Teacher's Guide

Grade 4

Water Matters!

Saving Your Water through Science

Southwest Florida
Water Management District

WATERMATTERS.ORG • 1-800-423-1476

Introduction

Welcome to the *Water Matters!* curriculum developed by the Southwest Florida Water Management District (SWFWMD). The SWFWMD manages the water resources for west-central Florida as directed by state law. It was established in 1961 as a flood protection agency. Since then, its responsibilities have grown to include managing the water supply, protecting water quality and preserving natural systems that serve important water-related functions.

As a teacher, you have a very important role in preparing students to take on the responsibility of being stewards of the land and our water resources. By educating your students about the protection of Florida's water, you teach them to be responsible citizens actively involved in maintaining a clean and healthy environment.

This Teacher's Guide accompanies the fourth-grade module of the *Water Matters!* curriculum, which is correlated to the Next Generation Sunshine State Standards. The Student Publication contains vocabulary words (*italicized* and **bolded**) with vocabulary activities and review questions after each section. The Teacher's Guide includes answers to student questions and additional content, activities and websites to explore.

We encourage teachers to use this guide electronically as there are hyperlinks available for easy access to other resources. In preparation for using the *Water Matters!* curriculum with your students, it will be helpful to read the entire Student Publication and Teacher's Guide and test or bookmark the hyperlinks in the Teacher's Guide. While using the curriculum —

- Read and discuss with your students the material presented in the Student Publication.
- Direct students to complete the vocabulary activities and questions at the end of each section of the Student Publication and then discuss the results with students.
- Implement the extension activities you select from the Teacher's Guide.

Please note:
Suggested extension activities with an asterisk after the name reference **Project WET** activities. Project WET, which stands for Water Education for Teachers, is a series of hands-on, investigative and easy-to-use activities for teaching students about water resources. To receive a Project WET guide, teachers must attend a six-hour training. If you don't have a Project WET guide, check with your colleagues or order a free sample of the guide by emailing *WaterEducation@WaterMatters.org*. To learn more about Project WET, visit *ProjectWET.org*.

A variety of other publications and electronic resources are available from the SWFWMD. Visit *WaterMatters.org/Education* to learn more. For questions or comments, email *WaterEducation@WaterMatters.org.*

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Section One: Water Ways

Key Ideas:

- Water is made up of tiny particles called molecules, which are too small to see.
- Depending on temperature, water can be a liquid, a solid or a gas.
- When water evaporates, molecules move faster and break away, causing the water to become an invisible gas.
- As air cools down, the molecules in water vapor slow so much that they come together to form tiny droplets of liquid water in a process called condensation.

Standards

SC.4.P.8.2
Identify properties and common uses of water in each of its states.
SC.4.P.10.2
Investigate and describe that energy has the ability to cause motion or create change.

Objectives

- Student will identify water and common uses of water in each of its states — liquid, solid and vapor (gas).
- Student will conduct observations about evaporation and condensation.
- Student will explain the way temperature affects water molecules.
- Student will describe the changes water undergoes when it changes states through heating and cooling.

Vocabulary

Condensation	Liquid	Solid
Evaporation	Ice	Water vapor
Freezing	Melts	
Gas	Molecules	

Bellringer

Put the chart on the board or make a handout for students. Ask students to list at least one example of each category (solid, liquid and gas) both inside and outside the classroom and then explain why they listed the item in that category.

	Solid	Liquid	Gas
Inside			
Outside			
How do you know these are a solid, liquid or gas?			

Engage

Shape Up or Go with the Flow?

This simple observation lets students discover the basic properties of liquids and solids. Divide students into groups and provide to each group:

- Two clear containers of different shapes (one that will hold less than 12 ounces and one that will hold a quart or more)
- Marker or tape for students to mark the liquid level
- Bag marked liquids containing 12-ounce bottle of water and 1/4 cup of syrup
- Bag marked solids containing pencil, block and paper clip, or give each group a different set of solids

Prepare a pouring area in the sink or somewhere liquids can be spilled. Have groups complete the investigation, recording the observations on the Student Page for this experiment found on page 22 of the Teacher's Guide.

Molecules in Motion*

Project WET Curriculum and Activity Guide 2009 page 47 or 2.0 version page 33. This physical activity requires an open area large enough for students to move around. Students pretend to be water molecules in each of water's physical states and react to the effects of heat energy.

Water Vapor Demonstrations

For several ways to demonstrate evaporation, see *Water Matters! Grade 3 Teacher's Guide, Section One*.

Explore

Students should read Section One of the student publication and complete the vocabulary review and questions. Here are additional options for expanding student knowledge about the states of water:

Popcorn Molecules Model

Using baby food jars and popped corn kernels, fill one jar completely with popcorn kernels representing molecules packed together so that hardly any movement is possible. Fill the second jar about a quarter full to represent molecules in liquids. Place only a few kernels in the third jar and shake it to represent the freedom of movement molecules have in gases.

