

UNIT 2

WATER: PICTURE OF A LIMITED RESOURCE

OBJECTIVES

- Identify water as a limited resource and rank amounts of saltwater, freshwater, and available freshwater from most to least.
- Describe the importance of water to the planet and daily life.
- Evaluate their water usage and describe ways to conserve water.
- Create illustrated pie charts and pictographs to communicate information.

SUMMARY

Students will compare amounts of saltwater, freshwater, and available freshwater on Earth and will identify ways that water is important to the planet and to their daily lives. They will log their household's indoor water usage and create both a pie chart and a pictograph to communicate that information. They will then evaluate which method they feel best represents the information and whether their views on the importance of water and conservation issues have changed.

TIME NEEDED

2 or more sessions

Note: This activity must be done over several days as students will need to take home the Calculate Your Daily Water Ways student activity sheet (SB page 13) to log their household's water usage.

MATERIALS

SCIENCE MATERIALS

- Student activity sheets (SB pages 12–15)
- Students' field notebooks
- Large map or globe
- Pencils and erasers
- Empty gallon container

ART MATERIALS

- Colored pencils, markers, or crayons



PREPARATION

- Read the science background information about water on pages 13–15.
- Read the student activity sheets and copy one per student (SB pages 12–15).
- Display a world map or globe at the front of the classroom to which students can refer during the lesson.

ACTIVITY INTRODUCTION

1. Ask students what kind of water makes up our oceans. Is it freshwater or saltwater? Where might they find freshwater? Where does it come from? Is water a limited resource or does our planet get more of it somehow? Review the water cycle as needed.
2. Ask students what water “does” for the planet (grows plants, creates habitats, creates weather, etc.). Then ask students why it is necessary that people have freshwater (to drink, take showers, do laundry, etc.). Brainstorm these needs with the class and write them on the board.
3. Ask for a volunteer to identify some bodies of water (oceans, lakes, rivers) on the map at the front of the classroom. Students can come up and point to these areas. If needed, point to a specific area or body of water and ask students what the body of water is and whether it is made up of saltwater or freshwater. Ask students if there is more freshwater or saltwater covering our planet. Have students explain their hypotheses (predictions).
4. Show students the limited amount of available freshwater by using a visual aid. Choose something round and easy to cut and divide such as an apple, pie, or paper plate to represent all the water on Earth. Cut out a section to represent 3%—just a small sliver. This sliver represents all the freshwater on Earth. The remaining 97% is saltwater in the oceans and not useful to us in terms of our survival. Cut out about 70% of the small section to represent unusable water trapped in glaciers and ice caps. The remaining freshwater is in lakes, rivers, ground water, and aquifers which is available for our use. Ask students if we can use all the water in our lakes and whether all the water underground is accessible to us. Make sure students understand that we have a very tiny portion of our planet’s water available for use.
5. Distribute a copy of the Pie Charts student activity sheet (SB page 12) to each student. Tell students that they will be creating an illustrated pie chart on the worksheet to show where the world’s freshwater is located. Review the basics of the use of pie charts to show parts or percentages of a whole as needed. Students can sketch and write ideas in their field notebooks before completing the activity sheet.
6. Tell students that there are more than 6 billion people on the planet. It is estimated that by 2050, there will be over 9 billion. What does that mean for water resources? Have students look at the pie chart that they created and discuss how much of the world’s freshwater is accessible for use. The answer is not exact, but it is less than 1%. We can’t access water in ice caps or glaciers, much of the ground water, etc.
7. Ask students how many gallons of water they think their household uses in a day. Hold up a gallon container, like a gallon milk jug, to give them a visual idea of how much water makes a gallon. Have students write a guess in their field notebooks. Distribute a copy of the Calculate Your Daily Water Ways student activity sheet (SB page 13) to each student. Explain to students that they are to take this sheet home to complete. They are to carefully monitor the water usage of every person in their households. Go over the activity sheet together and provide examples of how to complete it. Explain that approximate values are given for the amount of water each appliance uses. Tell students to try to find out the exact amounts of water their home appliances use by reading any labels. For example, the activity sheet uses 55 gallons per load for a washing machine. If students discover that their home machine uses less or more water per load, have them adjust the equation as needed. They should check all home appliances before calculating.

