**Teacher's Guide** **Grade 3**

# 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 third-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 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 Three 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, solid or gas.
- When water evaporates, it becomes a gas and is invisible.
- 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.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.1.3**
Keep records as appropriate, such as pictorial, written, or simple charts and graphs, of investigations conducted.

**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.3.P.10.2**
Recognize that energy has the ability to cause motion or create change.

## Objectives

- The student will identify water in each of its states — liquid, solid and vapor.
- The student will explain how temperature affects the molecules in water.
- The student will conduct observations about evaporation.
- The student will describe the changes water undergoes when it changes states through heating and cooling by using familiar scientific terms, such as melting, freezing, boiling, evaporation and condensation.

## Vocabulary

| | | |
|---|---|---|
| Condensation | Liquid | Solid |
| Evaporation | Ice | Water cycle |
| Freezing | Melting | Water vapor |
| Gas | Molecules | |

## Bellringer

Place two unopened 8-ounce bottles of water (identical except that one is frozen and one is at room temperature) side by side on your desk so that students can see them. Take the frozen bottle out of the freezer a few minutes before class begins so that condensation has begun and water has begun to run down the sides. Ask the students to think of all the ways the two bottles are alike and different. Share responses.

## Engage

### Liquid, Solid, Vapor

Have two water bottles; one at room temperature, one frozen (see Bellringer); two clear containers of different shapes that will hold more than the contents of the bottle; and a carton or bottle of juice or milk (optional). Tell the students they are going to learn about water three different ways. Water is amazing because it can be a liquid, a solid or a vapor (gas).

**Liquid:** Open the room-temperature water bottle and pour some of the water into a clear container. Tell students that this is water in a liquid state. Ask if they can think of other liquids (e.g., orange juice, milk). Ask what they notice about all those liquids. (Liquids can be poured and have no shape of their own. They take the shape of their container). Remind students the water took the shape of the water bottle when it was in the bottle and now takes the shape of the new container. Use a second container of a different shape. Ask the students what they think will happen to the water when you pour it into the last container. Point out that the water did not fill the whole container.

**Solid:** Ask students what solid means. Ask about some things that are solid in the room (pencil, books, desk, table, etc.). Ask what the difference is between liquid and solid (liquid takes the shape of its container; solid keeps its own shape). Demonstrate this by putting a pencil (solid) in two different-sized containers and asking if the pencil changed its shape. What do we call water when it is a solid (ice)? Ask how you could change the liquid water in this container into a solid (freezer). Ask why this works. (Tell students they will learn more about this soon.)

**Vapor** (gas)**:** Tell students water can be in a third state — water vapor, also called gas. If you have a heat source, boil water to demonstrate evaporation. Before boiling the water, either use a measuring cup to determine the amount of water with which you are starting or mark the beginning water line on the container. Boil water and point out the steam. If you are using a kettle, turn an open container upside down over the spout, allowing the steam to fill the container. Remind your students that solids do not take the shape of the container, liquids do take the shape of the container but they do not completely fill the container. How is water when it's in the state of water vapor or gas different? (It takes the shape of a container and fills it up). After some of the water has evaporated, measure what is left or look at the line you made on your container. Ask students where the water went. Ask them what made the liquid water turn into a gas (heat). Tell students that this process of turning liquid water into a gas is called evaporation. Ask students why they think boiling the water makes it turn to gas and seem to disappear. (Tell students they will learn more about this soon).

### Additional or alternate ways to teach evaporation without a heat source:

### My Own Water Drop

Using an eye dropper, place one small water drop directly on each student's desk (or on a plastic lid). Remind students not to touch the water drop. Record the current time on the board. After one hour, ask students to observe their water drop and discuss any observations they have. After the drop completely evaporates (this could take a few hours depending on the size of the drop and room conditions), ask students how long it took and to consider where the water went.

### Quick Evaporation on My Finger

After giving students each a drop of water on their fingers, have them smear the drop of water onto the back of their hand or on their arm. After about three minutes the water should have evaporated. You can have them blow on the wet spot to make it dry faster. Ask students where they think the water went.

### Pavement Evaporation

Take students outside on a sunny day and pour some water on the pavement. Observe what happens to it. Ask students why the water evaporated (heat from the sun). Discuss where the water might have gone.

**Molecules in Motion***
Project WET Curriculum and Activity Guide 2009, page 47, 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 (solid, liquid, gas) reacting to the effects of heat energy.

## Explore

Students should read Section One of the *Water Matters!* Student Publication and complete the vocabulary review and questions.

Here are additional options for expanding student knowledge about the states of water:

**Investigating Evaporation**
This group activity allows students to investigate whether the size and shape of a container affects the rate of evaporation. Each group will need two containers with openings of various sizes (bottles, saucers, shallow bowls, etc.); funnels; plastic measuring cups and a copy of "Investigating Evaporation Record Page" found on Student Page 29 of this guide.

**The Flight of Water**
Conduct this investigation to test whether water evaporates more quickly indoors or outdoors. It's "Extension Activity Number 1" in WaterDrops, *Water Cycle Teacher's Guide*. You may download or order this publication free from *WaterMatters.org/Publications*.

**It's Raining in the Coffee Pot**
This activity demonstrates evaporation, condensation and precipitation. Refer to *WaterMatters.org/Education/Activities.*

**Cloud Breath**
Give each student a transparent plastic cup. Ask students to exhale through their mouths into their cups. Students can see and feel the condensation from the water vapor on the inside of the cups. Ask students to use what they have learned to describe what happened. They should be able to explain that the surface of the cup is cooler than the water vapor in their breath. When the vapor reaches the cup, molecules slow down and come together, condensing into tiny drops of water.

## Explain

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

### Tell a Partner About Molecules and Temperature

After completing a few of the activities in the unit, have students use the words *temperature* and *molecules* to explain to a partner what happens to water when it evaporates. Then have the partner explain to the first student what happens when an ice cube melts, using the words *temperature* and *molecules*. Select a set of partners to explain it to the class. Allow other students to add to the explanation or ask questions.

### Dear Parent…Molecules Move!

After students learn about how molecules move, have them write a paragraph explaining how temperature changes water from solid to liquid, and to gas. Have them write a letter to a family member, then take the letter home to help explain the process.

## Elaborate

### After Investigating Evaporation

After completing the "Investigating Evaporation" activity, have students create a graph showing evaporation times for all the containers. Discuss why they think times differed.

