

The Vanishing Tropical Forests

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Twenty years ago, when this photo was taken at Hoya Grande in Honduras, the forest on the mountaintops in the background was untouched and the pine forest (foreground) relatively unspoiled. Today, with the population in Central American countries increased by more than 50 per cent since then and growing by three per cent each year, much of the forest cover has been removed to open the land for agriculture and grazing, as in the center of the photo. Lack of conservation practices is leading to rapid destruction of the forests and ultimate damage to the soil through erosion, overgrazing, primitive agricultural practices, and neglect.

The tropical world holds a fascination for most people, though there are perhaps more popular misconceptions about the tropics than any other region. Strictly speaking, the tropics is that part of the world extending $23\frac{1}{2}$ degrees north of the equator to the Tropic of Cancer and an equal distance south of the equator to the Tropic of Capricorn. A quick look at a map or atlas will show that there are some tropical lands on all continents except Antarctica and that two of the continents, South America and Africa, have more than one-half of their land area located within the tropics.

The largest tropical rain forest area, and perhaps the least disturbed one in the world, occurs in the Amazon basin. This region extends from Belém do Para on the mouth of the Amazon River west and southwest across the continent to the foothills of the Andes, northwest to the table mountains of the "Lost World," and south to southern Peru. (An Amazonian estuary is shown in a diorama in Hall 26).

The great continent of Africa is largely within the tropics. The rain forests of the Congo basin are enormous in extent but not nearly so impressive as are those of the Amazon basin. Within the African tropics are great areas of desert; the Sahara at the north and the Kalahari toward

the south. The Namib desert along the coast of South West Africa, due to the cold Bengala Current offshore, is one of the least "tropical" places within the tropics. In this desert grow some of the most curious plants to be found anywhere. *Welwitschia* is one of those, shown in a diorama in the Museum's Hall 26.

The Eurasian continent has a relatively small portion of its area in the tropics, including parts of Saudi Arabia, India and southeast Asia. The tropical forests of southeast Asia were, and perhaps still are, some of the richest in the world. However, the terrific population pressure in that region seems to indicate that most forests will be gone there within the century. Europe, if considered a continent separate from Asia, is wholly outside the tropics.

Australia is seldom thought of as tropical even though nearly half of that great island falls within the tropics. On the other hand, Oceania, no continent but a name applied to that great mass of islands in the Pacific, is in many people's thinking a tropical paradise.

To those of us who live in the Midwest the easily accessible regions of the tropics are those almost straight south of us in Mexico and Central America. The exuberance of the vegetation in these tropics attracts and often overwhelms the visitor or even the botanist whose experience

has been with regions in the so-called temperate climates. We lived in a small valley in Honduras for a number of years, a valley perhaps six or seven miles wide and about 15 miles long. There are more kinds of native flowering plants in that small valley than in the eastern U.S. of Gray's *Manual of Botany*. There are possibly more kinds of native trees on don Leo Salazar's Santa María de Ostuma farm in the Cordillera Central de Nicaragua than there are in all the New England states. There is another great difference, too. A hillside in the Berkshires of New England may have relatively great numbers of individuals of two or three or perhaps a half dozen species of trees. A hillside covered with cloud forest on the Cordillera Central de Nicaragua, or in the Cordillera de Talamanca in Costa Rica may have an almost bewildering aggregation of species of trees, but relatively few individuals of any one species.

It is a common experience in the tropics to find a tree and to never see another individual of it. Tropical climates have been and are more amenable to the development of numerous kinds of plants, than are the more severe temperate climates. The competition for space among successful kinds of trees in the tropics is very great. There are relatively few kinds of trees in temperate climates that have become really successful, covering large areas geographically and abundant in appropriate habits. However, of the trees of temperate climates that may be said to be successful, some are outstandingly so. One of the contributing reasons for this may be that there may be fewer kinds of successful trees and consequently the competition for space is less among the kinds of trees.

The old saw that "it is difficult to see the forest because of the trees" might be reversed in the tropics. The late Paul Allen, then associated with the United Fruit Company, collected specimens from a very large tree in the rain forest down in the southwestern corner of Costa Rica.* The late Paul Standley and I studied the specimens and, after showing them to many other botanists familiar with tropical floras, described a new genus and species based on them. A tree a hundred feet or more tall and 30 inches in diameter must be a rather conspicuous plant yet it was not discovered until 1951. How long it will be until another collector finds it and collects it I have no way of knowing, yet Allen said that it was a very conspicuous tree when in flower.

The Museum has had a continuing interest in the flora of Central America for more than 75 years. The knowledge so gained is useful and often essential in understanding any other branch of science. In particular, study of the flora and what is happening to it help us to understand the relation of man to his environment in Latin America, and what man is doing to his environment.

What effect does vegetation have on the production of food and on agriculture and on the regional rainfall so essential to both plantation and subsistence agriculture?

* *Pentaplaris doroteae*. A design made from the technical illustration of this plant was used as a cover design on "Homage to Standley," a small book published by the Museum to honor a staff member who was one of America's best known botanists.