UNIT 2

WATER: PICTURE OF A LIMITED RESOURCE

EXPLORATION

1. When students bring back their completed activity sheets, put the students in groups of about 4–5 students. In their groups, have them discuss what (if anything) surprised them about their household’s water use and to record that information in their field notebooks. Ask for volunteers to share their collected data and what they learned.
2. Distribute a copy of the Bar Charts & Pictographs student activity sheet (SB page 14) to each student. Explain to students that there are several different ways to depict this type of data. One example is a pictograph. A pictograph uses pictures or symbols to show amounts of what is being measured. Before there were alphabets, people needed a system to keep track of events and numbers of things. Hieroglyphics (Ancient Egyptian writing), Chinese characters (each character represents a whole word), and cuneiform (Sumerian writing), are all forms of pictographs. Writing around the world has evolved from these symbols, and there are numerous forms of alphabets in use today. Our American English letters are Latin in form, while our numerals are Arabic. Give an example of a pictograph on the board. An example could be a drawing of a fish. Each drawing of a fish represents 100 dried fish stored for the winter. Ask students, “If there are 10 fish drawn, how many fish are stored?” Pictographs are still used to show information today. A pictograph must have symbols that clearly represent each item and a key showing how much each symbol represents.
3. Tell students they will be creating a pictograph of their household’s water usage. They must think of a symbol to represent each type of water use on the worksheet that they completed at home. Have students refer to their activity sheets to create a pictograph of the household’s water usage in their field notebooks.

Fish

{Latin characters spell fish}



{Chinese symbol for fish}



{Hieroglyphic symbols spell fish vertically}



{Sumerian symbol for fish}

COMMUNICATION/ASSESSMENT

1. Have students discuss different ways to save water in groups or as a class. This could be in their household, or on a larger scale, at the school, in the community, or even the world. You may wish to send home with each student a copy of Tips to Help You Save Water Around the House (SB page 15) from the Association of Zoos and Aquariums.
2. Students should respond to the following in their field notebooks:
 - a. Write a list ranking the amounts of saltwater and freshwater from most to least. Be sure to clarify how much freshwater is available for use. What did you learn about the importance of water that you didn't know before?
 - b. What did you learn about how much freshwater you use each day?
 - c. Will you change the way you use water based on what you know now? List and describe at least three ways to use less water.
 - d. Discuss the advantages and disadvantages of using art in charts and graphs to communicate information. Does art make charts more interesting?
3. Field notebook challenge: Tell a story using pictograms. Your symbols should be easily understood; otherwise provide a key for your reader. You can also create a secret code using pictograms that you can share with friends.

ADDITIONAL ACTIVITY

Have students work in small groups to come up with a comparison question related to water usage. The groups can research their question and create a pictograph showing the information. An example might be comparing the daily household water usage in the U.S., Africa, China, and Egypt.

EXTENSION ACTIVITY

Have students form groups to research amounts of water available in other countries or continents and how water is used there. Also instruct them to investigate the populations of those regions and the accessibility of water. Assign each group a different continent or country to compare to the United States using different types of graphs and charts.

**ASSOCIATION
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Special Thanks!

Thank you to the Association of Zoos and Aquariums for contributing their Calculate Your Daily Water Ways and Tips to Help You Save Water Around the House worksheets for this activity. www.aza.org.

NAME:

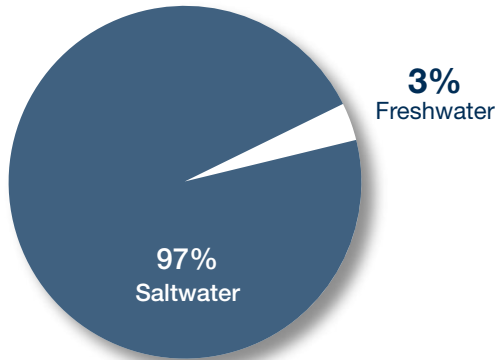
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PIE CHARTS

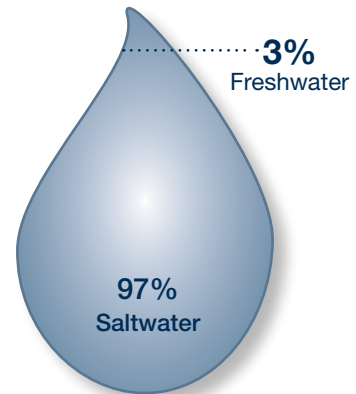
Pie charts are helpful for showing parts or percentages. Here are examples of a regular pie chart and a pie chart that uses art to illustrate this point.

EARTH'S WATER

Regular Pie Chart



Illustrated Pie Chart



Think of colors, symbols, and shapes that represent water and create an illustrated pie chart that shows where the freshwater on Earth is located using the percentages below.

Where is the freshwater on Earth?

68.7%

Ice Caps & Glaciers

0.3%

Surface water
(lakes, rivers, etc.)

30.1%

Ground water

0.9%

Other
(soil, plants, atmosphere, etc.)

