics about water, you learned about the earth's surface water. Which one below does NOT represent a body of fresh water?
 - ocean
 - river
 - lake
 - creek
- Most of Florida's water supply comes from ground water. Where do we find ground water?
 - in oceans
 - in rivers
 - in underground soil and aquifers
 - along the highways
- Which form of precipitation do we typically experience in Florida?
 - snow
 - transpiration
 - rain
 - evaporation
- Florida has had one of the worst droughts on record. What are the effects of a drought on the environment?
 - water levels of streams, creeks and rivers fall
 - survival is more difficult for wildlife
 - soil becomes dry
 - all of the above
- Based on information you learned while investigating water conservation, where is the most water used in your home?
 - in the garage
 - in the kitchen
 - in the bathroom
 - in the laundry area
- Which one below does NOT belong in a list of tips for conserving water?
 - Hose off driveways and sidewalks to keep them clean.
 - Check faucets and pipes for any leaks.
 - Turn off the water while washing your hands.
 - Use an automatic dishwasher for full loads only.
- Which statement below is TRUE about reservoirs?
 - There are no reservoirs in the Tampa Bay area.
 - Reservoirs are an effective way to collect and store surface water for future use.
 - The C.W. Bill Young Regional Reservoir can hold 1 billion gallons of water.
 - Reservoir water can only be used for irrigation purposes.
- Water can be applied to the surface of well fields and wetlands to increase the amount of water entering the aquifer. What is this process called?
 - Florida-Friendly Landscaping™
 - rehydration
 - storm water
 - conservation
- Which statement below is TRUE about reclaimed water?
 - It can be used for drinking and other personal uses.
 - It contains a salty concentrate used for cooking.
 - It has been chemically treated and filtered for irrigation purposes.
 - It is injected into underground aquifers for storage.
- The future of our water resources depends on all of us working together. How can citizens get involved?
 - by teaching others about the importance of water conservation
 - by volunteering their time at a community event
 - by helping organize a neighborhood project
 - all of the above



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The Southwest Florida Water Management District (District) does not discriminate on the basis of disability. This nondiscrimination policy involves every aspect of the District's functions, including access to and participation in the District's programs and activities. Anyone requiring reasonable accommodation as provided for in the Americans with Disabilities Act should contact the District's Human Resources Bureau Chief, 2379 Broad St., Brooksville, FL 34604-6899; telephone (352) 796-7211 or 1-800-423-1476 (FL only), ext. 4702; TDD 1-800-231-6103 (FL only); or email ADACoordinator@WaterMatters.org.

Activities in *Solving Florida's Water Puzzle* address the following Common Core State Standards and Next Generation Sunshine State Standards for grades 6–8:

Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects

College and Career Readiness Anchor Standards

Writing: Text Types and Purposes

W.CCR.2: Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

Writing: Production and Distribution of Writing

W.CCR.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Speaking and Listening: Comprehension and Collaboration

SL.CCR.1: Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

Speaking and Listening: Presentation of Knowledge and Ideas

SL.CCR.6: Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

Common Core State Standards for Literacy in History/Social Studies, Science, and Technical Subjects

Reading Standards for Literacy in History/Social Studies

Reading: Key Ideas and Details

RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts.

RST.6-8.2: Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

RST.6-8.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects

Writing: Production and Distribution of Writing

WHST.6-8.6: Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

Writing: Range of Writing

WHST.6-8.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Common Core State Standards for Mathematics

MP.6: Attend to precision.

Next Generation Sunshine State Standards for Science

- SC.6.E.6.2: Recognize that there are a variety of different landforms on Earth's surface such as coastlines, dunes, rivers, mountains, glaciers, deltas, and lakes and relate these landforms as they apply to Florida.
- SC.6.E.7.2: Investigate and apply how the cycling of water between the atmosphere and hydrosphere has an effect on weather patterns and climate.
- SC.6.E.7.5: Explain how energy provided by the sun influences global patterns of atmospheric movement and the temperature differences between air, water, and land.
- SC.6.E.7.6: Differentiate between weather and climate.
- SC.6.N.1.4: Discuss, compare, and negotiate methods used, results obtained, and explanations among groups of students conducting the same investigation.
- 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.L.17.2: Compare and contrast the relationships among organisms such as mutualism, predation, parasitism, competition and commensalism.
- SC.7.L.17.3: Describe and investigate various limiting factors in the local ecosystem and their impact on native populations, including food, shelter, water, space, disease, parasitism, predation, and nesting sites.
- SC.8.P.9.1: Explore the Law of Conservation of Mass by demonstrating and concluding that mass is conserved when substances undergo physical and chemical changes.