Changing States

Let students use this interactive activity to explore how changing temperature changes several substances: chocolate, wax and butter. *Bbc.co.uk/Schools/ScienceClips/Ages/8_9/Solid_liquids_fs.shtml#top*

Next, let students use this interactive activity to explore gases and then practice identifying whether substances are solids, liquids or gases. Once you have acessed the link, select Sorter:
Bbc.co.uk/Schools/ScienceClips/Ages/9_10/Gases_fs.shtml

Explain

By completing the questions after Section One, students will explain what they read and comprehended. Here is an additional opportunity for students to explain what they've learned about the states of water:

Tell a Partner About Molecules and Temperature

Have students use the words *temperature* and *molecules* to explain to a partner what happens to water when it evaporates. Then have the other partner explain what happens when an ice cube melts, also using the words *temperature* and *molecules*. Select one partner pair to explain it to the class. Allow other students to add to the explanation or ask questions.

Elaborate

You Can't Drink Frozen Water

Students will decide how to design an experiment to solve a problem. This activity is found on page 22 of this Teacher's Guide. Students should realize they must replicate the temperature of the water park for best results. If desired, students also could conduct the experiment to see if their design worked.

Water Three Ways

Divide students into teams and have each team collaborate to make a "Water Three Ways" poster. Directions:

1. Title your poster "Water Three Ways."
2. Divide the poster into three columns and label the columns: Solid, Liquid, Water Vapor.
3. Under each term, draw or paste a cut-out illustration such as an ice cube (solid), pitcher or bottle of water (liquid), and steam coming out of a kettle (water vapor). Illustrations to cut-out are provided on Student Page 20 of this Teacher's Guide.
4. Under each illustration, add an illustration of the molecules made by gluing Cheerios or another similar cereal within cylinder shapes.
5. Paste photos under the appropriate columns with examples of the way water in that state is used. For example, ice to cool drinks or to ice an injury; water vapor coming out of a vaporizer or steaming the wrinkles out of clothing.

Evaluate

My Water Book (Whole Unit)

Make a whole-unit "Water Book," adding pages for each section in this unit. For this section, have students create three photo collage pages — one devoted to showing water as a solid, one as a liquid and one as water vapor. Each page also should include ways water is used in that state. Copies of Student Page 20 also can be provided to students for this activity.

How I Changed

Instruct students to do the "How I Changed" vocabulary activity on page 23 of the Teacher's Guide. The activity can be used to evaluate students' understanding of what causes water to change states in the environment.

Additional Free Resources

Poster

Download or order FREE posters illustrating *evaporation* and *condensation* at *WaterMatters.org/Publications*.

Changing the State of Water: Freezing

Resource ID#: 46353 CPALMS, this lesson plan provides students hands-on experience with the freezing process: *http://www.cpalms.org/Public/PreviewResource/Preview/46353*

Section Two:
The Power of the Water Cycle

Key Ideas:

- All the water on Earth is part of nature's never-ending system called the water cycle, which is powered by energy from the sun.
- The power of water, gravity, wind, heat and cold cause weathering and erosion.

Standards

SC.4.E.6.4
Describe the basic differences between physical weathering (breaking down of rock by wind, water, ice, temperature change, and plants) and erosion (movement of rock by gravity, wind, water, and ice).
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.10.2
Investigate and describe that energy has the ability to cause motion or create change.

Objectives

- Student will explain how energy from the sun powers the water cycle, which continuously recycles all the water on Earth.
- Students will compare and contrast types of water cycle models.
- Students will apply previous knowledge about the states of water to explain how water moves through the hydrologic cycle.
- Students will explain the basic differences between weathering and erosion.

Vocabulary

Aquifer	Percolation	Water cycle
Erosion	Precipitation	Weathering
Groundwater	Transpiration	

Bellringer

To assess student knowledge or recall of the water cycle, write these terms on the board: condensation, evaporation, percolation, precipitation, transpiration. Then pass out copies of the Hydrologic Cycle Fill-in-the-Blanks found at *WaterMatters.org/Education/Activities*.

Engage

Water Cycle Podcast
Show this video to your class. It's less than five minutes and is easily found at *WaterMatters.org/Podcasts*. An accompanying teacher's guide for grades 4 and 5 also is available at the same link.

The Incredible Journey*
Project WET Curriculum and Activity Guide 2009 version page 161 or 2.0 version page 155; or the 2.0 Sampler, page 19. Also available on *ProjectWET.org*. With the roll of a cube, students simulate the movement of water within the water cycle.

Hydrologic Cycle Poster
Order the FREE *Hydrologic Cycle Poster* from *WaterMatters.org/Publications* for display, or download it. Explain that the poster is a model of the water cycle. Ask students how this model is different from the real water cycle. For additional vocabulary review, provide students another copy of the "Hydrologic Cycle Fill-in-the-Blanks" and see how many of the terms your students can fill in after discussing the poster.

Explore

Students should read Section Two of the student publication and complete the vocabulary review exercises and questions. Refer to the "Water Cycle Foldable Vocabulary Review" on page 10 of the Student Publication. You'll need to provide students with a copy of page 24 in this Teacher's Guide.

Here are additional options for expanding student knowledge about the water cycle and the power of water:

Water Cycle in a Bag
"Water Cycle in a Bag" can be a demonstration only or an individual student project. A list of materials and directions can be found at: *WaterMatters.org/Education/Activities*. Remind students that the plastic bag water cycle is a model.

Baggie on a Branch
For additional review of transpiration, see this activity in *Water Matters! Grade 3 Teacher's Guide*, Page 11.

