

# Lesson Plan 1:

## *The Water Cycle and Guam's Fresh Water*

### INFORMATION

Lesson Plan Title: The Water Cycle and Guam's Fresh Water

Primary Subject: Science, Social Studies

Secondary Subjects: Art, Language Arts, Chamorro Studies, Spelling, Vocabulary

Grade Level: 3-7

*Note to Educators: These educational materials are designed as a companion to the "Guam Water Kids" pre-recorded presentation and website at [www.guamwaterkids.com](http://www.guamwaterkids.com).*

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### OVERVIEW

Guam has a limited amount of **fresh water**, which is one of Guam's most important **natural resources**. Fresh water is renewed by the Earth's natural recycling of ocean water and other surface water. This process is called the **Water Cycle** or Hydrologic Cycle. The Water Cycle may be examined by looking at four simple stages. Students will follow the path of the Water Cycle to learn how it functions before returning to the concept that all four stages occur continuously and simultaneously and serve to renew the important natural resource of fresh water. In this lesson we define fresh water, learn its importance to our lives and study the Water Cycle. Lesson Plan 2 addresses how pollution threatens fresh water resources and how students can help protect Guam's fresh water.

The "Guam Water Kids" companion website and presentation uses **four stages** to explain the Water Cycle. The overall cycle is illustrated with maps, animated drawings, and photos of Guam. Note that all four stages are occurring simultaneously. Everyday examples help orient students to the specifics of Guam's fresh water resources.

#### **Evaporation and Transpiration (or Evapotranspiration)**

**Evaporation** occurs as the sun heats up the **surface water** in rivers, lakes, oceans, and the soil, and turns collected water into a **vapor**. The vaporized water rises into the **atmosphere**.

**Transpiration** is the process by which water is returned into the air from plant surfaces such as leaves.

**Evapotranspiration** is the transfer of water from Earth into the atmosphere from these combined sources.

**Everyday examples:** Evaporation is occurring when a puddle of water dries in the sun. Vaporized water can be seen as the steam rises from a pot of boiling water.

### **Condensation**

**Condensation** occurs when the **water vapor** in the air cools and changes is collected in the **atmosphere**, forming clouds.

**Everyday example:** Condensation forms on the outside of a glass of cold water on a hot day. The water on the outside of the glass actually comes from the air. Water vapor in the warm air turns back into a liquid when it touches the cold glass.

### **Precipitation**

**Precipitation** occurs when so much water has condensed that the clouds can no longer hold it. The water falls to Earth in the form of rain, sleet, hail, and snow.

**Everyday example:** On Guam precipitation in the form of rain replenishes the island's natural resource of fresh water.

### **Collection and Infiltration**

**Collection and Infiltration:** Some of the rain made by the Water Cycle falls right back into the oceans, but some rain that falls onto land drains into rivers and lakes and collects there. Some rain falls onto land and seeps underground or **infiltrates** and is **collected** in underground.

**Everyday example:** On Guam much of our surface water is collected in Fena Lake and the Ugum River. Guam's groundwater collects under the surface of the northern part of the island to form the fresh water lens of the Northern Guam Lens Aquifer. Groundwater and surface water are the sources of the island's fresh water supply.

### **GOALS / OBJECTIVES:**

Students will be able to explain the importance of fresh water to life. [*Science Standard 2 Life Science: 1.2.4, 2.2.3*]

Students will be able to name some ways in which fresh water is one of our island's most important natural resources. [*Health Education Standard 1: Core Concepts 2.1.3*]

Students will be able to able to explain the Water Cycle and how Guam's supply of fresh water is renewed by this process. [*Science Standard 2: Life Science Biology BI.2.1, Standard 3: Physical Science 1.3.2, 4.3.7*]

Students will be able to connect the relationship of the Water Cycle to oceans, weather, and climate. [*Science Standard 4. Earth and Space Science: 5.4.2*]

Students will be able to connect the relationship of the Water Cycle to oceans, weather, and climate. [*Science – Standard 3: Physical Science 5.3.1; Standard 4: 8.4.7; Standard 4. Earth and Space Science: K.4.1, 1.4.2, 5.4.2. Standard 2: Life Science Biology BI.2.26*]

Students will be able to use **Language Arts** skills of writing to name and explain the stages of the Water Cycle through the use of pictures and words to describe natural phenomena around them. [*Standard 4: Writing Purposes, Processes, and Strategies*]

