INVERSE

Laser scans have revealed something strange at the edge of the rainforest

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The world's third-largest island is full of life: Orangutans swing from branches, pygmy elephants roam the land, and exploding ants creep along the treetops.

But Borneo, a massive spot of land in Southeast Asia, is also home to thriving industries like logging and palm oil production. Both require leveling forests, leaving Borneo's lush tree cover fragmented.

With the help of airborne lasers, researchers have discovered what a fragmented forest canopy means in the long-term for tropical trees.

Trees at the edges of forests store 22 PERCENT LESS CARBON than trees inside forests, and the effect extends more than 100 meters into the forest, finds a study published Monday in the journal *Proceedings of the National Academy of Sciences*.

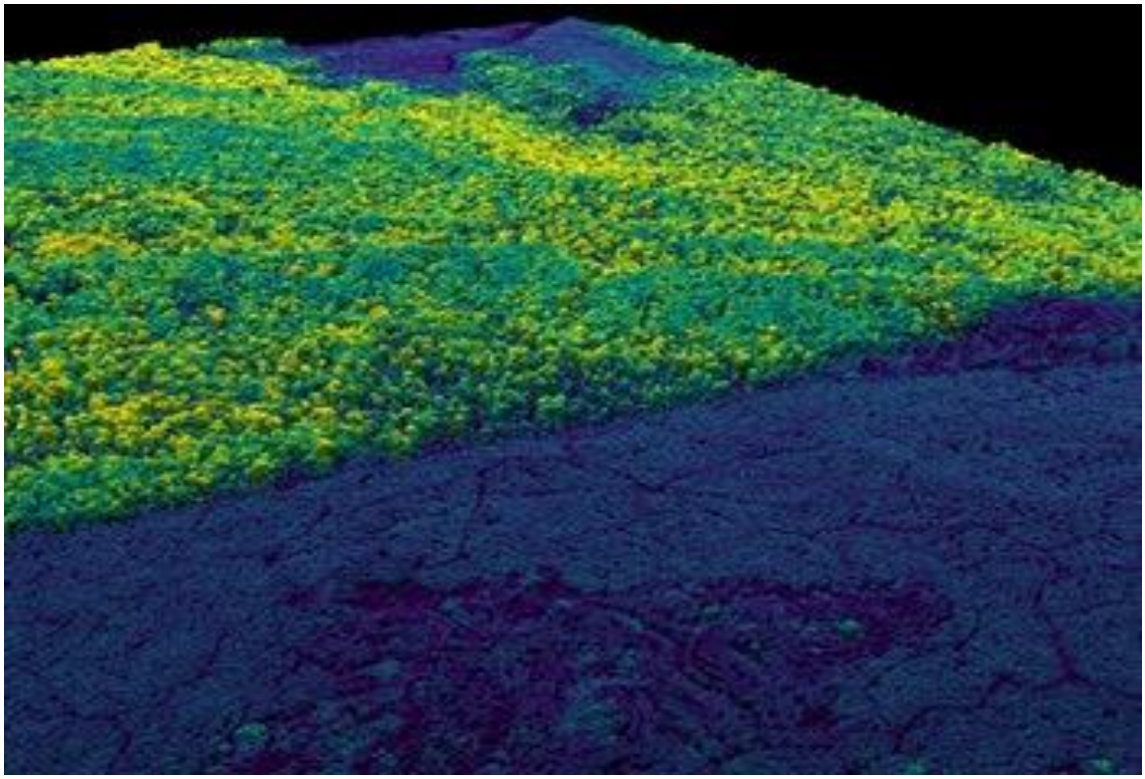
Trees at the edge of a forest are less likely to grow tall, and more likely to die, so those forest fragments create big shifts in the tree canopy and overall structure. All of this, to use a non-technical phrase, throws out of whack the natural processes that produce a healthy forest, which in turn produces a healthy planet.

The research team used airborne light detection and ranging, known as LiDAR, and laser imaging spectroscopy to study these so-called "edge effects." They focused on the places where lowland forests in Malaysian Borneo meet oil palm plantations.

Changes in the way trees take in light, grow, and produce leaves underlie the drop in carbon storage, the researchers found. Scanning the trees from above, the researchers found "significant reductions in canopy height and leaf mass per area."

CLEARING TREES FOR OIL PALM PLANTATIONS — Palm oil is a common ingredient in shampoo, lipstick, and instant noodles. The vegetable oil's high melting point makes it a valuable addition to a huge range of products — and growing all those oil palms requires big plantations in tropical climates.

Researchers knew already that clear-cutting tropical rainforests has an immediate impact on the global environment, deleting animal habitat from the Earth and releasing tons of carbon dioxide. Clearing one hectare of rainforest, and replacing it with a palm oil plantation, emits 174 tons of carbon dioxide, found a study published in June 2019. As *Inverse* reported at the time, that's the greenhouse gas equivalent of flying a jetliner from New York to Geneva.



Blue regions show oil palm plantations; yellow and green are forest regions, colored by tree height, as a proxy for carbon.Global Airborne Observatory, ASU Center for Global Discovery and Conservation Science

Some estimates suggest palm oil production peaked in the late 2000s. From 2008 to 2010, large palm oil plantations accounted for 57 percent of tropical deforestation, but that percentage has dropped in recent years, found a study published in February 2019. Small-scale farming, drought, and wildfires pose bigger threats now.

But the long-term carbon footprint of already-leveled trees is bigger than previously realized, the new study shows. If trees in fragmented forests aren't stashing away climate-warming carbon, there's more of the gas free in the atmosphere, heating up the planet.

The study makes a case for mitigating these declines in carbon storage, says lead author Elsa Ordway, an environmental researcher at Harvard University, in a statement.

That can be done through creating “buffer zones between intensively farmed areas and forest ecosystems," Ordway said.

"Although our results indicate that some forests are more vulnerable to edge effects than others, such a strategy could be implemented at scale to reduce the negative impacts of land-clearing on remaining forests."

RAINFOREST ANIMALS FACE THREAT OF EXTINCTION — Beyond the issue of carbon storage, sweeping changes in the rainforest spell trouble for the diverse range of species that call Borneo home, including several that are critically endangered.

Over the past 60 years, the Bornean orangutan population has been cut in half, in large part because of logging in the animals’ habitat. There are an estimated 41,000 orangutans left in Borneo.

Borneo elephants, also called pygmy elephants, are also endangered. Just 1,500 remain in the wild.

The smallest elephant species in Asia, these "baby-faced" animals sport "oversized ears, plump bellies and tails so long they sometimes drag on the ground as they walk," reports the World Wildlife Fund.

With demand high for palm oil products, the industry that produces the oil continues to expand in places like Borneo, wiping out forests to grow more oil palm trees. As a result, the edge effects that hinder remaining tropical forests could have a widespread effect: Nearly 20 percent of tropical forests are within 100 meters of a non-forest edge, say the authors of the new study.

The study can help to inform conservationists about how, and why, biodiversity is struggling in forest fragments, said study co-author and Arizona State University professor Greg Asner in a statement.

"The importance of this discovery trickles all the way down to how conservation managers work to mitigate biodiversity losses associated with agricultural expansion," Asner said.

Source: https://www.inverse.com/science/edge-effects-are-making-us-lose-more-forest-than-expected