Demonstrate Weathering and Erosion
Use a hammer to break up a piece of sandstone, limestone or other soft rock. Leave half the pebbles on a table and use a fan to demonstrate the erosion of wind blowing the pieces of rock away. Place the other pieces of broken rock on top of a layer of dirt in a shoebox. Tear one of the short ends of the shoe box down to the dirt level to allow the water to escape and the erosion to occur. Tilt the shoe box so that the torn side is at the bottom of the slant and place the shoe box inside another larger container or the sink. Spray or pour water down the slope to demonstrate water erosion.

Explain

By completing the questions after Section Two, students will explain what they read and comprehended.

Make a Water Cycle Bracelet
Have students construct a water cycle bracelet after ordering the supplies from SWFWMD by emailing *WaterEducation@WaterMatters.org*. View the instructions at *WaterMatters.org/Education/Activities*. Have students use the bracelet to explain the water cycle to a partner or family member.

Write About an Incredible Journey
After completing the "Incredible Journey," ask students to write a paragraph describing the journey of a raindrop that includes the following terms: condensation, evaporation, percolation, precipitation, transpiration and sun's energy.

Elaborate

Comparing Water Cycle Models
Select three of the models you used in this section (hydrologic cycle poster, "Incredible Journey," "Water Cycle in a Bag," "Water Cycle Bracelet," or one of the online water cycles listed under Additional Resources). Have students explain how each is a model of the real water cycle and how they are different from the real water cycle. Have teams research or invent a different water cycle model and share their idea with the class.

Graphing Results
After completing "Incredible Journey," compile the data from student tally sheets and construct a graph of the results.

Evaluate

My Water Book (Whole Unit)
Make a whole-unit "Water Book," adding pages for each section in this unit. For this section, have students find pictures of landscapes and place labels where the parts of the water cycle are occurring (for example, label condensation in the clouds, precipitation where rain is falling from the sky, percolation where rain is hitting the ground, etc.). This may take several photos. Also include photos of weathering and erosion.

Let Me Explain My Water Cycle Bracelet
Have students explain the water cycle using the beads on the bracelets they created. Prompt them to explain that the cycle is not a progression of linear steps but all the steps are going on at all times.

Additional Resources

EPA's Interactive Thirstin's Water Cycle
Interactive water cycle at this link: *Epa.gov/ogwdw/Kids/Flash/Flash_watercycle.html.*

USGS's Water Cycle for Kids
This can be printed or viewed online at *Water.usgs.gov/Edu/Watercycle-kids-beg.html*.

Study Jams — Weathering and Erosion
This three-minute video is available from WatchKnowLearn, a non-profit that makes more than 50,000 educational videos available for free and without registration. The video is available at this link: *Watchknowlearn.org/Video.aspx?VideoID=13256*.

Photos of Weathering and Erosion
Share these *weathering and erosion photos* with students.

PBS Video The Grand Canyon: How It Formed
Share this video with students:
Pbslearningmedia.org/Resource/ess05.sci.ess.earthsys.canyon/The-grand-canyon-how-it-formed/.

Virtual Tour in an Aquifer
Take students on a virtual cave dive into the aquifer at Wakulla Spring's by visiting *FloridaSprings.org/Expedition/Wakullaflash/.* Once on the webpage, click "Exploring Wakulla" then "Virtual Cave Dive."

Section Three:
Renewable But Limited

Key Ideas:

- Water is a renewable, yet limited, resource.
- There is no new water on Earth, and as the population grows, there are more people using the water.
- Humans impact the environment positively and negatively.
- Using water wisely helps protect the water on Earth.

Standards

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

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

Objectives

- Student will explain how water can be both a renewable and limited resource.
- Student will label a graphic to represent the percentage of the Earth's salt and fresh water.
- Student will calculate the combined daily water use of the classes' families.
- Student will list ways people protect and pollute water.
- Student will justify why we must all conserve and protect our water resources.

Vocabulary

Conserve	Nonrenewable resource	Salt water
Fresh water	Natural resource	Water pollution
Glaciers	Renewable resource	

Bellringer

We are Water Users
Ask students to make a list of all ways they and their families use water at home indoors and outdoors.

Engage

Yours, Mine and Ours
This activity helps students think about water as a limited resource. Start with a pitcher of water. Give each student a piece of paper with a scenario that represents a water user in Florida and a number of cups. Here are some examples:

- Hospital — 3 cups
- Water park — 4 cups
- A family with two children who water their landscape regularly — 2 cups

- A family with two children who never water their landscape — 1 cup
- Large orange grove — 5 cups
- Small blueberry farm — 3 cups
- A senior citizen living alone — ½ cup
- A senior citizen facility — 3 cups
- A restaurant — 2 cups
- Dairy farm — 4 cups
- Car wash (recycles its water) — ½ cup
- Bicycle factory — 3 cups
- City firefighters — 4 cups
- Doggie Day Care — 1 cup
- Grocery store — 2 cups
- Our school — 3 cups

Give students the number of small cups they need according to their water use.

Have students draw a number to see what order they go in. After the first student reads his/her scenario, fill the student's specified number of cups from the pitcher. Continue with each student until you run out of water (be sure to run out). Use the activity to talk about water as a limited resource, priorities and conservation.

Explore

Students should read Section Three of the student publication and complete the vocabulary review and questions.

