

Tropical Rain Forests - Ecological factors, Characteristics and life forms

Introduction

- Rain forests are called "cradles of diversity".
- They spawn and support 50 percent of all living organisms on Earth even though they cover less than 5% of Earth's surface.
- A rainforest's importance is truly incomprehensible when it comes to species diversity.

Tropical Rainforests



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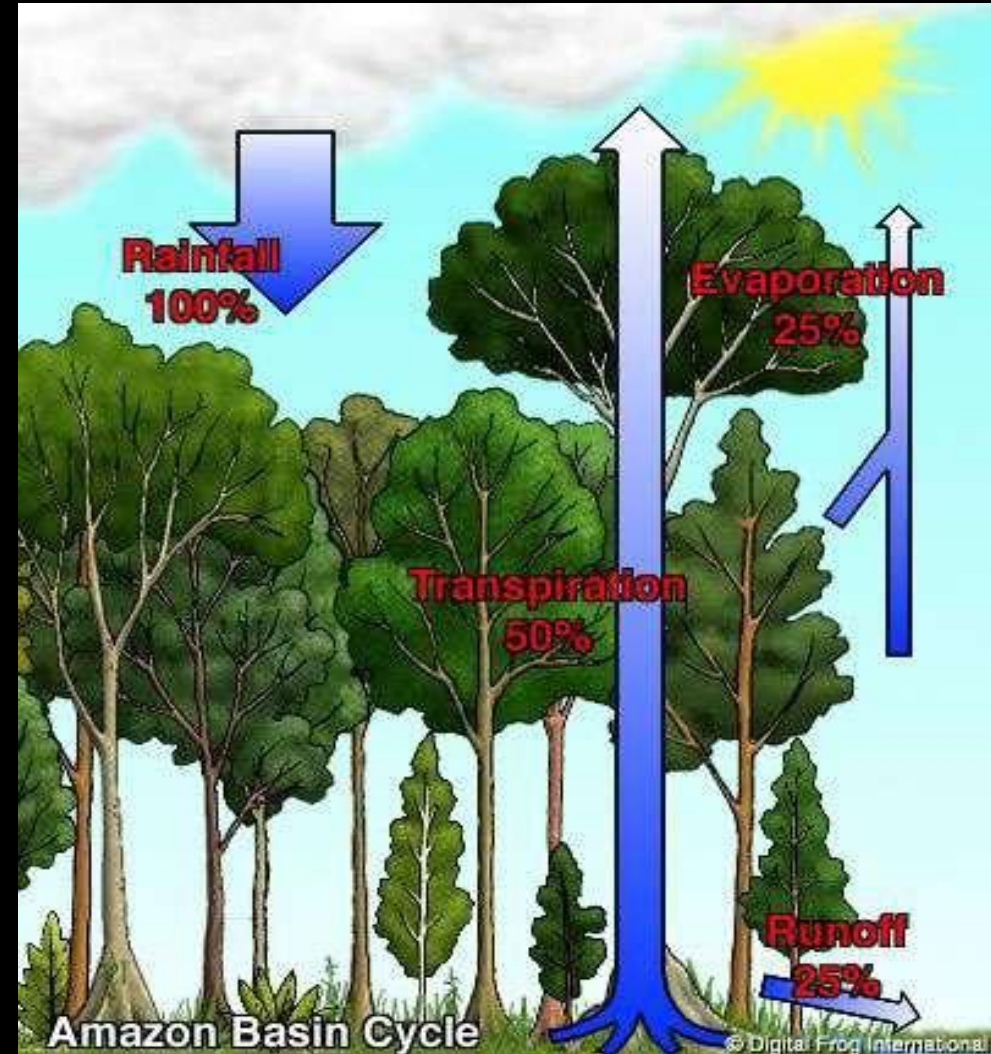


Abiotic Factors of Rain Forests

- Abiotic factors are those non-living, inert elements of an ecosystem that interact with the living components.
- The way that the abiotic factors interact with a particular ecosystem determines the types of plants and animals that can live in that ecosystem.
- The abiotic factors of the rainforest biome are the amount of **water, sunlight, temperature and soil, and climate.**

Water

- The rainforest normally receives no less than 80 inches of rainfall annually.
- This is one of the most visible abiotic factors of the rain forest.
- The air under the canopy layer is still and very humid.
- The trees also give off water through their leaves in a process called transpiration.
- This process can account for as much as half of the precipitation in a rain forest.



