

## **2.0 “WATER IS LIFE” GLOBAL WATER AWARENESS MINI-UNIT (GRADES 3-5)**

## National Curriculum Alignment:

### Geography Grades K-5

#### **NSS-G.K-12.3**

Physical Systems: Understand the physical processes that shape the patterns of Earth's surface/ Understand the characteristics and spatial distribution of ecosystems on Earth's surface.

#### **NSS-G.K-12.4**

Human Systems: Understand the characteristics, distribution, and migration of human populations on Earth's surface/ Understand the characteristics, distribution, and complexity of Earth's cultural mosaics/ Understand the patterns and networks of economic interdependence on Earth's surface/ Understand the processes, patterns, and functions of human settlement/ Understand how the forces of cooperation and conflict among people influence the division and control of Earth's surface.

#### **NSS-G.K-12.5**

Environment and Society: Understand how human actions modify the physical environment/ Understand how physical systems affect human systems/ Understand the changes that occur in the meaning, use, distribution, and importance of resources.

#### **NSS-G.K-12.6**

Uses of Geography: Understand how to apply geography to interpret the present and plan for the future.

### Science Grades K-5

#### **NS.K-4.3**

Life Science: Organisms and environment

#### **NS.K-4.4**

Earth and Space Science: Properties of earth materials

#### **NS.K-4.6**

Personal and Social Perspectives: Types of resources/ Changes in environments

### Math Grades K-5

#### **NM-MEA.3-5.1**

Understand Measurable Attributes of Objects and the Units, Systems, and Processes of Measurement

#### **NM-MEA.3-5.2**

Apply Appropriate Techniques, Tools, and Formulas to Determine Measurements

**NM-MEA.6-8.1**

Understand Measurable Attributes of Objects and the Units, Systems, and Processes of Measurement

**NM-MEA.6-8.2**

Apply Appropriate Techniques, Tools, and Formulas to Determine Measurements

**NM-NUM.3-5.1**

Understand numbers, ways of representing numbers, relationships among numbers, and number systems/Understand the place-value structure of the base-ten number system and be able to represent and compare whole numbers and decimals/ Recognize and generate equivalent forms of commonly used fractions, decimals, and percents.

**:: Elementary**

**:: A Drop in the Bucket**

**:: Level of difficulty and duration:** 

**Pre-activities:**

Students should understand/review percentages and should be familiar with the basic facts relating to the Earth's surface (water types and percentages). (Review the Water Awareness Basic Fact Sheet)

**Objective:**

Students will calculate the percentage of fresh water available for human use and explain why water is a limited resource. By estimating and calculating the percent of available fresh water on Earth, students understand that fresh water is limited and must be conserved and protected.

**Background Information:**

Students may know that Earth is covered mainly by water, but they may not realize that only a small amount is available for human consumption.

Ironically, on a planet approximately 71 percent water, this resource is one of the main limiting factors for life on Earth. The Water Availability Table summarizes the major factors affecting the amount of available water on Earth. If all the clean, fresh water were distributed equally among people, there would be about 1.82 million gallons (7 million liters) per person. This is only about .003 percent of the total water on Earth. On a global scale, only a small percentage of water is available, but this percentage represents a large amount per individual. The paradox is that, for some, water may appear plentiful, but for others it is a scarce commodity. Why are some people in need of more water? Geography, climate, and weather affect water distribution. Agriculture, industry, and domestic use also affect availability.

**Lesson:**

Students will estimate the proportion of potable water on Earth and compare it to the rest of the water on the planet. Students work in small groups. Instruct them to draw a large circle with a marker on white sheet of paper. Offer them two sheets of different-colored construction paper. One color represents available fresh water; the other represents the rest of the water on the planet. Next, inform students that they will be tearing the two sheets of paper into a total of 100 small pieces. Students will estimate how many pieces will represent potable water and how many pieces will indicate the rest of the water on the planet. Instruct each group to tear up their paper and arrange the 100 pieces within the circle so that these pieces reflect their estimates. Have groups record the number of pieces representing "potable" water and "remaining" water.