Vocabulary
To prepare your students for the vocabulary review on page 5 of the Student Publication, explain each vocabulary word, tapping into prior knowledge and using imagery. For example:

Conserve

Definition: Use wisely, don't waste, save.

Use Imagery: Saving money in a piggy bank to buy a toy later. Using the leftover water in a bottle to water a plant.

Sentence: To conserve water, I turned off the faucet as I was brushing my teeth.

Next, have students complete a 3x5 card like the example in the Student Publication or a foldable. After students have completed their own sentences, have them work with a partner to complete the cards with their partner's sentence.

Here are additional options to expand student knowledge about water use, conservation and protection:

Daily Water Use at Home
After studying the need to conserve water, have students take home a copy of the "Daily Water Use at Home" survey found at *WaterMatters.org/Publications* and work with their family members to fill in the chart. Have students share their families' ideas for saving water and how much water they would save if they did so. Calculate and graph the total amount of water used by all families and the total amount of water that families pledged to save.

Waterful Food
In this activity found at *WaterMatters.org/Education/Activities*, students will learn about the amount of water needed to produce one serving of commonly eaten foods. Then they will use their math skills to perform computations.

Sum of the Parts*
Project WET Curriculum and Activity Guide, 2009 version page 267 or 2.0 version page 284. Students demonstrate how everyone contributes to the pollution of a river by creating a use for their own piece of land.

Surface and Groundwater Connections
Order or download *Water Smart Connections Teacher's Guide* from *WaterMatters.org/Publications.* Conduct activity 2.3 on page 3. Students will compare how fast water from the surface percolates through three different kinds of soils. They will use food coloring to observe how soils can filter water.

Explain

By completing the questions after Section Three, students will explain what they read and comprehended.

Encouraging Conservation at Our School
Use the conservation messages students wrote in response to question 4 in the Student Publication, Section Three to make posters for the classroom or the whole school. Once your class calculates the water their families will save, challenge other classes to match or exceed your pledge. Combine all pledges to get a schoolwide total. Have totals promoted on school signs or contact your local newspaper to report your efforts. You will find many ideas to promote water conservation at your school at *WaterMatters.org/Education/Classroom_Challenge.*

Water Slideshow
Have students create a digital slideshow that shows all types of water (the ocean, lakes, ponds, puddles, rainfall, glaciers, etc.) and all the ways water is used. Then ask students to show their slides to the class and justify why we must all conserve this limited and precious resource.

Elaborate

Drips and Drops
Students will use math skills to determine how much water can be saved by taking a shorter shower or by fixing a leaky faucet. Download or order the FREE *WaterDrops Water Conservation Teacher's Guide* from *WaterMatters.org/Publications*, and work through "Drips and Drops, Extended Activity Number 1."

Only Three Gallons a Day
Studies have found that people in developing countries use an average of less than three gallons of water per day. Some places, people must walk long distances several times a week to get water to carry home. Using students' calculations from the "Daily Water Use," have students compare their own family's water use with that of a family of the same size limited to three gallons a day per person. Have students write a paragraph called "Living with Only Three Gallons of Water a Day."

Evaluate

My Water Book (Whole Unit)
Make a whole-unit "Water Book," adding pages for each section in this unit. For this section, have students include the following:

- Photos of water conservation and water waste
- A page of favorite slogans created in response to question 4 in the Student Publication, Section Three
- Bar chart created in "Waterful Foods" activity
- Student's own family's water use data compared to the class average
- Photos of healthy and polluted water
- Their family's water protection pledge

Pledge to Protect
After learning ways they and their families can help prevent water pollution, have students talk to their families and agree on at least one way they will change a behavior to help keep water clean and healthy. See Student Page 25 for the "Water Conservation Pledge Card."

Additional Resources

Water — Who Needs It?
Watch this 14-minute video for an introduction to the importance of water to all living things and ways to conserve. The video, which is produced by the State of California's Department of Water Resources, can easily be divided into segments as needed. *https://www.youtube.com/watch?v=l67HwLegDLE*

Quizlet
Use this free interactive site to practice renewable and nonrenewable concepts and terms using several methods: *Quizlet.com/56639976/Renewable-and-nonrenewable-resources-flash-cards/.*

Section Four: Interdependence

Key Ideas:

- Plants and animals in a shared environment interact and depend on each other to satisfy their basic needs.
- Energy from the sun is transferred along the food chain through the producers to the consumers.
- Humans impact the environment both positively and negatively.

Standards

SC.4.L.17.3
Trace the flow of energy from the Sun as it is transferred along the food chain through the producers to the consumers.
SC.4.L.17.4
Recognize ways plants and animals, including humans, can impact the environment.

Objectives

- Student will explain how energy flows through the food chain.
- Student will explain how living things within an ecosystem affect each other.
- Student will report on one Florida animal, its status and its habitat.
- Student will identify ways humans harm and help the environment.

Vocabulary

Consumers	Food chain	Interdependence
Ecosystems	Food web	Photosynthesis
Estuary	Habitat	Producers

Bellringer

Write on the board: "A living thing's habitat is the place where it lives. It needs to include all of the things necessary for it to survive." Project one or more of the pictures of frog habitat from this site for students: *Tiutenko.Wordpress.com/2012/08/04/Pool-frog-shooting-2/*.