Sunlight

- Light is the main source of energy in the rain forest.
- Plants use chlorophyll to change energy from sunlight into chemical energy through photosynthesis.
- In the rain forest, most of the sunlight is absorbed by the upper canopy, made up of trees between 60 and 100 feet tall.
- Only about 1 percent of the sunlight that strikes the top of the rain forest reaches to the forest floor.
- Plants are adapted to these conditions -- plants in the understory have large leaves to better absorb the weaker light, while those in the upper canopy have small leaves to reduce water loss in the strong sunlight.

Soil

- The rain forest soil is shallow and thin, with few nutrients and soluble minerals.
- The heavy rains common in rain forests wash away the nutrients in the soil.
- As a result, the nutrients in a rain forest are largely found in the roots and leaves of living plants, and in the decomposing vegetation on the forest floor, rather than in the soil.

Temperature and Climate

- Due to location in equatorial region, the temperature in a rain forest rarely gets higher than 33 degrees C or drops below 20 degrees.
- The high and constant temperatures increase the rate of evaporation and keep humidity high. High rain fall also adds to that effect.
- Warm temperatures also allow growth to occur quickly.
- As animal and insect life does not need to expend energy keeping warm, it can spend more energy on reproduction and reproduce with greater frequency.
- This explains some of the abundance of life in the rain forest.

Rain Forest Ecology

- Sunlight is a major limiting factor.
- There is no annual rhythm to the forest; rather each species has to evolve its own flowering and fruiting seasons.
- A variety of strategies have been successful in the struggle to reach light to adapt to the low intensity of light beneath the canopy.

Distribution



Location

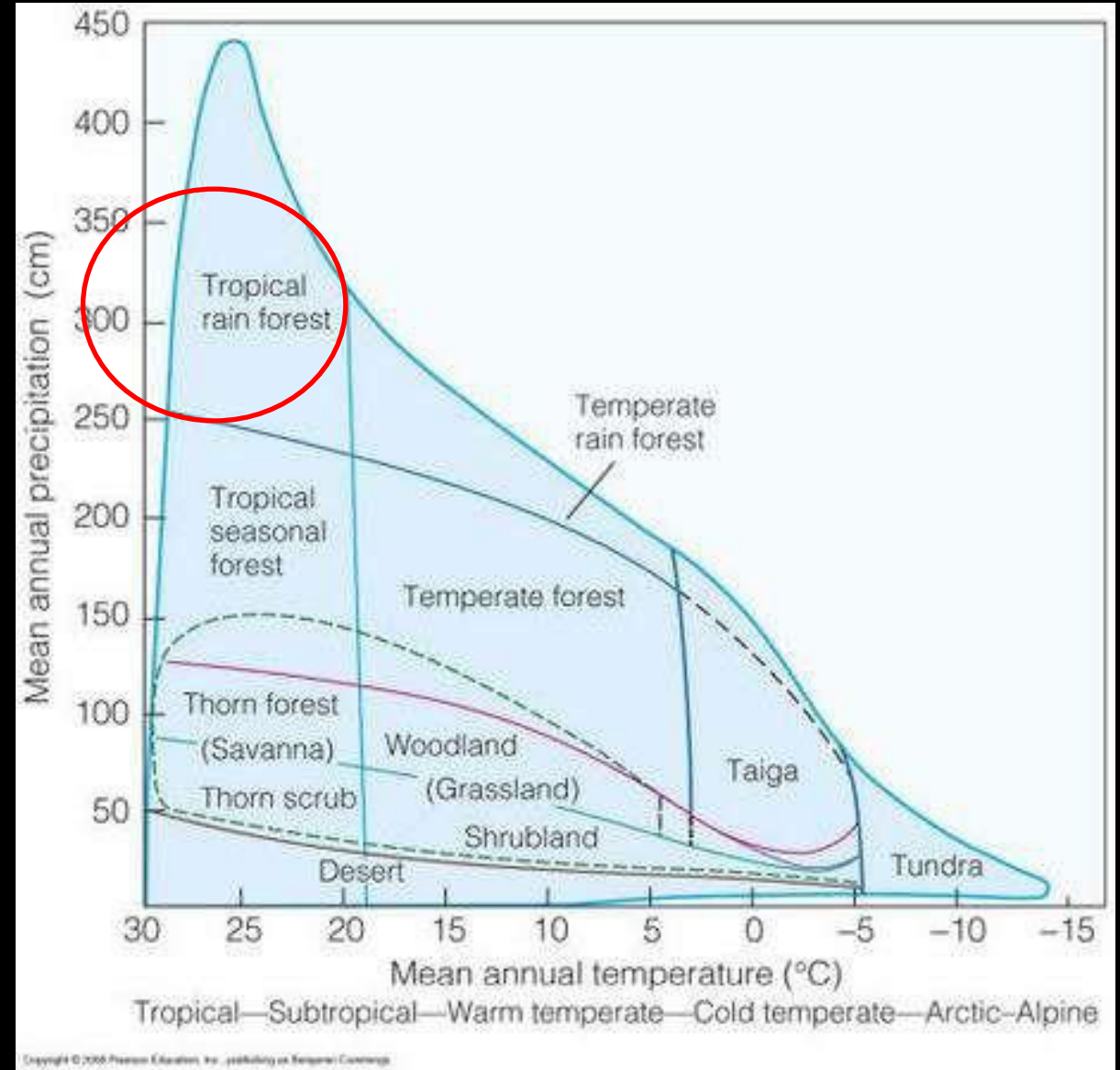
- Tropical rainforests mainly occur inside the World's equatorial regions.
- Tropical rainforests are restricted to the small land area between the latitudes 22.5° North and 22.5° South of the equator - between the Tropic of Capricorn and the Tropic of Cancer.