Students will be able to use **Fine Arts** skills to show with drawings that the Earth's water moves in a continuous cycle, which renews Guam's fresh water supply. [*Standard 4: Building Connections*]

Students will be able to use **Social Studies** skills of knowledge of landforms to describe different features of Guam geology that are related to the collection and infiltration of Guam's fresh water. They will observe and describe different features of the island of Guam. [*8.3.2*]

*Standards refer to Guam Public School System standards*

## **RESOURCES/MATERIALS NEEDED:**

- Computer with Internet access.
- Lesson Plan: "The Water Cycle and Guam's Fresh Water" — (Downloadable at [www.guamwaterkids.com](http://www.guamwaterkids.com).)
- Teachers' Instructional Presentation "The Water Cycle and Guam's Fresh Water" — downloadable at [www.guamwaterkids.com](http://www.guamwaterkids.com). (Parts 1,2,3)
- Lined and drawing paper, pencils, crayons, markers, crayon pastels, and other art supplies.
- Time Required: 50 minutes

## **PROCEDURE:**

### **Lesson Introduction**

1. Ask what is a precious treasure and what is an example? Students respond.
2. Ask what is one of Guam's most important natural resources? Students respond.

### **Main Lesson**

Tell the class that even though we sometimes take it for granted, **fresh water** is one of our island's most important **natural resources**. Fresh water, the drinkable water we use for daily life, is a **natural resource** that we cannot do without. As a natural resource, fresh water provides an important and basic need and it should be protected.

**Show Part 1** of the Guam Water Kids presentation that explains why fresh water is one of Guam's most important **natural resources**. (Downloadable at [www.guamwaterkids.com](http://www.guamwaterkids.com))

Ask how does Guam get its supply of **fresh water**? Students respond.

**Show Part 2** of the Guam Water Kids presentation which explains the stages of the **Water Cycle** and how the Earth's supply of fresh water is renewed. (Downloadable at [www.guamwaterkids.com](http://www.guamwaterkids.com))

Ask what is **evaporation**? Students respond.

Confirm that **evaporation** occurs as the sun heats up the **surface water** in rivers, lakes and oceans and soil and turns it into a **vapor**. The vaporized water rises into the **atmosphere**. Similarly **transpiration** is the process by which plants return water into the air from plant surfaces such as leaves. **Evapotranspiration** is the transfer of water from Earth's surface into the atmosphere through both evaporation and transpiration.

*An example of evaporation* is a puddle of water drying up in the sun. **Vaporized water** can be easily observed as the steam rises from a pot of boiling water.

Ask what is **condensation**? Students respond.

Confirm that **condensation** occurs when the water vapor rises, cools and changes back into liquid, forming clouds. Example, water forms on the outside of a glass of ice water on a hot day. **Water vapor** in the warm air turns back into **liquid** when it cools on contact with the cold glass.

Ask what is **precipitation**? Students respond.

Confirm that precipitation occurs when so much water has condensed that the air cannot hold it anymore. The clouds get heavy and water falls back to the Earth in the form of rain. Note as rain falls from the atmosphere it is free of pollutants.

Ask what is "**collection and infiltration**"? Students respond.

Confirm that **collection** occurs when water falls back to Earth as **precipitation** or rain. The rain that falls on land will flow into lakes or rivers or underground aquifers. Some of The rain will be flow back into the ocean, but some will be collected in the island's fresh water supply.

Confirm that **infiltration** occurs when rain soaks into the Earth and collects underground. The limestone rock of northern Guam is especially porous and water easily filters down to the underground formations that make up the Northern Guam Lens Aquifer. Most (about 80 percent) of the fresh water we use on Guam is pumped from the fresh water lens of this aquifer.

**Show Part 3** of the Guam Water Kids presentation that explains where the natural fresh water resources (Surface Water and Ground Water) are found on Guam.

Ask students specifically **where is Guam's fresh water**? Students respond.

Confirm that Guam's natural resource of fresh water is found on both the surface and underground.

Ask what are examples of **Surface Water**? Ask what part of Guam (north or south) we generally find Surface Water.

Confirm that Guam's Surface Water Fresh water is stored in rivers and lakes — most of which are located in southern Guam.

Ask what is a **watershed**?

Confirm that a watershed is the area of land that drains into a river or lake.

Ask where Guam's the underground supply of fresh water (**groundwater**) on Guam is found.

Confirm that much of Guam's ground water is collected in the Northern Guam Lens Aquifer.

Ask what is an **aquifer**?