Engage

The Life Box*

Project WET Curriculum and Activity Guide, 2009 version page 76 or 2.0 version page 69. Students discover four essential, interdependent factors needed to sustain life.

Dramatic Food Chains

CPALMS Resource ID#46523: This fun lesson gives students the chance to "act out" food chains.

Explore

Students should read Section Four of the student publication and complete the vocabulary review and questions. Here are additional options for expanding student knowledge about interdependence:

The Needs of Living Things Worksheet

Have students complete this worksheet found on Student Page 26 in this Teacher's Guide.

NOAA Aquatic Food Chain Interactive

Students click and drag each organism to create a simple food chain. At the end of this exercise, students will see how the simple food chains they created form a larger food web. *Click here* or type *NOAA aquatic food chain interactive* into your search engine.

Explain

By completing the questions after Section Four, students will explain what they read and comprehended. Here are additional options for having students explain what they learned about species, habitats and interdependence:

My Animal Report

Have students select a Florida species to report on to the class. See *Additional Free Resources* for research ideas.

Here are some guiding questions:

1. What does your animal look like? (include a photo)
2. What habitat does your animal live in?
3. Where in Florida is your animal's habitat located?
4. What living things does your animal need to survive?
5. How does your animal behave in regards to getting food, shelter and water?
6. What is your animal's food chain or food web?
7. How does your animal interact with other animals?
8. How do human activities impact your animal?

Elaborate

The Plant and Pollution Connection

Activity 4 of the *WaterDrops Activity Packet* introduces students to acid rain and guides them through an experiment to learn of its effect on plants. Order or download the packet from *WaterMatters.org/Publications.*

Evaluate

My Water Book (Whole Unit)

Make a whole-unit "Water Book," adding pages for each section in this unit. For this section have students use the animal that they researched for "My Animal Report." Include the following:

- Picture of selected animal
- Picture of the animal's habitat
- Pictorial representation of a food chain and/or food web involving the selected animal
- Tell whether the selected animal is threatened or endangered and, if so, why
- Pictures of ways peoples' actions can pollute water
- Poster with messages about protecting water from being polluted

My Animal Report

This report seen under *Explain* on the previous page makes an excellent assessment.

Additional Free Resources

Common Species Posters

Download or order one or all of the common species posters for no cost at *WaterMatters.org/Publications*. Species include: wildflowers, insects, birds, frogs and toads, butterflies, reptiles, trees and shrubs, and mammals.

Florida Fish and Wildlife Conservation Commission

A current list of imperiled species can be found at: *MyFWC.com/WildlifeHabitats/Imperiled/Profiles/*.

Manatee Coloring Book

Learn more about manatees in this coloring book packed with information from Florida's Fish and Wildlife Conservation Commission: *MyFWC.com/Media/415161/Manatee_Colorbook.pdf*.

Save Our Species Coloring Book

Find ordering information or download to print EPA's "Save Our Species" coloring book from this link: *Epa.gov/sites/production/files/2013-08/documents/cbook.pdf*.

United States Geological Society SOFIA

This site for kids describes southern Florida ecosystems: *Sofia.Usgs.gov/Virtual_tour/Kids/Ecosys.html*. From this page, students can move to the "Critters" page.

Student Publication Answer Key

Section One: Water's Ways

Vocabulary Review

Dear Friend,

I learned something amazing today — water is made of molecules and THEY MOVE!!! First, did you know that water, just like everything else around us, is made up of tiny ***molecules*** that are so small, we can't see them with our eyes.

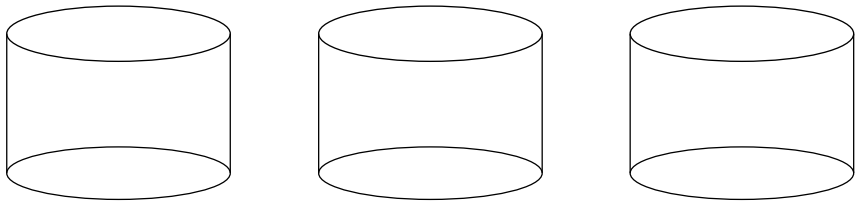
Second, ***water*** can change from liquid to solid to gas. Whether it is a liquid, a solid or a gas depends on temperature because temperature changes the way molecules ***move***.

When water is frozen, it is a ***solid*** and it is called ***ice***. As the water gets cold enough to ***freeze***, the molecules move very close together and slow down so much they hardly move at all.

When the ***temperature*** gets warmer, the molecules move faster and aren't as close together. The ice ***melts*** and the water becomes a ***liquid***.

In class, we saw water heated until it boiled. We learned that heat made the ***molecules*** move faster and spread farther apart. Some moved so fast that they broke away. The water seemed to disappear, but it really changed into a ***gas*** called ***water vapor***. When this process happens, it is called ***evaporation***.

Here is a picture showing how molecules look in solids, liquids and gases.



Solid **Liquid** **Gas**

Isn't science great?