### No Snow

Ask students to research winter temperatures and snowfall amounts last year in Buffalo, New York, and compare them to Tampa, Florida. One source for historic averages is found at: *Intellicast.com*. Then have students write a paragraph explaining how and why Florida's winters are different from those in Buffalo.

## Evaluate

### Matter Sort

Use the second part of this interactive exercise to have students place substances in the correct states of matter: solids, liquids or gases. Available at: *BBC.co.uk/Schools/Scienceclips/Ages/9_10/Gases_fs.shtml.*

### Solid, Liquids or Gases?

Using Student Page 30 of this guide, have students sort the items into the correct categories. Answers:

Solids: car, pencil, igloo, ice cube, chair, sand, bucket, shovel
Liquids: clouds, ink, milk, cola, glue, motor oil, fish tank
Gases: tea kettle, balloon

### How I Changed

Question 8 at the end of Section One in the Student Publication, can be used to evaluate students' understanding of what causes water to change states in the environment.

## Additional Resources

### Evaporation and Condensation Posters

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

### Project WET's Water Cycle Educator Resources

The "Water Cycle" activity from Project WET's website covers the states of matter and the water cycle: *DiscoverWater.org*.

# Section Two:
# The Amazing Water Cycle

## Key Ideas:

- All the water on Earth is part of nature's never-ending system called the water cycle.
- Powered by the energy of the sun, all the water that falls to the ground as precipitation sooner or later makes its way back into the clouds where it eventually becomes precipitation again.
- Temperature and its effect on water molecules explain why evaporation, condensation and precipitation work.

## Standards

**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.1.2**
Compare the observations made by different groups using the same tools and seek reasons to explain the differences across groups.

**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.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.3.P.10.2**
Recognize that energy has the ability to cause motion or create change.

## Objectives

- The student will explain the process by which water on Earth is recycled over and over in the water cycle.
- The students will identify the states of water as it moves through the hydrologic cycle.
- The students will identify real-world examples of the water cycle.
- The students will engage in investigations about evaporation and condensation.
- The students will compare and contrast how the models of evaporation and condensation are different from the real phenomenon in the natural world.

## Vocabulary

| | | |
|---|---|---|
| Condensation | Percolation | Transpiration |
| Evaporation | Precipitation | Water cycle |
| Hydrologic | | |

## Bellringer

Ask students to guess what clouds are made of and how they are formed. Share responses.

## Engage

### What Do These Have in Common?

Show the collage of photographs on page 28 with rain falling on the ground, clouds, sun shining down on land or water, the ocean, a river and a plant. Ask students to guess what all these things have in common. They are all part of the water cycle! Tell students they will be exploring this more to find out the answer.

### Exotic Water Drops

Set up a scenario to capture students' imaginations about a drop of water and its travels. Before class, put a drop of water in a see-through container such as a baby food jar and put the jar in a large paper grocery bag. Close the bag so that the students can't see there is only one jar in it.

- Tell the class that you brought in a special collection that you wanted to share with them.
- Assemble students around you; show them the water drop in the baby food jar.
- Explain that the water drop is from your special collection of drops because it came from the snow on Mt. Everest — the highest mountain in the world.
- Replace the jar in the grocery bag, making sure that students don't see that there is only one jar in the bag.
- Pretending that it is another jar, remove the same jar from the bag and tell students that this water drop was once water swallowed by a dinosaur.
- Repeat the process a few times with other places of interest.
- Ask students if they would like to see the whole collection again. Then, remove the one jar. Show students the empty bag.
- Explain that the one water drop in the jar might have come from all those places.
- Ask students to think about what they have learned and how water comes and goes. Invite students to explain how one single drop of water could have been all those places.

## Explore

Students should read Section Two of the *Water Matters!* Student Publication and complete the vocabulary review exercises and questions.

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

### Hydrologic Cycle Poster

Order or download the FREE *Hydrologic Cycle Poster* from *WaterMatters.org/Publications*. Explain that all the water on Earth is constantly moving through the water cycle, and the water on Earth now is the same water that has always been here and the only water we will ever have.

Present your water drop in the baby food jar again. Tell students that although you got the water drop out of the faucet, the drop could have traveled to all of the places you described. Point out that a dinosaur might have once swallowed the water that students just drank from the water fountain.

- Using the poster, discuss each stage of the cycle and each vocabulary word. Remind students the hydrologic cycle is the same as the water cycle.
- Explain the poster is a model of the water cycle and models are something scientists use to help understand and explain how things work. Ask students how this model is different from the real water cycle.
- After discussing the poster, remove it from students' sight and pass out "The Hydrologic Cycle", Student Page 31. See how many terms students can fill in.

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

**Water Cycle Podcast**
Show this video to your class. It's less than five minutes and is easily found at *WaterMatters.org/Podcasts*.

**Water Cycle Everywhere**
This worksheet from WaterDrops, Water Cycle helps students recognize real-world examples of condensation. The booklet can be downloaded or ordered FREE from *WaterMatters.org/Publications*. Answer key: rains, cools, water or hydrologic.

**Water Cycle in a Bag**
This activity can be done as a demonstration or an individual student project. Visit *WaterMatters.org/Activities* for directions. Remind students that the plastic bag water cycle is a model to help them learn about the real hydrologic cycle. Discuss how this model is alike and how it is different from the water cycle going on all around them.

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

**Water Cycle Hanger**
Students will create a water cycle mobile on a hanger using Activity 5 in the *WaterDrops Activity Packet*, available FREE for ordering or downloading at *WaterMatters.org/Publications.* Have students take home their mobile and use it to explain the water cycle to family members.

**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/Activities.*

When you explain the water cycle using the bracelet, help your students understand that it is all going on at the same time. It doesn't always follow the same pattern. This is a good opportunity to help your students understand that models have limits and they can't show everything about a natural process. Once they have completed the bracelet, have them take it home and use it to explain the water cycle to family members.

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

**Compare Seasons and Locations**
After completing the "Incredible Journey", have students compare the movement of water during different seasons and at different locations around the globe.

## Evaluate

### What Do These Have in Common?

If you created a collage of photographs (rain falling on the ground, clouds, sun shining down on land or water, the ocean, a river, a plant) earlier, show it again. Ask students to answer what all these things have in common. They are all part of the water cycle. Ask students to identify which part of the water cycle each picture represents.

### Hydrologic Cycle Fill-in-the-Blanks

Refer to the "The Hydrologic Cycle", found at *WaterMatters.org/Education/Activities* from the District's website.