Location

- The largest unbroken stretch of rainforest is found in the Amazon river basin of South America.
- Over half of this forest lies in Brazil, which holds about one-third of the world's remaining tropical rainforests.
- Another 20% of the world's remaining rainforest exists in Indonesia and Congo Basin, while the balance of the world's rainforests are scattered around the globe in tropical regions. In India Andaman and Nicobar Islands has good area under rain forests

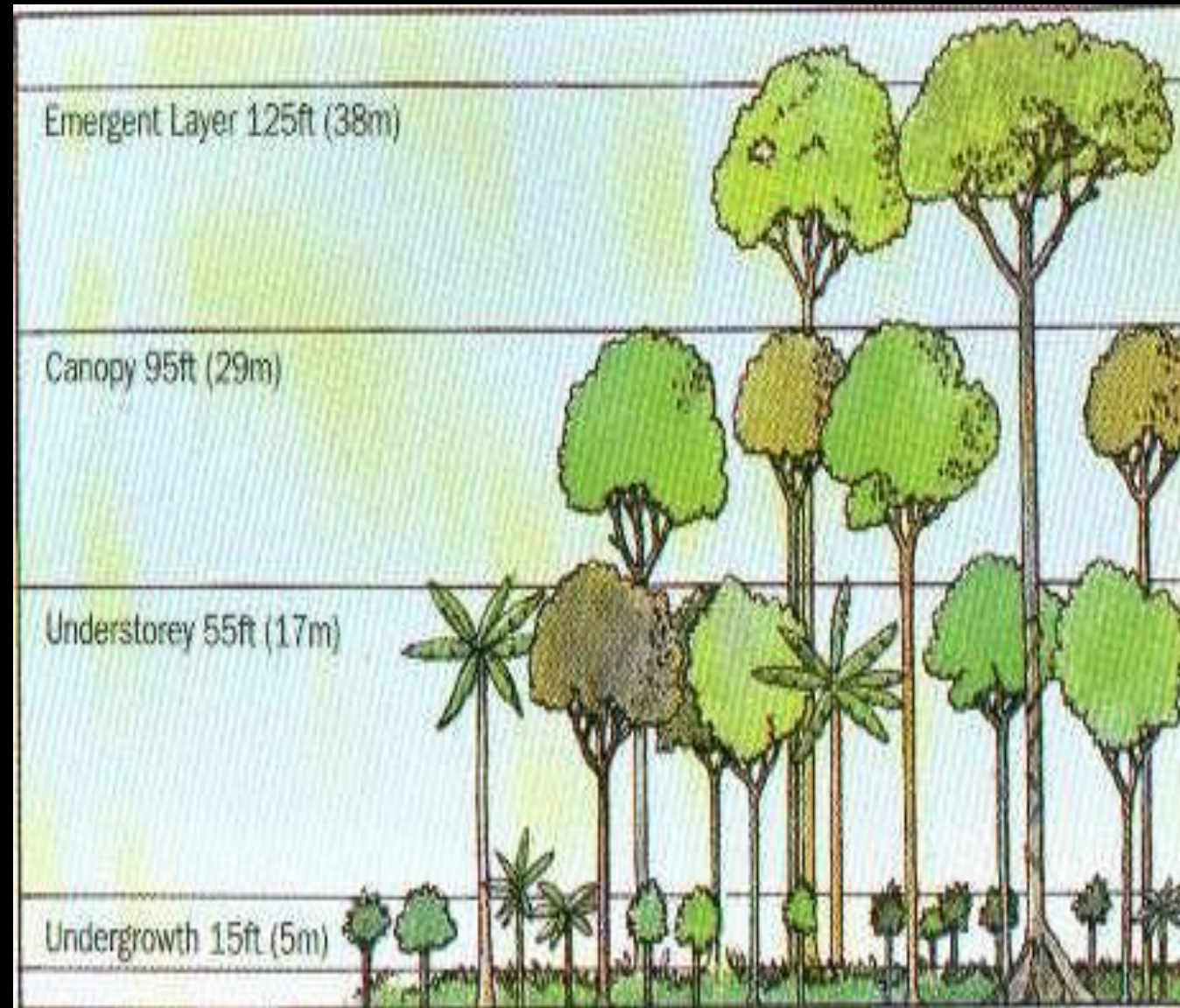
Precipitation and Temperature

- An important characteristic of tropical rainforests is moisture.
- Solar energy produces frequent rainstorms.
- High volumes of rain in rainforests can cause local streams and creeks to rise 10-20 feet over the course of two hours.
- Mean monthly temperatures are above 64 ° F; (18 °)
- usually a brief season of reduced precipitation



