



# Rainforest in a Jar: The Water Cycle

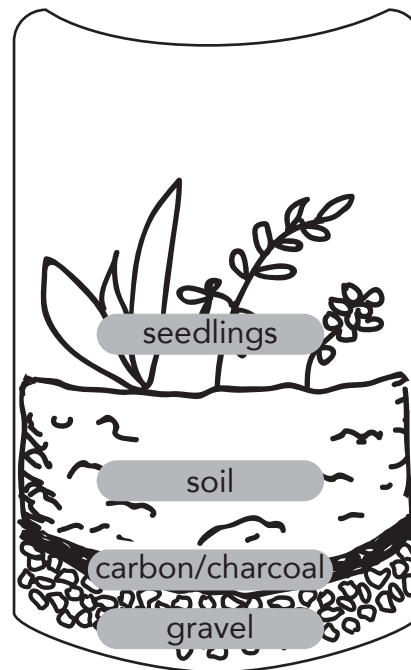


## SYNOPSIS

This project-based lesson on the water cycle and its relationship with the rainforest is student-driven for inquiry-designed learning. Students create individual terrariums to observe how a self-sustaining biome works. Discussion covers the water cycle that occurs in the rainforest, including precipitation, transpiration, evaporation, condensation.

## MATERIALS

- For each student: one clean medium-size jar with a lid, such as a peanut butter or pasta sauce jar or even a Mason storage jar. A large plastic pop/soda bottle can also work ([example here](#)).
- [Pea gravel](#)
- [Activated granular carbon/charcoal](#)
- Potting soil
- 3 to 4 small leafy rooted plants per terrarium: fern, ivy and/or begonia. Succulents work better in an unlidded desert terrarium (see Learning Extension p4)
- Spray bottle or small watering can
- Water



## INSTRUCTIONAL PROCEDURE

Distribute handout (p2) and discuss the water cycle with reference to the rainforest. Explain how the terrarium is like a rainforest in a jar because it is a self-sustaining biome.

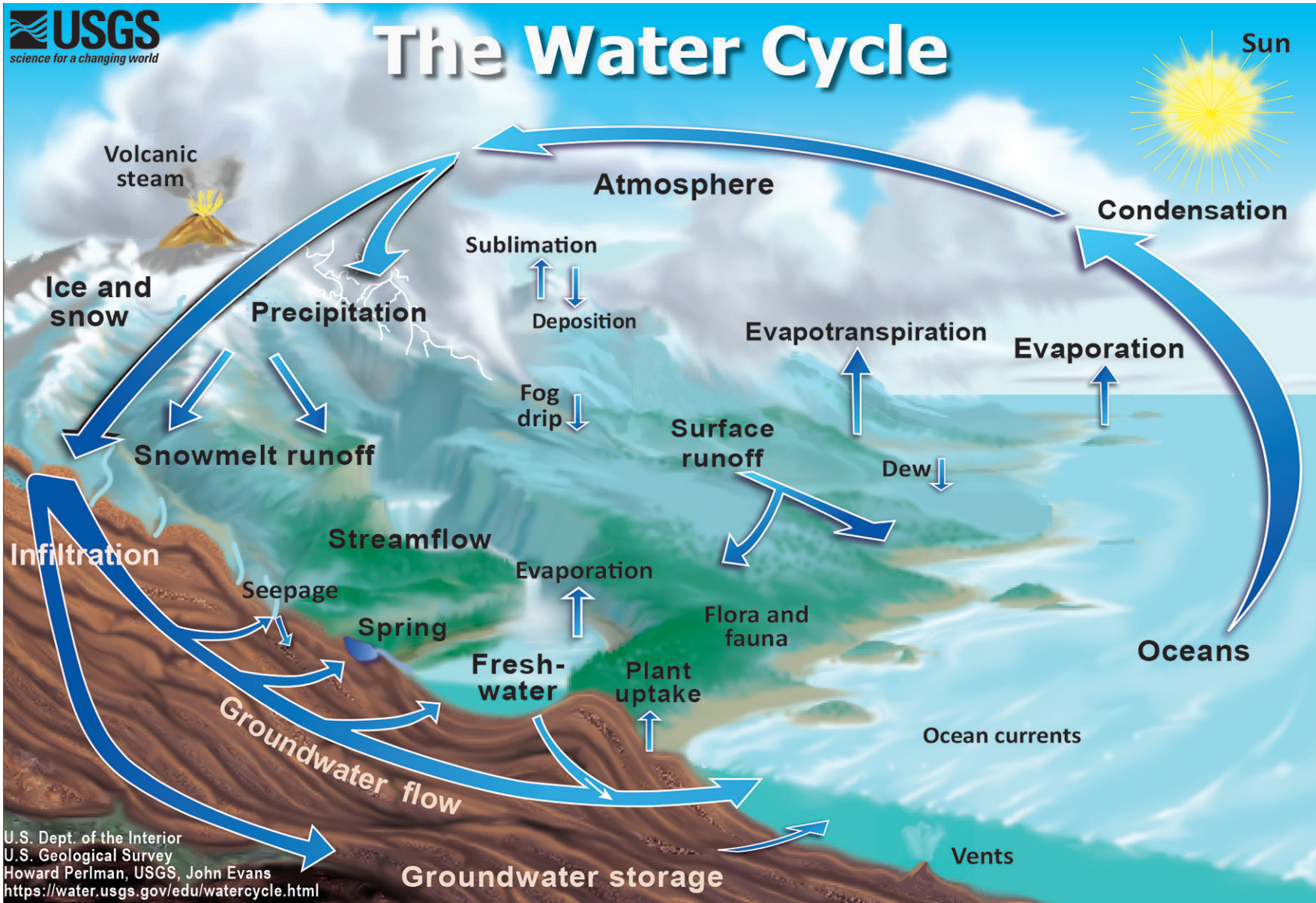
- 1 For proper drainage, in the bottom of a jar, place 1–2 inches of **pea gravel**.
- 2 Add a half-inch layer of **activated charcoal**.
- 3 Fill jar about half-full with **potting soil**.
- 4 Press 3–4 holes into the soil with thumb. Place **plant roots** into holes, then cover roots with soil, leaving plants above the soil surface. Pat down gently. The tops of the plants need to be lower than the top of the jar. Allow them some room to grow!
- 5 Add a little more **gravel** to the top of the soil around the plants.
- 6 Spray 10–15 spritzes of **water** into the jar, or lightly sprinkle with watering can.
- 7 Close top with lid and place jar in a location that has indirect sunlight. If the water condensation inside the jar appears heavy and runs down the insides, remove the lid for short periods of time as needed. If too little condensation, mist plants with water.

