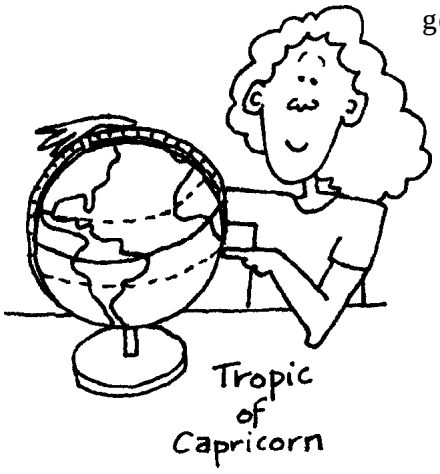
# Tropical Forest EcoColumn

*This document is an extension to the EcoColumn Information Document and includes information excerpted from* Bottle Biology, *a manual available from Kendall/Hunt Publishing Company (tel: 800-228-1810).*

**What comes to mind when you hear "tropical forest?":** Perhaps you think of towering trees, lush greenery, the shrieks and chatters of parrots and monkeys and perhaps even a loin-clothed individual hurtling through dappled light on the end of a hanging vine.

Tropical forests include all forests growing in the "equatorial belt" between the Tropic of Cancer and the Tropic of Capricorn. While these forests are generally very warm, they vary tremendously depending on their geography, including topography, elevation, proximity to coasts and soil type.




**Diversity among tropical forests:** Perhaps the most familiar type of tropical forest is the *rain forest*, which typically receives at least 1250 mm (49 in.) of rain a year (some receive as much as 8000 mm, or 312 in., a year). The average temperature is 27 degrees C (81 degrees F). However, the tremendous lushness and variety of species in these rain forests are largely due to the fact that temperature and rainfall are constant throughout the year. Because there are no dramatic seasonal changes, plants thrive all year round.

Other types of tropical forests are drier and more seasonal. Some forests experience marked dry seasons in which trees shed their leaves. Three progressively drier and more seasonal types of forests are the *humid seasonal forests*, *savanna forests* and *semi-arid thorn forests*. The rain forests and humid seasonal forests are often referred to together as the *tropical moist forests*

Savanna and semi-arid thorn forests experience much more variation in temperatures between day and night, receive less rainfall and may have as much as 10 drought months each year. These harsh environments support far fewer plants and animals than moist tropical forests and have a fraction of the species diversity.

There are many different types of forests within the broad categories defines above. For example, the category "tropical rain forest" includes lowland evergreen forests, semi-evergreen forests, montane or high altitude forests, heath forests, peat forests, cloud forests and swamp forests – and they are all tropical!

**Diversity within a lowland rain forest:** Lowland rain forests, the richest tropical forests in terms of species diversity, contain up to four general layers of vegetation. Tall, buttressed trees tower upwards, interlocking their crowns in a dense *canopy* 30 meters above. These giants absorb much of the intense tropical sunlight, allowing as little as one percent of the light to filter down to the forest floor. They also buffer the forest floor from all but the strongest winds. These trees tend to have oval-shaped leaves with an elongated "drip tip" that shed water easily.

**Sun seekers** – Other plants just below the canopy take advantage of the trees and their

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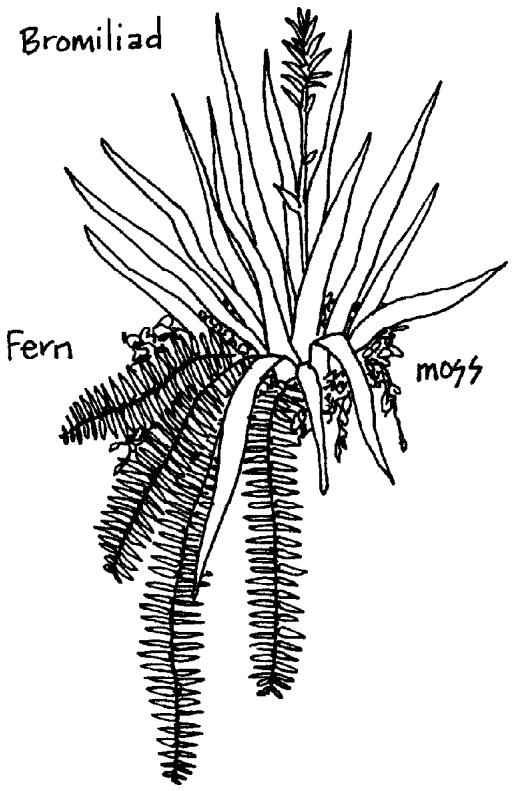
access to sunlight. Vines climb their way up tree trunks from the dark forest floor, then sprawl out along tree branches once they near the canopy.