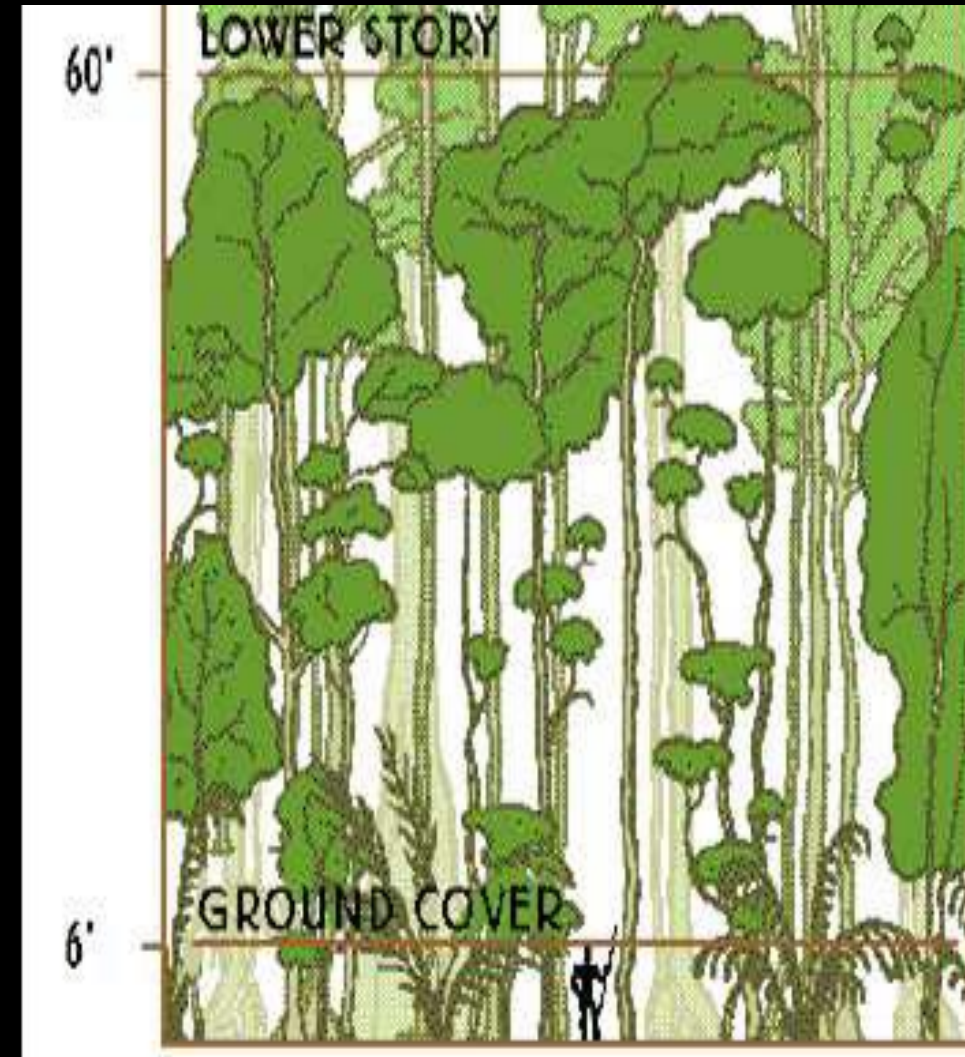
Structure

- Most of life in the tropical rainforest exists vertically in the trees, above the shaded forest floor - in the layers.
- Each tropical rainforest canopy layer harbors its own unique plant and animal species interacting with the ecosystem around them.
- The primary tropical rainforest is divided into at least five layers: the overstory, the true canopy, the understory, the shrub layer, and the forest floor.



