

Penetrating the Remote Amazon Rain Forest

Brazil's vast Amazon rain forest, almost half the size of the continental United States, has long been protected by its great expanse and the difficulty of traversing it. Huge bites have been chomped from its southern and eastern edges over the past three decades to make way for cattle ranches, farms, highways and human settlements. But the remote interior has remained untouched and largely inaccessible.

That has led some skeptics to suggest that dire predictions about the fate of the rain forest have been greatly exaggerated. After all, satellite images show that only 14 percent of the original Amazon forest in Brazil has been cleared, and some of that is growing back. That would seem to leave almost 90 percent of the forest still standing — by far the largest expanse of intact rain forest anywhere in the world.

But an accumulating body of evidence suggests that the actual destruction is far worse than the satellite images convey — and will get even worse in coming years. The satellites can see areas cleared for ranches and farms, but they cannot spot the trees lost to logging, which is done selectively in the Amazon rather than by clear-cutting, and they cannot see destruction from fires beneath the forest canopy. Scientists from the Woods Hole Research Center and Brazil estimated last year that, when these two factors are considered, the forests are actually disappearing at more than twice the rate officially reported.

The loss threatens to reduce the great diversity of plants, insects and

New roads, dams and river projects may fragment the jungle.

wildlife that makes the Amazon the greatest repository of species on earth. It could also speed the rate of global warming because forests store great amounts of carbon dioxide, the chief global warming gas, and then release it when the trees are burned or decompose.

Alarming, the forest is becoming increasingly vulnerable to fires like those that are currently devastating the American West and that devastated the Amazon itself in 1997-98. Under normal circumstances, fire is not part of the ecology of the damp, humid rain forest. Truly destructive fires used to be rare events, occurring every few centuries under conditions of severe drought. But bad fires now seem to be occurring every couple of decades, and many researchers have concluded that the forest is drying to the point where the danger of conflagration is significant.

Now the forest is facing an added threat — a slew of paved roads and other infrastructure projects, mostly proposed under a development program known as *Avança Brasil* (Forward Brazil). These projects could rob the forest of its inaccessibility and spur accelerated development, further fragmenting the jungle.

The evidence of what could happen is already visible along a road that runs 800 miles north from Manaus, a

remote jungle metropolis, to the Venezuelan border, as I found on a trip to the area this summer. Though originally billed as a surgical cut through the trees to give Manaus an overland link to the sea, the road soon sprouted offshoots into the surrounding forest and prompted the central government to announce a grandiose colonization scheme to boost agricultural production. Soon the adjacent forest had been chopped into fragments to accommodate fields and pastures. The result, according to research by Brazil's National Institute for Amazon Research and the Smithsonian Institution, conducted in forest fragments north of Manaus, was to deprive some species of their habitats and allow sunlight and hot winds to penetrate the forest and dry it out.

Much the same may well happen elsewhere as additional roads through the jungle are paved, including one from Santarém, an inland port along the Amazon, to Cuiabá in the south, right through the center of the rain forest. By one count, the length of paved road through the Amazon will increase by more than 2,700 miles in coming years. At the same time, river channels will be widened, dams will be built for electric power, and the forest will be transected by power and gas lines. Meanwhile, Asian and Brazilian timber companies are boosting their cutting and a wholly new threat — large-scale soybean farming — is emerging.

The best hope for the Amazon lies in a heightened environmental consciousness. Environmentally minded governors have been elected in two

Amazon states, and even the governor of Amazonas, the state encompassing Manaus, who once vowed to give a chainsaw to every citizen, has begun extolling ecotourism. In one farsighted move, Brazil has set aside sizable tracts in the Amazon as Indian reserves, thereby giving stewardship to the indigenous peoples who have long lived in harmony with the forest.

No one can expect Brazil to forgo all development of the vast Amazon, least of all the industrialized nations that long ago leveled their own virgin forests. But the trick will be to guide development along lines that preserve the region's biological diversity and its sponge-like ability to absorb carbon dioxide and thus forestall global warming. International lending agencies can play a role here by ensuring that whatever projects they finance are minimally destructive. The G-7, in particular, has a farsighted pilot program to encourage sustainable development.

Some researchers hope that a way can be found to give Brazil credit under global warming agreements for the contribution its forests make in storing carbon dioxide. Environmentalists fear that approach could divert attention from the need to curb fossil fuel emissions, and the Brazilian government itself, always wary about outside interference in the Amazon, has been opposed. But the approach may gain momentum from the recent decision of the United States to seek similar credit for its own forests. It is surely in the world's interest to encourage Brazil to slow the destruction.

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Fonte: *New York Times*
Data: *21/8/2000* pg. *2*
Class: *21/8/2000*
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