

Google Earth Classroom Activity : The Amazon Rainforest and the Water Cycle

The Amazon River basin of South America is considered the largest rainforest on Earth, traversing the countries of Brazil, Bolivia, Peru, Ecuador, Colombia, Venezuela, Guyana, Suriname, and French Guiana. The Amazon River flows east, beginning in the high elevations of the Andes Mountains and traveling 6,400 km (4,000 miles) to the Atlantic Ocean off the coast of Brazil. Although second to the Nile River in length, the Amazon is the largest of the world's rivers by volume, holding 20% of Earth's available fresh water. This volume is created by an impressive system of over 15,000 tributaries (smaller rivers and streams) feeding its flow. At its mouth, the Amazon River pours an average of 200,000 cubic meters (50,000 gallons) of river water into the Atlantic Ocean each second.

With water prevalent, rainforest plants rarely lack this essential resource; instead, plants regularly expel excess water. By transpiring water from the underside of their broad leaves during the warm daytime, trees draw water up the stem so that soil nutrients dissolved in the water may spread throughout their tissues. This transpiration, in turn, contributes to constant rainfall by providing water vapor to the atmosphere. The vapor will eventually form clouds that provide rain for the rainforest habitat. The Amazon Rainforest is particularly efficient with recycling water in this way, recycling at least 50% of the local water in the form of precipitation. Estimates for the volume of water moved via the combined processes of evaporation and transpiration average 9×10^{12} m³/yr, which means the Amazon Basin contributes 6.5 trillion gallons (6,500,000,000,000 gallons) of water to the atmosphere each day.

Moisture generated by rainforests travels around the world. Scientists have discovered that rainfall in America's Midwest is affected by forests in the Congo. Meanwhile, moisture created in the Amazon ends up falling as rain as far away as Texas, and forests in Southeast Asia influence rain patterns in southeastern Europe and China. When forests are cut down, less moisture goes into the atmosphere and rainfall declines, sometimes leading to drought. In recent years, the rainforests of Borneo and the Amazon have experienced very severe droughts. These have been made worse by deforestation; distant rainforests are therefore important to farmers everywhere.

Teach your students about how the water cycle works in the amazon rainforest and where there are other rain forests around the world.

Learning Objectives:

- Students will learn about how the water cycle functions in the Amazon rainforest.
- Students will learn about Brazil's flying river.
- Students will map out rainforests around the world.

Audience: 5th-9th grade

Categories: Geography, Science

Voyager Story: I am WATER / Eu sou Água

Tools Required: Access to a Chrome Browser, Google Earth, Google My Maps, paper/pencil.

Recommended Website:

[USGS Water Cycle Diagram](#)

[Mongabay Teacher Resources](#)

[The Nature Conservancy](#)

[View the Amazon River in Street View](#)

[Rios Voadores](#)

Classroom Activity Guide:

Chapter A: Google Earth Voyager Story: I am Water

Chapter B: Learning about the water cycle in the rainforest.

Chapter C: Create a Canopy for the Classroom

Chapter D: Brazil's Flying Rivers

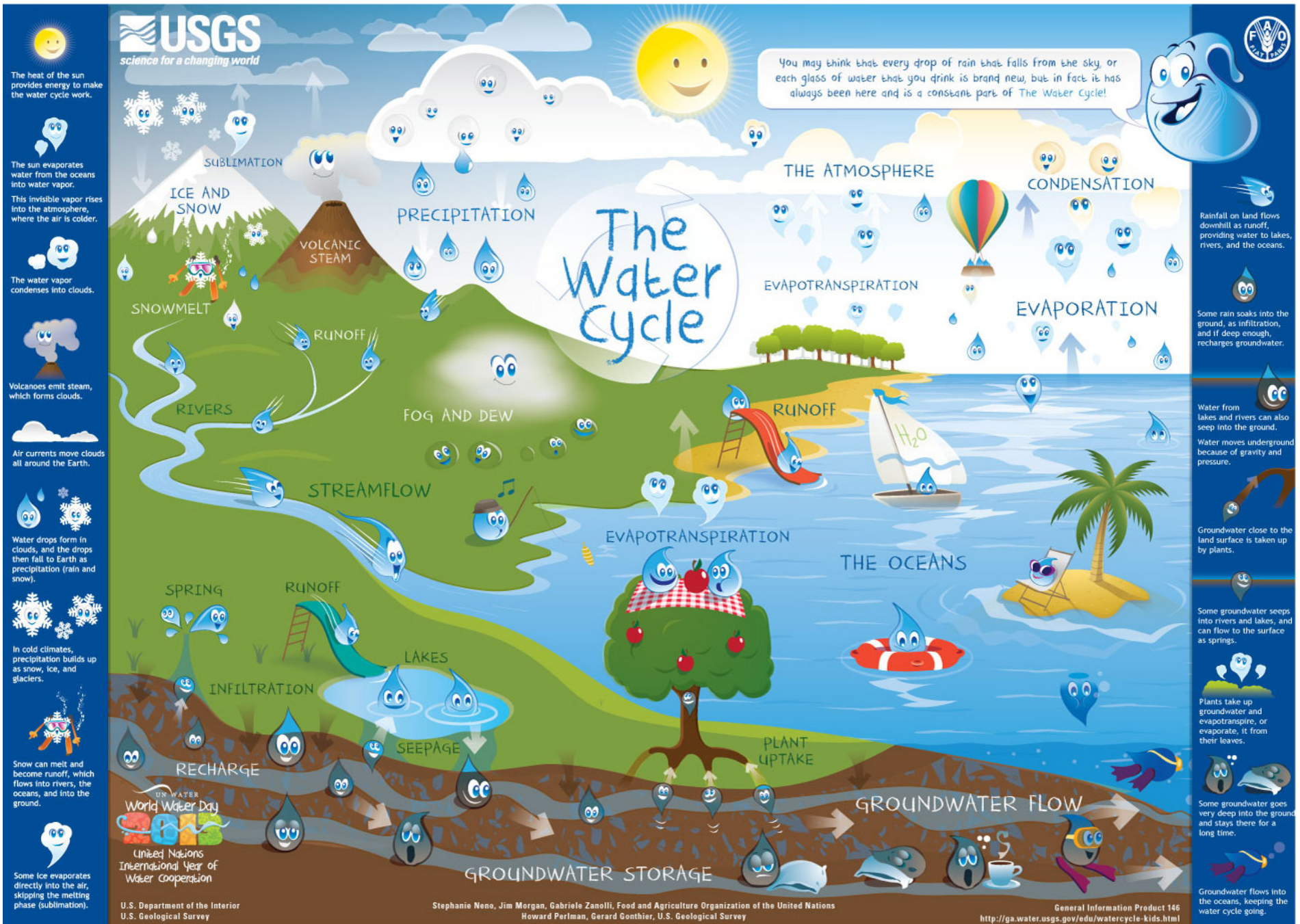
Chapter E: Where else in the world do rainforests grow?

