GRADE LEVEL: 5-8 | TIME REQUIREMENT: 3 HOURS

EARTH AND SPACE SCIENCE: WATER CYCLE

1 READING | 2 ACTIVITIES

INTRODUCTION

Water is so ubiquitous that is easy to forget how important it is. Yet clean water was a very important part of logistics planning in World War II. Prior wars and the growth of urban areas had shown that deadly diseases like cholera can spread when clean water isn't available. Tropical diseases like malaria that are associated with stagnant water had killed millions in previous conflicts.

World War II covered territories from the deserts of North Africa, the arid Mediterranean, the mountains of the Alps, and the forests of Europe. The geography of the campaigns included the brutal ice of Greenland and the drenching rains of the tropical Pacific. In all these areas, troops needed clean water to drink and bathe to avoid disease.

OBJECTIVE

These resources focus on different aspects of the water cycle, framed by the challenge of finding potable water in the Pacific Theater during World War II. Testing water samples and building a solar still, students investigate the water cycle and the physical properties of water.

STANDARDS

NGSS DCI ESS2.C
The Roles of Water in Earth's Surface Processes

NGSS SEP
Developing and Using Models

NGSS SEP
Planning and Carrying Out Investigations

NGSS CCC
Systems and System Models

NGSS CCC
Scale, Proportion, and Quantity

PERFORMANCE EXPECTATIONS

NGSS 5-ESS2-2
Describe and graph the amounts of salt water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.

NGSS MS-ESS2-4
Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.

READING (1)

1. WATER EVERYWHERE

Description
This reading describes the Pacific Theater of World War II, which was dominated by expanses of ocean, drenched jungles, and wide rivers. In spite of all this water, finding clean water to drink and bathe in was a big challenge. You might use a diagram of the water cycle along with this reading. You could also perform a demonstration of the water distribution model. For this demonstration, start with a liter of water in a clear container so that students can watch. Remove the appropriate amounts of water, in sequence, into smaller and smaller containers, as outlined in the student handout. You could also have students make bar graphs of the relative amounts of water to practice their quantitative skills.

ACTIVITIES (2)

1. MEASURING WATER

Description
This is an activity that can be done in combination with Water Everywhere. This activity will require you or your students to collect samples of local water sources, on field trips, at school, or at home.

Supplies
Water Samples
pH paper
Thermometer
Other water quality tests (optional)

Instructions
You will need water samples that your students have collected. If that isn't possible, you could just make your own samples by adding dirt or other material to water or by taking it from a fish tank or other source. Recording temperature data only works if you are collecting water in the field. You will also need pH paper, which you can get inexpensively at a pet store or from a science materials supplier. You could easily add other water quality tests with some simple supplies. For example, pool and aquarium kits allow you to measure ammonium or salinity. Additionally, if you are in the field, you can use tools to measure how far into the water you can see or to record what animals and plants you see in the water.

2. SOLAR STILL

Description
This is an investigation activity that is perfect to follow the previous two. Please note that this activity is best done outside in groups on a warm, clear day. You can modify it to be done inside with heat lamps or an incandescent bulb.

Supplies
1 Small bucket
1 Small plastic cup
2 Cups of water, to which you have added some salt or dirt
Clear plastic (you may be able to use plastic wrap)
A small rock

Instructions
Have the students put the dirty water (or you can use salt water) in the bottom of the bucket. Then place the small cup upright in the middle of the bucket. Cover the bucket with the plastic, placing the weight on it in the middle so that the center of the plastic is lower than the edges. Then place the bucket in a warm spot outside. The water will slowly evaporate as it warms in the bucket, and some of it will condense on the plastic. Because the plastic is lower in the center of the bucket, the condensation will run down toward the center. If it is very warm and sunny outside, this will happen over a couple of hours. If it is cool, it may take longer.

To accelerate the process, you could add a heat lamp and keep it inside. When enough condensation builds up, it will drip into the cup. This is a model of the evaporation-condensation portion of the water cycle. This is also a rudimentary demonstration of a water purification method that was used by American servicemen during World War II.

ACTIVITY

MEASURING WATER

INTRODUCTION

Your class is going to learn about the characteristics of water from different sources in your community. Your teacher will give you specific instructions about how you will collect and test water.

If you can't see through your sample or if it has material still floating in it, leave it to sit undisturbed, and record how long it takes to settle.

TEMPERATURE	SECCHI DEPTH	DISSOLVED SOLIDS	pH

NAME: **DATE:**

1. Do you think the water from either of your samples is safe to drink? How could you know for sure?

2. If you answered no, how could you make it safe to drink?

3. Does water for different uses need to all be treated in the same way? For example, can water in a fishpond be the same as water to drink? Does water to drink have to be the same as water to irrigate crops?