

Understanding Global Water Distribution: The International Year of Freshwater 2003

Grade Level: 5-12

Subject Areas: Earth Science, Hydrology

Duration: 50 minutes

Setting: classroom, lab

Skills: measurement, global perspective

Vocabulary: groundwater, surface water, glaciers, freshwater lakes, atmospheric and soil moisture

Related State Content Benchmark Objectives

- Use maps of the earth to locate water in its various forms and describe conditions under which they exist.
- Identify sources of water and its uses.

Objectives

Students will be able to:

- describe the distribution of Earth's water
- name the sources of freshwater on Earth
- describe the uniqueness of the Great Lakes as a large source of fresh water, in comparison with other inland waters of the world.

Materials

- 1,000 mL freshwater
- 2 x 1,000 mL graduated cylinder
- 6 x 50 mL graduated cylinder
- red, blue, and green food coloring
- eye dropper
- bucket
- paper labels for the six divisions of Earth's water indicating water source and quantity
- world map or globe

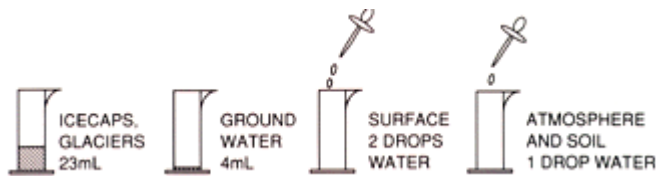
Background

Freshwater ecosystems are a rare and vital global resource. The United Nations declared this year as the “Year of Freshwater 2003”. During each shipboard program students are reminded that almost 20% of the Earth’s available freshwater is contained within the Great Lakes. It is likely that most of these students assume that a supply of clean freshwater will always be available to them. Humans must have freshwater to live, but about 97.5% of the Earth's water is too salty to use. The remaining 2.5% is freshwater, but most of it is in polar icecaps, remote glaciers, and icebergs. This makes it inaccessible. Accessible freshwater, therefore, comes from streams, lakes, and underground sources. These sources represent less than one-half of 1% of all water on Earth. Placing the massive units of measure used to calculate this fact into perspective is challenging for students of any age. Students of all ages will understand the visual demonstration of water distribution described below and older students will benefit from the wrap-up questions. Please give your students an edge for the Schoolship program by introducing global water distribution and discussing the importance of the Great Lakes as a source of fresh surface water.

The Activity

1. Peak your students’ interest by organizing them for a quick water collection trip from a local stream, lake, or pond. If that is not possible, ask each student to collect 1 cup of water from home. At the beginning of class, have each student pour their cup of water into a bucket. Ask them to share where it came from and how its tastes, smells, etc.
2. Fill one 1,000-mL graduated cylinder with water to the 1,000 mL line. This represents the Earth's entire supply of water.

- Pour 28 mL of the total water into a second 1,000-mL graduated cylinder. The 28 mL of water represents the Earth's total freshwater supply. Add blue food coloring to this freshwater. The remaining 972 mL of water is saltwater that occurs primarily in oceans. Add red food coloring to this "salt water".
- Divide the 28 mL of freshwater by pouring into smaller containers, 23 mL for icecaps and glaciers, 4 mL for ground water, 2 drops for surface water, and 1 drop for the water in the atmosphere and soil.



- Using data from "Graphical Representation of Global Waters" on the following page, list the percentages of Earth's water on the chalkboard and use labels to identify the water in each graduated cylinder. Refer to the numbers on as you continue.
- Challenge your students to divide the 2 drops of surface water into five parts. One fifth of the 2 drops equals the amount of the world's fresh surface water supply contained in the Great Lakes watershed. Use another 50 mL graduated cylinder filled with 50 mL of water to describe all surface freshwater. Add green food coloring and separate 20% or 10 mL for the Great Lakes.
- Show students the globe or world map and encourage them to talk about where the other 4/5th of fresh surface water is located. Do they see any other large lakes like ours? Use the figure "The surface areas of large inland water of the world" as an overhead to stimulate discussion. You may also wish to copy this figure for your class and have them find and circle the 5 largest areas of inland surface water.