Confirm that an aquifer is an underground layer of rocks that holds water (groundwater).

Encourage students to use the computers or iPads to explore the **Guam Water Kids** website at their own pace [www.guamwaterkids.com](http://www.guamwaterkids.com) during *group activity time* or on their own time.

### **Evaluation**

- Ask students to **draw the Water Cycle** using arrows to show the four stages water passes through. (Students may draw the water cycle on their own or see page 6 below).
- Divide class into small groups. Provide students with the **word bank** (included below) and ask members of each group to **write a paragraph** explaining their picture.
- Allow each group to **share its work** with the class.
- **Create a poster** that tells about Guam's fresh water and its importance to our island.

### **Reflection**

Were the students motivated by the Guam Water Kids presentation?

Did the students work together cooperatively?

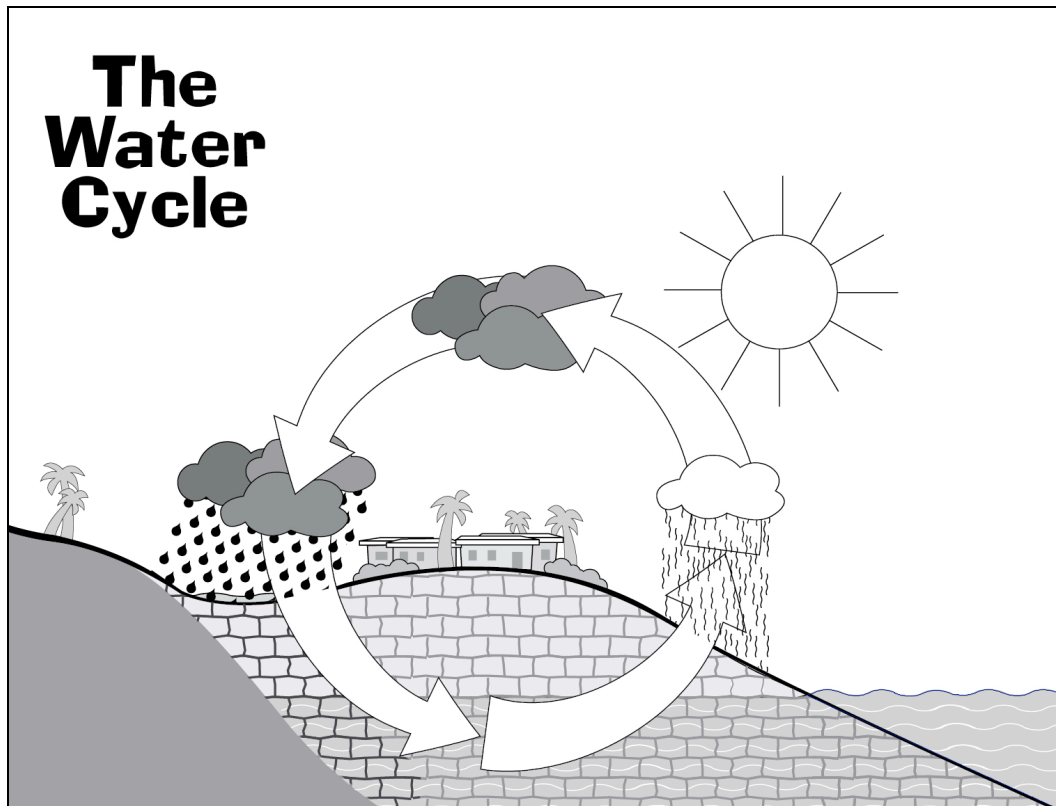
Did the activity reinforce the lesson?

Were the students able to follow the directions?

Was the presenter/teacher able to manage the class closely

## WORD BANK

fresh water  
drinkable water  
natural resource  
Water Cycle  
evaporation  
transpiration  
evapotranspiration  
vapor  
condensation  
precipitation  
infiltration  
collection  
aquifer  
surface water  
groundwater  
limestone  
porous  
liquid



## **NOTES AND CREDITS:**

This lesson plan is a component of the educational materials that accompany the "Guam Water Kids" multi-media presentation and website at [www.guamwaterkids.com](http://www.guamwaterkids.com). Teachers and students may freely use these materials.

Presented by WERI-The Water and Environmental Research Institute of the Western Pacific at the University of Guam.

Funded by the U.S. Geological Survey, WERI, and Triple J Enterprises of Guam and the Ford Motor Company Conservation & Environmental Grants.

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