



Usable Water

Authors: Michigan Water Stewardship Program, Eaton Conservation District, adapted from 'A Drop in the Bucket' from Project WET

Lesson Overview: This lesson contains information which is the foundation to understanding water on Earth. Through a demonstration of amounts of water available on Earth, students will gain a perspective regarding how little water is available on Earth for human consumption and understanding why it is important to protect and conserve the water we have on Earth.

Objectives: Students will be able to:

1. Learn the locations of water on earth.
2. Understand the need for water conservation.
3. Discover immediate action individuals can take to conserve water.
4. Recognize ground water as the most available source of fresh water.

This lesson meets the following Michigan Department of Education standards:

Next Generation Science Standards (NGSS):

- ✓ 2-ESS2-3 – Obtain information where water is found on Earth and that it can be solid or liquid
- ✓ 4-ESS2-2 – Analyze and interpret data from maps to describe patterns of Earth's features
- ✓ 5-ESS2-2 – Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth

Michigan Grade Level Content Expectations (GLCEs):

- ✓ S.IP.02.11 – Make purposeful observation of the natural world using the appropriate senses
- ✓ P.PM.02.14 – Measure the volume of liquids using common measuring tools (measuring cups, measuring spoons)
- ✓ E.FE.02.11 – Identify water sources (wells, springs, lakes, rivers, oceans)
- ✓ E.FE.02.12 – Identify household uses of water (drinking, cleaning, food preparation)
- ✓ S.IP.03.16 - Construct simple charts and graphs from data and observations
- ✓ S.RS.03.14 – Use data/samples as evidence to separate fact from opinion
- ✓ S.IP.04.12 - Generate questions based on observations
- ✓ S.IP.04.15 - Make accurate measurements with appropriate units (centimeters, meters, Celsius, grams, seconds, minutes,) for the measurement tool.
- ✓ S.IP.04.16 – Construct simple charts and graphs from data and observations
- ✓ S.IA.04.11 - Summarize information from charts and graphs to answer scientific questions
- ✓ S.IA.04.14 - Develop research strategies and skills for information gathering and problem solving
- ✓ S.RS.04.18 - Describe the effect humans and other organisms have on the balance of the natural world
- ✓ S.IP.05.11 – Generate questions based on observations, investigations, and research
- ✓ S.RS.05.17 – Describe the effect humans and other organisms have on the balance in the natural world

Recommended Grade(s): 2nd grade, 3rd grade, 4th grade, 5th grade

Recommended Subject(s): Earth Science **Duration:** Prep time: 5 min., Activity: 30 min

Materials Required: 1 gallon of water, ½ cup measuring cup, clear bowl, eye dropper, teaspoon, table spoon, small plate, food dye (optional), plastic inflatable globe, 7 clear gallon jugs, dry erase marker, funnel

Suggested Vocabulary for Students: atmosphere, climate, condensation, contaminates, conservation, drought, evaporation, glaciers, groundwater, hydrologic cycle/water cycle, icecaps, infiltration, precipitation, run-off, sewage, surface water, water conservation, water vapor

Background Information for Educator:

Water covers more than 70 percent of the earth's surface. Water is in the oceans, rivers, lakes, ground, and the air we breathe. Water helps regulate the earth's climate. The land quickly absorbs and releases heat from the sun, but the oceans absorb and release the heat slowly. This causes the ocean breezes to cool the land in the summer and warm it in the winter.

The continuous movement of water in and around the earth is called the **hydrologic cycle** or the **water cycle**. When rain or snow falls on oceans and land as **precipitation**, the soil will soak up some of the water. Plants will take up some of this water through their roots. Some water will move through the soil through the process of **infiltration** and become **groundwater**. Some of the water will also **run-off** or flow across the land into streams, marshes, lakes, and oceans. The water that remains on top of the earth is called **surface water**. Surface water will return to the **atmosphere** through **evaporation**. **Water vapor** in the air may then form clouds that cause precipitation (rain or snow) to occur again. This is a continuous cycle.

Life is not possible without water. Water is in every living thing. Our body is nearly 65% water. Our blood is 92%, muscles and kidneys are 79%, and bones are 31% water! Our major organs like the brain and heart are 73%, lungs are 83%, and our skin is 64% water! An ear of corn is nearly 70% water, a potato is about 80%, and a tomato is about 95%. In order for living things to carry out life processes, we must keep our water supply clean and healthy. We can live without food for nearly a month, but we cannot live without water for more than a few days.

Many people believe there is not enough water to meet all the needs of the people throughout the world. Yet, the world will always have the same amount of water because of the water cycle. In fact, the water we have today is the exact same water the dinosaurs drank from! However, the world's water is unevenly distributed. Some places that have plenty of water go through a drought at times and other places go through a constant drought. We must manage our water quality and supply carefully so it remains safe and plentiful to use.

Many conservation problems are due to mismanagement of our water supply. Over many years, people have dumped untreated sewage and other wastes into lakes and rivers. This **contaminates** the water. More and more people now realize we have to take special care of our water to ensure its quality, not only for now, but for the future.

