

Water Meter Monitoring

Adapted from: “Read a water meter and water bill,” in Environmental Action: Water Conservation. And “Meter Reader” in H₂O Below: An Activity Guide for the Study of Groundwater.

Grade Level: Basic

Duration: Varied

Setting: School, home

Summary: Students record their school and home water meter numbers (values).

Objectives: Students will learn how to read a water meter and conclude how much water (in gallons) was used. Students will also learn how to appreciate water conservation.

Vocabulary: Conservation, dial, economics

Related Module Resources:

- Water Conservation section of Module Resource Folder

Materials (Included in Module):

- Handouts

Additional Materials (NOT Included in Module):

- Water Meters to read

ACADEMIC STANDARDS:

7th Grade

- 4.2.B Examine the renewability of the resources
- Identify the waste derived from the use of renewable and nonrenewable resources.
 - Determine how consumption may impact the availability of resources.

10th Grade

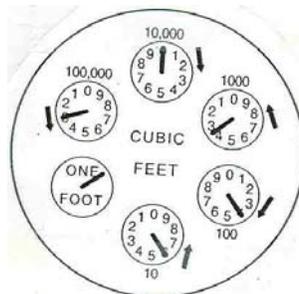
- 4.2.B Evaluate factors affecting availability of natural resources.
- evaluate the effect of consumer desires on various natural resources.

12th Grade

- 4.2.B Analyze factors affecting the availability of renewable and nonrenewable resources.
- evaluate the use of natural resources and offer approaches for using them while diminishing the waste.

BACKGROUND: Students and adults alike rarely understand how much water they use per day. In this activity, students will monitor the water meter at their school and at home to understand and analyze water usage.

Some water meters project a number that is easy to read, like the odometer of a car. Other water meters, however, are setup like circular dials with five small meters. Each small dial measures a place value, like ones or tens place. You read these dials clockwise. The meter below, measured in cubic feet, is 303,460 Ccft



Since the hand in the *100,000*'s dial is on 3, we know that a 3 goes in the 100,000's place. Record a number for each dial that represents a place value. If a hand falls between two numbers, use the smaller number. In the ones place, a zero is automatically written in. The "One Foot" dial is used only to monitor water leaks. If you notice the "One Foot" hand moving, you should call your plumber.

If your meter is in cubic feet, a quick equation can convert your measurements into gallons. Simply subtract the most recent measurement from the prior measurement to get the total cubic feet of water used. Take that number and multiply by 7.48 to get the amount in gallons.

$(\text{Prior Ccf} - \text{Recent Ccf}) \times 7.48 = \text{amount in gallons}$

OVERVIEW: Students will record their school and home water meter numbers (values).

PROCEDURE:

At School:

1. Have your class record the water meter value when the day begins and also again before they go home. Do this for a typical school week.
2. Once the measurements have been taken, use the formula $[(\text{Prior Ccf} - \text{Recent Ccf}) \times 7.48]$ to determine how many gallons of water were used in a day. Compare these results to the remaining four days.
3. You can find the volume of water an individual student uses by dividing the total amount of water used by the total amount of people in the school (faculty and visitors included).
4. To look at water conservation economically, obtain recent water bills from the school and have students compare their results to those on the bills. Since water bills usually account for a 30-day period, simply multiply an average day's water use total by 30 to find total monthly usage. Some error will occur here since water usage can increase and decrease dramatically day to day. Your results should come close to the water bill.
5. Also, to find out how much money is used on water per person, divide the total amount of the bill by the total population.

At Home:

1. To encourage students to read their meters at home, set up a "Water Conservation Contest". This contest will find who has the lowest water usage in the class.
2. Students will record their meter values daily on the chart that follows before they leave for school and once they come home from school. Effort should be made to check near the same time each day.
3. At the end of the week, have the students average their own values of gallons per day.
4. Then have the students divide their number of gallons per day by the number of people in their family.
5. Have the students secretly submit this number to the teacher so that they don't compare values with their fellow classmates, which might cause them to lower their amounts.

6. The teacher announces winner and gives a prize of bonus points, pencils, or a hearty “congratulations!”. The teacher recaps the importance of the activity and asks for comments on what students have learned.
7. Students can also fill out “Water Survey: How much water do you use?” as they monitor their meters.

DISCUSSION: Have students describe their own findings and feelings towards water consumption. Were their results as they expected? Ask students about the price of the water found on their school’s bill. Is this startling? What could be done to reduce cost? Explain how water conservation can save money and save natural resources. Which is more important? Ask students if they plan on conserving water at home. What was your household’s largest conservation pitfall: long showers, toilet running, cooking, etc.?

