

Tropical Ecosystems

The tropics are important not just for their economic exports, but also because about 40 percent of the world's human population lives within the tropical zone (by 2008 statistics).

The tropics fall between the Tropic of Capricorn and the Tropic of Cancer. The amount of daylight is fairly constant. The temperatures are never very cold at low elevations, remaining above 64°F throughout the year. Seasons such as spring, summer, winter and fall don't have much meaning, instead there are the wet and dry seasons driven by the tropical rain belt moving within the region. There are many different habitats within the tropics including: tropical rainforest, cloud forest, wetlands, dry deciduous forest, spiny forest, desert and even alpine habitat on the highest mountains. At the Conservatory we have a tropical rainforest in the Lowland and Aquatic Galleries and the cloud forest in the Highland Gallery.



For each 1,000 foot rise in altitude there is a 4° F drop in temperature. For example, if at sea level the average temperature is 75° F, at 10,000 feet the average temperature would be only 35° F. This has a dramatic effect on plant and animal distribution.

In tropical mountainous areas several types of forests occur. At sea level there are lowland rainforests and mangroves. Montane forests are cooler and may contain deciduous trees. At cloud level moist, dripping cloud forests can occur. They are cooler than lowland forests. High mountains may also have alpine, tundra and snow covered peaks.

Tropical Rainforest

Rainforests, we often talk about them, but what are they exactly and where are they?

Are all Tropical Forests, Rainforests?

Only a small percentage of the tropical forests are rainforests. To be a tropical rainforest, forested areas must:

- Lie between the Tropic of Cancer and the Tropic of Capricorn.
- Receive rainfall regularly throughout the year (80- 400 inches a year).
- Remain warm and frost free all year long (mean temperatures are between 70° and 85°F) with very little daily fluctuation.

Consequently, many forested areas in the tropics are not rainforests. Forests that receive irregular rainfall (monsoons followed by a dry season) are moist deciduous forests. Trees in these forests may drop their leaves in the dry season. Montane forests are found in mountainous areas and may contain plants such as oaks, pines and rhododendrons (found in Highlands), which are characteristic of temperate forests. At higher altitudes temperatures are cooler, and even close to the equator, frost and snow can occur.

Tropical rainforests comprise only 40% of the world's tropical forests and only 20% of the world's total forests. They 6% of the Earth's land surface. It's also important to remember that not all rainforests are in the tropics. Our Pacific Northwest is home to temperate rainforest.

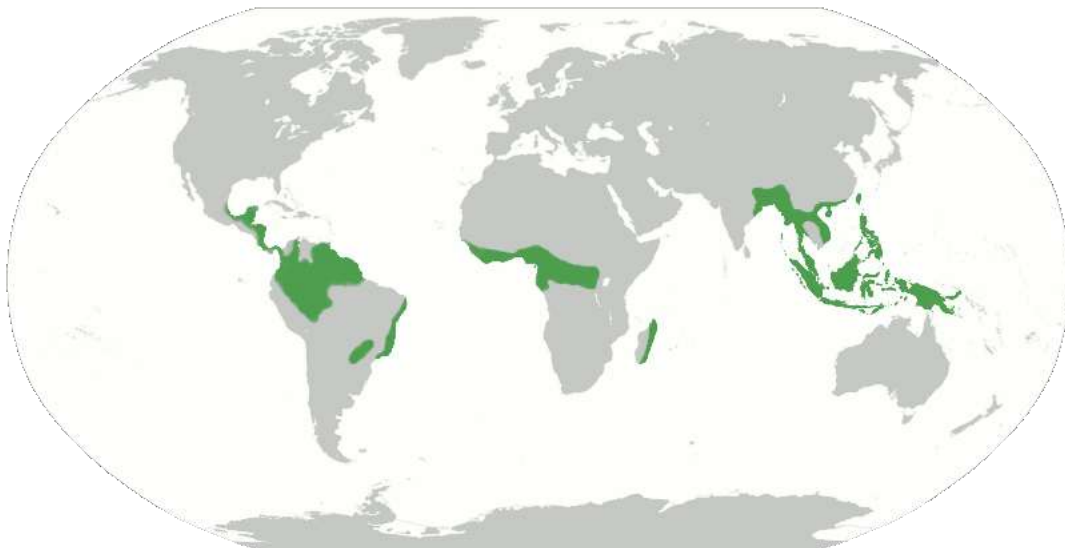


Image Credit: http://en.wikipedia.org/wiki/File:800px-tropical_wet_forests.png

Tropical Rainforest Layers

Emergent Layer

These giant trees thrust above the dense canopy layer and have huge mushroom-shaped crowns. These trees enjoy the greatest amount of sunlight but also must endure high temperatures, low humidity, and strong winds. The leaves are thick, waxy and smaller than lower down. Our Kapok is an example.

Canopy Layer

The broad, irregular crowns of these trees form a tight, continuous canopy 60 to 90 feet above the ground. The branches are often densely covered with other plants (epiphytes) and tied together with vines (lianas). The canopy is home to 90% of the organisms found in the rainforest; many seeking the brighter light in the treetops. Brazil nut trees are a keystone species in the Amazon.