Although 70 percent of the earth is water, nearly 97 percent is in the oceans. Ocean water is too salty for drinking, manufacturing, and farming. The fresh water available for us to use is about three percent of the earth's water supply. Three-fourths of the three percent fresh water is unavailable because it is in icecaps and other glaciers.

Lesson Procedure:

How Much Water Do You Use In A Day

- ~ Prior to the lesson, ask students to make a list of all the water that they use in one 24-hour period of time. Have students measure or estimate amounts of water used. Discuss results as a class. What were the common uses of water? Who used the most water? Who used the least water?
- ~ Most likely students accounted for obvious uses like the amount of water they used to brush their teeth and drink. What about indirect uses of water, such as the water used to process the food they ate, and the water used in our home for cooking, bathing and flushing the toilet? What are ways to reduce the amount of water used every day?

Globe Toss

- ~ To help students visualize all the water in the world and how very little of it is available for drinking, toss around an inflatable globe. Repeat this approximately 100 times (~4x per student. The longer you do this, the better the results). Each time the student catches the globe, ask them to tell the class what their right thumb is touching. Is it land or water? If it is water, what kind of water and is it drinkable? Record this information on the chalkboard or white board. Your results should more or less indicate that 70% of the time, thumbs will touch water and 30% land. As far as freshwater and saltwater goes, the type of water touched will largely be saltwater tied up in oceans.

Activity:

This table shows the distribution of Earth's water supply. Share this information with your students.

Location of Water Supply:

Source	% of Water Supply	Measurable Amount
Oceans	97.25%	15 cups + 1/3 cup + 1 tablespoon
Ice	2.05%	5 tablespoons + 1/2 teaspoon
Groundwater	0.68%	1 tablespoon + 2 teaspoons
Atmosphere	0.001%	1 drop of water
Inland Lakes	0.01%	8 drops of water
Rivers	0.0001%	1/10 drop of water

- ~ To demonstrate how much measurable water is available in each reservoir on Earth, take the one gallon of water and explain that this is a scientific scale model, and all the water in the world is contained within that one gallon. Have the students make hypotheses about how much water will belong in each reservoir (the 6 labeled jugs).
- ~ Using the funnel, slowly pour the water into one jug. Instruct your students to silently raise their hand when they think the jug is appropriately filled; stop pouring when about 2/3 of the class has their hands raised. Continue pouring in each jug while asking for examples of each type of source (ex: name rivers, name oceans, describe ground water, etc) until all the original water is distributed between all the water sources (saving the ocean for last). If there is a disagreement that a certain water body needs more or less water, make any necessary adjustments.

- ~ Once the class is at a general agreeance, use the dry-erase marker to draw a line across each jug to show the line of water in their hypothesis. Have the class help you arrange the water sources from most to least. Pour all the water back into the original container.
- ~ Then use the chart to pour the proper amounts of each water source into each jug.
 - Rivers – moisture inside jug
 - Lakes – 8 drops of water
 - Atmosphere – 1 drop of water
 - Groundwater – 1 tbs + 2 tsp
 - Ice – 5 tbs + ½ tsp
 - Oceans– 15 cups + 1/3 cup + 1 tbs
- ~ Ask the students to arrange the corrected amounts from most to least water. Ask which bodies of water are either inaccessible (glaciers, atmosphere) or unusable (ocean); remove those from view. Which bodies of water are acceptable for all life forms to consume and survive one?
- ~ * When you are all finished, recycle the water by watering plants on the school grounds!

Wrap up:

- ~ Where the students correct? Where the students surprised by the results?
- ~ Though water covers over 70% of the surface of the Earth, most of this water is not suitable for drinking. What would happen if there was a shortage of fresh water?
- ~ How might this affect the Great Lakes, which contains 20% of the world's freshwater supply?

Assessment Options:

- ~ Describe the water cycle.
- ~ Where is the least/most water?
- ~ Which source is the least/most usable by living things?
- ~ Which source is most readily available?
- ~ Which source is stored in the solid form? The liquid form? The gas form?
- ~ How can you and your family conserve water at home?
- ~ Why is water important?

Adaptations/Extension/Enhancements:

- ~ Have students make a visual display showing the distribution of water on earth.
- ~ Introduce the water cycle. Ask students to place the location of water on a diagram they make of the water cycle.
- ~ Assign individuals or groups of students the task of making a poster to encourage others to practice water conservation. Display these posters in the hallways or in the community (grocery store, bank, library, etc.) so many will see them.

Additional Resources:

- ~ MWSP website: www.miwaterstewardship.org
- ~ Water usage worksheet for student and family: <https://www.epa.gov/sites/production/files/2017-02/documents/ws-ourwater-drop-table.pdf>
- ~ EPA Water Sense Kids: <http://www.epa.gov/watersense/kids/simpleways.html>
- ~ Project WET: <https://www.projectwet.org/>

Our MWSP logo represents the two hands of Michigan - both the upper and lower peninsulas - and caring for our water resources and water quality. The green hand symbolizes all vegetation and crops in our state and the tan hand symbolizes soils. The lighter blue water signifies the vast surface water throughout the state and the darker blue water denotes groundwater.