### 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 does not happen in a particular order but all the steps are going on at all times.

### How I Changed, Revisited

If your students completed this activity in Section One, ask them to re-read their story. If you did not complete Question 8 at the end of Section One in the Student Publication, have students complete the story now. Next ask students to tell what part of the hydrologic cycle Aqua was in at each stage, when she:

- was in the ocean when the sun warmed her and she went into the air (evaporation)
- cooled and turned to liquid (condensation)
- fell from the sky (precipitation)

Ask students to write a continuation of the adventure, making sure Aqua goes through the other stages of the water cycle (transpiration and percolation) as well.

## Additional Resources

### Water Cycle Posters

Order or download FREE posters illustrating each stage of the hydrologic cycle at *WaterMatters.org/Publications.*

### WaterDrops Water Cycle Publication

Order or download the WaterDrops, Water Cycle Student Publication and *Teacher's Guide* from *WaterMatters.org/Publications.*

### EPA's Animated Water Cycle

See an animated water cycle for grades K–3 at *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.*

# Section Three:
# Plants' Place in the Water Cycle

## Key Ideas:

- Plants play a key role in the water cycle through transpiration.
- Transpiration is the process of plants taking in water through the roots and releasing what they don't need through the leaves.
- Plants use energy from the sun, air and water to make their own food.
- Plants help people by providing food, oxygen and clean water.

## Standards

**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.1.3**
Keep records as appropriate, such as pictorial, written, or simple charts and graphs, of investigations conducted.

**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.

## Objectives

- The student will explain the process by which plants contribute to the water cycle.
- The student will explain the process of transpiration.
- The student will describe the structures of a plant and their functions.
- The student will list ways plants help people.

## Vocabulary

| | | |
|---|---|---|
| Evaporation | Leaves | Stems |
| Flower | Photosynthesis | Transpiration |
| Fruit | Seed | |

## Bellringer

Have two potted plants of the same type on display side by side (or photos). One is healthy and growing. The other has been deprived of water and sunlight and will appear wilted and dying with few leaves. Tell students you bought the plants the same day and they are the same kind of plants. Ask students to list ways the plants are alike and different. Ask students to write down why they might be different.

## Engage

**Baggie on a Branch Investigation**
Identify shrubs and trees on the school ground the class can use. Use as many different kinds of plants as possible including both shrubs and trees. Assign teams for this activity. Each team will need a twist tie and a gallon-size, transparent, plastic baggie or newspaper bag.

- Starting early in the day, have each team select a plant and place a baggie over a branch. Direct students to wrap the bag snugly around a bare portion of the branch and secure it with a twist tie.
- Return to the classroom and distribute to each student a "Baggie on a Branch" Record Page found on Student Page 32 in this guide. After students fill in the first part of the record page, decide on and record appropriate intervals to check the plants. On a warm day, in direct sunlight, several drops may be visible after 30 minutes. After several hours, a few teaspoons of water should accumulate.
- Teams will trace their leaf on their record page or draw a picture of it with accurate measurements. When students check their bags, they should bring along the record page, pencils and a ruler for measuring. After the final check, students should remove the baggies from the branch and close the bag again with the twist tie to preserve the water. Teams will then measure and record the water that accumulated in their baggie.

"Baggie on a Branch" extensions are listed under both *Explain* and *Elaborate*.

**Making Colored Flowers**
Demonstrate to students both how water moves through plants and how the color of a flower can be changed. Add a fourth bottle of red food coloring to several inches of water in a jar. Place a white cut flower in the water. Explain to students that plants usually absorb water through their roots from soil, but cut flowers continue to "drink" water for a period of time. The stem takes up the colored water, changing the color of the flower. The complete process takes 4-6 hours so start the demonstration in the morning so students can see the results at the end of the day, or start it just before students go home so they can see the results the next morning.

**Plants Clean Our Water**
After completing "Making Colored Flowers", use the tinted flower to demonstrate how the process of transpiration filters water. Leaving the tinted flower in the red-colored water, place a baggie around the flower and some leaves. Place it in a sunny window. Check the bag in an hour or so, longer if there's not much sun out. The condensation that appears in the bag will be clear. Point out how the process of transpiration is one way plants help clean water before it is returned to the water cycle.

## Explore

Students should read Section Three of the *Water Matters!* Student Publication and complete the vocabulary review and questions.

Here are additional options for expanding student knowledge about how plants fit into the water cycle:

**Biology of Plants**
This website explains the structure of a plant and includes an animated graphic of a fruit tree growing from seed to tree and forming fruit: *Mbgnet.net/Bioplants/Parts.html.*

### The Sweating Landscape

Download or order from the *WaterDrops Activity Packet* at *WaterMatters.org/Publications*. In the "Sweating Landscape", Activity 10, students further explore condensation and transpiration. They also create a garden of their own to observe in the classroom.

## Explain

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

### Baggie on a Branch, Continued

After students have completed the "Baggie on a Branch" investigation, have them answer the following questions in their teams. Instruct the teams to decide on one answer to each question and be ready to share their answers with the class:

- What evidence do you have that plants give off water vapor?
- Why didn't the water vapor evaporate into the air?
- You can't see water vapor all around the rest of the plant. Why can you see it in the baggie?
- What does the condensation in the baggie look like?
- Do you think all kinds of plants give off water vapor? What could you do to find out?

### Transpiration Explanation

Order or download the *Transpiration Poster* from *WaterMatters.org/Publications*. Have students and their partners use the poster to explain the process of transpiration to each other. As you walk around, select one student to explain it to the class. Invite other students to add anything they think was left out.

## Elaborate

### Inferring from Baggie on a Branch

After students have measured and recorded their team's accumulated water from "Baggie on a Branch", have students compare and contrast amounts of water, size of leaves, amount of sun or other conditions. Ask students to infer a hypothesis from what they have observed and what they know about transpiration that would explain why the amounts of water differ.

### Sunny Versus Shady Baggie on a Branch

Conduct "Baggie on a Branch" in sunny and shady spots or on sunny and shady days. Make observations at the same time intervals and compare the differences. Explain to students why the results differ.

### Sweating Landscape Compared to No Water

Set up the sweating garden as instructed in the "Sweating Landscape" activity. Have another small potted plant (identical to the one in your sweating garden) but leave it outside the plastic bottle. Do not water the outside plant. Observe the condition of the plant each day and compare it to the plant inside the bottle. How many days does it take before the outside plant dies? Use this activity to reinforce how plants need water to survive and how the water cycle allows plants to live in nature.

