

Discovering Rainforest Locations

GRADE LEVEL	4 th -8 th ; California Content Standards for 4 th , 5 th and 6 th
SUBJECTS	Life Sciences, Using Information Patterns
DURATION	Activity: 60 minutes Prep: 10 minutes
SETTING	Classroom

Objectives

Students will:

1. Practice reading and interpreting various types of world maps.
2. Identify the locations of tropical rainforests.
3. Discover that abiotic factors such as temperature and precipitation help determine what types of ecosystems exist in a given area.

Materials

- Blank world maps (one per student)
- One set of World Data maps for each group of students, including:
 - Temperature
 - Precipitation
 - Biodiversity
 - Soil
- Colored pencils (each student needs four different colors)
- Tropical rainforest maps on transparencies (one per group of students)

Teacher Prep

- Print out blank world maps (one per student)
- Print out World Data Maps (one per group of students)
- Print out rainforest maps **on transparencies** (one per group of students)

Scientific Terms for Students

- **Abiotic:** non-living; not derived from living things.
- **Soil:** the top layer of the earth's surface, consisting of rock and mineral particles mixed with organic matter.
- **Biodiversity:** Bio=biological. Diversity=a variety of things. An area with many types of living things has high biodiversity.

Background for Educators

Rainfall: The word "rainforest" clearly implies the fact that these are the some of the world's wettest ecosystems. Tropical rainforests around the world have high humidity, about 88% during the wet season and about 77% in the dry season (ucsb.edu). Although the amount of rainfall varies for different years and different rainforests, generally rainforests receive very high rainfall each year. For example, South America's tropical rainforests receive an average of 2300cm (905 inches) of rain in a typical year (Forsyth). **In comparison, San Francisco receives only about 58 centimeters (23 inches) of rain per year** (usclimatedata.com). Despite relatively consistent rain in these ecosystems, there are distinct dry seasons in some rainforests. Tropical rainforests' wet and dry seasons vary in their timing, duration and severity around the globe.

Temperature: Tropical rainforests, found in the equatorial region between the *Tropic of Cancer* (23°27'N) and the *Tropic of Capricorn* (23°27'S), have high year-round temperatures. A typical daytime temperature in tropical rainforests is 29°C (85°F) although temperatures can be much higher. Because the tropics are in the center of the globe and do not tilt dramatically toward or away from the sun during any season, like temperate regions of the earth do, they receive direct and consistent radiation. This steady flow of radiation from the sun produces consistently high temperatures throughout the year. In the majority of tropical rainforests, there is at most a 5°C difference in temperature between the seasons.

Soil Composition: Because of the tremendous amount and diversity of foliage in tropical rainforests, many people think that rainforest soils are rich with nutrients. In fact, rainforest soils are nutrient-poor. The large amount of rain means that any nutrients released into the soil via decomposition are not stored in the soil for long. Rainwater seeps into the ground and leaches nutrients from the soil. Another reason that nutrients are not stored in the soil for long is the extremely rapid rate of decomposition found in rainforest ecosystems. The high diversity of decomposers, such as bacteria, fungi, and insects, coupled with the high humidity and temperatures of tropical rainforests accelerate the decomposition process. The nutrients released by decomposition are quickly taken up by plants, instead of being stored in the soil.

Biodiversity: Biodiversity is a measure of the total variety of organisms in nature. It can be described at many scales including ecosystem biodiversity, species biodiversity, and genetic biodiversity. Species biodiversity is the easiest to comprehend, and is the scale on which we focus this activity. Species diversity varies greatly from place to place around the globe. Tropical rainforests are areas of extremely high biodiversity as compared with other ecosystems.

Activity

Introduction

1. Ask students what they have learned about tropical rainforests.
2. Make sure to review or introduce these four characteristics of rainforests:
 - Rainfall
 - Temperature
 - Soil composition
 - Biodiversity
3. Tell students they are now going to compare these four factors to predict where rainforests are.

Procedure

1. Divide the students up into groups of 4.
2. Hand out a blank world map and 4 different colored pencils to each student.
3. Hand out a set of world data maps (rainfall, temperature, biodiversity and soil) so that each student has one map to work from. Do not hand out the tropical rainforest maps on transparencies yet. They are not used until the end of the activity.
4. Tell students to choose one color for each of the four data maps and create a legend on their blank map.

