

# The Amazon is reaching a tipping point due to deforestation

By Amanda Paulson, Christian Science Monitor, adapted by Newsela staff on 09.06.19

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Image 1. This photo shows the Amazon rain forest in Brazil. The Amazon covers an area of almost three million square miles. Photo by: FG Trade/Getty Images

Camp 41 is a handful of tin-roofed, open-sided structures deep within the world's largest tropical wilderness. It's been a home base for hundreds of ecologists conducting research for the past 40 years. We're 50 miles north of Manaus, Brazil, and a half-mile hike into primary Amazon rain forest.

I'm here with Thomas Lovejoy, a legendary ecologist and "godfather of biodiversity." Lovejoy has been studying the Amazon for more than 50 years. As an environmental journalist, I'm tagging along with him. I'm hoping to get an understanding of what role this forest plays in two of the biggest environmental crises facing our planet: climate change and biodiversity loss.

The rain forest covers an area of about 3 million square miles. That's nearly the size of America's lower 48 states. Most of the Amazon lies in Brazil, but it also extends into seven other countries. It is one of Earth's most important environmental filters. The rain forest sucks carbon dioxide out of the atmosphere to use in photosynthesis. This also helps to prevent the buildup of greenhouse

gases. When greenhouse gases like carbon dioxide are released into the air — usually from the burning of fossil fuels, like oil — they trap heat in the atmosphere, which leads to a rise in global temperatures.

## **Biodiversity And Carbon**

The Amazon "is the largest terrestrial repository of biodiversity on the planet," says Lovejoy. "And it has a tremendous amount of carbon in it which we do not want to end up in the atmosphere."

But Lovejoy and other scientists also say the Amazon is nearing a tipping point. This is largely due to deforestation, which is the process of clearing away forests. If much more deforestation occurs in the Amazon, the water cycle that supports it could be upset, endangering the entire planet.

The rain forest is a uniquely stable environment that allows life to flourish in complex relationships. In the area around Camp 41, a small chunk of rain forest about the size of two football fields might have 250 core species of birds. It might also have 320 different kinds of trees. Nearly every bird, insect and amphibian has developed unique features and habits to play a specialized role in the system.

Take army ants, for example. Swarms of them rove the forest floor, eating whatever they find. Several bird species have evolved to follow the ants. They do not eat the army ants, but instead, they eat all the creatures that are forced to escape the swarm of ants. Certain butterflies, meanwhile, follow the birds that follow the army ants. These butterflies suck nitrogen from the birds' droppings.



"That kind of complex interaction among many species is one of the classic things that we associate with the rainy tropics," says Mario Cohn-Haft. He is an ornithologist, or a bird expert, who works for the National Institute of Amazonian Research. These complex interactions reach a peak point in the Amazon, he says.

The Amazon's dense forests are critical beyond the species that reside in them. They're also a vast carbon repository. Between 90 and 120 billion tons of carbon are stored in the Amazon Basin. That's equivalent to a decade's worth of carbon emissions from cars, power plants and other industrial sources.

The Amazon's ability to absorb more carbon than it emits makes it a "carbon sink" or sponge. However, its ability to be a sponge is declining. For climate scientists, that makes it an important part of climate-change solutions. It also makes it a potential threat should deforestation increase significantly.

One of the biggest concerns is this: At what point the Amazon, or parts of the Amazon, might reach a "tipping point." Scientists fear that at some point, this ecosystem — which generates about half of its own rainfall — could cease to exist.

Since 2000, the region has been hit by three unprecedented droughts, which led to substantially worse fires. Daniel Nepstad is the executive director of the Earth Innovation Institute. He says that

the Amazon's carbon pool is leaking out slowly with deforestation. "It's actually happening; it's not a hypothetical thing." There is a potential for more with forest fires.

Early models indicated 30 or 40 percent deforestation might make the ecosystem break down and turn parts of the Amazon into savanna. Now, with climate change and fire, Lovejoy and others predict that just 20 or 25 percent deforestation might make this ecosystem break down. Already, 17 percent of the Brazilian Amazon is gone.

### **Amazon's Benefits To Humanity**

Today, the Amazon provides huge benefits to the planet's climate. The moisture generated in the Amazon produces rainfall in the Andes Mountains, southern Brazil, Paraguay and Argentina.

It even sends rainfall all the way up to the Midwestern United States, says Adrian Forsyth. He is a tropical ecologist and the president and co-founder of the Amazon Conservation Association.

In the late 1970s, Lovejoy suggested a long-running experiment in the forests around Manaus. He wanted to look at the effects of breaking up large forested areas into smaller areas of forest. These small sections are usually separated by roads or buildings. In 1980, he coined the term "biological diversity."

At the time, a debate was raging about whether it was better to have a single large protected area or several small protected areas of rain forest. Some people argued that smaller plots might be less susceptible to threats and therefore would support more diversity.

Lovejoy saw an opportunity in a Brazilian law that required certain cattle ranchers to reserve 50 percent of their land as forest. He designed an experiment monitoring a number of isolated pieces of forest of different sizes: 2 1/2 acres, 25 acres, and 250 acres. The results — though the experiment was still ongoing — have been conclusive: Bigger is better.

"Large blocks are necessary for large predators," says Dr. Forsyth. "When you take those out of the system, the whole system starts to unravel."

Researchers found that a 250-acre fragment loses half of its bird species in 15 years. The carbon density of the forest, in turn, changes when these species leave.

Ultimately, Lovejoy says it takes at least 400 square miles for an Amazon rain forest to be stable. This finding has influenced Brazil and other countries in their conservation efforts over the years.

Nearly 20 percent of the world's river water flows in the Amazon Basin. The mighty Amazon River itself and the Rio Negro tributary — a smaller river that flows into the Amazon — are both edged by miles of várzea forest. These forests are regularly flooded as their waters rise and fall by as much as 50 feet a year. The "muddy" waters of the várzea support specific trees and animal species.

The ecosystem of the Rio Negro is its own separate world. The várzea forests there have different trees, birds, insects and amphibians. Off a smaller river that flows into the Rio Negro is yet



another ecosystem: a white-sand savanna. These savannas are found throughout the Amazon Basin and support completely different species.

The diversity of these smaller worlds also contributes to the region's vulnerability. And most deforestation happens in specific areas in the Amazon, says Cohn-Haft.

The loss of life in the Amazon is also worrisome for people. Tens of thousands of different species of trees alone grow in the area. Only a handful of them — including cashews, pineapple and cacao — have been tapped for human use. Other animal products are used for medicine. Lovejoy said that the venom from the bushmaster snake was the basis for a huge class of drugs for high blood pressure.



### **Manage As A Whole System**

Brazil has created an impressive network of protected areas for both conservation and indigenous peoples. The country has also reduced its deforestation rate nearly 80 percent since its peak in 2004. But it is now facing significant political and economic instability, so conservation is often a low priority for Brazil's government.

There are still reasons for hope. In many ways, it's remarkable that such a vast ecosystem has remained largely intact. In 1965, Lovejoy notes, one national park in Venezuela and one indigenous park in Brazil were the only protected areas in the Amazon, but now, about half the basin is protected.

"There are hopeful possibilities," says Lovejoy. The key, he says, is that it has to be managed as a whole, "so that all that great repository of biodiversity remains intact. Because it does operate as a system."