Note: For simplicity, measurements have been retained in metric.

1. Show the class a liter (1000 mL) of water and tell them it represents all the water on Earth.
2. Ask where most of the water is located. (Refer to a globe or map.) Pour 30 mL of the water into a 100-mL graduated cylinder. This represents Earth's fresh water, about 3 percent of the total.
3. Put salt in the remaining 970 mL to simulate water found in oceans, unsuitable for human consumption.

4. Ask students what is at the Earth's poles. Almost 80 percent of Earth's fresh water is frozen in ice caps and glaciers. Pour 6 mL of fresh water into a small dish or cylinder and place the rest in a nearby freezer or ice bucket. The water in the dish (around 0.6 percent of the total) represents non-frozen fresh water. Only about 1.5 mL of this water is surface water; the rest is underground.
5. Use an eyedropper or a glass stirring rod to remove a single drop of water (0.003 mL). Release this one drop into a small metal bucket. Make sure the students are very quiet so they can hear the sound of the drop hitting the bottom of the bucket. This represents clean, fresh water that is not polluted or otherwise unavailable for use, about .003 percent of the total! This precious drop must be managed properly.
6. Discuss the results of the demonstration. At this point many students will conclude that a very small amount of water is available to humans. However, this single drop is actually a large volume of water on a global scale. Have students use the Water Availability Table to calculate the actual amounts.

**Materials:**

2 colors of construction paper, sheets of white paper, markers, water, globe or world map, 1000-mL beaker, 100-mL graduated cylinders, small dish, salt, freezer or an ice bucket, eyedroppers or glass stirring rod, small metal bucket, and copies of Water Availability Table.

**Post-activities:**

Refer back to students' earlier guesses about how much water on Earth is available to humans and compare the actual percent of Earth's water available. Have students explain their reasoning for their initial estimates. How would they adjust their proportions? (One-half of one of the pieces of paper represents potentially available water [0.5 percent]. Only one small corner of this half [0.003 percent] is actually potable water.)

**Possible discussion question:**

*Why does more than one-third of the world's population not have access to clean water?*

Discuss the main factors affecting water distribution on Earth. Be sure to consider such influences as drought, contamination, flooding and economic conditions.

## WATER AVAILABILITY TABLE

Quantity to be divided among people on Earth	Amount Available Liters/person	% of total water
All the water on Earth	233.3 billion	100%
Only the fresh water (calculate 3% of the amount available)		3%
Only the non-frozen fresh water (calculate 20% of the remaining amount available)		0.6%
Available fresh water that is not polluted, trapped in soil, too far below ground, etc. (calculate 0.5% of the remaining amount available)		.003%

## ANSWER KEY

Total water on Earth divided among people	233.3 billion liters/ person
Minus the 97% of each share (226.3 billion) that contains salt	7 billion liters/person
Minus the 80% of this 7 billion that is frozen at the poles (5.6 billion)	1.4 billion liters/person
Minus the 99.5% of the 1.4 billion that is unavailable (1.393 billion)	7 million liters/person

# GLOBAL AWARENESS FACT SHEET

All living creatures, including humans, need water to survive

Despite all the water in the world, only a small amount is available to humans and other creatures that depend on freshwater

Poor people often pay more for water than wealthy people living in the same city

Water can travel from one part of the world to another through the water cycle

Human activities affect water quality all over the world

Many people living in other countries die because the water they drink makes them sick

2.6 billion people in the world lack basic sanitation resources

A person needs 4 to 5 gallons of clean water per day to survive

More than 700 gallons of water are needed to grow the cotton for just one T-shirt!

