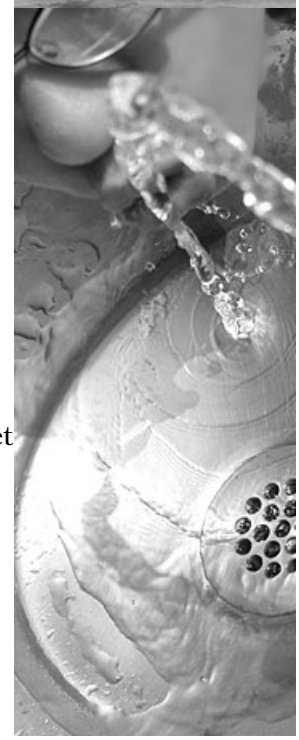
Water Quantity



Activity: Students remove measured amounts of water from a five-gallon bucket, simulating the amount of fresh water available on earth.

Grade Level: 4-8
Subjects: Science, social studies
Setting: Classroom
Duration: 1 hour
Key terms: Freshwater, Groundwater, Salt Water, Surface Water

OBJECTIVES

After participating in this activity, students will:

- Experience the relative scarcity of freshwater on the planet
- Explain why some of the earth's water is not easily accessible

SUMMARY

Even though the earth contains an abundance of water, only a small percentage is fresh water. An even smaller amount of this freshwater is accessible and usable by the people and animals that need it. As the human population grows, the amount of freshwater available per person shrinks. The relatively small amount of available freshwater demonstrates how critical it is for everyone to help maintain clean, healthy lakes and streams.

BACKGROUND

Oceans and seas contain more than 97 percent of the water on the planet. Because it is salt water, it is not healthy for humans and animals to drink. The remaining supply of water on Earth is fresh water.
The amount of freshwater available for use by living beings is very small (See chart). The Great Lakes contain 20 percent of the world's supply of surface freshwater. Other reservoirs of freshwater are not available for use by humans. For instance, more than 2 percent of the Earth's freshwater is "locked" in ice caps and glaciers.

The Earth's supply of water remains the same: the planet has as much water as it will ever have. Yet world population continues to grow. The relatively small amount of available freshwater supports more than 6 billion people. As this number increase, the amount of fresh water available per person decreases. Thus maintaining the quality of the Earth's available fresh water is vitally important.

Amount of water in each major reservoir on Earth:

Saltwater in oceans:	97.2%
Ice caps and glaciers:	2.14%
Groundwater:	0.61%
Surface water:	0.009%
Soil moisture	0.005%
Total:	**100%**

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HTTP://WWW.MISEAGRANT.UMICH.EDU/FLOW
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MATERIALS & PREPARATION

- 5-gallon bucket
- 2-cup transparent measuring cup
- 1-cup transparent measuring cup
- 1 eye-dropper
- Water body worksheet

Advance Preparation

Before class starts, fill the 5-gallon bucket with water. Have the other materials nearby in a place where the whole class can observe.

Note: Be sure to wipe water off the floor if it spills during this activity.

PROCEDURE

1) Explain to students that the water in the 5-gallon bucket represents all the water on Earth. Ask them to name the kinds of water that exist in, on or around Earth. They should be able to name rivers, lakes, oceans, clouds or water vapor, ice caps, groundwater, water held in soil, and water held in plants and animals. Provide hints so that all types of water are mentioned.
2) Ask two students to come up and help with the demonstration. Ask one of them to remove two cups of water from the bucket, using a measuring cup. Have the student hold that amount so everyone in the class can see it. Ask: What does the water in the cup represent? (Freshwater.) Ask: What does the water remaining in the bucket represent? (Saltwater.) Explain that the saltwater is not usable by humans because drinking it would make us very sick.
3) Move the bucket aside. Ask the first student to pour 1/2 cup of water into the one-cup measurer held by the other student. Ask: What does the 1-1/2 cups still left in the two-cup measurer represent? (Polar ice caps.) Explain that this water is unavailable for our use because it is frozen. Set this cup aside. The first student can return to his or her seat.
4) Ask the class what the 1/2 cup of water represents. (Groundwater, surface water (e.g. lakes, rivers, wetlands), and water vapor in the atmosphere.) Have the class guess how much water should be removed from the cup to represent only the surface water on Earth. After a few guesses, pull out the eye dropper from your pocket and draw some water into it. Place one drop of water into the hand of a few students. Explain that one drop of water out of a whole 5-gallon bucket represents the water that is available to us and other animals for drinking.
5) Allow the class to think about this for a minute. Then explain to them that the total amount of water on the planet is not going to change. Even though water moves around on the planet and changes from one kind to another, we will never have any more than we have right now.