Another group of plants, called epiphytes (literally "upon plants") also inhabit the upper tree trunks and branches. These plants, including ferns, mosses, lichens, orchids, bromeliads and even cacti do not actually live off the tree like parasites, but use it for mechanical support and access to sun and nutrient-rich rainwater.

Epiphytes disperse their seeds by wind and often grow on top of one another: a fern on a moss on a lichen on a tree trunk. Because they are not in contact with the ground, these "hangers-on" must conserve their own supplies of water and nutrients. Some orchids store water in bulbous stems. Tank bromeliads have large, water-tight pockets, which can hold over two liters of water. Canopy trees have smooth or flaky bark to make it more difficult for sunlight-hungry vines and epiphytes to gain a footing.

**In the shade** – Far below the canopy the forest **understory** is shady, humid and calm. Shade-adapted herbs and shrubs and small trees grow to several meters in height. These plants germinate and grow to maturity in the absence of any direct sunlight, although they may include species adapted to take advantage of any gaps in the canopy. If a branch or tree falls, perhaps pulled down by a heavy load of epiphytes, the gap can




create a sudden column of light, photosynthetic energy for any plant that can grow quickly to take advantage of the light before the canopy closes in again.

**On the forest floor** – Mosses, ferns, seedlings and a layer of leaf litter lie on the forest floor. Below this fallen plant material lie tangled rootlets of forest trees and the pale mycelial strands of fungi, which rapidly decompose plant matter and recycle nutrients back into the forest.

## Three Types of Tropical Forest

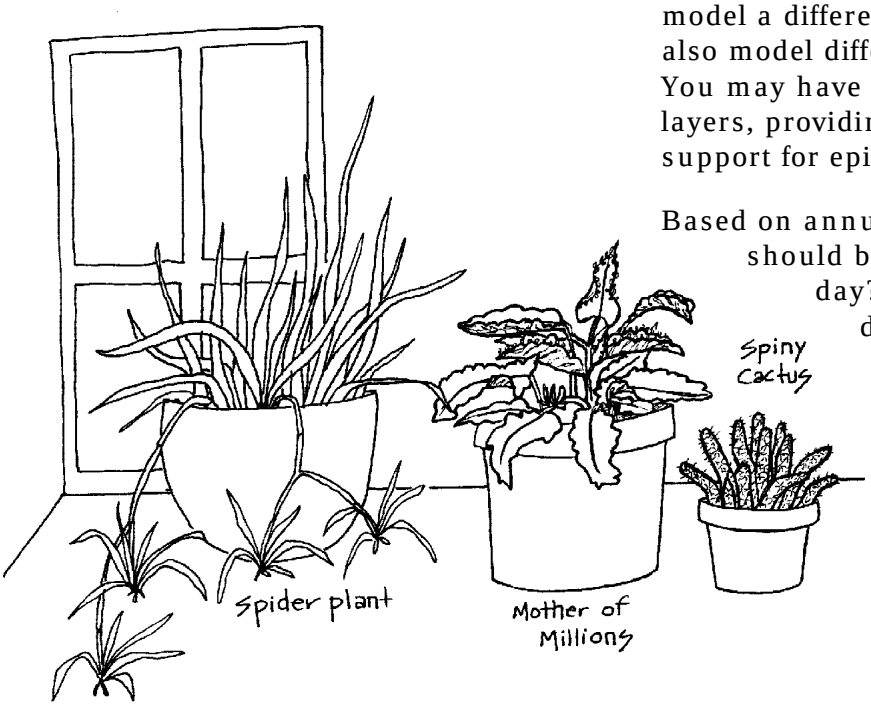
| Forest type: | lowland rain forest | humid seasonal forest | semi-arid thorn woodland |
|---|---|---|---|
| Annual rainfall: | 2000 mm (80 in) | 2000 cm (80 in) | 1000 mm (40 in) |
| Monthly rainfall: | 165 mm/mo. x 12 | 225 mm/mo. x 8<br>50 mm/mo. x 4 | 96 mm/mo. x 10<br>20 mm/mo. x 2 |
| Annual avg. temperature: | 28˚C (82˚F) | 25˚C (77˚F) | 28˚C (82˚F) |
| Annual temp. variation: | 3˚C (37˚F) | 18˚C (64˚F) | 35˚C (95˚F) |
| Daily temp. variation: | 8˚C (46˚F) | 18˚C (64˚F) | 30˚C (86˚F) |