People living in water-rich regions can affect how people use water in water-deprived areas

Conserving water helps to preserve the planet's natural resources

Protecting freshwater resources is difficult because many rivers, lakes, and underground aquifers cross national boundaries

Salt water accounts for more than 97 percent of the water on Earth.

Millions of women and children spend several hours a day collecting water

In many parts of the world, fresh water is being used faster than it can be replaced

Less than 1% of the world's fresh water is readily accessible for direct human use

The earth has a limited amount of water. The same water keeps going around and around the planet in a process called the water cycle

A person can live weeks without food, but only about three days without water

All people need access to safe drinking water and improved sanitation conditions

Many people in the world suffer from health problems caused by drinking dirty water

**Sources:** (<http://www.amnh.org>) (<http://water.org>) (<http://news.nationalgeographic.com>)

## Vocabulary Safari Search

Draw a line to connect terms to the correct definition

fit or suitable for drinking	Sanitation	Rural	the promotion and preservation of health
a hole drilled or bored into the earth to obtain water	Resource		interference in the affairs of another
geological formation containing ground water	Terrain	Glacier	wind and heavy rains
extreme illness	Well	Contaminate	"of the countryside"
Taking precautions for the sake of cleanliness	Potable	Monsoon	something that indicates limits
a source of supply, support, or aid	Hygiene	Agriculture	a rate or proportion per hundred
one of the main land-masses of the globe	Boundary	Intervention	farming and/or raising livestock
to make unsuitable by contact with something unclean	Disease	Percentage	A huge mass of ice
easy to approach, reach, enter, or use	Archipelago	Accessible	a large group or chain of islands
natural environment being contaminated with harmful substances	Continent	Aquifer	the natural features of a tract of land
		Pollution	



# Vocabulary Safari Search Key

**Potable** - fit or suitable for drinking

**Well** - a hole drilled or bored into the earth to obtain water

**Aquifer** - any geological formation containing or conducting ground water

**Disease** - extreme illness

**Sanitation** - the application of measures for the sake of cleanliness

**Resource** - a source of supply, support, or aid

**Continent** - one of the main landmasses of the globe

**Contaminate** - to make unsuitable by contact or mixture with something unclean

**Accessible** - easy to approach, reach, enter, or use

**Pollution** - natural environment being contaminated with harmful substances

**Hygiene** - the promotion and preservation of health

**Intervention** - interference in the affairs of another

**Monsoon** - wind storm and heavy rains

**Rural** - "of the countryside"

**Boundary** - something that indicates bounds or limits

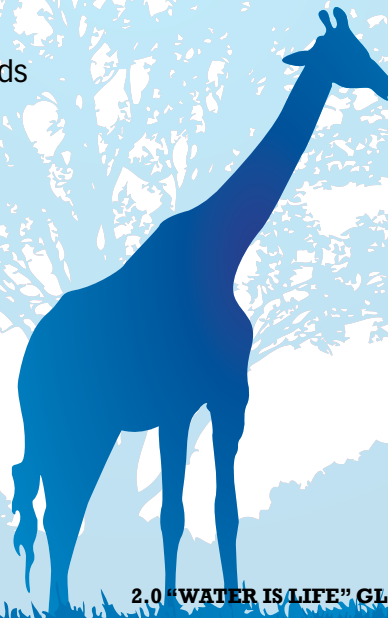
**Percentage** - a rate or proportion per hundred

**Agriculture** - farming and/or raising livestock

**Glacier** - A huge mass of ice

**Archipelago** - a large group or chain of islands

**Terrain** - the natural features of land



# “HOT WATER” GAME INSTRUCTIONS

“Hot Water” is suggested as a review for activities that have familiarized students with the Global Water Awareness Vocabulary List. The Global Water Awareness Fact Sheet, Global Water Awareness “Vocabulary Safari Search”, Water Awareness World Tour, and the “Water is Life” Website Search Activity all help familiarize students with terms and definitions from the list.