Discuss the results

Spend some time discussing the activity with the class. The following questions are a good place to start:

- Were you surprised at how little water is available to use?
- Would you call water a scarce or an abundant resource? Why?
- What do we need/use water for?
- Why can't we drink saltwater?
- The number of people who need to use Earth's freshwater keeps increasing. If the amount of freshwater cannot change, but there are more people who need it, what does that mean? What might happen?
- Can people and animals live without clean freshwater?
- What is the main cause of the increased demand for freshwater?

Ask students to think about the term "water quality." Find out what they think it means. If they get stuck, have them think about it in terms of low water quality or high water quality: would they want to drink, wash, swim, or cook with low quality water or high quality water? Have them come up with as many descriptions as they can for what might be "low quality" and "high quality" water. See: Lesson 2.4

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SOURCE

Originally from North Carolina Museum of Natural Sciences-Adapted with permission from the Girls in Science Program for Fisheries Learning on the Web, http://www.miseagrant.umich.edu/flow, Michigan Sea Grant. Original source content: *Hands On Save Our Streams—The Save Our Streams Teacher's Manual*, Chapter One, Watersheds, Water Water Everywhere and Not A Drop to Spare, Water Supply Activity, The Izaak Walton League of America.

GLOSSARY

Freshwater: Not salt or ocean water.

Groundwater: Water held below the surface of the land, underground.

Salt Water: Ocean or sea water.

Surface Water: Water that is above ground, e.g., in lakes and rivers.

ASSESSMENT/EVALUATION

An assessment chart is included in the following pages to allow teachers to create their own assessment.

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Water Quantity
Assessment

This assessment chart was designed for teachers to create their own assessment. The recommended points show the relative difficulty of student performance. In creating assessments, the total point value will depend on the number and type of perform-

Learning Objective	Student Performance	Recommended # Points
Experience the relative scarcity of freshwater on the planet	Compare: The amount of available freshwater to the total amount of water on the planet	1 each
Explain why some of Earth's water is not easily accessible	List: The places or types of water that are not readily usable by us	1 each
Understand that as the human population increases, the amount of freshwater per person decreases	Explain: That the amount of freshwater on the planet is basically constant Explain: That since the amount of freshwater stays the same, as the human population increases there is less freshwater per person.	1 each 3 each

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Water Quantity
Standards and Benchmarks

For PDF summaries of the Elementary and Middle school standards listed here, see:

Elementary: www.miseagrant.umich.edu/flow/pdf/FLOW_Elementary_Standards.pdf
Middle: www.miseagrant.umich.edu/flow/pdf/FLOW_Middle_Standards.pdf

State of Michigan

Science	
Elementary	Middle
II.1.4 III.5.3 III.5.5 V.1.1 V.1.5 V.2.1 V.2.3 V.2.4	II.1.3 V.2.1

Social Studies	
Elementary	Middle
II.2.2	II.2.4 II.2.5

NSES	
Elementary	Middle
B1-1 C1-1 C3-4 F2-1 F2-2 F3-1 F3-3	D1-6 F2-2 F3-2

AAAS	
Elementary	Middle
n/a	4B-8 4B-11 5D-1

NAAEE	
Elementary	Middle
2.3-D 2.4-A 2.4-E	2.3-D 2.4-A 2.4-E

NCSS	
Elementary	Middle
IX.d	IX.d

Notes:
NSES = National Science Education Standards
AAAS = American Association for the Advancement of Science (Benchmarks)
NAAEE = North American Association of Environmental Education (Guidelines for Excellence)
NCSS = National Council for the Social Studies (Standards)

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