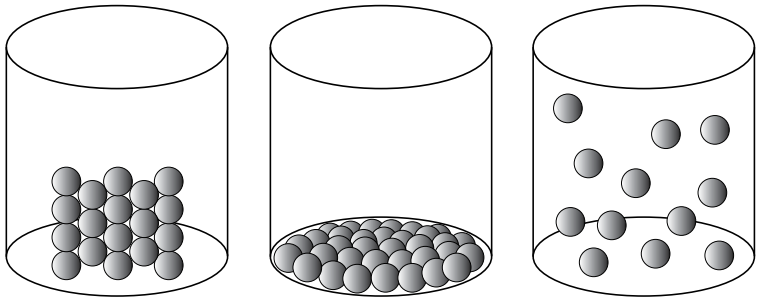
Sincerely,

_____

Section One continued

Questions

1. By looking at the picture of the molecules in each container, decide which container holds a gas, a solid or a liquid. Write the correct word under each cup.



2. Everything around us is made up of molecules. True or false?

   True

3. Using the words "molecules" and "temperature", explain what is happening when water changes from a liquid to a solid?

   When the temperature of liquid water is lowered, the cold air causes the molecules in the water to stay tightly together and slow down so much they only vibrate. When the water freezes, it turns to ice, a solid.

4. Heat energy changes liquid water to solid. True or false?

   False

5. Water molecules are always moving, but temperature changes the way they move. True or false?

   True

6. Explain what is really happening when a puddle seems to disappear on a sunny day.

   The sun heats the water, making the molecules move faster and faster. As they move farther apart, they separate from the other water molecules and go up into the air. The water evaporates, turning to water vapor.

Section Two: The Power of the Water Cycle

Vocabulary Review:

There is no answer key for this activity. Refer to the final photo in the Student Publication to confirm students followed the instructions.

Questions

1. Only part of all the water in the world is circulated in the water cycle. True or false?

   False

2. Explain how the sun's energy powers the water cycle.

   Energy from the sun makes the water molecules on the surface of Earth and on plants move faster and farther apart until they break away from the other molecules and go up into the air as water vapor.

3. When you see clouds in the sky, you are seeing the part of the water cycle called percolation. True or false?

   False

4. Explain where water can be found on Earth as a liquid, a solid and a gas. Give at least two examples for each. Answers will vary, but here are examples:

   As a liquid, water can be found in oceans and swimming pools.
   As a solid, water can be found in glaciers and snow cones.
   As a gas, water can be found in the air and my soda pop bubbles.

5. Write a W in the blank before the examples of weathering and write an E in the blank before the examples of erosion.

   E Beach sand being carried into the ocean by waves

   W Ocean waves smashing into rocks to create sand

   W Water getting into cracks in rocks, then freezing, causing the rock to break into smaller pieces

   W A canyon being carved out by a river

Section Three: Renewable But Limited

Vocabulary Review:

Refer to the Student Publication for the definitions and use your judgement as to whether the student's sentence and drawing reflect an understanding of the word.

Questions

1. Using what you've learned in Section Three, explain why water is a renewable resource and why it is a limited natural resource:

   Water is a renewable resource because the water cycle recycles the water over and over. Water is a limited resource because only a small portion of Earth's water is fresh and we cannot make more water.

2. Of all the water in the world, only a very small fraction is fresh water that we can use. True or false?

   True

3. Explain why we need to conserve water if we have the same amount of water on Earth today that we have always had.

   We need to conserve water because the amount of water on Earth stays the same but more people need to use the water all the time.

4. Write a short message to read over your school's loudspeaker convincing students to save water. Include at least one reason why they should conserve water and at least one way they can.

   Student answers will vary. Reasons to conserve might include water is limited, most of Earth's water is salt water or only 1/100 of fresh water is available to humans. Ways to conserve might include watering your lawn less, taking shorter showers or turning off the water when brushing your teeth.

5. Describe at least two ways water can get polluted.

   Student answers will vary but may include fertilizer, pesticide, pet waste, litter, gas, oil, dirt and more.

Section Four: Interdependence — Everything is Connected

Vocabulary Review

1–3 . Label the correct image either a "food chain" or a "food web."

1. a. Food web b. Food chain
   c. A food chain follows just one path of what eats what in an ecosystem. A food web consists of all the food chains in an ecosystem.

2. a. Producer b. Consumer
   c. Producers are plants that produce their own food through photosynthesis. Consumers eat the producers or eat a consumer that has eaten the producer to get energy.

3. a. Habitat b. Ecosystem
   c. An ecosystem is a community of plants and animals that includes the surrounding environment. Within ecosystems there may be many habitats. A living thing's habitat is the place where it lives. The habitat must include all of the things necessary for it to survive.

4–6 . Write the three words from the word list on the previous page that were not used in the pairs above. Write a definition for each word.

4. Estuary: Where land and sea meet and where freshwater streams meet and mix with the sea's salt water to create a nursery for fish and other animals.

5. Interdependence: Living things in a shared environment depending on each other to satisfy their basic needs.

6. Photosynthesis: The process of plants using carbon dioxide from the air, combining it with chlorophyll and water from the soil to produce food that gives plants energy.

Questions

Write short answers in complete sentences.

1. Which is more important to human life — transpiration or photosynthesis? Explain why you chose that answer.

   Both are essential. Without transpiration, the water cycle couldn't function and all living things need water to live. Without photosynthesis, there would be no food chain and all human life depends on getting energy from food.

2. List three ways you and your family could help prevent water pollution.

   Various suggestions are in the text.

