

Fragmentation rapidly erodes Amazonian biodiversity

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An international research team has discovered that forest fragmentation poses an even greater threat to Amazonian biodiversity than previously thought. Their findings, to be published next week (27 November – 1 December) in the journal *Proceedings of the National Academy of Sciences USA*, summarizes key findings from the world's largest and longest-running experimental study of habitat fragmentation.

The Amazon contains the planet's most biologically diverse tree communities, with up to three hundred species occurring in an area the size of just two football fields. These forests are being rapidly felled and fragmented for timber operations, cattle ranches and industrial soy farms.

The team, led by William Laurance of the Smithsonian Tropical Research Institute in Panama, has been studying the fates of nearly 32,000 Amazonian trees since 1980.

The most striking finding, say the authors, is the remarkable speed at which tree communities are changing in forest fragments.

“Rainforest trees can live for centuries, even millennia,” said Laurance, “so none of us expected things to change too fast. But in just two decades—a wink of time for a thousand year-old tree—the ecosystem has been seriously degraded.”

The main driver of these changes, say the authors, is ecological changes

near the margins of forest fragments. “When you fragment the rainforest, hot winds from the surrounding pastures blow into the forest and kill many trees, which just can’t handle the stress,” said Henrique Nascimento, a team member from Brazil’s National Institute for Amazonian Research in Manaus. “Also, winds build up around the fragment and knock down a lot of trees.”

The trees that regenerate in their place are very different from the trees that died. “When you fragment a forest, the winners are common pioneer and generalist species that like forest disturbance,” said Laurance. “The losers are rare, slow-growing tree species that provide fruit, nectar, and homes for a diversity of rainforest animals.”

To understand how fragmentation is affecting the trees, the team studied 22 different characteristics of the increasing and declining species. “Our results show that tree communities in fragments are being completely restructured,” said Nascimento. “Most vulnerable are trees specialized for living in the dark forest understory that need animals such as birds or bats to disperse their seeds and pollen.”

Fragmentation is also changing the dynamics and structure of the forest. Tree communities in fragments are highly unstable, losing and gaining species at a high rate. Fragments also tend to lose many of their large trees and become dominated by small, fast-growing species.

Forest fragmentation may even increase global warming. The authors demonstrate that the small, fast-growing trees that proliferate in fragments contain less biomass, and hence store less carbon, than do the original rainforest trees they replaced. The carbon from the dead rainforest trees is broken down by microbes and fungi to become carbon dioxide, the most important greenhouse gas.

“Fragmentation is affecting the forest in a lot of ways,” said Laurance.

“These changes occur remarkably fast, and when you completely alter something as basic as the trees, the other species that live in the rainforest will surely be affected too.”

Source: Smithsonian Tropical Research Institute

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