Chapter A: Google Earth Voyager Story: I am Water

1. Open Google Earth Voyager and have your students read the 'I am Water' story.
2. Tell them to write down 5 things they learned while going through the story.
3. Have a short classroom discussion about what they learned from the story.

Chapter B: Learning about the water cycle in the rainforest.

1. Use the USGS diagram (next page) to walk through the cycle of water.
2. The following ten processes show how the water cycle operates in the rainforest, but have been mixed up. Have the students place the processes into a sequence to show how the rainforest creates its own water cycle.
 - a) Clouds form
 - b) Droplets merge to form rain
 - c) Evaporation from ground surfaces
 - d) Evapotranspiration
 - e) Pores in the leaves
 - f) Temperature cools water vapour in atmosphere
 - g) Transpiration
 - h) Water droplets
 - i) Water vapour condenses
 - j) Water vapour given off



3. Ask the students to draw their own diagram of the process, linking them together using arrows, so that the diagram shows how one process leads to another.
4. Have the students write how the cycle produced would change if the trees were cut down. And how that would impact their life at school and at home.

Chapter C: Create a Canopy for the Classroom

Rainforests are wet not only because they receive a lot of rain, but also because their vegetation "recycles" water. That is, the rainforest canopy, or "roof," traps moisture inside the forest.

1. To help students understand why a tropical rain forest is so steamy and wet, demonstrate the canopy effect using a healthy potted houseplant, a clear plastic bag, and a large rubber band or piece of tape. Water the plant, then place the plastic bag over the plant. Secure the edges of the bag to the pot with tape or the rubber band. Place the plant in a sunlit spot and observe for several days. For a control, water a second plant but do not put a bag on top of it. Place it in the same spot as your bagged plant.
2. Have students record the results and ask them questions about their observations. Such as, what happens to the plastic bag? What part of the rain forest acts like the plastic bag in this experiment?

Chapter D: Brazil's Flying Rivers

The flying river is a movement of large quantities of water vapor transported in the atmosphere from the Amazon Basin to other parts of South America. The forest trees release water vapor into the atmosphere through transpiration and this moisture is deposited in other localities in the form of precipitation, forming a virtual river.

1. Have your students research the Flying Rivers of Brazil.
2. Using a Google My Map have them create polygons of where the rivers travel and the surrounding locations and countries they impact.
3. Have your students create a classroom action plan for protecting the Flying Rivers.

Chapter E: Where else in the world do rainforests grow?

1. Have your students research temperate and tropical rainforests and where they are in the world. With the Google My Map they created for the Flying River, have them add the rainforests of the world.
2. Ask them the following questions:
 - a. How does photosynthesis work? Use these words: chlorophyll, leaves, sunlight, carbon compounds.
 - b. Why is net primary productivity highest in the northern hemisphere between April and August, whereas in the southern hemisphere it's between October and February?
 - c. Why is there very little variation in temperature in equatorial regions between one month and another?
 - d. Why is the word 'seasonal' more meaningful about rainfall than about temperature in equatorial regions?
 - e. Why are Brazil's Flying Rivers unique to the Amazon? Are there other places in the world where there is a similar phenomena?
 - f. Rainforests often get between 3,000- 4,000mm rainfall annually. Use an atlas to find out how this compares to the school.