

WATER QUALITY AWARENESS IN URBAN ENVIRONMENTS

LESSON 1

WHERE IN THE WORLD IS WATER?



LESSON 1: Where in the World is Water?

Lesson Overview: Water, one of Earth's most limited resources, is "re-cycled" over and over again. It is important to understand the restricted accessibility of fresh water available on earth to sustain human, animal and plant life.

We may think that water is everywhere, but is it? Although water covers 70-75% of the earth's surface, most of it is in the world's oceans (97 %!) in the form of **salt water**, which cannot be used to support life on land because of its salinity (salt content). (**Note:** A very small amount of saltwater is found in inland bodies of water like Utah's Great Salt Lake). After oceans, 2% of the remaining water is frozen in icecaps and glaciers. Although this is **fresh water**, it is also unavailable to plants and animals that live on land because it is frozen. The remaining water on earth – less than 1% – is found in **groundwater**, freshwater **lakes**, **streams**, and as **water vapor** in the atmosphere.

NOTE: Percentages in this lesson are approximated calculations as water distribution is continually changing.

Activity Concepts: Global water distribution

Subject Links: Science: hydrologic cycle

Vocabulary: Global water distribution; salt water; freshwater; groundwater; lakes; streams; water vapor; and water conservation.

Purpose of activities: Youth will have the opportunity to explore how water is distributed on Earth.

Overview of activities: Youth will explore global water distribution through hands-on activities.

Time Required: Approximately 20-30 minutes (Activity 1); approximately 30-40 minutes (Activity 2).

Getting Ready:

- Divide the participants into small groups of 4-6 youth.
- Provide each group with the materials needed for both activities.

Materials Needed for each Group:

- 12-inch inflatable globe (Activity 1)
- One five-gallon container (e.g., aquarium; bucket; bottle) (Activity 2)
- Writing materials, preferably markers and flip chart paper (Activities 1 and 2)
- Calculator (Activities 1 and 2)
- Measuring cup (Activity 2)
- One set of measuring spoons (1 TBSP; 1 TSP; $\frac{3}{4}$ TSP; $\frac{1}{2}$ TSP; $\frac{1}{4}$ TSP)(Activity 2)
- One mL syringe
- **Handout:** *Water Distribution on Earth*

Opening Questions:

Ask the youth the questions below. Ask them to explain their thoughts. Ask them to record their thoughts and ideas on the butcher paper or flip chart.

- What are some things you know about water?
- Where, outside of our homes and schools, do we find water?
- Why do you think water is important to humans? Why do you think it is important to plants and animals?

Activity 1:

Experiencing (Procedure):

Have each group inflate their globe and stand in a circle. Playing “soft toss” catch, have them throw the globe to one another a total of 100 times. After each catch, they should look at where their left thumb is on the globe. Is it on water? Is it on land?

Ask the groups to assign a record-keeper to keep record of how many times they catch the globe “on water” and “on land” using the paper provided.

Ask each group to share their totals and record the numbers on the paper provided.

Ask the groups to total the numbers for all groups and determine the percentages of the globe covered by water and the percentage of the globe covered by land using the paper provided.

Sharing, Processing, and Generalizing:

Once the youth have completed their individual and combined calculations, discuss the questions below:

1. What are some of the things you learned about the make-up of earth? Please share your thoughts.
2. What does this new knowledge tell you or make you wonder about where plants and animals live? Please share your thoughts.

Concept and Term Introduction:

At this point, it is important to ensure that the concept of global water distribution has been introduced or discovered by the youth. (Note: The goal is to have the youth discover terms and concepts independently within each group.) If their calculations are accurate, the youth should have discovered that 70-75% of the earth’s surface is covered by water, and most of it is in the world’s oceans as **salt water**; the remaining water is **fresh water**.

Activity 2:

Experiencing (Procedure):

Based on what they learned in Activity 1, ask the youth to now predict how much water on the earth is salt water and how much is fresh water. **Ask them to record their predictions on the paper provided and explain how they arrived at their figures.**

Ask each group to fill their 5-gallon container (80 cups) with water. Tell them that this represents all of the water on the earth. **Using their measuring spoons and/or plastic syringe, ask them to remove the following amounts and place that water into the measuring cup provided:**

- 0.2 mL or .0008 cups = amount of freshwater in the atmosphere as water vapor.
- 0.9 mL or .004 cups = amount of fresh water in soil moisture.
- 1.7 mL or .0072 cups = amount of fresh water in the world's rivers, streams, and lakes.
- $\frac{1}{2}$ cup = amount of the world's fresh water in groundwater.
- $1 \frac{3}{4}$ cups = amount of the world's freshwater in polar ice caps and glaciers.

Inform the youth that the water remaining in the 5-gallon container (1,280 TBSP) represents salt water, most of which is in the world's oceans. This water is unavailable for use by plants and animals that live on land because of its salt content.

Ask the youth to calculate the percentages of freshwater in streams, water vapor, lakes, groundwater, polar ice caps/glaciers, and oceans.

Volunteer Key:

- Water vapor = $.0008 \text{ cups} / 80 \text{ cups} = 0.001\%$
- Soil moisture = $.004 \text{ cups} / 80 \text{ cups} = 0.005\%$
- Freshwater rivers, streams, lakes = $.0072 \text{ cups} / 80 \text{ cups} = 0.009\%$
- Groundwater = $\frac{1}{2} \text{ cup} / 80 \text{ cups} = 0.6\%$
- Polar Ice Caps and Glaciers = $1 \frac{3}{4} \text{ cups} / 80 \text{ cups} = 2.2\%$
- Oceans and other salt water sources = $77 \frac{3}{4} \text{ cups} / 80 \text{ cups} = 97.2\%$

Sharing, Processing, and Generalizing:

Once the youth have completed their calculations, discuss the questions below:

1. What are some of the things you learned about the distribution of water on the earth? Please share your thoughts.
2. What does this new knowledge tell you or make you wonder about water availability for plants and animals that live on land? What about water availability for humans? Please share your thoughts.
3. What does **water conservation** mean to you? Please explain. Based on what you know about the distribution of water on the earth, why do you think that water conservation might be important? Please explain.