## Evaluate

### Parts of a Plant Fill-in-the-Blank

Have students label the parts of a plant and note at least one purpose for each part using "Parts of a Plant Fill-in-the-Blank" on Student Page 33 of this guide.

Alternatively, have students draw their own illustration showing the process of transpiration and the parts of a plant involved.

**Left Behind — A Transpiration Adventure**
As a journal writing assignment, ask students to write a paragraph about a water drop's journey starting in the soil near a plant's roots and ending in transpiration. Tell students to pretend to be the water drop and to include a water-drop friend who got left behind instead of moving with them through the water cycle.

**Making Inferences**
Use the information found in this section to have students answer the following questions:

1. Can transpiration occur without evaporation?

   Answer: No, transpiration is evaporation of water from the leaf of a plant.

2. What would happen to the water cycle if any one part, for example evaporation, suddenly stopped?

   Answer: If one part stopped, the whole cycle would be broken and no longer function. If evaporation stopped, there could be no condensation and without condensation, there would be no precipitation and so on.

3. What part do humans play in the water cycle?

   Answer: Humans take in (drink) water and expel it through sweat and urine. Humans add pollution to water through farming, fertilizing, industry, manufacturing, etc. Humans also use water on their landscapes, contributing to evaporation and percolation.

## Additional Resources

**Parts of a Plant Lesson Plan**
"Parts of a Plant" lesson plan, Resource ID#: 30700, can be accessed through *Cpalms.org*. In this lesson, third-grade students learn the basic functions of a plant and recognize their importance. Students also will review parts of the plant with a five-flap activity.

# Section Four: Water and You

## Key Ideas:

- Most of the Earth is covered with water but only a small part can be used for drinking.
- Everything living needs water to live.
- People should conserve water, not waste it.

## Standards

**SC.3.N.1.2**
Compare the observations made by different groups using the same tools and seek reasons to explain the differences across groups.

**SC.3.N.1.3**
Keep records as appropriate, such as pictorial, written, or simple charts and graphs, of investigations conducted.

## Objectives

- The student will label a graphic to represent the percentage of the Earth's salt and fresh water.
- The student will create a graphic to represent the percentage of water in his/her body.
- The student will estimate, and then record his/her own daily water use.
- The student will estimate, and then calculate the combined daily water use of the class.
- The student will justify why we must all conserve our water resources.

## Vocabulary

| | | |
|---|---|---|
| Conserve | Glaciers | Salt water |
| Fresh water | Groundwater | Surface water |

## Bellringer

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

## Engage

**The Blue Planet***
Project WET Curriculum and Activity Guide 2.0 version, page 125 or the 2.0 Sampler, page 9. Students will estimate the percentage of Earth's surface that is covered by water. To check their estimates, students will toss an inflatable globe and take a probability sample.

**People Need Water**
Encourage students to discuss our need for water by asking questions similar to these:

- What does it feel like to be very thirsty?
- What would happen to a person if he or she could not get any water?
- How much of your body do you think is made up of water? (If you plan to do the "Aqua Bodies" activity, students will look further into this. If not, point out that about two-thirds of our body weight is water. Explain that we need water to survive and being thirsty is our body's way of making sure that we get the water we need.)
- Use a circle divided into three equal parts, a measuring cup or a number line to make sure students understand two-thirds.

**Aqua Bodies***
Project WET Curriculum and Activity Guide 2009 version, page 63 or 2.0 version, page 45. In this activity, students will demonstrate how much of their bodies are composed of water, where water is found within their bodies and the functions of water in their bodies.

Alternately, have students color in a blank body outline of themselves from Student Page 35 approximately two-thirds of the way up (about up to the armpits).

## Explore

Students should read Section Four of the *Water Matters!* Student Publication and complete the vocabulary review and questions.

**Vocabulary:**
Explain each vocabulary word, tapping into prior knowledge and using imagery. Here are some examples:

- Conserve:
  Definition: Use wisely, don't waste, save.
  Use Imagery: 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.
- Fresh water
  Definition: Water without salt that can be used for drinking by humans.
  Use imagery: Imagine all the places we can find fresh water — faucet, water bottle, lake, river, garden hose.
  Sentence: Even though the people in the boat were surrounded by salt water, they needed fresh water to drink.
- Glaciers
  Definition: Very large and slow-moving areas of ice that don't normally melt in the summer.
  Imagery: Show pictures of icebergs and glaciers.
  Sentence: The glaciers stay frozen all year at both the North Pole and the South Pole.
- Groundwater
  Definition: Water stored under the ground.
  Imagery: Use the hydrologic cycle poster to show percolation and explain that in Florida, most of the water we use comes from groundwater.
  Sentence: After it rained, the water gradually soaked into the ground and became groundwater.

- Salt water
  Definition: Water that is too salty for people to drink.
  Imagery: Photos of the oceans. Talk about students' experiences with tasting water at the beach.
  Sentence: Even though I got very thirsty swimming at the beach, I could not drink the salt water.
- Surface water
  Definition: Water that collects on the surface of the Earth.
  Imagery: Show pictures of lakes, streams, rivers, puddles, the ocean, etc.
  Sentence: Some of the rain ran off into ditches, puddles and lakes and became surface water, but some soaked into the ground and become groundwater.

Next, have students complete a 3x5 card like the example in the Student Publication or create a foldable for each vocabulary word.

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

**Water for Thirsty Me**

- Before this activity, write the name of each student on a disposable cup using a permanent marker. Make a mark on the same place of each student's cup to indicate how full to fill it.
- Ask students to guess how many cups of water they actually drink each day and encourage them to explain how they arrived at their guesses. Ask students how they could find out how many cups they actually drink each day.
- Distribute and explain the "Water for Thirsty Me" data sheet from Student Page 34. Have students record their estimates of how many cups of water they think they drink.
- Hand out cups. Instruct students to keep track of the water they drink for one day. Ask students to keep their cups clean, to use their cups for drinking only and to return their data sheets the next day. Emphasize that the assignment is not a contest to see who can drink the most.
- The next day, have students share their data sheets and compare the students' findings with their estimates. After discussing the comparisons, ask students to estimate how much water the whole class drinks in one day. Encourage them to justify their estimates. Record students' estimates and have the students calculate the actual water consumed. Using these totals from the student data sheets, have the class create a graph reflecting the data they collected.

