

Parts of Amazon close to tipping point

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The Mato Grosso, the most scarred region of the Amazon rainforest, is teetering on a deforestation "tipping point", and may soon be on a one-way route to becoming a dry and relatively barren savannah.

Mônica Carneiro Alves Senna and colleagues at the Federal University of Viçosa, Brazil, used computer models to simulate how the Amazon would recover from various amounts of deforestation. Their simulations ranged from a complete wipe-out of the entire forest to a situation where just one fifth of the forest would be removed.

Previous studies have shown that cutting trees has a double effect on the forest's recovery. Fewer trees means less rain - because rainclouds are more likely to form above moist forests.

It also leads to poorer quality soil, as most of the Amazon's nutrients come from decaying vegetation, explains Yadvinder Malhi of the University of Oxford. "By removing the forest you remove the nutrients," he says.

Rain makers

Both of these conditions make it more difficult for trees to grow back, and can change the lush tropical forest to other landscapes, such as a seasonal forest - or even dry savannah.

Senna and colleagues confirmed that getting rid of any amount of trees would reduce the amount of annual rainfall. With 20% deforested region, on average, 0.5 mm less rain fell per day than in a fully forested region. Beyond 40% of deforestation, the reduction in precipitation was more severe - 1 mm less per day than a fully forested region.

In all cases, rainfall eventually returned to current levels after 50 years, but the forest did not return to its original state.

In their models, the researchers did not assume that the forest would be left alone after a certain level of deforestation was reached. Instead, clearing activities continued at current rates and planned road projects were carried out. The point of the study was to see if there were any critical "tipping points" beyond which the forest could not recover.

Treeless landscape

When Senna and colleagues integrated a loss of soil quality into their models, the change was much more profound.

The Mato Grosso region in the southern Amazon - an area more than twice the size of California - experienced irreversible effects with a relatively small drop in forested regions. Already, about 17% of this region's forest has been cleared. When the team simulated 20% deforestation, Senna found that northern Mato Grosso was not able to recover its forested state even after 50 years. Instead, it became a dry, bare savannah.

Senna's simulation may even be optimistic. Her modelling does not take into account the effect of climate change, which recent studies have shown could turn the Amazon into a tinderbox, more vulnerable to fires.

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