**The Rainforests**

Student's Name

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Course Code & Name

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Due Date

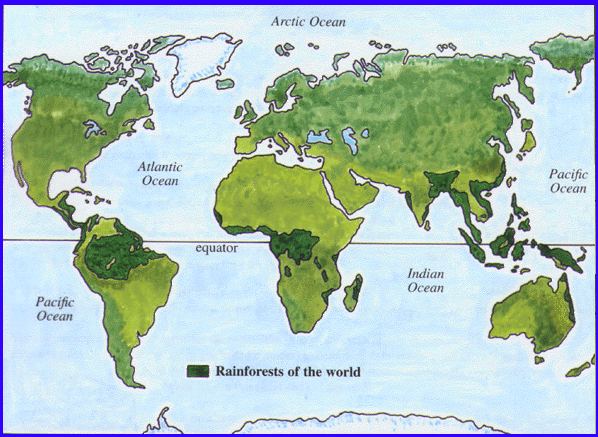
**The Rainforests**

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**Fig. 1:** A Rainforest (National Geographic, 2019).

Found in all other continents except Antarctica, rainforests refer to ecosystems that primarily consist of evergreen trees that receive high amounts of rainfall, hence the origin of their name, "rain forests." Rainforests fall into two categories, tropical and temperate. Tropical rainforests are situated near the equator, where the climate is warm, while temperate rainforests are situated in the cooler coastal regions further south or north of the equator (Nunez, 2019). Rainforests consist of four layers: the emergent, the upper canopy understory, and the forest floor(Nunez, 2019). In the emergent layer, trees grow up to more than 200 feet, with their branches appearing above the canopy. On the other hand, the upper canopy consists of a thick vegetation layer approximately 20 feet. The upper canopy acts as a habitat of the rainforests' fauna and forms a thick vegetation layer that blocks sunlight from reaching below the rainforest. The understory, located below the canopy, is a layer characterized by low light. The understory is further identified by its short plants with large and broad leaves, such as philodendrons and palms. Besides that, the forest floor layer is dark and primarily consists of few plants and decaying matter which feeds the tree's roots. Although only covering 6% of the earth's surface, rainforests are the habitat of over 50% of the world's fauna and flora species (California Institute of Technology, n.d.). Therefore, rainforests are significant in sustaining animal and plants species.

**Location**

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**Fig. 2: Location of World's rain forests** (California Institute of Technology, n.d.).

***Tropical Rainforests***

Tropical rainforests are majorly found between the latitudes of 23.5°N and 23.5°S. This region represents the area between the Tropic of Cancer and the Tropic of Capricorn (National Geographic, n.d.). Tropical rainforests are located in Australia, Central, and South America, the island of New Guinea, western and central Africa, Southeast Asia, and Western India (National Geographic, n.d.).

***Temperate Rainforests***

These rainforests are situated in the mid-latitude regions, which temperatures are milder than in the tropics. Temperate rainforests are majorly located in mountainous and coastal regions. The coastal and mountainous conditions assist in creating huge amounts of rainfall which sustains the temperate rainforests. Temperate rainforests are found in Southern Australia, Chile, New Zealand, the UK, Pacific Northwest in North America coasts, Norway, and Japan.

**Weather and Climate**

***Tropical Rainforests***

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**Fig. 3**: Moisture in a Tropical Rainforest (Pearce, 2018).

The climate of tropical rainforests is typically warm and wet throughout the year. In the rainforests, the sun strikes the tropics almost perpendicularly, producing high solar energy that maintains high temperatures in the tropics. As a result, rainforests experience high temperatures ranging from 21° to 30°C (70° to 85°F) (National Geographic, n.d.). These high temperatures increase plants' transpiration rate, increasing the amount of water vapor in the rainforest's atmosphere. With high water vapor in the atmosphere, tropical rainforests exhibit average humidity ranging from 77% to 88% (National Geographic, n.d.). As a result of the high humidity, tropical rainforests experience extreme rainfall ranging between 200-1000cm or 80-400 inches annually. Further, the high humidity and temperatures enable tropical rainforests to produce approximately three-quarters of their rain through transpiration and evaporation.

***Temperate Rainforests***

Temperate rainforests experience mild temperatures; hence they are much cooler than tropical rainforests. The areas are not characterized by extremely high or extremely low temperatures (Madaan, n.d.). In this regard, temperatures in rainforests average from10° to 21°C. Additionally, the climate is less sunny and rainy, hence receiving rainfall between 150-500cm per year (National Geographic, n.d.). In this aspect, temperate rainforests are wet but not as tropical rainforests, which receive higher amounts of rainfall. Temperate rainforests experience two distinct seasons, winter and summer. The winter season is long and wet, while the summer season is short and dry. Throughout winter, temperatures in rainforests hardly go below 0°C (Madaan, n.d.). On the other hand, temperatures during the summer season hardly rise above 27°C. Hence, due to the absence of extreme temperatures, this biome depicts the characteristics of a temperate climate, hence named the temperate rainforest. Generally, tropical rainforests are vital as they assist in maintaining global weather patterns and precipitation. The water vapor that evaporates from rainforest's tree fall as rain in other areas.

