

Title: Water You Doing About This?

Source: The Water Sourcebook Series, U.S. Environmental Protection Agency

Subject(s): Science, Math

Grade(s): 9-12

Objectives: Students will demonstrate the amount of water used in an average home each day and explain how to manage and conserve water resources to meet our needs and those of the natural world.

Summary: The activity begins with students reflecting on the ways that they use water and the quantity of water they use each day. Students will then record their daily water use and that of the rest of their household. Students will make estimations of total water use, average each family member's water use over one week and one day, and make comparisons with the national average. Students will then consider ways to conserve water and reduce their family's water use. They will research methods of water conservation and the cost associated with these methods.

Standards: MM1D3. Students will relate samples to a population.

MM1P4. Students will make connections among mathematical ideas and to other disciplines.

SCSh5. Students will demonstrate the computation and estimation skills necessary for analyzing data and developing reasonable scientific explanations.

SEV4. Students will understand and describe availability, allocation and conservation of energy and other resources.

# WATER YOU DOING ABOUT THIS?

9-12

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## OBJECTIVES

The student will do the following:

1. Demonstrate quantities of water that an average family uses on a daily basis.
2. Explain how water resources can be managed to meet human needs.
3. Explain how water can be conserved.

### SUBJECTS:

Science (Physical, Earth Science), Related Arts, Math, Social Studies (Economics) Health

### TIME:

1 class period and after-school time

### MATERIALS:

data sheet  
tables  
writing materials  
calculator

## BACKGROUND INFORMATION

Water is too important to take for granted: without it, life would not exist on Earth. Our bodies need water to function properly. Tremendous amounts of water have been used all over the world. Water use in the United States is as follows:

8% for domestic use (washing, drinking, toilet)

10% for business/industry

33% for irrigation

49% for electric power plants

Although the world's total water supply is enormous, over 97% of it is salty ocean water. Salt water cannot be used

for drinking, irrigating crops, power plants, or other industries. All of these uses require fresh water supplies that only make up three percent of the world's total water; and 2/3 of that is frozen in Antarctica, Greenland, and alpine glaciers. Only 0.6% of the Earth's water supply is usable as liquid and fresh water. This water is unevenly distributed in lakes, rivers, and underground.

Since the water supply on Earth is fixed, the total amount stays the same. As the world's population grows, the demand for water also increases. We cannot increase the water supply; however, we can manage it more effectively. Scientists estimate that 30-50 percent of the water in the United States is wasted. One part of water management in which everyone can take part is water conservation--using only what is needed.

Since most of the water used in the United States is not used in our homes, it may seem we can do nothing about its use. We must keep in mind that industries use water to produce the products we purchase. If we do not demand a new car every two years, recycle as much as possible, and do not waste food and other materials, water will be saved!

We can also encourage conservation of water through industries by legislative action. Laws can be passed to require water conservation equipment and methods. Federal and state subsidies that encourage waste of water can be eliminated or reduced.

Reducing the amount of water used in flushing the toilet by only 10% would save enough water for doing the laundry and almost enough for drinking. Using a water-saving toilet can cut water usage almost 75 percent. Water pollution is a problem even in communities that have adequate water supplies. This makes clean fresh water more expensive. Our concern about water shortages should not just be for human consumption but also for the impact on the environment. When reservoirs are built, valleys are flooded and downstream rivers are changed. Channelizing of streams destroys riparian communities along their banks. Diverting water from one area to another using canals or pipes damages the environment from where the water was taken as well as from where the canals and pipes were laid. Conserving water just makes sense - environmentally, financially, and ETHICALLY!

### Terms

**conservation:** act of using the resources only when needed for the purpose of protecting from waste or loss of resources

**riparian communities:** living organisms adjacent to or living on the bank of a river, lake, or pond

## **ADVANCE PREPARATION**

Copy Data Chart and Water Use Student Sheets for each student.

## PROCEDURE

### I. Setting the stage

- A. Have the students list various ways that water is used in the home. Before students record how much water they use in a day and a week, have students record on their Data Sheet how much they THINK they use.
- B. Remind students that they will need to time showers and check for low flow equipment in their homes.

