

8th Grade
Water Quantity

Water To Supply an Ever-growing Population

LEARNING OBJECTIVES

The student will begin to understand that although water cycles through our environment, the amount of available freshwater is limited. The student will begin to understand the need for alternative solutions for future freshwater supplies.

STUDENT PERFORMANCE OBJECTIVES

- *The students will recognize that water is an essential element of the natural environment.
- *The students will model the hydrologic cycle.
- *The students will evaluate the changes in population over time and evaluate the present and future demands for freshwater.
- *The students will research and identify known ways to conserve freshwater.
- *The students will investigate the control and distribution of freshwater locally and globally
- *The students will devise alternative solutions for conserving freshwater for the growing population.

BACKGROUND

The United States abundance of water leads many people to believe that there will never be a shortage of water. Water constantly cycles through the environment; however, water does not fall evenly on the Earth. Water is carried by tradewinds and weather patterns to different parts of the world, and only a small portion of water falls down into our freshwater supplies. Most of the water returns to the oceans. While the United States has an abundance of freshwater with its rivers, lakes, aquifers, and streams, other countries and continents struggle for survival due to their limited supply. As water knows no boundaries, many states and countries share water resources, which creates a need for cooperation and planning.

Due to the natural cycle of water, it is impossible to calculate an exact volume of total water that exists in the world. The world's water is found in the oceans, lakes, rivers and streams, as well as glaciers, groundwater and the atmosphere. The volume of the Earth's water can be estimated by utilizing known resources and unknown or inferred resources. Many of our estimates of unknown resources are made through indirect evidence and therefore are uncertain.

An inventory of this valuable resource we need to live, grow food and raise animals is taken providing us with information that three-fourths of the world is made of water. This number is misleading as 97 percent of that water is in the oceans, full of salt and unusable for our needs. Two percent is tied up in glaciers or in the atmosphere leaving less than one percent as available fresh water. This makes water a concern for all. Understanding the little water that is available, conserving this valuable resource and cooperating with other nations will help us to develop and make wise choices about our resources.

Although each person needs only one gallon of water a day to sustain life per person, the average United States household uses 150 gallons. This is more than most other nations around the world. However, freshwater sources are becoming scarce for many countries, especially those experiencing high population growth.

The amount of water on Earth has remained approximately the same since the beginning. However, the number of people using this water has grown considerably. As we continue to use this limited, valuable resource some of the water becomes unusable and therefore further limits the supply even more. The future of the available freshwater may depend on innovative and currently unknown solutions.

See other lessons on the watercycle, watersheds, wastewater, surface water, groundwater, local watersheds, available freshwater and conservation.

<for more>

MATERIALS

- * World maps or globes for each group of students
- * Datasheet [WQty/8-1]
- * Glass aquarium
- * Plexiglass?
- * Soil
- * Fast growing plants (such as: moss and liverworts)
- * Water sprayer
- * Salt water
- * Distilling apparatus

OPENING

Ask the class:

How much water is in the world today? Is water a limited resource? How is water redistributed around the globe in the watercycle?

PROCEDURE

Discuss with the class:

What is the hydrologic cycle? How does it redistribute the world's water? How is the water used and/or misused?

The activity (as listed in step #4) has been adapted from EPA's The Water Source Book; *The Hydrologic Cycle*. To order copies of The Water Sourcebook, contact the Water Environment Federation, <http://www.wef.org>

1. Using globes or maps, have students identify water sources around the world.
2. Using the datasheet [WQty/8-1] have the students draw and label the water resources around the world and answer the questions on the datasheet.
3. Discuss the countries with high populations and review their water sources. Are their water supplies limited?
4. Create a water cycle.
 - a) In the aquarium place a soil mixture in one end so that it slopes down from one side of the aquarium to the other.
 - b) Tilt the aquarium so that one side is slightly higher than the other.
 - c) Pour water in the other end of the aquarium so that it creates a pool.
 - d) Plant the moss and/or liverworts in the soil and mist well with a sprayer to dampen the plants and the soil, but not enough to make mud.
 - e) Place the Plexiglass ? in the aquarium so that one end sits in the lower end of the aquarium and the other end is flush with the top of the higher end of the aquarium.
 - f) Set the aquarium in a window so that it gets indirect or partial light through out the day.
5. Have the students observe the aquarium for a few days. Discuss and review the stages of the hydrologic cycle.
6. Ask the class how they could tell that evaporation and transpiration were taking place.
7. Discuss how water is essential for life on Earth.
8. Identify your city's water source (for Denton Lake Lewisville and Lake Ray Roberts) and how water is collected and distributed to the residents.
9. Have the students open the Ecoplex web site (<http://www.ecoplex.unt.edu/main.html>) to compare the water levels of Lake Lewisville over time (for the last year or two to observe times of drought and times of rain. Best example rainfall between 1998-1999). (See lesson [H₂O is Underground Too](#)).
10. After identifying periods of drought or low rainfall, discuss what

management techniques, if any, cities used to conserve water (such as water rationing, encouraging xeroscaping and contingency plans).

11. Discuss the population growth of your city and determine the effect population has on the water supplies for your area.
12. Ask the class if the hydrologic cycle distributes water to all parts of the world equally.
13. Ask the class how the population growth of the world affects the water supply.
14. Have the class discuss the short term and long term conservation methods we can use to protect water sources.
15. Ask the class if there is any other way to provide water to the world. Are there any other alternative solutions to collect and store water?
16. Have the students brainstorm their ideas.
17. Inform the students that their role as scientists is to invent alternative solutions to address the Earth's Water issues.
18. Have an Invention Conference for the students to present their ideas

**SO WHAT?
(LIFE APPLICATION)**

Have the students create a brochure to discuss global water issues and explain their invention or solution.

**CURRICULUM
EXTENSIONS**

Math:

Have the students research the population of their city and calculate the amount of water that their residents use.

Language Arts:

Have the students create a water trivia game to inform others of the value of water as a limited resource.

Have the students write the Congress person from their district requesting the Water Rights of their city and state.

Science:

Have the students discuss some things that water is capable of doing such as: Water as the universal solvent, surface tension and capillary action. Have the students create test and experiments to demonstrate these characteristics.

Investigate water's role in providing the world's energy (hydropower, hydroelectric and tidal power).

Social Studies:

Locate areas around the world that have had recent water shortages. Research and discover if these areas have large industries, agricultural areas, economic center or deserts. How do these activities affect the water supply?

TEKS:**RESOURCES**

Ecoplex web site <http://www.ecoplex.unt.edu/main.html>

The Water Sourcebook

<http://www.stark.k12.oh.us/Docs/units/1996/water.mr/>

<http://www.ga.usgs.gov/edu/earthriverslandscape.html>

<http://www.und.nodak.edu/instrudt/eng/fkarner/pages/hands.htm>

<http://www.ncsa.uiuc.edu/Edu/RSE/RSEred/lesson3Activity3.html>

<http://www.cityofdenton.com/utilities/waterquality.1999.html>