**Daily Water Use at Home**

Students can take home a copy of the *Daily Water Use at Home survey* and work with their family members to fill in the chart. Order or download FREE from *WaterMatters.org/Publications.*

**Power of 10**

Alternatively, students can work with their families to take the online "Water Use Calculator" at *WaterMatters.org/PowerofTen* and pledge to reduce their household water use by at least 10%. Have each student share their family's pledge with the class and calculate the total of all families' pledges. Create a graph representing all families' pledges.

**Conservation Tic-Tac-Toe**

Students will learn about the importance of water conservation and practical ways to save water at home. Download *WaterDrops Activity Packet,* "Activity Number 9" or order FREE from *WaterMatters.org/Publications.*

## Explain

By completing the questions after Section Four, students will explain what they read and understood.

### Water Conservation Challenge

Once students have learned why people need to conserve water, have them communicate that need to others. This webpage includes a variety of classroom and home activities to reinforce water conservation. The ideas will help your class celebrate Water Conservation Month (April) or promote conservation at any time: *WaterMatters.org/ClassroomChallenge.*

### Encouraging Conservation at Our School

Use the conservation messages students wrote in response to Question 2 in Section Four of the Student Publication to make posters for the classroom or the whole school. Select several slogans to have students read over the loudspeaker. If your class worked with their families to calculate the total amount of water they pledged to conserve, share this with the rest of the school and challenge other classes to match or exceed your pledge. Combine all pledges to get a schoolwide total. Contact your local newspaper to report your efforts.

## 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 dripping 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.

### Waterful Foods

In this activity, students will discuss the amount of water needed to produce one serving of commonly eaten foods. Then they will use their math skills to perform computations and complete a chart. The activity is available at *WaterMatters.org/Activities*.

### Comparing Water Use

In Africa, many people must walk long distances several times a week to get water to carry home. Studies have found that people in developing countries use an average of less than three gallons of water per day. Multiply three gallons by the number of people in their family to get the daily family use for Africa. Using their calculations from the "Daily Water Use at Home" or the "Water Use Calculator", have students compare their family's use with the African family of the same size.

## Evaluate

### 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 it's used (drinking, washing, watering, recreation, transportation, agriculture, manufacturing, etc.). Have students show their slides to the class and justify why we must all conserve this limited and precious resource.

### Analyzing Perspectives

As a journal writing assignment, ask students to write a paragraph from the perspective of a child living somewhere with no running water. Several times a week you and your mother have to walk five miles each way to a river where your mother can wash your family's laundry and you can fill up buckets with water to carry back to your home. How would your life change? What would you do to use less water?

## Additional Resources

### WaterDrops Water Conservation

Order a Teacher's Guide and class set of WaterDrops *Water Conservation publication* FREE from *WaterMatters.org/Publications.*

### Calculate Amount of Water in Your Body

Students can enter their weight into this online calculator to determine how many glasses of water are in their bodies: *DcWater.com/Kids/Activities/LiquidOfLife.html.*

# Student Publication Answer Key

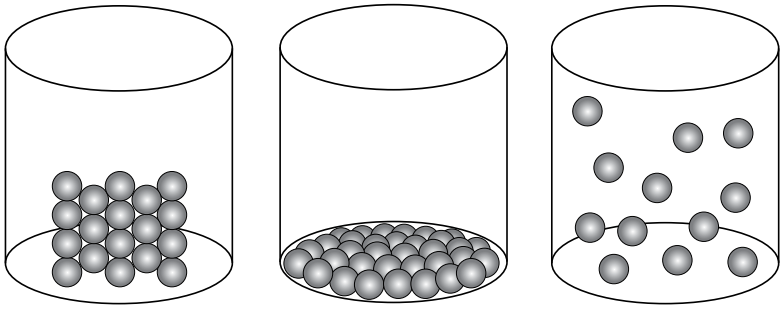
## Section One: Water Three Ways

**Vocabulary Review**

| | |
|---|---|
| **Condensation** | As air cools down, the molecules in water vapor slow so much that they move closer together to form tiny droplets of liquid water. |
| **Evaporation** | When heat causes the water molecules to move so fast they break away and go up in the air as water vapor. |
| **Freezing** | The process of cooling liquid water to a solid state called ice. |
| **Gas** | Molecules in this state are often invisible and can fill a container of any size or shape. Water molecules in this state also are called water vapor. |
| **Liquid** | A substance that flows when you pour it and has no shape of its own so it takes the shape of its container. |
| **Melting** | Changing a solid to a liquid by adding heat. |
| **Molecules** | Tiny objects so small we can't see them that fit together to form larger things all around us. |
| **Solid** | A substance that holds its own shape and doesn't flow like a liquid. |

**Questions**

1. Look at the picture of the molecules in each cup. Decide which cup holds a **gas**, a **solid** or a **liquid**. Write the correct word under each cup.



solid liquid gas

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

(true) false

3. What are two ways to make water evaporate?

Water can be evaporated by setting it in an open container in a room or by heating it until it boils.

4. Heat changes liquid water to solid. True or False?

true (false)

5. Temperature changes the way molecules move. True or False?

(true) false

6. Explain what is really happening when a puddle disappears 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.

How I Changed

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 **hot**. All of a sudden, I was lifted up into the **air**. I looked down at myself and was surprised that I was invisible. I knew then that I had **evaporated**. I had changed from a liquid to a **gas**. I felt like I was flying! Wee! I flew for many miles and covered a long distance.