**Soils**

A majority of rainforest soils are considered poor in nutrients. In this case, over two-thirds of global rainforests and 75% of the Amazonian rainforest are "wet deserts" as they grow on clay-like soils, which are highly acidic and deprived of nutrients. As a result, the rainforest soils are old and poor in nutrients, especially in regions that have not experienced recent volcanic activities to replenish soil nutrients. Such poor nutrient soils are found in regions like the Amazon basin (Butler, 2019). The Amazon basin soils lack vital minerals such as potassium, calcium, phosphorous, and magnesium. However, the Amazon basin soils are rich in aluminum oxide and iron oxide, responsible for producing the soils' reddish or yellowish characteristic color.

***The Reason as to Why Rainforests Have Poor Soils***

With the dense vegetation, high moisture, and warmth, people expect the rainforest soils to be rich. However, as aforementioned, these soils are impoverished and lack vital plant nutrients. Various reasons render rainforest soils to be poor, among them the soil's acidity levels. Rainforest soils are highly acidic, hence hindering plans from absorbing nutrients. Plants rely on roots and soil acidity differences to absorb minerals. When the soil is highly acidic, like in the rainforests, there is no significant acidity difference, hence little absorption of plant minerals from the soil.

Additionally, the clay-type soil in rainforests has a poor ability to trap plant nutrients, hence unable to guard nutrients against being washed away through leaching. Therefore, if humans decided to clear the lands and add nutrients into the soils, the nutrients would be washed away. Additionally, the high solar energy and moisture that characterize tropical rainforests cause decaying matter to decompose faster compared to other climates. In this regard, the decomposing matter rapidly releases and loses nutrients, making the rainforest soils poor (West Texas A&M University, 2015). Moreover, as aforementioned, rainforest climates receive huge amounts of rainfall compared with other climates. Therefore, the extreme rains experienced in rainforests wash away valuable nutrients quickly than in other climates, making the soils poor in nutrients.

***How Plants Survive in the Poor Rainforest Soils***

The rainforest floor consists of a dense layer of quickly decomposing organic material. The decomposing material consists of plant leaves and branches from layers above the rainforest floor and animals that have died on the rainforest floor. As the quickly decomposing organic matter releases nutrients, they are directly washed into the plants' roots without directly being absorbed into the soil. The nutrients uptake is facilitated by a symbiotic relationship between the plants' roots and mycorrhizae, a fungus. The fungus attaches itself to the plants' roots to facilitate quicker nutrients uptake. On the other hand, the rainforest plants provide the fungus with sugars and shelter.

**Biogeography**

**The Tropical Rainforest**

As aforementioned, the tropical rainforests host approximately 50% of the world's fauna and flora species. Hence, the tropical rainforests contain the most diverse plants and animal ecosystems. Scientists argue that the huge ecological diversity observed in the tropical rainforests is because tropical rainforests are one of the earth's oldest ecosystems. For example, some tropical rainforests in Asia have been estimated to be over 100 million years old ( National Geographic, n.d.). Hence, tropical rainforests have preserved plant and animal species for a long time, thus the diverse plant and animal species.

 For example, the largest tropical rainforest in the world, the Amazon rainforest, contains about 4000 diverse plant species, approximately 3000 fish species, over 1300 diverse bird species, 427 mammal species, and over 2.5 million insect species (Butler, 2019). Some of the animals present in the Amazon rainforest include poison dart frogs whose bright colors warn off their predators, pink river dolphins that are contained in the rainforest's waters, spider monkeys that swim include poison dart frogs whose bright colors warn off their predators, and the Red-bellied piranhas found in the Amazon rain forest waters. Additionally, the Amazon rainforest has an estimated 4 billion trees, and millions of fungi species decompose dying organic material, acting as vital elements of the forests' nutrient cycle.

**Birds and Insects**

Birds are vital animals in the tropical rainforests. As birds mostly feed on seeds and fruits, their droppings germinate into new plants, enabling the tropical rainforests to grow. Research indicates that 27% of the earth's bird species inhabit the tropical rainforests. On the other hand, insects are the largest group of animals living in tropical rainforests (University of California, n.d.). The insects include stick insects, menacing mosquitoes, bright-colored butterflies such as the blue morpho butterfly, ant colonies, and millions of others. Therefore, tropical rainforests are crucial habitats that maintain the world's ecological diversity.



**Fig. 4**: The Blue Morpho Butterfly (Rainforest Alliance, 2019).

**Adaptations**

Animals living in the tropical rainforests have adapted to such unique ecological conditions. For example, the animals have adapted to living in the rainforest trees. An example is the New World monkeys with a prehensile capable of curling around tree branches, enabling the monkey to maintain a firm grip on tree branches using its tail. Additionally, other animals have bright patterns and colorations to ward of their predators.

**Temperate Rainforests**

The ecological systems in temperate rainforests are less diverse than in tropical rainforests. However, temperate rainforests act as a habitat for a significant number of plants and animal species. The ecological diversity of temperate rainforests consist of large mammals, reptiles, small birds, and insects. The species vary in temperate rainforests across the world. In Australia, wallabies, potoroos, and other ground dwellers such as bandicoots live on the rainforest's floor. In the Pacific Northwest, bobcats, black bears, and mountain lions are the major predators.

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