| House Plant | Origin |
|---|---|
| Cape primrose *(streptocarpus)* | South Afr. rainforest |
| Moss fern or spike moss (*Selaginella)* | Asian, Afr., Am. & Aust. rain forest |
| Miniature gloxinia *(Sinningia pusilla)* | Brazilian rain forest |
| Strawberry begonia (geranium) *(Saxifraga sarmentosa)* | China & Japan |
| Miniature African violets *(Saintpaulia)* | East Africa |
| Swedish ivy (*Plectranthus nummularius)* | Australia, Pacific Islands |
| Artillery plant (*Pilea microphylla)* | West Indies |
| Aluminum plant *(Pilea cadierei)* | Vietnam |
| Baby's tears (*Pilea depressa)* | Puerto Rico |
| Wandering Jew *(Tradescantia fluminensis)* | Argentina, Brazil |
| Spider plant *(Chlorophytum comosum)* | Cape of Good Hope |
| Maidenhair fern *(Adiantum)* | South American rain forest |
| For drier environments: | |
| Jade plants *(Crassula argenta)*, | S. Africa (Cape Province, Natal) |
| Mother of millions *(Kalanchoe)* | Madagascar |

Plants that generally grow well in bottle environments include small-leaved ferns, small bromeliads, small-leaved ivies, mosses, liverworts, small sedum plants and small cacti.

**Diversity of tropical plants:** Now that you have thought about diversity between and within tropical forests, think about how plants adapt to a particular tropical climate or rain forest layer.

Many house plants are tropical plants. Gather clippings of several house plants (they can be transported wrapped in a moist paper towel). Do some research on the plants to find out their place of origin and what environments they prefer. Discuss plant and leaf size and shape, tolerance to wind, light requirements and when plants flower and bear fruit. Relate this information to what type of forest and forest layer might naturally host these plants.




**Create a tropical EcoColumn:** Using your house plants, and working individually or in groups, plan and create a tropical EcoColumn. Each EcoColumn chamber can model a different rain forest layer. You can also model different types of tropical forest. You may have to simulate plants for some layers, providing sticks or other structural support for epiphytes, for example.

Based on annual **rainfall**, how much water should be added to your column each day? Poke ventilation holes to decrease humidity. How much **light** are your plants receiving? What is the **temperature** in your column? A column near a light or in the sun will get very hot. How much should the temperature change during a 24-hour period? Don't forget the soil and decomposition layer.

**Rain Forest References**

Forsyth, Adrian & Ken Miyata 1984. *Tropical Nature: Life and Death in the Rain Forests of Central and South America.* New York: Charles Scribner's Sons.

Meyers, Norman 1984. *The Primary Source: Tropical Forests and our Future* New York: Norton.

*Rainforests — A Teacher's Resource Guide.* Compiled by Lynne Chase and available from: Rainforest Action Network, 301 Broadway, Suite A, San Francisco, CA 94133; (415) 398-4044.

Whitmore, T.C. 1990. *An Introduction to Tropical Rain Forests.* Oxford: Claredon Press.

**Additional Reading**

Behnke, F. 1972. *The Changing World of Living Things.* Holt, Rinehart & Winston (New York). This middle school-level book introduces readers to ecological concepts such as cycles, balances and habitats.

Corner, T. 1992. "Ecology in a Jar." *The Science Teacher* 59(3):32-37. Middle school-level activities for introducing ecological concepts.

Cruzan, J. 1988. "Teaching Ecology with Microcosms." *The American Biology Teacher* 50(1):46-47. Upper-level experimental ecology labs on such topics as soil community, species interaction, nutrient cycles and biogeography.

Downer, A. 1993. *Spring Pool: A Guide to the Ecology of Temporary Ponds.* Watts (New York). An invitation to explore the wildlife that breeds, feeds and rests in seasonal wetlands: middle school-level.

McCombs, L. and R. Nichols. 1986. *What's Ecology?* Addison Wesley (New York). A good high school-level introduction to ecology.

Spurgeon, R. 1988. *Usborne Science & Experiments: Ecology.* Usborne Publishing (London). A middle school-level, fun-filled book of activities and examples to illustrate the basic terms and ideas of ecology.