Wrap-up Questions

As you examine and compare the different volumes of water in the graduated cylinders, ask your students the following questions:

- Where is most of Earth's water found
- Can cities near oceans use the water from the oceans for households and industry?
- Can salts be removed from water?
- Which of the four freshwater graduated cylinders represents the most freshwater on Earth?
- Is this a source of freshwater commonly used by humans for drinking, watering lawns, etc.?
- Approximately what percentage of the Earth's freshwater is ground water?
- What percentage of fresh surface water is found in the Great Lakes?
- What are other large reservoirs of fresh surface water as seen on the globe or world map?

Answers

- Oceans
- No, the ocean water contains salts that are harmful to humans, kill plants, and corrode metals.
- Yes, but the desalinization process is very expensive.
- Icecaps and glaciers.
- No, icecaps and glaciers are usually too far away from population centers.
- 14% in the demonstration, but sources say up to 30.1%
- 20%
- Lake Victoria, Lake Baikal, etc.

Additional Resources

<http://www.wateryear2003.org>

Presents activities and data compiled for the International Year of Freshwater 2003

<http://www.worldwater.org/links.htm>

The ultimate global water links page

<http://www.nationalgeographic.com/wildworld/index/html>

Site about the terrestrial ecoregions of the world which pays special attention to the Great Lakes

<http://www.pbs.org/earthonedge/ecosystems/freshwater.html>

Excellent freshwater report for older students to get a global perspective. In downloadable form.

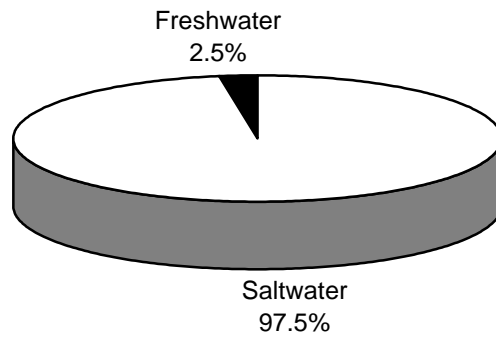
Sources:

<http://www.und.nodak.edu/instruct/eng/fkarner/pages/hands.htm> Courtesy of the American Water Resource Association AWRA Adapted from South Florida Water Management District, "Auditing Your Water Use"

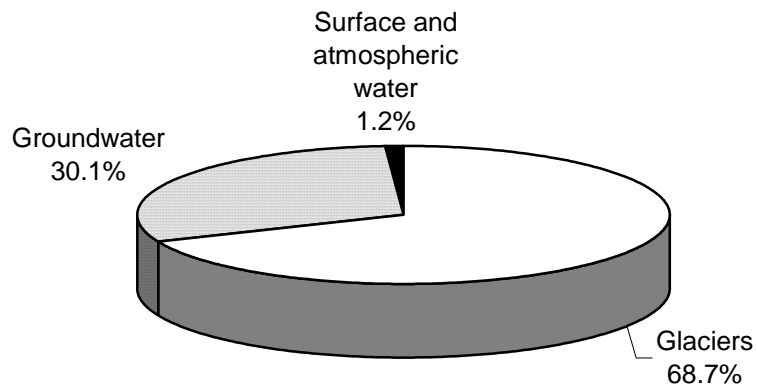
Ruttner, Franz., 1969. Fundamentals of Limnology. University of Toronto Press. Pg. 177