For example:

LEGEND
Green = Biodiversity
Blue = Precipitation
Red = Temperature
Brown = Soil Composition

5. Starting with the map in front of them, students will use the color they chose to go with that map and circle the areas on their blank maps that have rainforest characteristics.
 - For biodiversity – circle areas of HIGH biodiversity
 - For rainfall – circle areas of HIGH rainfall
 - For temperature – circle areas of HIGH temperature
 - For soil composition – circle areas of nutrient-POOR, weathered soils
6. After a few minutes, have students rotate maps. You will rotate three times so that each student gets to use each map.
7. Once all students have worked with each of the world data maps, they will use a regular pencil to color in the areas where they think tropical rainforests are according to the data they have compiled. This should be areas that have all four factors, **not** areas that they believe have rainforests based on prior knowledge.
8. After students have completed their maps, hand out one tropical rainforest map transparency to each group. Students can take turns placing the transparency on top of their map to see how close they were to locating the world’s tropical rainforests.

Wrap-Up

Discuss the following questions:

- Are your maps a close fit with the actual rainforest locations?
- Why might the fit not be perfect?
- Why would some areas have tropical rainforests even if they don’t have all four factors?
 - *Our maps might not perfectly match because some rainforests don’t have all four of these characteristics. A few rainforests might have different soils that are newer and haven’t been weathered as much. Or, a few rainforests might have a little less biodiversity. A few rainforests might also receive less rainfall than the average rainforest.*
- Why would some areas have all four factors but no tropical rainforests?
 - *Tropical rainforests have very a specific combination of characteristics. Other ecosystems may have some of the same characteristics as tropical rainforests. For example, areas with high rainfall that are not tropical rainforests are temperate rainforests like in the Pacific Northwest of U.S., Chile and*

New Zealand. Areas that have really high temperatures but are not tropical rainforests are desert regions.

- **Teacher Tip-** *To give students a chance to think about and rehearse their answers, consider using a Think-Pair-Share when posing these questions to your class. In a Think-Pair-Share, students think about their own answer and discuss their thoughts with a partner before sharing their answers with the whole class.*

Extension

1. Discuss cause-and-effect relationships:

- Which of the four factors (rainfall, temperature, biodiversity and soil) caused the rainforests to develop?
 - **Rainfall:** *Water is often a scarce resource for plants and animals, and the abundance of rain in the tropical regions allowed these dense tropical forests to evolve.*
 - **Temperature:** *Because the tropics have consistently warm temperatures, many plants are able to stay active year-round.*
- Which of these factors were caused by the rainforest?
 - **Nutrient-poor soils:** *The wetness and the rapid decomposition that occurs within the rainforest have caused these soils to become nutrient-depleted.*
 - **Biodiversity:** *The warm and wet environment of the rainforests has created many ecological niches, which promotes speciation and biodiversity.*

- #### 2. Predict where other habitats might be.
- Use these same maps to make predictions about where in our world other habitats may be found. For example, hot deserts have high temperatures, low precipitation, low biodiversity, and nutrient-poor soils. Some habitats to investigate include tundra, hot deserts, temperate rainforests, taiga, grasslands, and chaparral. Look up the four factors ahead of time or assign this task to students.

Correlated California Content Standards

Grades Kindergarten through Fifth

Historical and Social Sciences Analysis Skills: Chronological and Spatial Thinking.

4. Students use map and globe skills to determine the absolute locations of places and interpret information available through a map's or globe's legend, scale, and symbolic representations.

Grade Four

Life Sciences

- 3a. Students know ecosystems can be characterized by their living and nonliving components.

Investigation and Experimentation

- 6c. Formulate and justify predictions based on cause-and-effect relationships.

Grade Five

Investigation and Experimentation

- 6h. Draw conclusions from scientific evidence and indicate whether further information is needed to support a specific conclusion.

Grade Six

Life Sciences

5e. Students know the number and types of organisms an ecosystem can support depends on the resources available and on abiotic factors, such as qualities of light and water, a range of temperatures, and soil composition.

Next Generation Science Standards

The items listed below indicate how the activity supports the three dimensions of the Next Generation Science Standards.

Science & Engineering Practices	Disciplinary Core Ideas	Cross Cutting Concepts
<p>Developing and Using Models: Develop and/or use models to describe and/or predict phenomena.</p> <p>Analyzing and Interpreting Data:</p> <ul style="list-style-type: none"> Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation. Analyze and interpret data to provide evidence for phenomena. 	<p>ESS2-A: Earth Materials and Systems. Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around.</p>	<p>Cause and Effect:</p> <ul style="list-style-type: none"> Events that occur together with regularity might or might not be a cause and effect relationship. Cause and effect relationships may be used to predict phenomena in natural or designed systems. <p>Systems and System Models:</p> <ul style="list-style-type: none"> A system can be described in terms of its components and their interactions. Models can be used to represent systems and their interactions – such as inputs, processes, and outputs, and energy, matter, and information flows within systems.

Related Performance Expectations

These activities outlined here are just one step toward reaching the Performance Expectations listed below. Additional lessons will be required.

4-ESS2-2: Analyze and interpret data from maps to describe patterns of Earth’s features.

5-ESS2-1: Develop a model using an example to describe ways in which the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

MS-ESS2-6: Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

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