NAME:

DATE:

1. SHOWERS

Total number of showers taken in one day, times the average number of minutes spent in the shower, times 4 gallons per minute, equals water used for household showers each day.

$$\frac{\text{_____}}{\# \text{ showers}} \times \frac{\text{_____}}{\# \text{ minutes}} \times 4 \text{ gallons/minute} = \text{_____} \text{ gallons}$$

2. BATHS

Total number of baths taken in one day, times 40 gallons, equals daily water used for baths.

$$\frac{\text{_____}}{\# \text{ baths}} \times 40 \text{ gallons/bath} = \text{_____} \text{ gallons}$$

3. TOILETS

Total number of flushes per day, times the number of gallons per flush (enter 4 if you are unsure), equals daily water used for flushing.

$$\frac{\text{_____}}{\# \text{ flushes}} \times \text{_____} \text{ gallons/flush} = \text{_____} \text{ gallons}$$

4. FAUCETS

Total number of times household members use faucets to shave, brush teeth, and wash hands, times average minutes used, times 3 gallons per minute, equals total gallons used daily for faucets.

$$\frac{\text{_____}}{\# \text{ uses}} \times \frac{\text{_____}}{\# \text{ minutes}} \times 3 \text{ gallons/minute} = \text{_____} \text{ gallons}$$

5. LAUNDRY

Total number of loads of laundry done on an average laundry day, times 55 gallons of water per load, equals gallons used for laundry.

$$\frac{\text{_____}}{\# \text{ loads}} \times 55 \text{ gallons/load} = \text{_____} \text{ gallons}$$

6. DISHWASHER

Total number of times dishwasher ran on an average day, times 15 gallons per load, equals water used for dishwasher cleaning.

$$\frac{\text{_____}}{\# \text{ loads}} \times 15 \text{ gallons/load} = \text{_____} \text{ gallons}$$

7. HAND WASHING DISHES

Total number of times dishes were washed by hand, times average number of minutes the water ran, times 3 gallons per minute, equals water used daily for washing dishes by hand.

$$\frac{\text{_____}}{\# \text{ loads}} \times \frac{\text{_____}}{\# \text{ minutes}} \times 3 \text{ gallons/minute} = \text{_____} \text{ gallons}$$

SPECIAL SUPPLEMENT *provided by:*

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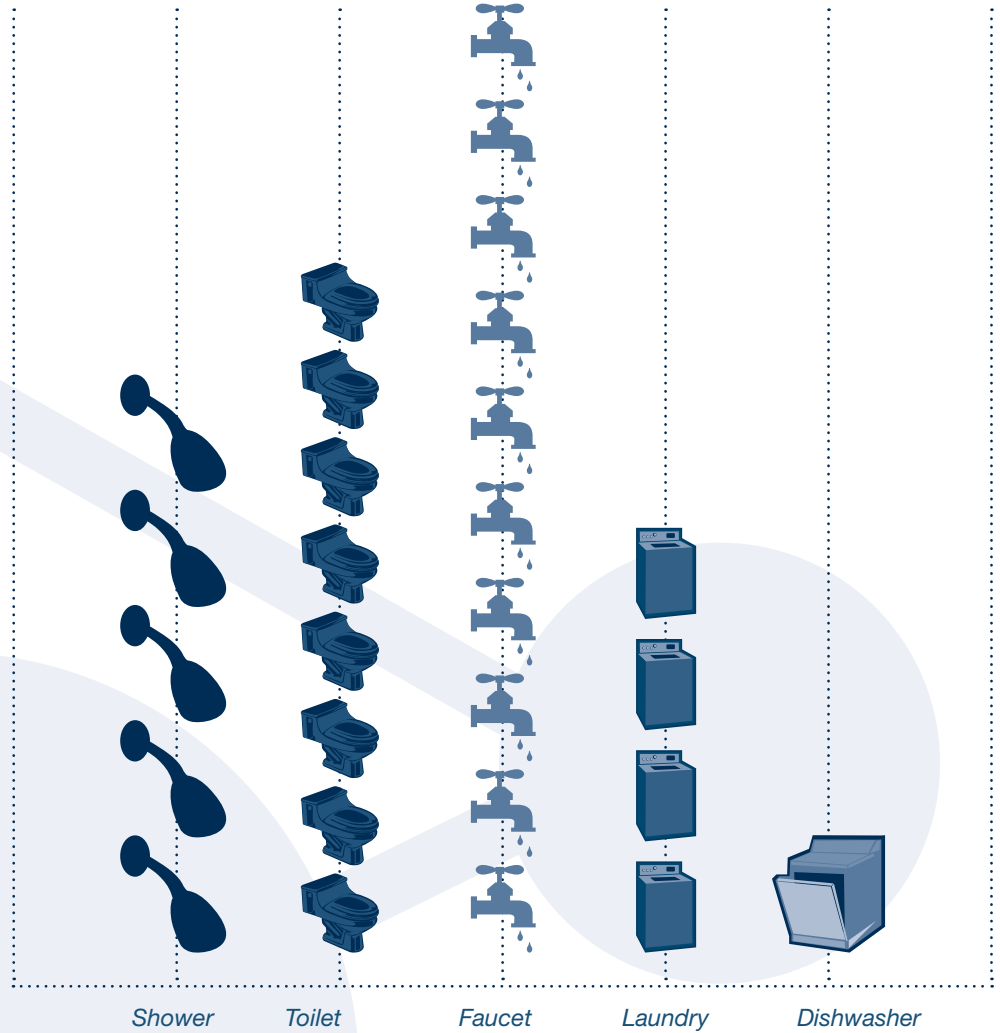
NAME: _____