What effect does a forest cover have on the climate, and what may be expected to happen if we remove that cover? Are tropical forests as luxuriant as they appear? If the soil can produce such magnificent forests, why does it not produce an abundance of food? Why are there not paper mills where plant growth is so lush? What effect do tropical diseases have on man in the tropics? Why do most people live in the highlands and shun the lowlands? Why must 80 per cent of Central Americans depend on agriculture? What about the utilization of water for agriculture? Is farm labor cheap or expensive at a dollar a day? Why not increase cattle raising and export meat? These and other questions deal with basic concepts of *conservation of natural areas; land tenure practices and the vegetation, and of agrarian laws and the forests.*

There has been much written in recent years about the population explosion. The rapid increase in the human population of Central America during this century, and more especially in recent years is bound to have, and does have, a very profound effect on the vegetation of Central America and on all the kinds of living things that depend on the natural vegetation.

It is my feeling, based on field experience in Central America and Mexico extending through 30 years, that the natural forests of Central America will all be gone before the end of this century except in spots too rugged to have any value in agriculture or too difficult to get the trees out.

The demand for land upon which to grow, or to try to grow, food crops increases in proportion to man's increase. The natural forests are being cut at an alarming rate to make way for subsistence or for plantation crops to satisfy man's immediate need for food.



Ancient volcanic soils on this mountainside in the Comayagua Valley in Honduras erode quickly when the protective forest cover is removed. Agricultural yield of this type of soil is not high, does not warrant destruction of trees to permit cultivation.



This area, near Lake Yojoa in central Honduras, shows the effects of primitive "milpa agriculture" practices on the forests.

Lake Yojoa in central Honduras is a gem in the midst of a lush tropical setting. The broad-leaf forests are as beautiful as any on the continent. If one wishes to cultivate this area lack of moisture is no problem for the rainy season is about eleven months long and during the short "dry" season rains may be frequent. The lands adjacent to the lake are relatively level and I suspect that perhaps a millenium ago the Maya cleared and planted here. Their descendants practice agriculture there today perhaps much as it was done then.

A kind of agriculture described as "milpa agriculture" is traditional. To be successful it requires vast amounts of land in comparison to the population living from that land. A bit of forest is cleared by fire, and the ax is also used now (that tool was unknown until after the Spanish conquest). The crop is planted among stumps and logs by making a hole in the fire-softened soil with a sharpened planting stick and dropping in a few seeds. The stumps and logs may be a nuisance but relative to the labor of removing them they are not. Harvest is done by hand and machinery was and still is mostly unknown or not used.

A field, like that at Lake Yojoa shown in the photograph may be planted with three or four crops during a year, one after another. The cleared and unfertilized land under this regime is depleted rapidly and in the course of perhaps three years the crops become so poor that the land is abandoned and a new clearing is made, the process started over again. The old piece of land is let go back to forest for a varying number of years. The resting period always becomes shorter as population pressures increase and demand for food increases. Consequently the lands with shortened rest periods are able to produce less on each new clearing or rotation.

The drier highlands and often the Pacific lowlands of Mexico and Central America, where the rainy season may be less, often much less, than six months long and alternating with a relatively harsh dry season the situation is very different and subsistence agriculture, also of the "milpa" type, along with grazing by excessive numbers of animals

has degraded much of these highlands for generations to come. The pressure to produce foods is so great that cultivation is carried out even when it is doubtful if the results warrant the time and labor involved.

The highlands of Mexico, Guatemala, Honduras and a part of Nicaragua are covered with what would seem to be endless forests of "Honduras pine," *Pinus oocarpa*. It is an excellent timber tree and a rapidly growing one. It grows on lands mostly unsuited to subsistence agriculture but on lands where cattle grazing can be practiced. Nevertheless, in times past and even now great areas of the pine is cut or burned to clear the land. Perhaps even today more is burned to clear land than is made into lumber. This pine is a renewable natural resource *par excellence*, and certainly rational use of Honduras pine would provide lumber to Central America and perhaps to much of the Caribbean region in perpetuity.

The photograph shows a new stand of "Honduran Pine" only six years after clear cutting of the pine forest. The "park-like" aspect of the forest indicates relatively heavy grazing. The control of grasses and herbs by grazing reduces the fire hazard to the young pines. Mature trees will come from this forest in 30-40 years.

At the invitation of the Mexican government about 25 years ago, the Rockefeller Foundation began an extensive research project into the potential of increasing the production of food plants used in the underdeveloped regions of the tropics. The plants involved were maize and wheat. The project, now sponsored by both the Rockefeller and the Ford Foundations, has been extended to other food crops important in the tropics and enlarged to cover other underdeveloped regions of the world.

While the increase in food production is only one of the problems of the underdeveloped regions of our continent—population control is perhaps the second in importance—I suspect that the "revolution" in tropical agriculture initiated by Rockefeller Foundation will prove to be the most important development in food production since the development of maize culture in America and that of rice and wheat in the Old World.

Valuable "Honduran Pine" forest areas are suitable for grazing but generally poor for crops, though many are destroyed for crops.





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