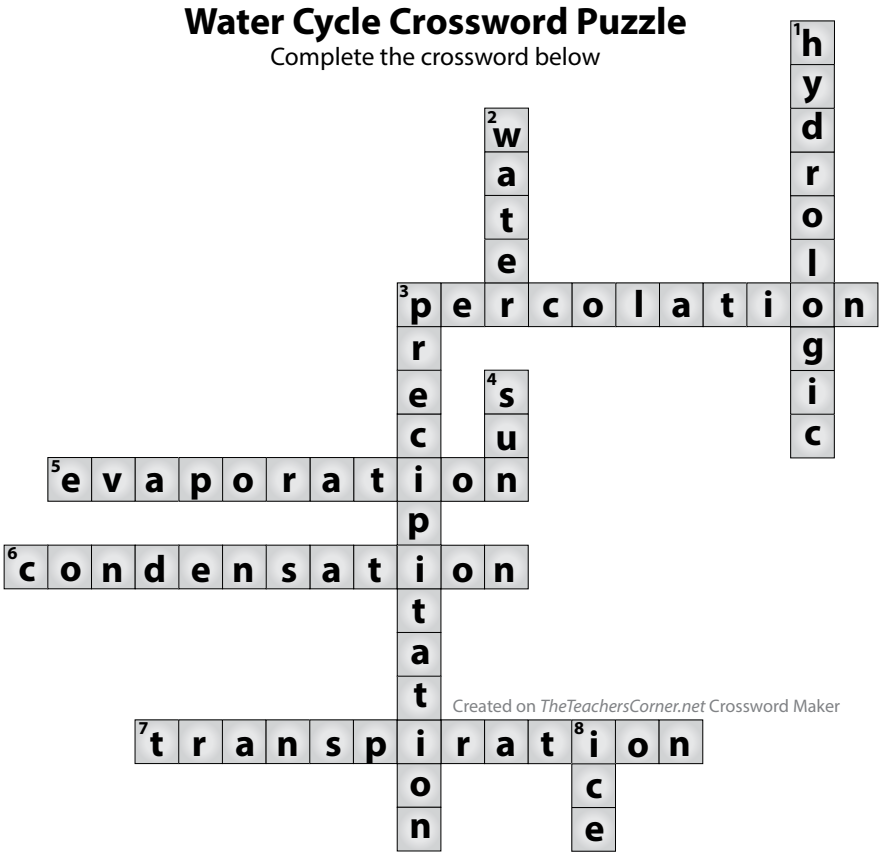
As I went higher and higher into the sky, the temperature began to get **colder**. I started going slower and began to feel heavier. I knew then that I was turning back into a **liquid**. I started to get so heavy that I fell down out of the sky a long, long way. Finally I landed. I looked around and 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 **moving** very slowly now, hardly at all. I was getting colder and colder. That's when I realized I was **freezing**! I looked down and saw that I was no longer a liquid, but now a **solid**. I had changed to **ice**. It was not much fun just being stuck there. Boring!

I was so glad when the sun came out and I started **melting**. Once I became **liquid** 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 Amazing Water Cycle

## Vocabulary Review




**Questions**

1. Only part of the world's water circulates in the water cycle. True or False?

   true (false)

2. Circle the best answer:

   Earth has the same amount of water now as it did millions of years ago. How is this possible?

   a. because we have many lakes, rivers and streams

   b. because plants and trees give off moisture

   **c. because water keeps moving through the water cycle**

   d. because it rains a lot

3. Couds in the sky are part of percolation in the water cycle. True or False?

   true (false)

4. What is the sun's part in the water cycle?

   The sun provides the energy to change liquids to gases, which causes evaporation and transpiration.

5. The water cycle is very important for life on Earth. Why is it called a cycle?

   A cycle is a pattern that happens over and over again. In the water cycle, water keeps moving through evaporation, condensation, precipitation, transpiration and percolation, over and over again.

## Section Three: Plants' Place in the Water Cycle

### Vocabulary Review

1. Underline these words each time you find them in the Section's reading.
2. Write a definition of each word in your own words below.

   Photosynthesis: The process plants use to make their own food.

   Transpiration: The part of the water cycle when the extra water that a plant doesn't need is evaporated from its leaves.
3. Write a sentence in your own words.

   Photosynthesis: Without photosynthesis, plants couldn't make their own food and people wouldn't have food to eat.

   Transpiration: Two hours after we put a baggie on a branch, because of transpiration, our group had a tablespoon of water.
4. Match the word to the purpose it has in a plant.

| flower | stem | seed | leaf | roots | fruit |
|---|---|---|---|---|---|
| Produces seeds so new plants can grow and provides food for insects, birds and bats | Supports the plant and carries water and nutrients to all the parts of the plant | Contains new plants and helps plants reproduce | Uses sunlight, water and carbon dioxide to make food through photosynthesis and provides water for transpiration | Absorbs water and minerals from the soil | Protects the seed and provides food |

**Questions**

1. What part do plants play in the hydrologic cycle?

   Plants are responsible for transpiration.

2. Why are plants good for people?

   Plants provide food to people, insects and animals. They also clean our water, produce oxygen for us to breathe, and provide water through transpiration to the water cycle.

3. Which order should these steps be placed in? Put number 1 in the blank next to the first step and so on.

   1 The plant takes in water through its roots.
   4 Water that the plant doesn't need is transpired out of the leaf and evaporates.
   3 Plants use carbon dioxide, sunlight and water to create their own food on the leaf.
   2 Water travels up from the roots through the stem to the leaves.

4. What is alike about evaporation and transpiration? What is different about them?

   Both evaporation and transpiration are the process of water changing from liquid to gas and going up into the air. While water can evaporate from any source of water (oceans, lakes, streams, puddles, cups, etc.), transpiration is evaporation only through plants.

## Section Four: Water and You

**Questions**

1. People can drink salt water in oceans. True or False?

   False

2. Write a short message convincing other students to save water. Include at least one reason why people should conserve water and one example of how to save water.

   Student answers will vary but should include reasons like water is limited, more people than ever are using the Earth's water, we all need water to live, etc. It should also include at least one way to conserve water. Reference Water Saving Tips, Daily Water Use at Home or the online Water Use Calculator for examples.

