

# TROPICAL RAINFORESTS

The tropical rainforest is earth's most complex biome in terms of both structure and species diversity. Tropical forests contain 70% of the world's vascular plants, 30% of all bird species and 90% of all invertebrates. The reason is that the tropical forest occurs under optimal growing conditions: abundant precipitation and year round warmth. There is no annual rhythm to the forest; rather each species has evolved its own flowering and fruiting seasons. Sunlight is a major limiting factor. A variety of strategies have been successful in the struggle to reach light or to adapt to the low intensity of light beneath the canopy.

**Tropical Rainforests** The tropical rainforest is found between 10 ° N and 10 ° S latitude at elevations below 3,000 feet. Above that elevation they become cloud forests. There are three major, disjunct groupings:

- Neotropical (Amazonia into Central America)
- African (Zaire Basin with an outlier in West Africa; also eastern Madagascar)
- Indo-Malaysian (west coast of India, Assam, southeast Asia, New Guinea and Queensland, Australia).



The species composition and even genera and families are distinct in each region. They also differ from species of temperate forests. Species diversity is highest in the extensive neotropical forest; second in the highly fragmented Indo-Malaysian formation; and lowest in Africa. Where 5 to a maximum of 30 species of tree share dominance in the Temperate Broadleaf Deciduous Forest, there may be 40 to 100 different species in one hectare of tropical rainforest. Tropical species of both plants and animals often have very restricted distribution areas. The forests of the Neotropics are the habitat for tens of thousands of plant and wildlife species — most of which have yet to be identified by scientists or seen by humans.

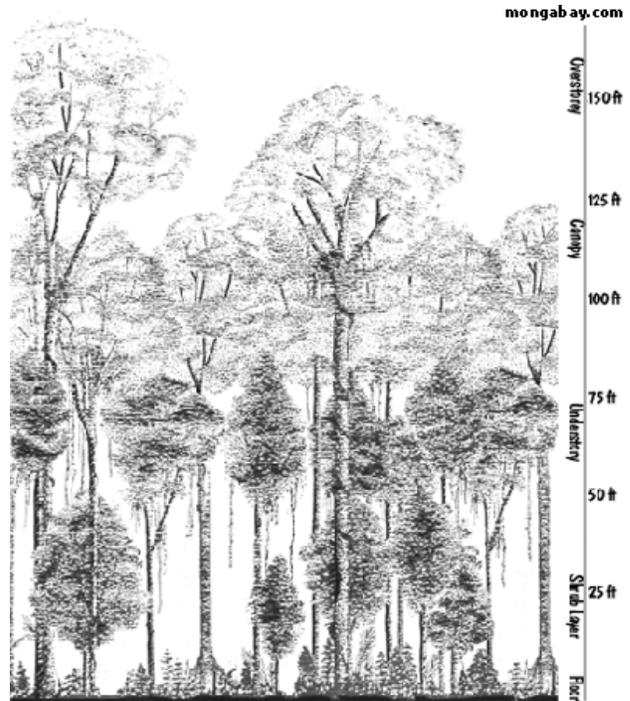
## **Climate:**

Mean monthly temperatures are above 64 ° F; precipitation is often in excess of 100 inches a year. There is usually a brief season of reduced precipitation. In monsoonal areas, there is a real dry season, but that is more than compensated for with abundant precipitation the rest of the year.

## Vegetation:

Biologists typically identify a vertical stratification of three layers of trees, and two layers of lower vegetation in tropical forests:

- Highest layer: the emergents. Widely spaced trees 100 to 120 feet tall with umbrella-shaped canopies extend above the general canopy of the forest. Since they must contend with drying winds, they tend to have small leaves and some species are deciduous during the brief dry season.
- Canopy layer: a closed canopy of 80 foot trees. Light is readily available at the top of this layer, but greatly reduced below it.
- Understory: a closed understory canopy of 60 foot trees. There is little air movement in this zone so humidity is constantly high.
- Shrub/sapling layer: Less than 3 percent of the light intercepted at the top of the forest canopy passes to this layer. Arrested growth is characteristic of young trees capable of a rapid surge of growth when a gap in canopy above them opens.



Ground layer: sparse plant growth. Less than 1 percent of the light that strikes the top of the forest penetrates to the forest floor. In such darkness few green plants (autotrophs) grow. Moisture is also reduced by the canopy above: one third of the precipitation is intercepted before it reaches the ground.

## Growth forms:

Various growth forms represent strategies to reach sunlight:

- Epiphytes: the so-called air plants grow on branches high in the trees, using the limbs merely for support and extracting moisture from the air and trapping the constant leaf-fall and wind-blown dust. Bromeliads (pineapple family) are especially abundant in the neotropics; the orchid family is widely distributed in all three formations of the tropical rainforest. As a demonstration of the relative aridity of exposed branches in the high canopy, epiphytic cacti also occur in the Americas.
- Strangler fig roots Lianas: woody vines grow rapidly up the tree trunks when there is a temporary gap in the canopy and flower and fruit in the tree tops of the two highest layers. Many are deciduous.

- Climbers: green-stemmed plants such as philodendron that remain in the understory. Many climbers, including the ancestors of the domesticated yams (Africa) and sweet potatoes (South America), store nutrients in roots and tubers.
- Stranglers: these plants begin life as epiphytes in the canopy and send their roots downward to the forest floor. The fig family is well represented among stranglers.
- Heterotrophs: non-photosynthetic plants that, like animals, do not use the sun's energy to make their own food. These plants, which can live on the forest floor, include parasites which derive their nutrients by tapping into the roots or stems of photosynthetic species and saprophytes which feed on decaying organic matter. Some orchids employ this strategy common to fungi and bacteria.

### **Common characteristics of tropical trees:**

Tropical species frequently possess one or more of the following attributes not seen in trees of higher latitudes:

- Tree buttresses Buttresses: many species have broad, woody flanges at the base of the trunk. Originally believed to help support the tree, it is now thought that the buttresses channel stem flow and its dissolved nutrients to the roots.
- Large leaves are common among trees of the third layer. Young individuals of trees destined for the higher layers may also have large leaves. When they reach the canopy, new leaves will be smaller. The large leaf surface helps intercept light in the sun-dappled lower strata of the forest.
- Drip tips facilitate drainage of precipitation off the leaf to promote transpiration and avoid accumulation of fungi. They occur in the lower layers and among the saplings of species of the emergent layer.

Other characteristics that distinguish tropical species of trees from those of temperate forests include:

- Exceptionally thin bark, often only 1-2 mm thick. Usually very smooth, although sometimes armed with spines or thorns.
- Cauliflory, the development of flowers (and hence fruits) directly from the trunk, rather than at the tips of branches.
- Large fleshy fruits attract birds, mammals, and even fish as dispersal agents.

### **Fauna:**

Animal life in the tropics is highly diverse, and much of it is found high in the trees. Common characteristics found among mammals and birds (and reptiles and amphibians, too) include adaptations to an arboreal life (for example, the prehensile tails of New World monkeys), bright colors and sharp patterns, loud vocalizations, and diets heavy on fruits. When the trees go, so too go nature's abundant creatures. See some Flora and Fauna of Cloudbridge.