EVALUATION:

- Prepare posters to place in school detailing how much water is consumed per day/ week/ month/ year.
- Explain economic and environmental benefits of water conservation.
- If consent is granted, measure the water meters of other schools, hospitals, or businesses to compare your results. Look for trends. Ask how they conserve water or make some suggestions, explaining the economic and environmental benefits.
- Complete the included “How Much?” handout.
- Demonstrate comprehension and usage of the equation : $(\text{Prior Ccf} - \text{Recent Ccf}) \times 7.48 = \text{total in gallons}$

EXTENSIONS AND MODIFICATIONS:

- The original procedure calls for daily checking of water meters. This activity can also be used in a tighter interval of testing. By testing twice a day, or even hourly, students can find trends throughout the school day.
- These trends can be linked to activities in the school that use excessive water such as gym showers, cafeteria, science labs, etc.
- From the results, a plan of action can be taken school wide to increase awareness and reduce water usage.
- Have an authority from the local water municipality visit the class and talk about the class’ efforts. This could also result in a field trip to the water municipality.

NOTES (PLEASE WRITE ANY SUGGESTIONS YOU HAVE FOR TEACHERS USING THIS ACTIVITY IN THE FUTURE):

Water Survey: How much water do you use?

Directions: This is a survey to determine how much water you use in your home during one full week. Place a check mark in the Times Per Day column every time someone in your family does the activity.

Activity	Times Per Day							Weekly Total	Water Per Activity	Total Water Used
Toilet Flushing	<input type="checkbox"/>		X 5 gallons =							
Short Shower (5-10 min.)	<input type="checkbox"/>		X 25 gallons =							
Long Shower (>10 min.)	<input type="checkbox"/>		X 35 gallons =							
Tub Bath	<input type="checkbox"/>		X 35 gallons =							
Teeth Brushing	<input type="checkbox"/>		X 2 gallons =							
Using Dishwasher	<input type="checkbox"/>		X 30 gallons =							
Washing clothes	<input type="checkbox"/>		X 10 gallons =							
Washing Dishes Filling a Basin	<input type="checkbox"/>		X 20 gallons =							
Washing Dishes with Running Water	<input type="checkbox"/>		X 40 gallons =							

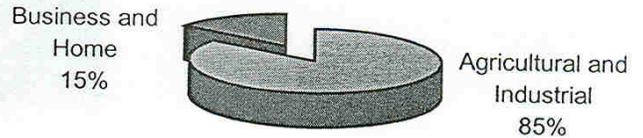
Note: Another significant seasonal water use is lawn and garden watering. This survey deals with daily water use in the home, but most of us use additional amounts of water at school, at work, and other places throughout the day!

Drinking Water Facts

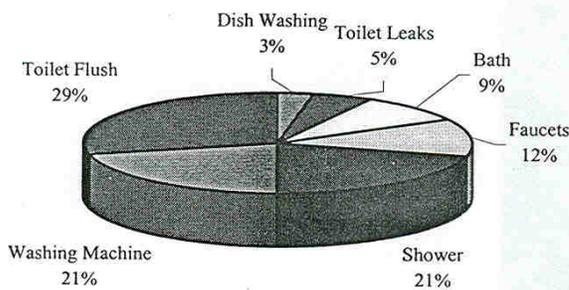
American Drinking Water Usage

In the United States, 85% of the water produced is used for agriculture, industry, and power generation. This leaves 15% for household use.

National Water Usage



Household Water Usage

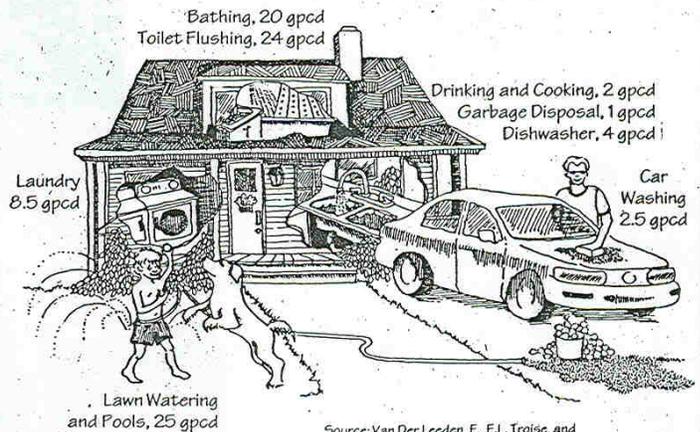


That remaining volume is distributed between many household needs. Toilet flushes take up the most with 29% of the total. The washing machine and shower come in second with 21% each. These three appliances total 71% of the total home water use, more than two thirds.

For a more intuitive and practical measure of home water use, look at this house diagram. Instead of total percentages, this chart approximates Gallons per Capita per Day (gpcd). This is the measure of how many gallons of water are used for each purpose by each person every day.

Common Household Uses of Drinking Water*

(Gallons per Capita per Day)



Source: Van Der Leeden, F., F.L. Troise, and D.K. Todd. *The Water Encyclopedia*. Lewis Publishers, Inc. Second Edition, 1990.

For a very comprehensive chart describing source, use, and distribution of drinking water, see the following page.

Source and Distribution of Public Water Supply