3. Fresh water in glaciers is water in a solid form. True or False?

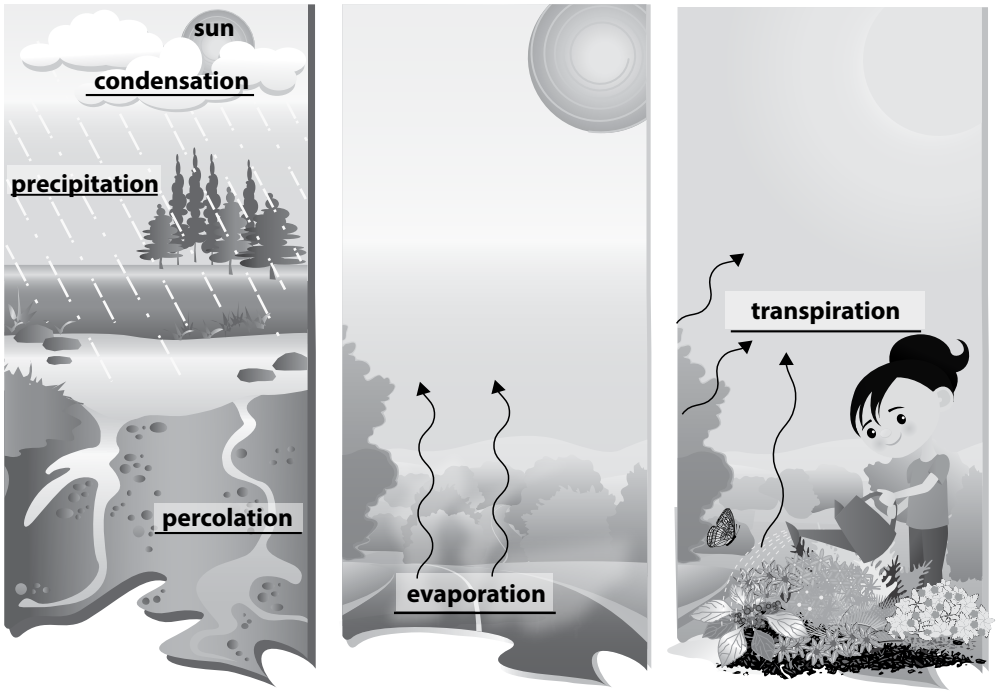
   True

4. It's time to conserve water! Develop a water conservation plan for your home by listing three ways you and your family can save water at home.

   Student answers will vary.

## Answers to Extension Activities

1. Water Cycle in the World
   Look at these pictures. Label all the places that the water cycle is taking place by writing the correct water cycle word. Choose from these words: **condensation**, **precipitation**, **percolation, evaporation** and **transpiration**.




2. In your opinion, what part of the water cycle is most important? Give reasons for your answer.
   Any of the parts could be selected as long as the reasons show an understanding of that part of the water cycle and how it is helpful. Or the student could explain that one part by itself is not more important than any other since all parts are needed to make the water cycle work.

3. Whole Unit Review
   Using vocabulary words from all four sections, answer the following questions. Some words will be used more than once:

   a. A **solid** is a substance that holds its shape and doesn't flow like a liquid.

   b. When water is boiling, its **molecules** are moving faster and faster until they break off and go into the air in a process called **evaporation**.

   c. Our bodies are about 2/3 **water**.

   d. When water is a gas, it is called **water vapor**.

   e. When you see rain, which part of the water cycle are you see seeing? **precipitation**

   f. When rain soaks into the ground, what part of the water cycle is it? **percolation**

g. The **temperature** changes how fast or slow molecules move.

h. The **sun** provides the energy that powers the **hydrologic** cycle.

i. How much of Earth's water circulates over and over again in the water cycle? **All**

j. Without **plants** there would be no transpiration.

k. Water is taken in by a plant's **roots** and travels up through its **stem**.

l. **Transpiration** takes place then water evaporates from a tree or plant's leaf.

m. Plants help people by producing **oxygen** to help us breathe.

n. Every living thing on Earth needs **water**.

o. Nearly all the water on Earth's surface is **salt water**.

p. To **conserve** water means to never waste it.

## Section One:
## Investigating Evaporation Record Page

**Group Instructions:**

- Choose two containers of different sizes and shapes.
- Using a measuring cup, pour one-half cup of water in each container.
- Put both the containers in the same place.
- Note the time on your Record Page.
- After several hours, carefully pour the water from each container back into the cup. Measure and record the amount. Then return the water to the container.
- The next day, carefully pour the water from each container back into the cup. Measure and record the amount.
- Talk about what happened.

### Investigating Evaporation Record Page

Name: _____

Question:

1. We chose two containers that looked like this:

2. We think more water will evaporate from the container that looks like this:

3. We poured 1/2 cup of water into each container at this time.

   _____

4. We measured the water again at these times on these days.

   _____ _____ _____

5. Here is what happened.

**Section One:**
**Solids, Liquids or Gases?**
Cut out the items and paste them into the correct box.

| Solids | Liquids | Gases |
| --- | --- | --- |
| | | |

**Section Two:**
**What Do These Have in Common?**

## Section Three:

## Baggie on a Branch Record Page

Investigate Question — Do plants give off water vapor?

1. Here is my description of the plant our team chose. _____

2. Once the baggie was fastened to the branch, there were this many leaves inside the baggie_____.

3. I have traced or drawn a picture of our leaf on the back of my Record Page. YES NO

4. We put a baggie on the branch of our plant at _____ (what time). Was the branch in the sun or in shade? _____

5. What time was it the first time you checked? _____

   Was the branch in the sun or in the shade? _____

   What did you observe about the branch and the baggie?_____

   _____

6. What time was it the last time you checked on your branch? _____

   Was the branch in the sun or in the shade? _____

   What did you observe about the branch and the baggie?