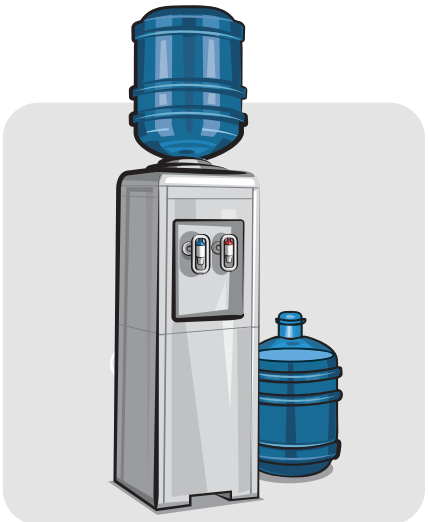
3. Draw and label a food chain showing one example of how you get energy. In addition to naming the item you are drawing, also label each item either "producer" or "consumer."

   Various answers are possible as long as there is only one producer at the bottom of the chain.

4. Using what you learned in this section, list at least two ways humans harm habitats and two ways humans help habitats and species?

   Human activities can harm habitats and species by paving over and building on species' habitats, forcing them out and by putting trash and dirt in them. Students may have other examples. People have helped by passing laws, protecting land, restoring habitats, protecting habitats from pollution, and educating people.

Section One: You Can't Drink Frozen Water and Water Three Ways



Section One: Shape Up or Go with the Flow?

Team directions:

1. Open the bottle of water and pour it all into the smaller container. Mark the container to show how far up the water came. Next pour all the water from the small container into the large container and mark the container. Describe what you observed.

   _____

   _____

2. Pour all of the syrup into the small container. Mark the container to show how far up the syrup came. Describe what you observed including how close your guess was.

   _____

   _____

3. Now go to the pouring area. Empty the contents of your containers one at a time into the sink, observing each. How are the liquids alike and different?

   Alike: _____

   Different: _____

Wash and dry all containers and bring them back to your station.

4. Look at all the items in your bag marked solids. What is alike and different about them?

   Alike: _____

   Different: _____

5. Place each solid item in the large container, one at a time. Describe what you observed.

   _____

   _____

6. Based on your observations of liquids and solids, how are they alike and different?

   Alike: _____

   Different: _____

Section One: You Can't Drink Frozen Water

You and a friend are going to a water park for the day. You plan to arrive at 9 a.m. You must pack your lunch in your insulated lunch bag. You have two frozen 12-ounce water bottles plus your lunch. Here's your problem: you need to keep your lunch cold till you eat, but you want to have at least 8 ounces of water to drink at 10:30 a.m. and 12 ounces of water to drink with your lunch at 12:30 p.m. How can you make sure your lunch stays cold and you still have the water you need to drink?

Materials needed for my experiment:

_____

_____

_____

_____

Directions for my experiment:

_____

_____

_____

_____

To make sure my experiment gives me the right results, I would need to make sure:

_____

_____

_____

_____

How I Changed

Fill in the blanks using the word bank.

air	gas	melting
colder	hot	moving
evaporated	ice	solid
freezing	liquid	liquid

I am a water drop and my name is ***Aqua***. I have lived in the ocean a long time and I love to see the pretty fish all around me. But last week that changed when something very strange happened.

The sky was blue and the sun was shining brightly on me as I floated along on top of a wave. As the sun shined on me, I started to get very, very _____. All of a sudden, I was lifting up into the _____. I looked down at myself and was surprised that I was invisible. I knew then that I had _____. I had changed from a liquid to a _____. I felt like I was flying! Wee! I flew for many miles.

