Conservation of Water

Strand	Earth Resources	
Topic	Investigating conservation of natural resources	
Primary SOL	6.9	The student will investigate and understand public policy decisions relating to the environment. Key concepts include c) the mitigation of land-use and environmental hazards through preventive measures; and d) cost/benefit tradeoffs in conservation policies.
Related SOL	6.1	The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which j) current applications are used to reinforce science concepts.
	6.7	The student will investigate and understand the natural processes and human interactions that affect watershed systems. Key concepts include f) major conservation, health, and safety issues associated with watersheds.

Background Information

All living organisms are dependent upon the availability of clean water and air and a healthy environment. While the supply of water seems limitless, water is not an infinite resource. Usable fresh water is actually quite limited and scarce in some places.

Local, state, and federal governments have significant roles in managing and protecting air, water, plant, and wildlife resources. Regulations, incentives, and voluntary efforts help conserve resources and protect environmental quality.

Conservation of resources and environmental protection begin with the individual. Understanding the watershed is the first step in protecting water and other natural resources. What goes on upstream can make water downstream unfit to use, forcing downstream users to clean up the water before it can be used again.

Use of renewable and nonrenewable resources must be considered in terms of their cost/benefit tradeoffs. Preventive measures, such as pollution prevention or thoughtfully planned and enforced land-use restrictions, can reduce the impact of problems in the future. Pollution prevention and waste management are usually less costly than cleanup.

Renewable resources should be managed so that they produce continuously. Sustainable development involves making decisions about long-term use of land and other natural resources with concern for maximum community benefit for the longest possible time and with the least amount of environmental damage.

The availability of fresh water may not be a problem in the United States today, but it is a problem in other parts of the world, such as the Middle East and northern Africa. The greatest influence on water availability is the number of people competing for it. As population grows, fresh water

becomes less and less available. China and Canada receive about the same amount of water due to precipitation. However, China's population is over 40 times that of Canada. It is projected that by the year 2025, one-fourth of the world's population will be in need of more water.

Besides higher populations, higher standards of living increase the demand for water. In the United States, for example, each individual uses approximately 370 liters of water each day, whereas in African nations, the average person uses only slightly more than 29 liters.

Materials

- Gallon jug
- Graduated cylinder
- Blue food coloring
- Water
- Salt
- Measuring spoons
- Copies of the attached handout
- Internet access or hard-copy information about water conservation agencies

Vocabulary

conservation, natural resources, nonrenewable resources, renewable resources, watershed

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

Introduction

1. Fill a clear, plastic gallon jug with water, and add a little blue food coloring. Tell students that this represents all the water on the Earth.
2. Pour 50 ml of the water into a graduated cylinder, and then add 6 tbsp. salt to the water left in the jug. Tell students that the water remaining in the jug represents all the ocean water on Earth, which is undrinkable because it is salty. Set the jug aside.
3. Hold up the graduated cylinder, and point out that the water in it represents all the freshwater on Earth. Of this amount, 70 percent is inaccessible to us because it is trapped in glaciers or is too deep in the ground to recover. Pour out 35 ml (i.e., 70 percent of the 50 ml in the beaker).
4. Now show students the amount left, and point out that this amount represents less than one percent of the total amount of water on Earth. This freshwater is all there is to support human needs for agriculture, drinking, and washing, as well as the needs of all lakes, rivers, streams, and other freshwater ecosystems. Ask the students, "Can we get more fresh water for our needs?" *(The amount of all fresh and salt water on Earth is constant due to the water cycle. There will never be any more or less water than there is right now. Human activity, though, can create an imbalance in the supply of fresh water.)* "How does human activity affect the balance in the supply of fresh water?" *(Increasing population, standard of living, and industrial activity all put greater and greater demands on the supply of fresh water.)*

Procedure

1. Pass out copies of the attached Water Conservation handout.
2. Have students calculate the amount of water their families use in one week, using the steps given on the handout.

Observations and Conclusions

1. Which category shows the most water usage? *(Most data show that toilet flushing uses the most water per day, followed by showers and baths.)*
2. Use the following questions to lead a class discussion of ways to decrease water use:
   - What are three ways to reduce the amount of water you use?
   - If you practiced these three conservation measures for a week, how much water would you save?
   - Suppose everyone in your family joined you in your conservation effort for one week. How much water would then be saved?

