Investigating the Use of Water in Your Home

Water is often called a renewable resource, but what does that really mean? Is water an unlimited resource? What happens to water after we use it? This investigation will help you understand exactly how much water you use in your home and how you can keep from wasting water. If many people are participating in this investigation, work in small groups of 3-5. Before you begin, think about all the ways water is used in your home. How much water do you and your family use at home everyday? Record your thoughts and share them with others. Make a list that combines everyone's uses of water in their homes.

Part A: Estimating Home Water Use

1

1. What would you do if a water shortage occurs in your area, and you have to reduce the amount of water used in your home? Think about and discuss with others what you would need to know to deal with the crisis. Record the main ideas from your discussion.

2

2. Make a plan for calculating the amount of water used in your home daily. To help you, use the list you made that combined the ways that everyone uses water. You may wish to make measurements in your home. You can also use the table, shown below, to help you get started.

Common Household Water Uses

Type of Use	U.S. System of Measurement		International System of Units *(approximation)*	
Using water from a tap	1.5	gallons/minute	5.7	liters/minute
Clothes washer	30-35	gallons/cycle	110-130	liters/cycle
Dishwasher	25	gallons/cycle	95	liters/cycle
Shower	2.5	gallons/minute	9.5	liters/minute
Bathtub	50	gallons	190	liters
Toilet	3.5	gallons/flush	13	liters/flush
Low-flow toilet	1.6	gallons/flush	6	liters/flush

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3. Record your plan and share it with others. Once you decide on a plan, carry it out, and record your findings.

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4. Organize a way of comparing everyone's results. This could take the form of a large, wall-size chart that would show how much water different families use for different things in one day. Answer the following questions.

a) Where are there great similarities? How could you explain these?
b) Where are there great differences? How could you explain these?
c) For what purposes do people seem to use the most water? Why is that?
d) Which water uses around the house could you cut back on? Explain your reasoning.
e) Calculate the average household water usage for everyone conducting this investigation.

Part B: Calculating Water Wasted in the Home

Materials Needed

For this investigation each group will need

- empty cardboard 2 liter (L) milk container *(or orange-juice container)*
- water
- very small sewing needle
- metal rack and objects to support it *(two stacks of books, for example)*
- container that fits under the rack *(to catch dripping water)*
- measuring cup or graduated cylinder
- stopwatch or watch with a second hand
- calculator
- paper towels *(for clean-up)*

1. In many buildings, dripping faucets waste water. Such leaks might seem very small, but the water losses can add up to be surprisingly large.

Use a needle to punch a small hole in the bottom of an empty cardboard container. Make the hole as small as you can.

2. Support the container on a rack about 15 centimeters (cm) above the tabletop. Place a measuring cup under the container to catch the dripping water. Fill the container half to two-thirds full of water.

3. Leave the cup under the container for a measured time, in minutes — long enough to fill the cup to a depth of 3 to 5 cm. Record the length of time.

4. Set the cup on a level surface and measure the volume of water caught in the cup. Your sight line should be at the same height as the water level in the cup.

Estimate the volume to the nearest milliliter (mL), and record that volume. To estimate, you may need to imagine that there are 10 small and equally spaced marks between the marks on the cup, and estimate where the water level is located along those imaginary marks.

5. Calculate the rate of water loss by dividing the volume, in milliliters, by the time, in minutes. Write this measurement in liters per day. Remember that there are 1000 mL in 1 L, and there are 1440 minutes in a day. Be sure to show your calculations along with your result.

6. Compare the values you obtained to the results of others.
   a) Why might the results vary from group to group?
   b) What are some reasons for the difference?

7. Discuss how you would deal with the water shortage described in Part A, number 1. Assume that the water shortage is temporary but that it will last at least a week. Try to be as creative as you can in your approach to the problem.

Work with your group to write a commercial to educate and inform citizens about the local water shortage and to explain your proposed solution. All group members should participate in the design and presentation of the commercial.

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8. If more than one group is working on a commercial, take turns presenting your commercial to the others. If there is only one group, try to find an audience and present your commercial to them.

Review

- What surprised you the most about how much water a family uses? Why?

- List 10 ways that you and other members of your group use water at home.
  a) Rank the uses in order of importance.
  b) Justify your ranking system.