   _____

7. From my observations, this is the answer to the question.

   _____

8. Here are some other questions I have about plants and water vapor.

   _____

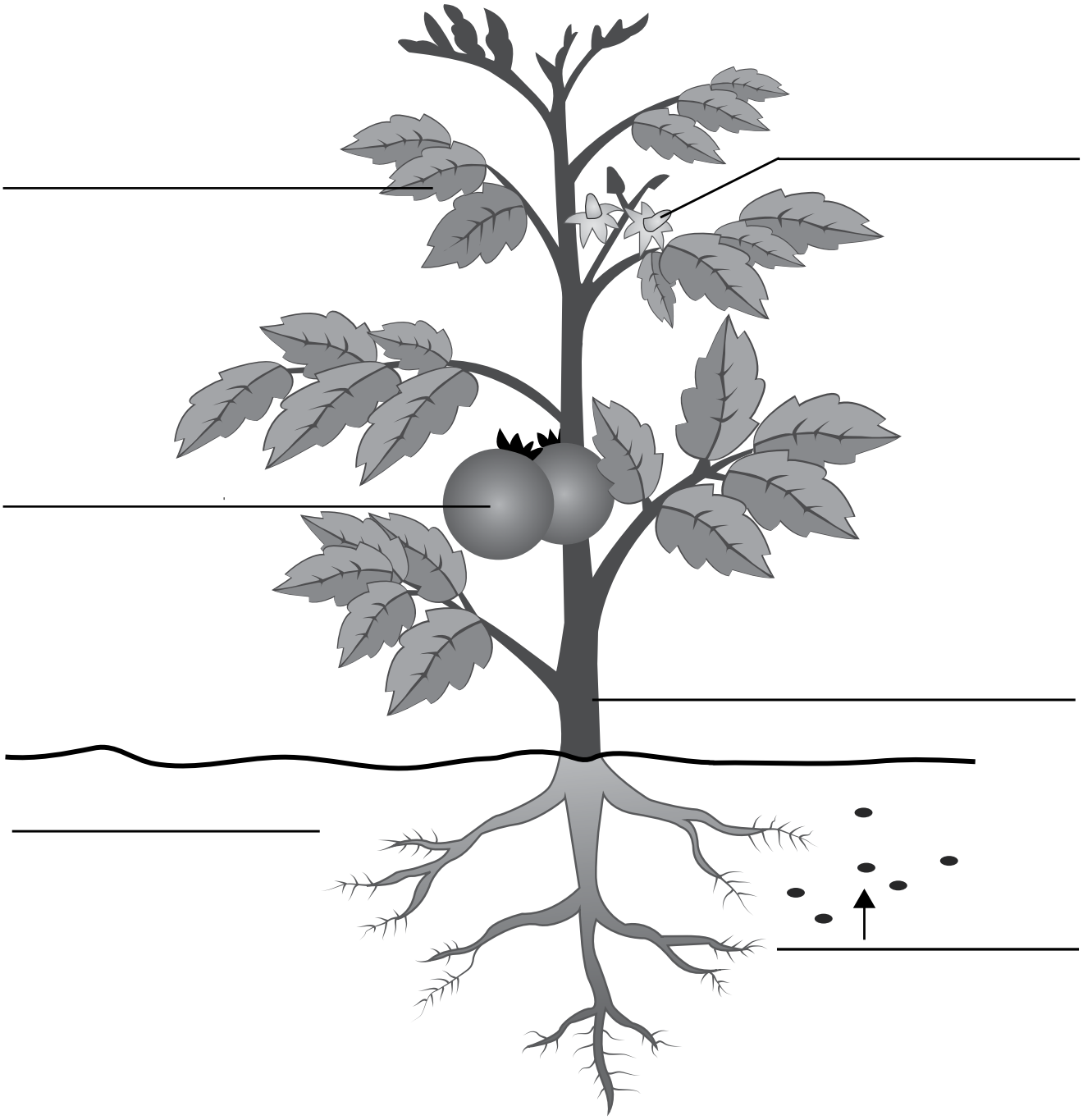
9. Our group measured this amount of water _____

**Section Three:**

**Parts of a Plant Fill-in-the-Blank**

# Parts of a Plant

Fill in the blanks with the correct plant part.
Under each part name, write at least one purpose it has.



**Section Four:**

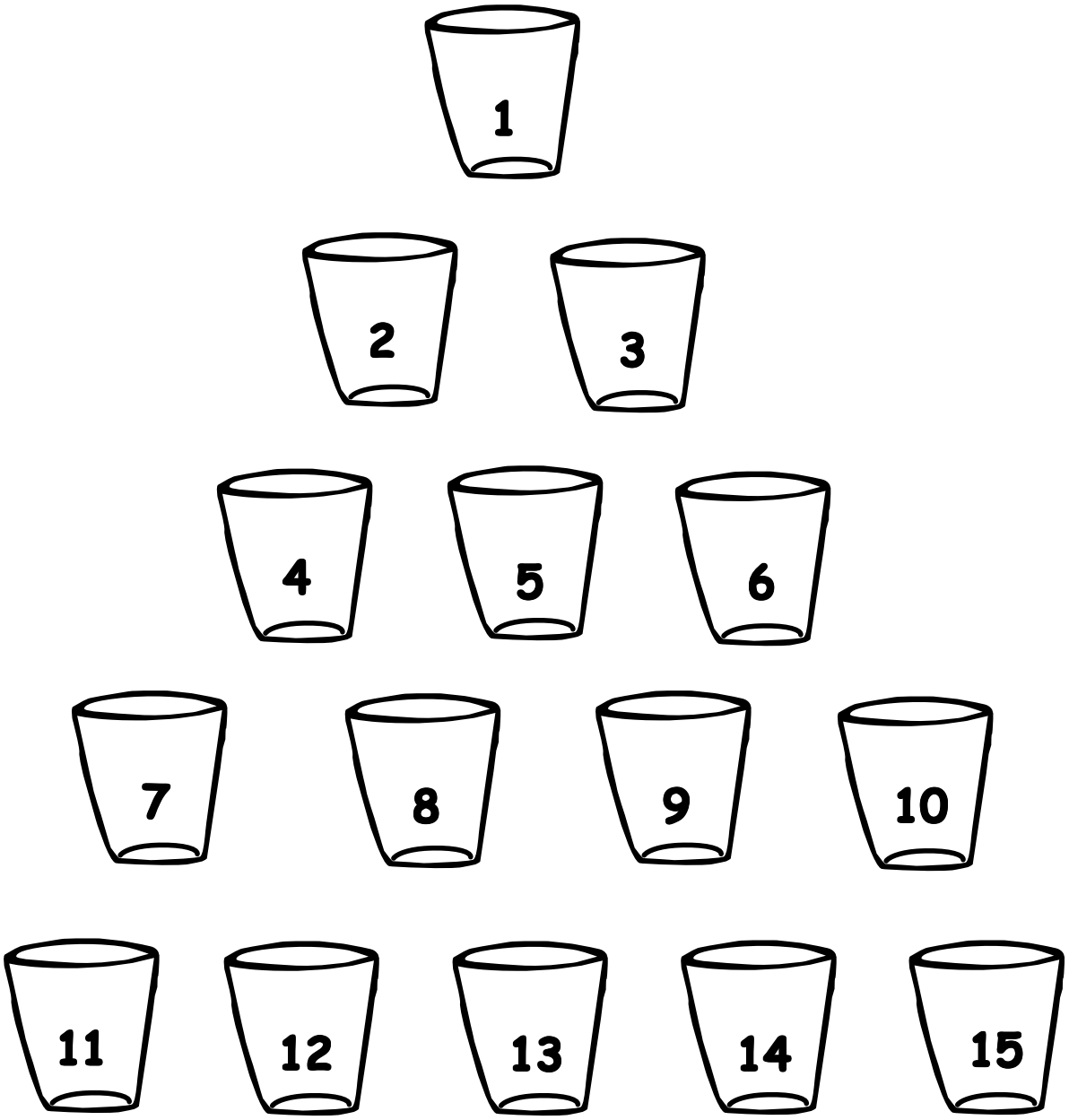
**Water for Thirsty Me**

# Water for Thirsty Me

Name: _____

DIRECTIONS:

Every time you drink a cup of water, color a cup, starting with cup number 1.



**Section Four:**

**Water in Me**

# Water in Me

Directions: Starting at the feet, color the body to show how much of the human body is made up of water.