Concept and Term Introduction:

At this point, it is important to ensure that the concepts of global water distribution and water conservation have been introduced or discovered by the youth. Important terms to introduce include: salt water; freshwater; groundwater; lakes; streams; and water vapor. (Note: The goal is to have the youth discover terms and concepts independently within each group.)

Additionally, provide each youth with a copy of the handout entitled *Water Distribution on Earth*.

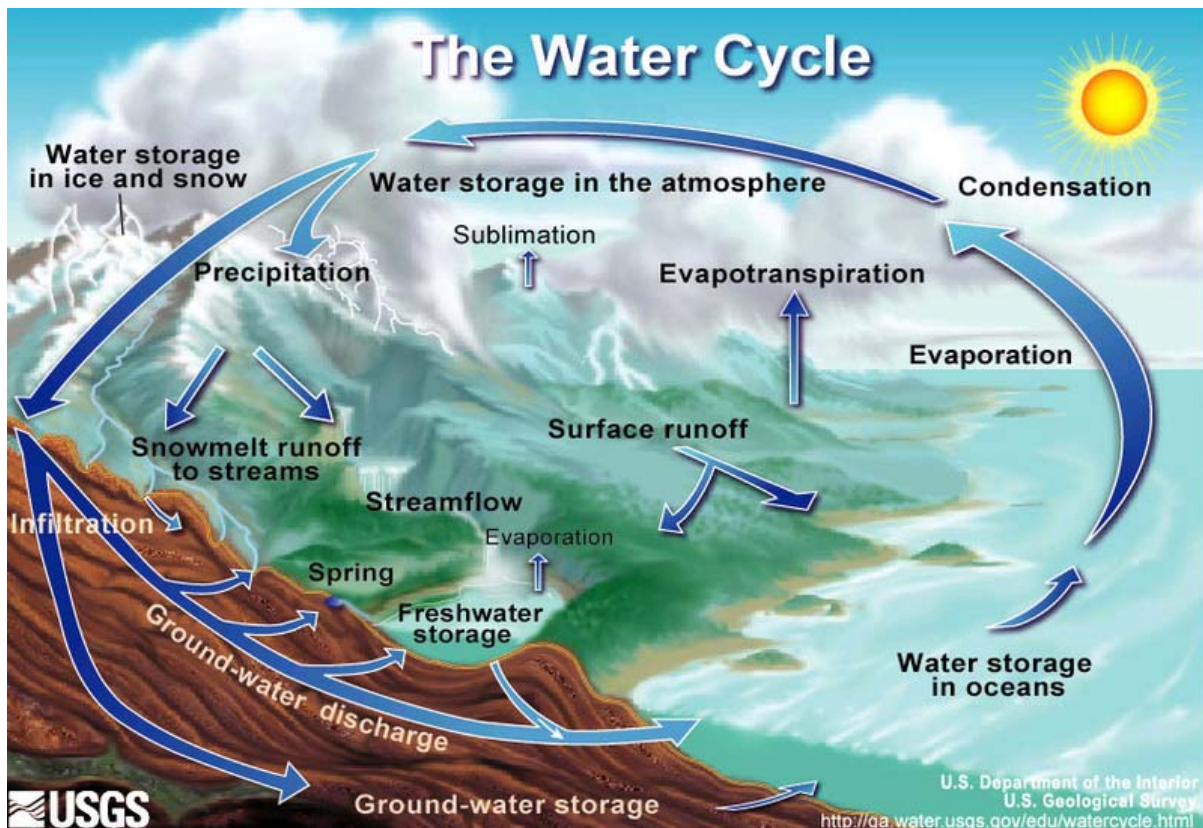
Concept Application:

The *Where in the World is Water?* curriculum activities provide youth with a wide variety of opportunities to apply their new knowledge in authentic contexts. Some examples include:

- Develop a list of ways to conserve water in the home environment. Present this list to your parents or care givers and try to estimate how many gallons of water you conserve in one week.
- Develop a list of ways to conserve water at school. Make a presentation to your class, your teachers, and/or your principal. Ask the school to adopt water conservation measures in order to help make the school more earth friendly.
- Develop a plan to conserve water in your community. Make a presentation to community leaders and propose your ideas. Write an article for a local paper that outlines your plan.

Water Distribution on Earth

- Water Vapor = .001% of the total water supply.
- Soil Moisture = 0.005% of the total water supply.
- Fresh Water Rivers, Streams and Lakes = .009% of the total water supply.
- Groundwater = 0.6% of the total water supply.
- Polar Ice Caps and Glaciers = 2.2% of the total water supply.
- Oceans and other salt water sources = 97.2 % of the total water supply.



LESSON HANDOUT

Resources:

Project WILD Aquatic. (1992). *Aquatic education activity guide*. Houston, Texas: Council for Environmental Education.

Harter, T. (2008). *Watersheds, Groundwater, and Drinking Water: A Practical Guide*. University of California Agriculture and Natural Resources. Publication 3497.

Wikipedia; http://commons.wikimedia.org/wiki/File:Water_cycle.png

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