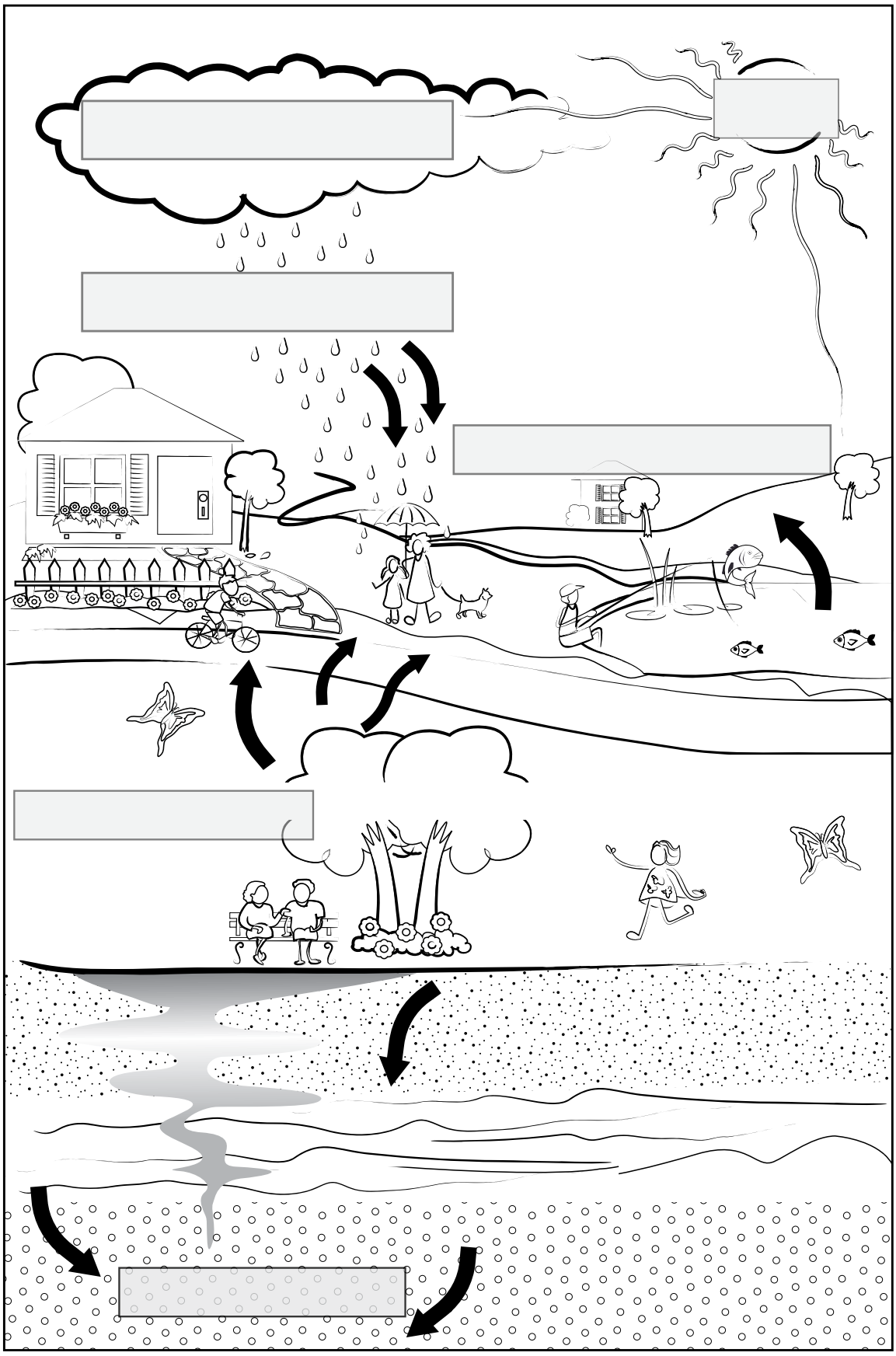
As I went higher and higher into the sky, the temperature began to get _____. I started going slower and began to feel heavier. I knew then that I was turning back into a _____. I started to get so heavy that I fell down out of the sky a long, long way. Finally I landed. I looked around and everything was completely different.

The warm ocean was gone! Instead I saw white stuff all around me and it was very cold. I found that I was _____ very slowly now, hardly at all. I was getting colder and colder. That's when I realized I was _____! I looked down and saw that I was no longer a liquid, but now a _____. I had changed to _____. It was not much fun just being stuck there. Boring!

I was so glad when the sun came out and I started _____. Once I became _____ again, I began to flow into a stream and had so much fun going faster and faster down the mountain. I even made new fish friends. What do you think what will happen to me next?

Section Two: The Water Cycle Foldable

Refer to the instructions on page 10 of your *WaterMatters!* Student Publication.



Definitions

The Sun: the source of energy for the never-ending water cycle.

Evaporation: vapor created when the sun heats water in lakes, streams, rivers or oceans.

Precipitation: moisture released when clouds become heavy and form rain, snow and hail.

Percolation: movement of water through the ground.

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.

Section Three: Pledge to Protect

Water-Saving Tips!

Toilet Flushing
Avoid using your toilet as a wastebasket. Tissues, insects and other things belong in a trash can, not the toilet.

Bathing
Take only shallow baths.

Shower
Limit the time water runs while you're taking a shower. Install a low-flow showerhead.

Brushing Teeth
Turn off the water while brushing your teeth.

Garbage Disposal
A garbage disposal requires a lot of water to operate properly. Use a disposal only when necessary.

Dishwasher
Use your automatic dishwasher only for full loads.

Washing Dishes by Hand
When washing dishes by hand, fill one sink or basin with soapy water and fill the rinsing sink to one-third or one-half full — avoid letting the water run continuously in the rinsing sink.

Washing Hands
Don't let the water run while you are washing your hands.

Laundry
Run only full loads in the washing machine. Running the machine when it's full will save you time, energy and water.

Yard Watering
Water only on your watering day and only when 30 percent of the lawn shows signs of wilt: leaf blades folded in half, blue-gray color and footprints remain on the lawn for several minutes after walking on it.

Water Conservation Pledge

I will make a sincere effort to take action on at least the following three water conservation strategies during the next six months:

1. _____

_____

2. _____

_____

3. _____

_____

I'm confident I can do my part toward making sure we all have plenty of clean, fresh water to use in the future.

_____

(Student Signature)

Section Four: The Needs of Living Things Worksheet

The Needs of Living Things

A living thing's habitat, the place where it lives, needs to include all of the things necessary for it to survive. Think of the things that are necessary for life to exist. In the space below, list everything that living things need in order to survive.

_____ _____ _____

_____ _____ _____

_____ _____ _____

Think about the needs of a black bear. In the box below, draw the habitat of a bear. Be sure to include everything that the bear would need in order to survive.

Think about the needs of a frog. In the box below, draw the habitat of a frog. Be sure to include everything that the frog would need in order to survive.