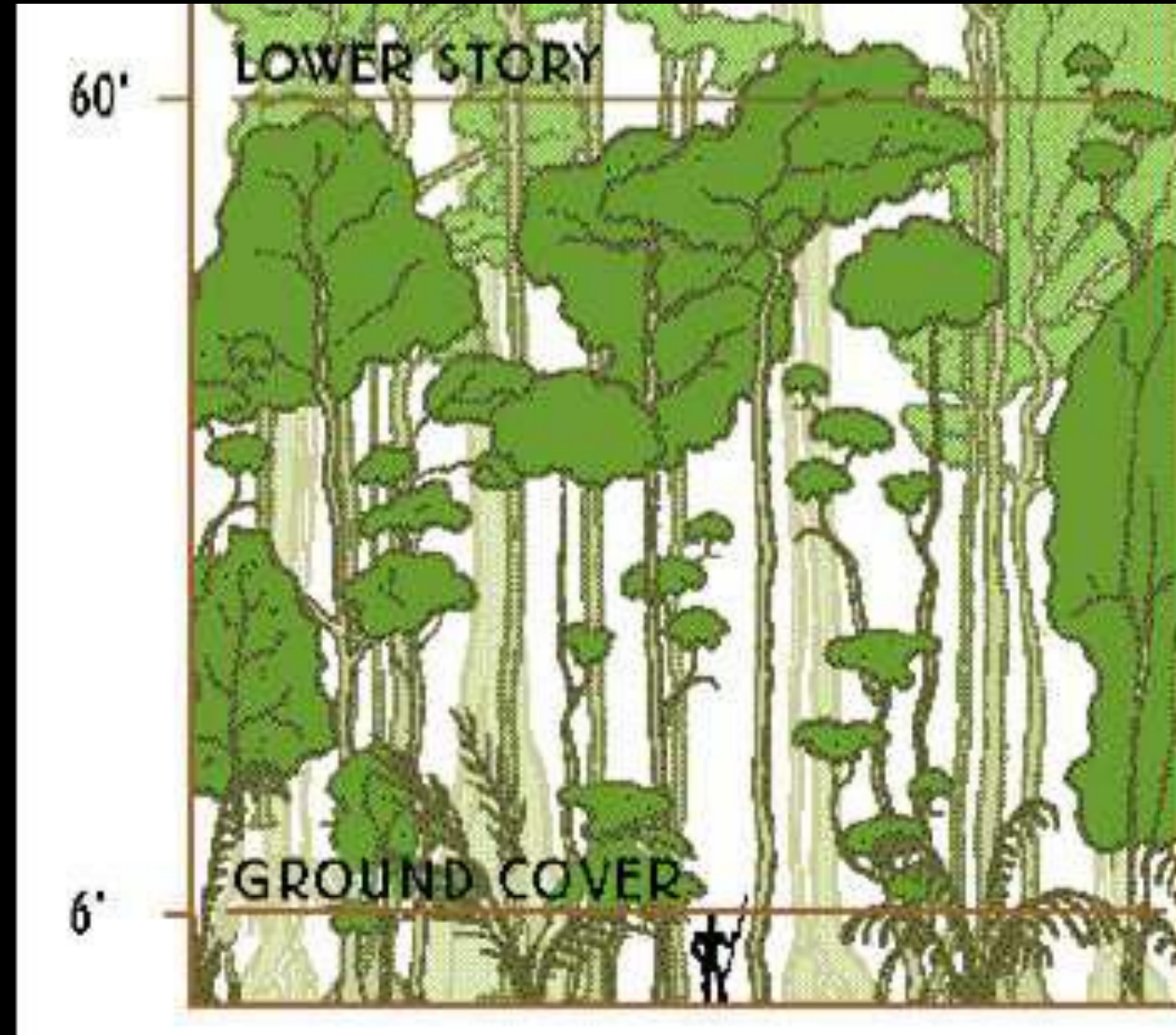
Forest Floor

- The area is mostly shade. Barely and direct light reaches this level, thus almost no plants grow in this area as a result.
- Since hardly any sun reaches the forest floor things begin to decay quickly.
- A leaf that might take one year to decompose in a regular climate will disappear in 6 weeks.