Understory

Receiving only 2-15% of the sunlight that falls on the canopy, the understory is a dark place. It is relatively open and contains young trees and leafy herbaceous plants that tolerate low light, with larger, thinner leaves to catch as much light as possible. Many popular house plants come from this layer. Only along rivers and roadways, in treefall and cut areas is sunlight sufficient to allow growth to become thick and impenetrable. Many of the plants in Lowlands are from the understory.

Forest Floor

The forest floor receives less than 2% of the sunlight and consequently, little grows here except plants adapted to very low light. On the floor is a thin layer of fallen leaves, seeds, fruits, and branches that very quickly decomposes. Only a thin layer of decaying organic matter is found, unlike in temperate deciduous forests. When you are in Lowlands, notice how dark it is at ground level.

Soil and Nutrient Recycling

Most tropical rainforest soils are relatively poor in nutrients. Millions of years of weathering and torrential rains have washed most of the nutrients out of the soil. More recent volcanic soils, however, can be very fertile. Tropical rainforest soils contain less organic matter than temperate forests and most of the available nutrients are found in the living plant and animal material. Nutrients in the soil are often in forms that are not accessible by plants.

Constant warmth and moisture promote rapid decay of organic matter. When a tree dies in the rainforest, living organisms quickly absorb the nutrients before they have a chance to be washed away. When tropical forests are cut and burned, heavy rains can quickly wash the released nutrients away, leaving the soil even more impoverished.

What Makes the Tropical Rainforest Special?

- The rainforests are home to half of the Earth's plant and animal species.
- They are winter homes to many birds that breed in temperate latitudes.
- Tropical rainforests are some of the most beautiful wildernesses on our planet.
- They are home to tribal cultures that have survived successfully in the forests for many thousands of years.
- The forests are a potential source of medicinal plants that may benefit everyone on Earth.
- The ecosystem of the rainforest is based on the most complex interdependence of plants and animals. This is both the forest's strength and its weakness: highly specialized organisms are particularly vulnerable to disturbance, because they cannot adapt fast enough to survive the change.
- Tropical rainforests help maintain global rain and weather patterns. Much of the water that evaporates from the trees returns in the form of rainfall. Removal of the forest can change the natural rainfall patterns.

Above excerpted from Missouri Botanical Gardens <http://www.mobot.org>

Cloud Forest



Image provided by --Bian Tan of Strybing Botanic Gardens.

Cloud forests, a type of rainforest, occur on high mountains in the tropics and experience very different environmental conditions from the lowlands. As one ascends in elevation, the hot steamy lowlands are left behind and several distinct vegetation zones occur, including lower montane forest, cloud forest or upper

montane forest, and even an alpine zone if the mountain is high enough. Cloud forests are so named because they are often shrouded in mist and fog, which greatly reduces the amount of light plants receive.

In a cloud forest the trees are shorter and have a higher stem density than in the lowlands. The trees usually appear crooked and stunted, due to exposure to wind, sun, and cold and the leaves get smaller, thicker and harder with increasing altitude. Notice how different the climate is in Highlands. The crowns of the trees are often compact and dense. The high moisture level and cool year-round temperatures foster plant communities rich in mosses, ferns, and epiphytes. In drier areas, many of these plants perform a process called “cloud stripping” where they provide a place for moisture to condense and then drip to the ground, even if it does not rain.

Despite lower species diversity than found in the lowlands, there are many **endemic** species, both plant and animal, which live in cloud forests and are found nowhere else. Major areas in the world where cloud forests are still found include southern Mexico, Central America, and all countries in tropical South America. On the other side of the globe, cloud forests can still be found in SE Asia, New Guinea, tropical Africa, Madagascar, and some islands in the South Pacific.

Amazon Basin

The Amazon Basin is massive. Covering 40 percent of South America, it lies within northern Brazil, Peru, Columbia, Ecuador, Bolivia, and Venezuela. It is the watershed for the Amazon River, the world’s most voluminous river and there is debate about whether it or the Nile is the world’s longest river.

Rivers in the tropical lowlands fork and meander in incredible twists and turns, sometimes almost turning back on themselves. Since these rivers are in very flat areas without any significant slope and have a soft clay-like soil, there is not much to predetermine the course and the rivers snake lazily along as they wish, changing direction frequently and leaving large lakes and swamps where they once flowed.

The sheer volume of water keeps things pumping however. Mind-boggling amounts of water flow through the jungle, flooding vast areas of forest and carving great river cliffs sometimes 100 feet high. One fifth of the world’s river water flows from the Amazon’s mouth.

Most rainforest rivers, like the Amazon, are a muddy brown. With the vast amount of rain, sediment is constantly running off into waterways – a billion tons of it a year in fact. Torrential downpours can turn a dry creek bed into a raging river in a matter of hours, taking soil, plants, trees with it. Black water rivers are

common in the tropics as well. Like deep, clear black tea, these rivers get their dark color from the tannins which leach from dissolved vegetation.

Aquatic plants grow in abundance in rainforest waterways, thriving on the sun that shines through these breaks in the forest canopy. Floating meadows are even a common site here. Great patches of floating plants can grow so densely that a whole community of small trees, shrubs, grasses, other plants and even animals can thrive aboard these living rafts. Some can reach up to a square mile in area.

Image Credit:
<http://en.wikipedia.org/wiki/File:Amazonrivermap.png>