Assessment

- **Questions**
  - What percent of Earth's water is available for human use or consumption?
  - List five acts of stewardship you can practice to help conserve water in your home, school, and community.
- **Journal/Writing Prompts**
  - Write a paragraph describing federal, state, or local agencies that promote conservation.
  - Describe three changes you plan to make in your life that will help to conserve water.
- **Other**
  - Have students locate and critique a media article or editorial (print or electronic) concerning water use or water quality. Analyze and evaluate the science concepts involved.
  - Have students produce a live commercial to support water conservation. If possible, make a video of the commercial.

Extensions and Connections (for all students)

- Divide students into two groups, one representing a citizens' rights group and the other representing a group of environmentalists. Have the environmentalists propose a federal law that would make it a crime to use fertilizer on lawns because it frequently runs off into the ground or surface water. Remind students that they must include justifications for the law and penalties for breaking it. Have the citizens' rights group prepare an argument against the law, contending that the law is unjust because it restricts their rights to private property. Have the two groups debate the issue.
- Have students predict events or circumstances that could negatively affect the supply of fresh water in your community. What would be the impact if the community's water source ran dry? How would people in your community compete for this resource? Would other communities be willing to share their water? Brainstorm ways that the community could work together to reduce its freshwater consumption.

- Describe the following scenario to students: "You live in the Middle East or in North Africa. Your country is classified as having a water shortage. Water shortages happen when demand exceeds supply due to population growth, drought, or widespread practices that consume excessive amounts of water. That means that there are insufficient water resources to meet the water needs for personal use, food production, industry, and environmental purposes. Due to restrictions on water use, you are permitted to use only one gallon of water per day. Since there is no plumbing in your region, you must walk a mile every day to get your gallon of freshwater." Have students try using only one gallon of water for one day. If this is too easy, challenge them to try it for a week. Discuss the value of that gallon of water.

Strategies for Differentiation

- Have students share with partners the primary water usage recorded on their Water Conservation activity sheet and then describe at least one way that they might conserve water in their homes.
- As alternative to brainstorming conservation ideas, allow students to search online and ask adults for suggestions.
- Have students interview adults and/or peers regarding their personal viewpoints of conservation.
- Pair students heterogeneously, and have pairs create water conservation posters. Display posters throughout school. You might provide templates and/or images, as needed.
- Take students to tour a water treatment plant to learn methods of conservation applicable to their lives.
- Invite the director of a water treatment plant to explain the work of the plant.
- Have the class create an "idea wall" to include ideas and catch phrases/rhymes/mottos for conservation and waste management.
- Have students complete graphic organizers to sort ideas from the "idea wall" as resources (e.g., "Renewable" = water, air, soil, plants, animals; "Nonrenewable" = coal, oil, natural gas, nuclear power, mineral resources).

Water Conservation

Name: _____ **Date:** _____ **Class:** _____

Purpose

To determine the amount of water used by a family in a week and to develop ideas for conservation of water

Prediction

How much water does your family use in one week?

Materials

Water Usage Data

Activity	Approximate Amount of Water Used
Taking a shower	5 gallon per minute
Taking a bath	25 gallons
Brushing teeth and letting water run	3 gallons
Cleaning the house	8 gallons
Running the dishwasher	14 gallons
Washing dishes by hand 3 times a day	10 gallons
Flushing the toilet	5 gallons per flush
Watering the lawn	10 gallons per minute
Letting faucet drip	15 gallons per day
Running the washing machine	40 gallons per load

Steps

1. Calculate how much water your family uses for showers in one week.

_____ × _____ = _____
No. of showers per week | Average no. of min. per shower | Showering min. per week

_____ × _____ = _____
Showering min. per week | Gallons per min. | Total gallons per week

2. Calculate the number of gallons used per week for the following activities:

Activity	Times/Week	Gallons/Activity	Gallons Used/Week
Taking showers (Transfer data from step 1.)			
Taking baths			
Brushing teeth and letting water run			
Cleaning the house			
Running the dishwasher			
Washing dishes by hand			
Flushing the toilet			
Watering the lawn			
Letting faucet drip			
Running the washing machine			
TOTAL GALLONS USED			

3. Assume water costs $0.01 per gallon. How much money does your family spend for water in one week?

   _____ × $0.01 = _____
   Gallons used Cost of water for one week

Analysis

1. What are three ways that you could reduce the amount of water you use?

2. How much water would you save if you practiced these three conservation measures for one week?

3. How much water would your family save if everyone practiced these three conservation measures?

4. How would your life be affected if no water came out when you turned the faucet on?