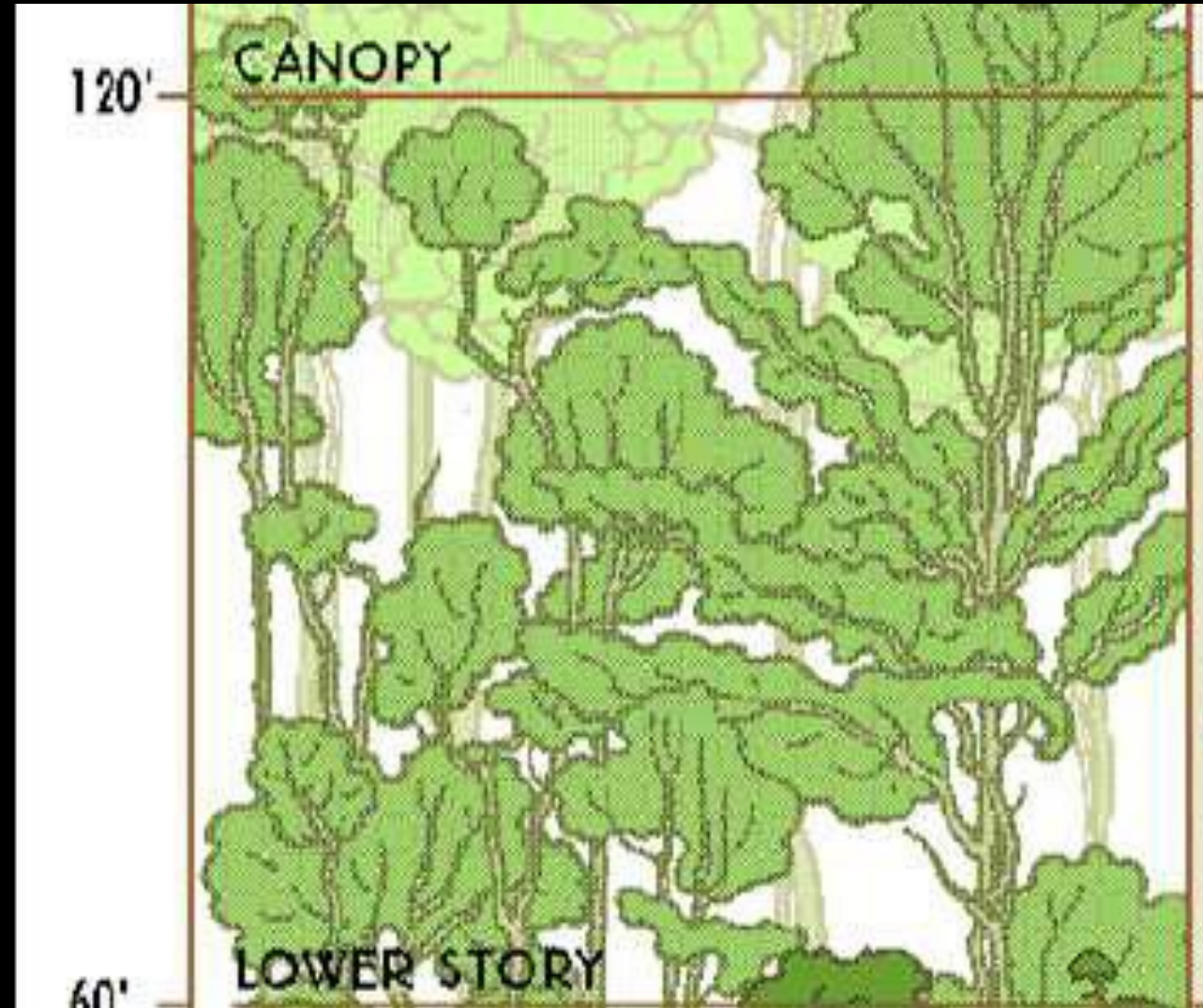
Understory Layer

- Little sunshine reaches this area so the plants have to grow larger leaves to reach the sunlight.
- The plants in this area seldom grow to 12 feet.
- Many animals live here including jaguars, red-eyed tree frogs and leopards. There is a large concentration of insects here.