GRAPHICAL REPRESENTATION OF GLOBAL WATERS

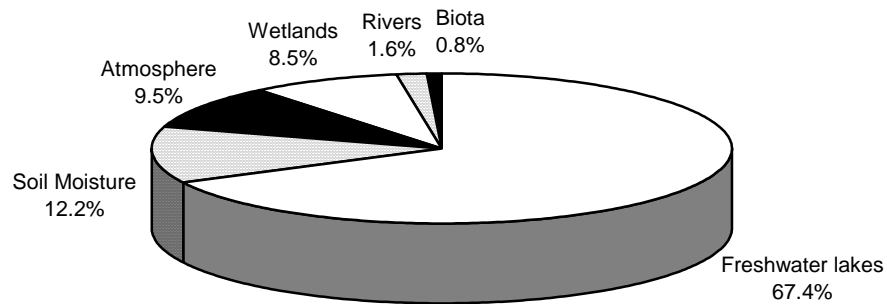
TOTAL WATER

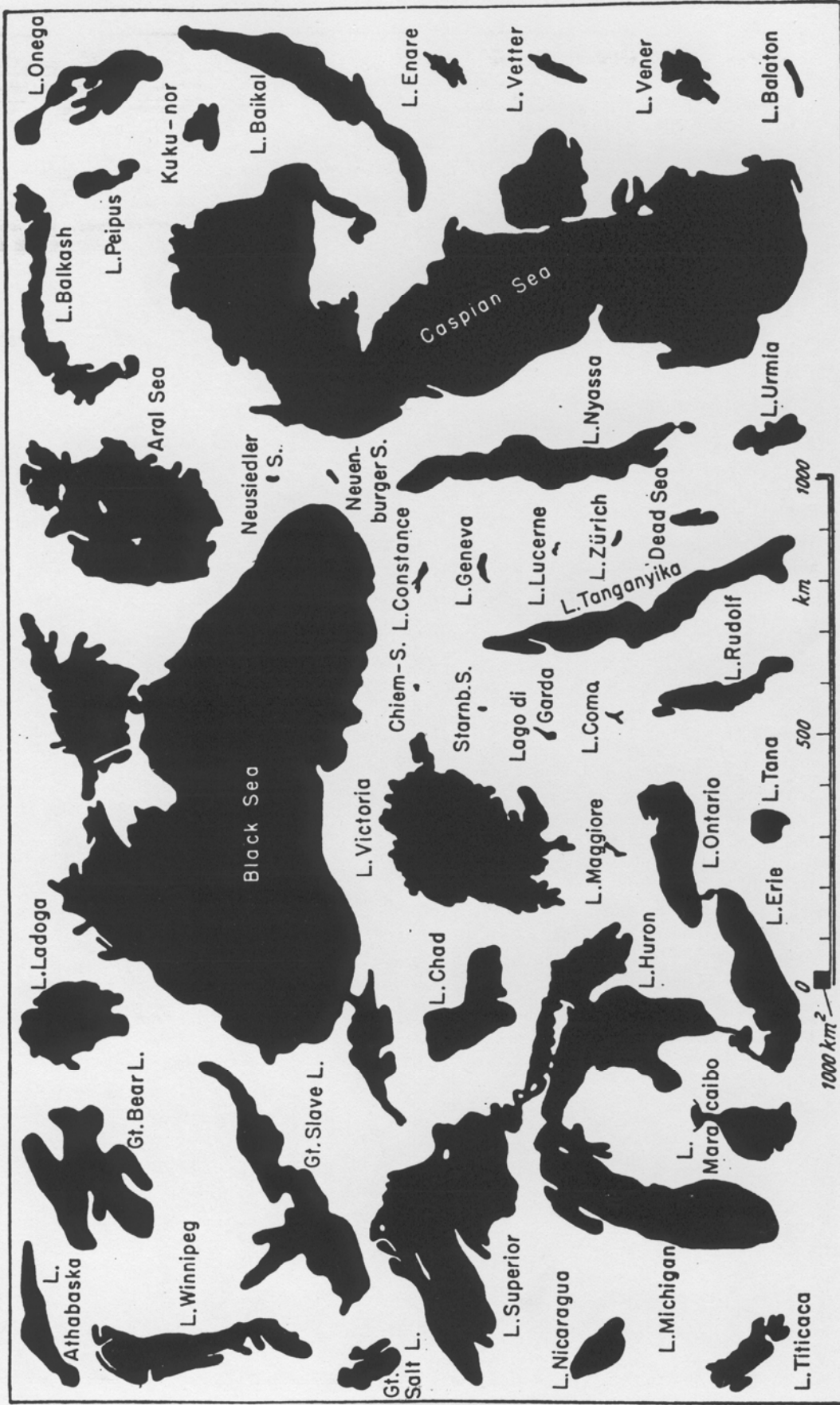


TOTAL FRESHWATER



SURFACE & ATMOSPHERIC WATER





The surface areas of a number of the large inland waters of the world, all drawn to the same scale.