### II. Activity

- A. Ask students to keep a Data Sheet of water use in their homes for two/three days. Students should record results on data table. They can add any appropriate activities that are not listed.
- B. Ask students to review the Student Sheet of average water volumes required for typical activities and then answer the following using the data from their two/three days.

1. Estimate the total amount of water your family uses in a week. Give your answer in gallons and liters. (approximately 4.2 liters in a gallon)

2. On average how much water did each family member use in a week? Give your answer in gallons and liters per person per week.

3. On average how much water was used per family member each day? Give your answer in gallons and liters per person per day.

4. Compare the daily volume of water used per person in your family to the average daily water volume used per person in the United States (100 gallons).

5. What reasons can you offer to explain any differences?

6. Compare daily volume of water used per person in your family to the average daily volume used per person in several other countries. (Show a variety of water uses.)

### III. Follow-up

- A. Have students list some other ways they could conserve water at home (turning off the hose when not in use, taking shorter showers, fixing leaky faucets, installing water conservative toilets and shower heads).
- B. Landscape with plants and grasses that are native to the area and thus require less watering.
- C. Have students find out what is done locally with wastewater. Is it discharged to a surface waterbody, injected underground, or sprayed onto land surfaces (e.g., dedicated sprayfields, agricultural areas, or public access areas, such as golf courses)? Have students determine additional “uses” for treated wastewater (e.g., aquifer recharge, etc.) and determine the level of treatment needed for each use and associated costs.
- D. Present any viable options as determined in C. above as recommendations to the community.

### IV. Extensions

- A. Have students find out the cost of installing different water saving devices in the home.
- B. Have students estimate how long it would take for each item to pay for itself.

## RESOURCE

“Water Quality and Pollution Control Handbook,” Alabama Cooperative Extension Service, Auburn University, Alabama, 36849.

**WATER USE**

<b>TABLE A</b>			
<b>Gallons of water typically used to produce various products in the United States</b>			
1 automobile	10,000	1 pound of grain fed beef	800
1 ton of brown paper bags	82,000	1 pound of rice	560
1 pound of cotton	2,000	1 pound of steel	25
1 pound of aluminum	1,000	1 gallon of gasoline	70

\*Producing aluminum from raw materials “costs” much more in terms of water than it does when producing aluminum from recycled aluminum.

<b>TABLE B</b>			
<b>Percentage of water consumed by various uses in the United States</b>			
irrigation	60%	industry	13%
rural domestic use	59%	power plant cooling	2%
urban domestic and business	29%		

<b>TABLE C</b>			
<b>Domestic use of water in the United States</b>			
toilet flushing	40%	drinking	5%
washing and bathing	37%	household cleaning	3%
kitchen usage	7%	garden usage	3%
laundry	4%	cleaning car	1%

Student Sheet

**DATA SHEET**

I THINK I USE APPROXIMATELY \_\_\_\_\_ GALLONS PER DAY;  
 I THINK I USE APPROXIMATELY \_\_\_\_\_ GALLONS PER WEEK

WATER USE	TIMES PER DAY	AMOUNT USED		TOTAL USED			
		average *estimated gallons	your estimated gallons	per day			per week
				1	2	3	
1. bathing		30					
2. showering		6 gals per min.					
3. flushing toilet		6					
4. washing face & hands		5					
5. getting a drink		.25					

6. brushing teeth		2					
7. cooking		10					
8. washing clothes		60					
9. washing dishes		30					
10 other							
			<b>TOTALS</b>				
<b>TOTALS (should include things that don't happen every week)</b>							

**\*estimates on Data Sheet are based on the following:**

1. This could vary depending on how full tub is for bathing.
2. 3 gallons/min with low-flow head
3. 1.5 gallons with water saver toilet
4. 2 gallons if water is turned off
5. Includes running water to reduce lead quantities from piping solder
6. 0.25 gallons if water is turned off
7. Per meal, includes rinsing
8. Large load
9. 10 gallons with dishwasher or using two 5-gallon pans