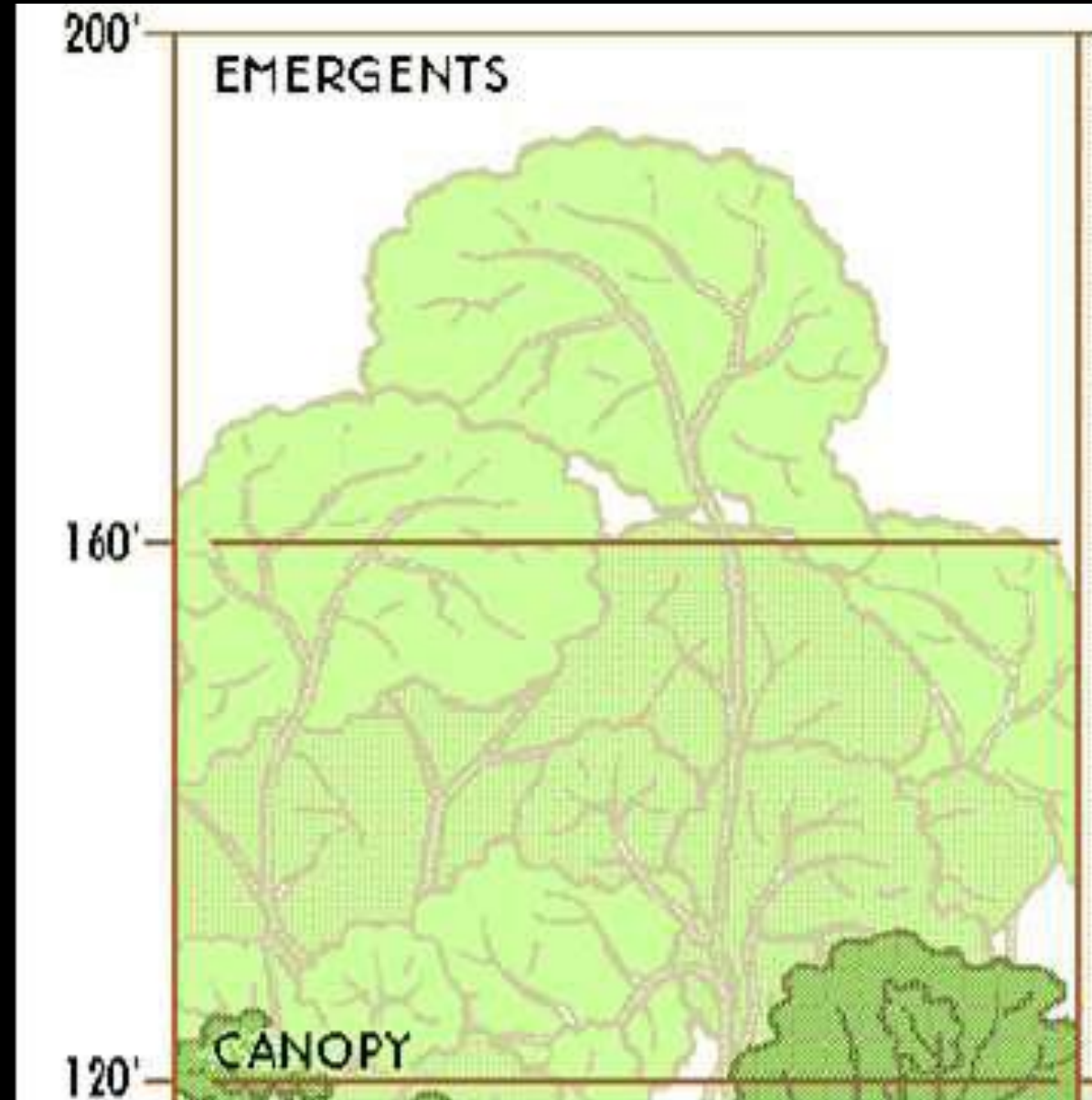
Canopy Layer

- This is the primary layer of the forest and forms a roof over the two remaining layers.
- Most canopy trees have smooth, oval leaves that come to a point. It's a maze of leaves and branches.
- Many animals live in this area since food is abundant. Those animals include: snakes, and treefrogs.



Emergent Layer

- The tallest trees are the emergents, towering as much as 200 feet above the forest floor with trunks that measure up to 16 feet around.
- Most of these trees are broad-leaved, hardwood evergreens. Sunlight is plentiful up here.
- Animals found are eagles, monkeys, bats etc



Biotic factors

Animal Adaptations

- The tropical rainforest is a wet, warm forest of trees that grow very closely together.
- The canopy can release gallons of water each year into the atmosphere and moisture hangs over the forest, keeping the interior warm and humid.
- Animals living in the rainforest adapted to these wet, warm conditions

Animals in the canopy: Primates

- Long arms to swing from tree to tree in the canopy, avoiding predators on the ground



The Aye-Aye (Lemur)

- Nocturnal feeder, to avoid dangerous predators by day.
- Large eyes allow more light in at night
- Builds nests on top of trees in the canopy
- Have a longer middle finger to reach within holes in tree



Photo by David Harring

Birds

- Have large beaks to lose more heat. Birds in tropical regions can afford to have larger beaks than birds in temperate regions.
- Differently sized beaks allow for different adaptations according to use
- Large beaks for cutting up pieces of fruit and nuts
 - Toucan
- Hooked beaks to tear small prey apart
 - Philippine Eagle
- Long thin beaks to reach within small holes on trees
 - Black-cheeked Woodpecker



Insects

- Camouflage allow longer survivability
 - Leaf-mimicking treehopper
- **Farming - Leafcutter ants** climb tall trees and cut small pieces of leaves which they carry back to their nest. The leaf pieces they carry are about 50 times their weight. The ants bury the leaf pieces, and the combination of the leaves and the ants' saliva encourages the growth of a fungus, which is the only food these ants eat.