- List the ways that you and others doing this investigation proposed to reduce water consumption in your homes.

Reflect

- Based upon what you learned about water conservation in the home, suggest three ways that your school or organization might conserve water.

- Refer to your calculations for the average daily household water use for your class. If water costs as much as milk, how much would the average weekly household water supply cost? Show your calculations and describe how you obtained your numbers.

- Could a water shortage ever occur in your area? Explain when or how it could happen, or why you think a water shortage could never occur.

Extending Your Investigation

Where does your community get its water? Does it come from water in rivers, lakes, reservoirs, or from underground? Visit www.agiweb.org/ies/water.html to find resources that will help you answer the following questions:

What is the water cycle?
Where do water resources come from?
What is a watershed?
What is the source of my local water resources?
What happens to the water I use in my home?

This activity was drawn from AGI's *Investigating Earth Systems*™ middle-school curriculum, funded by the National Science Foundation (grant number 93-53035), the Chevron Corporation, and the American Geological Institute Foundation. For more information about *Investigating Earth Systems,* please contact the publisher, It's About Time Publishing at 1-888-698-8463, or visit their web site at www.its-about-time.com.

is essential for life, and is constantly on the move.

The images on the front show how water moves and changes from liquid to solid to vapor in a never-ending cycle. As the diagram here shows, Earth recycles water in several ways. Water evaporating from the ocean surface becomes vapor that may be moved to the continents by winds. When the water vapor condenses, it falls to the ground as rain or snow. Water that falls to the Earth's surface evaporates, passes into the soil, flows along the soil surface into streams or other water bodies, or recharges groundwater. The roots of plants draw water up into their leaves and return it to the atmosphere in the form of water vapor through a process called transpiration. As Earth recycles water, the total amount near the surface stays almost the same through time.

We commonly take for granted that clean and abundant water is as close as the nearest faucet. But, freshwater resources are scarce in many parts of the world, because water is not distributed evenly. More than 97 percent of the water on Earth is saltwater in the oceans. Most of the world's fresh water is frozen solid in large glaciers in Antarctica and Greenland. And almost all of the fresh water that is available for human use is groundwater that is contained in soil and rock below the surface or in rivers and lakes. Having too much water (floods) or not having enough (droughts) may have serious effects on people, wildlife, and habitats.

The objective of the posters and books in the *AGI Environmental Awareness Series* is to increase readers' understanding of natural resources and the environmental concerns associated with them. That knowledge can help us — as individuals and as a society — protect and wisely manage both Earth's renewable resources, such as water, and nonrenewable resources, such as minerals and petroleum.

AGI gratefully acknowledges support provided by the USDA Forest Service and the U.S. Geological Survey to produce this poster, *Water — The Essential Resource*, and the book, *Water and the Environment.* These materials are part of the AGI Environmental Awareness Series. Other titles in the Series are *Sustaining Our Soils and Society, Metal Mining and the Environment,* and *Living with Karst — A Fragile Foundation.* Each of the non-technical, 64-page publications contains a colorful, informative poster with a student activity. Information about these publications is available on the AGI web site, www.agiweb.org/pubs and from the American Geological Institute.
Phone: (703) 379-2480 E-mail: pubs@agiweb.org.

Sources of Additional Information

American Geological Institute
www.agiweb.org
American Institute of Hydrology
www.aihydro.org/
American Water Res. Assoc.
www.awra.org
American Water Works Assoc.
www.awwa.org/
Assoc. of Amer. State Geologists
www.kgs.ukans.edu/ASASG/AASG
Bureau of Land Management
www. blm.gov/
Internatl. Assoc. of Hydrogeolists
www.iah.org/
National Groundwater Assoc.
www.ngwa.org
National Park Service
www.nps.gov/
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www.montana.edu/wwwwet/
USDA Forest Service
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U.S. Fish and Wildlife Services
www. fws.gov/
U.S. Geological Survey
www.usgs.gov/
Water Environment Federation
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www.yearofcleanwater.org/

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Project Management: GeoWorks
Activity: John B. Southard & Matthew C. Smith
Design: De Atley Design
Printing: CLB Printing
Printed in U.S.A.