## RESOURCES

[A Kid's Guide for Making a Terrarium](#)  
by Stephanie Bearce

[\(We Both Read\) About the Rain Forest](#)  
by Heather Johansen

[One Day in the Tropical Rain Forest](#)  
by Jean Craighead George







# The water cycle, rainforest and your terrarium



The water that we see today is the same water since the beginning of Earth. Water moves in a continual **water cycle** from Earth to the sky then back to Earth again.

Water comes in different forms: liquid, solid and gas. Water exists in different forms of **precipitation**, as **vapor** and also flowing in freshwater and salt water bodies. Ancient water is frozen in huge glaciers.

The rainforest has a lot of water! Its moist environment is caused by weather, plant **transpiration** and **condensation**. Water vapor hovers throughout the plants and trees and appears as though a cloud has settled on the Earth. Some parts of the rainforest are called cloud forests, because they look and feel as though they are inside a cloud.

A terrarium helps us to understand how the water cycle works in the rainforest. The warmth of the sun causes the water in the terrarium to condense, watering the plants. The plants perform transpiration, putting moisture back into the **atmosphere** of the terrarium jar.

## VOCABULARY

**Atmosphere:** All of the air, made up of gases and liquids, that surround the Earth.

**Condensation:** When water changes from a gas to a liquid. Condensation can be seen on the outside of a glass of iced tea on a hot summer day or as ice crystals on a window pane in winter.

**Precipitation:** Any form of water that falls from the sky including rain, snow, ice, sleet, or hail. When water vapor condenses and becomes heavy it falls from the sky to Earth.

**Rainforest:** A lush, dense forest rich in biodiversity and having a hot, wet climate with heavy annual rainfall.

**Transpiration:** A plant process that moves moisture through a plant's roots and stems to the underside of the leaves, where it is released into the atmosphere through tiny holes called stomata. A stoma is a pore in the outer skin of leaves and stems that facilitates gas exchange.

**Water cycle:** The process of how water continually cycles from the Earth to the atmosphere and back to Earth. The water cycle includes precipitation, evaporation, transpiration, runoff, percolation and storage in fresh- and saltwater bodies (rivers, lakes, oceans, etc.), glacial ice and groundwater.

**Water Vapor:** Water in a gaseous state, such as steam or clouds.



## INSTRUCTIONAL OBJECTIVES

Students will ...

- + Understand the process of Earth's water cycle
- + Be able to describe the importance of the water cycle in the rainforest biome
- + Create a model of a rainforest and the water cycle
- + Build a terrarium to model the process of the water cycle in the rainforest
- + Explain how the sun produces the energy that provides the flow of the water cycle
- + Analyze the role of plants in producing water vapor
- + Create conditions to produce condensation

**ASSESSMENT** Did the student ...

- Follow the steps to build a terrarium that recreates the water cycle?
- Effectively describe the water cycle process and its importance to the rainforest?
- Label their drawing of the terrarium accurately?

## ESSENTIAL QUESTIONS

- Why is the water cycle vital to the health and growth of the rain forest, that sloths and other creatures rely on for survival?
- How can a model of the rainforest and water cycle help explain the water cycle process?

## LEARNING EXTENSION

- Desert terrarium: Make another terrarium using succulent plants in a soil/sand mixture to mimic the desert biome. Leave lid off the jar, place terrarium in a sunny location and spritz with water once a week.
- Draw your own rainforest and include your favorite rainforest plants and animals.
- Write a fictional story about an adventure in the rainforest that includes you as the main character.

## DIFFERENTIATION/ INDIVIDUALIZED ACTIVITIES

The use and visuals of videos can help students with special needs, engage students in the learning process and meet the learning needs of diverse learners:

["Water Cycle Song"](#) by Have Fun Teaching

["Water Cycle"](#) by Bill Nye the Science Guy

## CONTENT AND NGSS STANDARDS

**MS-LS2-2.** Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

**MS-LS2-5.** Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

**MS-ESS2-1.** Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.

**MS-ESS2-4.** Develop a model to describe the cycling of water through the Earth's systems driven

by energy from the sun and the force of gravity.

**Prerequisites:** State the understanding and knowledge that is necessary for this lesson.



## LANGUAGE ARTS

### Writing skills:

Keep a daily journal of what you observe about your terrarium. What can you observe?

Check on your terrarium a few hours after it has been near indirect sunlight.

- + What do you notice on the insides and underside of the lid?
- + Do you think you will need to add more water? Why or why not?
- + Do you think the plants will grow? Explain.

Compare your terrarium to a rainforest? What is the same and what is different?

After a week, is it still wet inside the terrarium? Explain what is happening. Will you need to add more water? Why or why not?