The object of the game is to stay out of “Hot Water”. Hot water can either be a location in the classroom or a designation that the student is no longer participating in the game. Examples of designations (other than a special location in the classroom) are red droplets of water cut out of construction paper or a stack of red plastic cups placed in the front of the room. Students will come to the front of the room either individually or in pairs and draw a term out of a basket or pail. If students are working in pairs they will each have an opportunity to explain the meaning of a single term they draw. If successful, they simply return to their seats to continue to play. If students cannot relate the meaning of the term they may pick up a red droplet of water to tape to their desk or they may place an empty red plastic cut on their desk so that the teacher can see they are no longer participating and will wait until the next round to re-enter the game. (Separate the terms from the definitions before placing in a container.)

**Scarce** - rare

**Potable** - fit or suitable for drinking

**Typhoid** - an infectious disease

**Well** - a hole drilled or bored into the earth to obtain water

**Aquifer** - any geological formation containing or conducting ground water

**Disease** - extreme illness

**Sanitation** - the application of measures for the sake of cleanliness

**Resource** - a source of supply, support, or aid

**Continent** - one of the main landmasses of the globe

**Contaminate** - to make unsuitable by contact or mixture with something unclean

**Accessible** - easy to approach, reach, enter, or use

**Pollution** - natural environment being contaminated with harmful substances

**Hygiene** - the promotion and preservation of health

**Economy** - a system of production, distribution and consumption

**Intervention** - interference in the affairs of another

**Monsoon** - wind storm and heavy rains

**Rural** - “of the countryside”

**Boundary** - something that indicates bounds or limits

**Percentage** - a rate or proportion per hundred

**Agriculture** - farming and/or raising livestock

**Glacier** - A huge mass of ice

**Archipelago** - a large group or chain of islands

**Terrain** - the natural features of land

# “WATER IS LIFE” WEBSITE SEARCH ACTIVITY

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Each of the below websites have valuable information that relates to the current global water crisis. Search each of the websites to find answers to the global water crisis questions. Remember to record the website where you find the answer to the question. Each website may offer differing information. (One easy way to search for specific information is to locate the search feature of a website and enter a keyword or phrase relating to your question.)

## Websites to search:

American Museum of Natural History: (<http://www.amnh.org>)

Discovery Education: (<http://www.discoveryeducation.com>)

Environmental Protection Agency: (<http://www.epa.gov>)

National Geographic: (<http://www.nationalgeographic.com>)

United Nations: (<http://www.un.org/Pubs/CyberSchoolBus/>)

WaterPartners International: (<http://www.water.org>)

**1:: How much water does the average person need each day to survive? Does your number of gallons include water for bathing and washing clothes? Does your number include water needed to grow food to eat?**

Answer: \_\_\_\_\_

Website: \_\_\_\_\_

**2:: What is the global percentage of saltwater vs. freshwater**

Answer: \_\_\_\_\_

Website: \_\_\_\_\_

**3:: Find a name and a brief description of a disease associated with contaminated water sources.**

Answer: \_\_\_\_\_

Website: \_\_\_\_\_

**4:: What percentage of the world's fresh water is ready for people to drink?**

Answer: \_\_\_\_\_

Website: \_\_\_\_\_

**5:: Why is it difficult for many people to find clean drinking water?**

Answer: \_\_\_\_\_

Website: \_\_\_\_\_

**6:: Search the WaterPartners International website and describe WaterCredit.**

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**7:: How many people on the planet do not have access to clean drinking water?**

Answer: \_\_\_\_\_

Website: \_\_\_\_\_

**8:: Visit the EPA website with your parents and click on "Surf your Watershed" for information about the source of the water in your home.**

Information: \_\_\_\_\_

**9:: List a fact about the global water crisis:**

Answer: \_\_\_\_\_

Website: \_\_\_\_\_

**10:: List a few water conservation ideas:**

Answer: \_\_\_\_\_

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Website: \_\_\_\_\_