DATE: _____

Pictographs use symbols to show amounts of things. Look at the pictograph below to calculate how many gallons of water were used for the following:

- Showers _____ gal.
- Toilet Flushes _____ gal.
- Faucet _____ gal.
- Laundry _____ gal.
- Dishwasher _____ gal.

GALLONS of WATER USED



{Each Symbol = 10 gallons of water used}

Think of *symbols* you could draw to represent each of the uses of water listed on the Calculate Your Daily Water Ways activity sheet you completed at home. Create a pictograph in your field notebook showing how much water your household used for each appliance.



“Sometimes I find using images and pictures is an easier way of communicating than words and numbers. The mind can take in all the information in an image more quickly than the eyes can read several lines of text.”

– Wyland

NAME:

DATE:

OLDER TOILETS: Replace older toilets with ultra-low flow toilets (ULFTs), which use only 1.6 gallons of water per flush. Using these could cut indoor water use by as much as 20%, up to 16,000 gallons annually for a family of four. Older toilets (before 1993) use 3.5 to 5 gallons per flush and account for up to half of all indoor water use.

SHOWERHEADS: Install a water efficient showerhead that uses no more than 2.5 gallons of water per minute. That's plenty of water for a refreshing, cleansing shower. A standard showerhead uses 5 to 10 gallons of water per minute. A water-efficient showerhead can save thousands of gallons of water per year. The energy savings associated with using less hot water are even greater than the value of the water itself. Annual savings of \$20 to \$30 per family are possible with a low-flow showerhead, which is more than the price of a new low-flow fixture. The savings are double or triple this if your water heater is electric!

AERATORS: Low-flow aerators on your kitchen and bathroom faucets are easy to install, reduce splashing, and cut water use in half. A flow rate of 2.2 gallons per minute is recommended for kitchen faucets and 1.5 gallons per minute for bathroom faucets.

A "RUNNING" TOILET CAN WASTE TWO GALLONS OF WATER PER MINUTE:

A silent leak in a toilet can waste up to 7,000 gallons of water per month. To find silent leaks, put food coloring in the tank. Do not flush. Check the toilet bowl 10 minutes later. If you see color in the bowl, the tank has a silent leak. A faucet leaking a slow steady drip—100 drops per minute—wastes 350 gallons per month.

A FAUCET LEAKING A SMALL STREAM WASTES 2,000 TO 2,700 GALLONS OF WATER PER MONTH:

Replacing worn washers in your faucets will usually stop leaks.

WHEN RUNNING WATER IN THE SINK OR TUB WHILE WAITING FOR IT TO GET HOT, PUT A GALLON JUG UNDER THE FAUCET:

You can then use this water for other things around the house. Don't turn on the water and walk away waiting for it to warm up. You are likely to waste hot water, and can end up increasing both your water and energy bills. Insulate hot water pipes where possible to avoid wasting water while waiting for the hot water to arrive.

WHILE BRUSHING YOUR TEETH, TURN OFF THE TAP AND SAVE 14 GALLONS OF WATER:

Rinse using a cup for water; run the tap only to rinse the toothbrush.

TAKING A SHORT SHOWER USING A WATER-EFFICIENT SHOWERHEAD CAN SAVE WATER AND MONEY:

When showering and washing hands, wet your body. Turn off the water, apply soap, and then turn on the water to rinse. Cutting one minute off your shower time can save about 700 gallons of water per month.

FILL YOUR DISHWASHER:

Your dishwasher uses the same amount of water whether it is full or just partially full of dishes, so make sure it is full before you run it. Many dishwashers have a water-saver cycle to save even more water. Also, scraping the dishes instead of using a pre-rinse cycle can save water. Even if you don't use a dishwasher, instead of running water to rinse dishes, fill the kitchen sink and dip the dishes in the water to rinse.

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