Predators

- Camouflage allow predators to hunt undetected
- They blend with the color of the leaves and trees
- Warn prospective predators to stay away from them



- Amazon Horned Frog



Plant Adaptations

- Bark
 - unlike deciduous forests where a thick bark helps to limit moisture evaporation from the tree's trunk due to high humidity of tropical rainforests, most trees have a thin, smooth bark.



Lianas

- Lianas are climbing woody vines that drape rainforest trees.
- They have adapted to life in the rainforest by having their roots in the ground and climbing high into the tree canopy to reach available sunlight
- Many lianas start life in the rainforest canopy and send roots down to the ground.



Drip tips

- The leaves of forest trees have adapted to cope with exceptionally high rainfall.
- Many tropical rainforest leaves have a drip tip.
- Plants need to shed water to avoid growth of fungus and bacteria in the warm, wet tropical rainforest.



Buttresses

- Many large trees have massive ridges near the base that can rise 30 feet high before blending into the trunk.
- Buttress roots provide extra stability, especially since roots of tropical rainforest trees are not typically as deep as those of trees in temperate zones.
- Prop and stilt roots help give support and are characteristic of tropical palms growing in shallow, wet soils.



Epiphytes

- Epiphytes are plants that live on the surface of other plants, especially the trunk and branches.
- They grow on trees to take advantage of the sunlight in the canopy.
- Most are orchids, bromeliads, ferns, and *Philodendron* relatives.
- Tiny plants called epiphylls, mostly mosses, liverworts and lichens, live on the surface of leaves.



Pitcher plants

- Pitcher plant vines of family Nepenthaceae have leaves that form a pitcher, complete with a lid.
- Sweet or foul-smelling nectar in the pitcher attracts insects, that lose their grip on the slick sides and fall into the liquid.
- Downward-pointing hairs inside the pitcher prevent the insects' escape.
- The insects are digested by the plants and provide nutrients.



Thank You