



(Top) Felled giant lies amid debris of lesser trees. Soon hacked-over plot will be fired for final destruction of nutrients. (Top right) Weeds and spindly second growth trees are about all that can be extracted from cleared plot. (Above) Colonist's privy pollutes formerly pristine jungle stream. Indians are more sanitary, use a hole in the wood which they cover up.

AMAZONIA I

Spoiling the jungle yields few riches

A rising tide of settlers, pushed by population boom, is destroying jungle for little profit

by Christopher Weathersbee

The Amazonian rain forest covers an area about the size of Europe or two-thirds of the United States. It is easy to think of this patch of woods as limitless.

To the mind of the nineteenth century European, used to traveling in or reading about the jungles of Africa and Asia, the vast deepness and darkness of Amazonia suggested unparalleled biological wealth. It would be a teeming, steaming place full of the strange cries of strange beasts and birds, unseen in vegetation so dense and lush as to seem sentient and hungry in its own right.

This still is the impression the jungle makes, at least in places in which modern man has not yet taken an interest. But they are the frosting on a much less exciting cake. Only when scientists finally took a belated look at the community of jungle life was the truth even suspected: As far as the romantic ideas of nineteenth century jungle adventure writers are concerned, the rain forest of the Amazon is a fraud.

Rainfall is Amazonia's great resource. Huge areas of the Amazon basin get more than 100 inches of rain a year, and the whole basin probably averages better than 80, twice what the eastern United States receives. Together with intense tropical sunlight, it should produce wild vegetation, and that is exactly what it does.

But the rain also leaches minerals. The soils of the Amazon basin, and of the world's other tropical rain forests, are so poor that botanists sometimes think the whole Amazon area should be a desert.

It isn't because the vegetation that has evolved can do without great reserves of nutrients in the soil and can capitalize on the water and light. Photosynthesis proceeds at a great rate, so plant energy foods are plentiful. The minerals without which plants cannot maintain their health are used over and over again.

The mechanism by which this hoard-



ing is accomplished is a relationship between plant roots and soil fungi called the mycorrhiza (SN: 2/8, p. 134).

The direct mineral cycling theory attempts to explain the vital role of mycorrhiza in the rain forest:

"The theory is based on the fact that the bulk of minerals available in the tropical rain forest ecosystems is tied up in the litter and living systems," says Dr. Nellie Stark of the Laboratory of Desert Biology of the University of Nevada. "Little available mineral ever occurs free in the soil at one time." Rainwater leaches it out too fast.

Basically what happens is this. Dead leaves and branches accumulate on the forest floor, where they quickly are attacked and broken down into their constituent chemicals by the mycorrhizal fungi. The fungi pass these nutrient chemicals into the root cells of higher plants; fungi and root cells are connected by microscopic bridges called hyphae. Where bacteria are main agents for decay, minerals are released into the soil and absorbed by roots.

Removal of a significant mass of plant matter, then, would inevitably involve removing a significant part of the mineral nutrients in an area also; it has been estimated that 70 to 80 percent of the minerals of the rain forest are locked up in living vegetation, most of the rest in the litter.

From an ecological standpoint, therefore, current agricultural practices in the Amazon basin are suicidal. All along the banks of the Caquetá River in Colombia the forest lies in ruins, great swatches of jungle laid flat by machete and axe, the debris on other recently cleared plots afire and sending huge columns of smoke aloft. Even a count of the number of colonists would give no index of the extent of the damage already done, since each farmer

cuts, burns and soon moves on to a virgin area.

In some parts of Amazonia, airline pilots report, the smoke billowing above the jungle is so thick they have to fly by instruments alone, and so extensive they may remain on instruments twenty or thirty minutes. Even to so large a forest, such assaults are ruinous.

Not only do the minerals go up in smoke or down the river in solution, but the mycorrhiza is damaged or destroyed. What is left after the fire is a field of the poorest soil known outside of the world's frank deserts. Mineral-poor crops may be raised for one or two years. Then nothing will grow but grass, so poor in nutrients cattle can barely subsist on it.

There seems little that existing agricultural technology can do to help either farmer or jungle. Current methods of chemical fertilization do nothing but waste money, since the fertilizer washes away before the plants can use it. In addition, even if the technology existed it would be a huge job to educate the settlers in its use.

The lack of adequately developed agricultural science in the region stems from the lack of money for basic studies, and is at the crux of the rain forest's ecological problems.

The secondary forest that grows on once-cleared land is markedly different from the massive, four-story stand of vegetation that is the primary forest. It grows slowly and provides poor habitat for animal life. Presumably in some areas the dribble of minerals available from the soil will allow primary-type forest to grow up from the secondary. But it will be a slow job of biological penny-pinching, and physical factors such as erosion and heat may not permit it.

It is surprising that tropical forests

should be heat sensitive, but this appears to be the case. It has been observed that the forests adjacent to man's clearings slowly die back. The theory is that in primary forest the plant cover keeps the soil temperature even and relatively low. At the edges of clearings the sun reaches the soil under the trees and overheats it. This and the day-to-night swing in soil temperature finally kills the trees.

The rain forest fauna, of course, goes the way of the forest. But in many areas man is not waiting for the removal of habitat to make inroads into the animal populations.

A forest which survives on strict economy has little surplus with which to support masses of animals. In common with tropical areas generally, and contrasting with temperate areas, there are many species, but few are abundant.

Thus when any one species becomes valuable to man and comes under attack, it is quite easy to make large dents in its population. Almost all of Central and South America's large cats, for instance, are seriously threatened by the fur trade.

Indians are collecting parrots in Colombian rain forest by the hundred thousand for a booming pet business in the United States (SN: 1/4, p. 20).

Monkeys are pouring out of Amazonia to satisfy the needs of research laboratories in the United States and elsewhere. Baby caimans and baby turtles are under serious attack, also for the pet trade.

One fauna raid with immediately serious human consequences was that on caimans, the small crocodilians that formerly were found in almost every ditch with enough water to float them. In large parts of its Colombian range the caiman has been decimated. Because it is a heavy snail-eater, snails in these areas have increased sharply. These snails transmit schistosomiasis, a disease caused by parasitic worms, to man and cattle.

It is illegal in Colombia to take caimans, and now the ranchers have their rifles ready for anyone they catch poaching. Nevertheless the caiman trade goes on, most of the captured reptiles taking on the name of alligator before being sold in U.S. pet shops.

Colombia's population will double by the end of the century. Malnutrition is prevalent there now, so few Colombians are going to listen to the long-range argument that cutting the jungle is a waste of time and jungle. In the short run, cutting the trees will yield a marginal diet to a new addition to the population which otherwise would starve to death, now. Before the jungle and its animals can be saved, technology will have to step forward and save the people. ◇