

## Dry Forest Ecology

### A Seasonal Climate

Dry Tropical Forest is found in regions where there are several months of severe to absolute dry season, with most rain falling during a (usually) brief wet season. More than any other factor, the absence of precipitation during a prolonged portion of the year is what produces true dry forest, an ecosystem type characterized by plants and animals possessing specific adaptations to survive the dry season. Dry forests typically are found in very warm regions in the tropics, where the mean annual temperature is greater than 17C (63F), and where rainfall is in the range of 250 to 2000 mm per year (10 to 80 inches).

### Adaptations

The single most important adaptation, among plants, to the extended droughts of the dry forest is deciduousness, the shedding of leaves. Plants drop their leaves after the rains end, and essentially halt photosynthesis, which otherwise produces water losses the plant cannot sustain during the dry season. Some plants, like the *Ceiba trichastandra*, have an alternative source of photosynthetic energy: they have green bark rich in chlorophyll that lets them continue to photosynthesize even when they have no leaves. Other plant adaptations include the development of water storage tissues, such as swollen roots or stems that allow them to draw on saved water to survive the dry season. Many plants have an extra, waxy layer on the outside of their leaves, which also slows water evaporation. Some plants even engage in "nyctinasty," a fabulous botanical word that means they close their leaves at night: clasping leaves together reduces the amount of exposed surface area, also slowing water loss.

Animals, too, have some fascinating adaptations to the dry forest's long rainless weeks and months. Foremost among these is "estivation," the summer-time equivalent of hibernation. Many frogs and insects simply burrow deep into damp mud, or their own excavated chambers, and go to sleep, reducing their metabolism (and thus their water needs). When the rains return, the increased moisture awakens these animals, and they return to the surface to breed. Other animals, such as birds and monkeys, show a remarkable degree of mobility during the dry season, retreating to damp areas such as stream beds, where year-round moisture enables them to survive. Howler monkeys, which eat nothing but green leaves and occasional fruits, have been known to cram into small stream side forests at amazingly high densities, yet they do not fight over territory as they would during the rest of the year.

### Synchronicity

It all starts with the first rains. Like a desert blooming in spring, the first thundershowers in the dry forest produce an outbreak of fresh green leaves. This habitat has literally set its watch by the dry season, and many key ecological processes all take their cue from the arrival of the rains. As the new leaves begin catching sunlight, plant growth, stalled during the dry months, shifts into high gear. The precipitation moistens the leaf litter accumulated on the forest floor, where bacteria and insects (many just awakened from estivation) start the decomposition process that releases nutrients for use by the growing plants. As the rainy season nears its end, trees and other plants drop their leaves and produce a

profusion of showy flowers in a fireworks-like display designed to attract as many pollinators as possible. Those that are lucky, who get the timing just right, succeed in having some of their flowers pollinated before the dry season commences.

During the dry season plants sit mostly dormant, drawing on their stored water, perhaps using their green bark to generate some energy, and waiting, waiting for the rains to fall again. Leaf litter dries, and insects, frogs and many others return to their chambers to wait as well. As this dry season reaches its conclusion, those pollinated flowers now produce fruits, which arrive with the first rains. Now there are fruits, and leaves, in abundance, and animals from birds to mammals to insects and lizards begin foraging voraciously to recover weight lost during the dry season, and begin looking for mates. Young are produced quickly, in order to take advantage of the surfeit of fruit and other foods. Soon the forest is teeming with new life, bright green and full of the sounds of animals stocking up in preparation for yet another long, hot dry season.

## Conservation

Dry tropical forest once occupied more land area than rainforest, at 42% of all intra-tropical vegetation. However, it is easily converted to cattle pasture by logging and burning, and now very little dry tropical forest remains. In Ecuador less than 2% of the original extent of this forest type remains, a statistic which is characteristic of most tropical dry forest regions in the world; however, in Central America sadly less than one-tenth of one percent remains. Because of these tremendous rates of loss, organisms that once were common in these forests now face extinction, merely for lack of habitat. Furthermore, because few functioning dry forest ecosystems remain (the forest is reduced to small, isolated patches in most parts of the world), their ecology is poorly studied, and their fauna and flora are far less well understood than in the much better-studied rainforests.

Some positive developments can be reported, however, particularly in Costa Rica and Africa. In the western Costa Rican province of Guanacaste, the tireless efforts of Dr. Dan Janzen led to the establishment of the Santa Rosa National Park, later reformed as the much more extensive [Guanacaste Conservation Area](#). Janzen has succeeded, virtually single-handedly, in resuscitating the nearly extirpated dry forest ecosystem in Costa Rica, an area which now enjoys visits by hundreds of thousands of tourists, students and researchers each year.

In Africa, the tremendous revenue potential of international tourism has been harnessed for decades, and now provides sufficient income to support the protection of dry forest and savannah (seasonal, but grass-dominated) ecosystems. The famed safaris to the [Serengeti National Park](#) are just one example of how the interest of the world has been used to protect ecosystems.

## Diversity

Although the dry tropical forest is not as species-rich as the famed rainforests of Amazonian South America, a remarkable diversity of [plants](#) and [animals](#) calls this habitat home. Between 50 and 70 woody plants (trees and large shrubs) can be found in only one-tenth of a hectare (0.25 acres), far more than in most temperate ecosystems, where hundreds of acres can be populated by only a handful of species. Even epiphytic plants can be abundant in dry forests, including bromeliads and a stunning variety of

orchids. These forests can be very rich in bird life, often numbering over 200 or 300 species, and are important as stop-overs for migratory fowl, especially those birds that follow the Pacific coast to the temperate breeding grounds. Despite the annual dry season, these forests can support a surprising diversity of amphibians, and of course, reptiles can be very abundant in dry forest, where their tough skin and hard-shelled eggs give them an advantage.