

Rising Ocean Temperatures Prime Amazon Rainforest for Fire

Scientists used to think the Amazon was too wet to burn but a warming Atlantic Ocean is drawing moisture away from the rainforest

By [Barbara Fraser](#) and [The Daily Climate](#) | April 9, 2012 | 10



Amazon rainforest near Puerto Maldonado Image: flickr/Ivan Mlinaric

MOYOBAMBA, Peru – Karina Pinasco watched in dismay as flames on a hillside at the edge of town lit up the sky one night in October 2010. A farmer had intended to clear a few hectares of land to plant coffee bushes, but the fire – set during an unusually hot, dry spell – quickly got out of hand.

Propelled by winds and high temperatures, it burned for 10 days, charring more than 250 acres of land.

"We realized we weren't prepared," says Pinasco, a biologist who heads [Amazónicos por la Amazonía](#), a local environmental organization. "The firefighters weren't trained. It was the rain that finally put it out."

Scientists used to think the rainforest, especially in the western Amazon, was too wet to burn. But major fire seasons in 2005 and 2010 made them reconsider.

Fires are a major source of carbon emissions in the Amazon, and scientists are beginning to worry that the region could become a net emitter, instead of a carbon sink. New findings link

rising ocean temperatures off the northern coast of Brazil to changing [weather](#) patterns: As the Atlantic warms, it draws moisture away from the forest, priming the region for bigger fires.

"We are reaching a tipping point in terms of drought, beyond which these forests can catch fire," says Daniel Nepstad, international program director at the Amazon Environmental Research Institute in Brasília, Brazil.

Once-a-century no more

The 2005 drought – considered a once-in-a-century event – resulted in unprecedented wildfires in Acre, the western Brazilian state bordering Peru. Flames scorched the tree canopy, and at one point the front face of the fire stretched nearly seven miles. As many as 1.2 million acres of forests were affected in Acre and the neighboring regions of Pando in Bolivia and Madre de Dios in Peru. Officials estimated upwards of \$100 million in economic damages.

But the forest loss wasn't the only concern for the Acre state government, said Foster Brown, a senior scientist at the Woods Hole Research Center and a professor at the Federal University of Acre in Rio Branco, the state capital. Choking smoke spiked respiratory ailments in the region and canceled flights.

Just five years later, another once-a-century drought struck, and fires spread out of control, especially in Acre, Bolivia's Pando region and Brazil's Mato Grosso state. Acre was better prepared, but in Bolivia, smoke from more than 20,000 fires reduced visibility and shut airports in several towns. The Bolivian government declared a state of emergency as more than 3.5 million acres of forest burned. In Mato Grosso, fires destroyed at least 100 homes.

Gigatons of carbon

The 2005 fires added 1.6 gigatons of carbon to the atmosphere, according to a study by Simon Lewis of the University of Leeds, who put emissions from the more widespread 2010 fires at 2.2 gigatons.

In a normal year, the Amazon forests store 0.4 gigatons of carbon a year in the trees and soil, meaning that two bad seasons like 2005 and 2010 could wipe out a decade of gain, according to Lewis' calculations.

And as humans push further into an increasingly drier Amazon, the problem could worsen.

In the western Amazon, humans are the chief source of sparks. With new roads being built and paved through once-inaccessible areas, Peru's Amazonian regions now have some of the country's highest population growth rates. Many of the newcomers clear a little land to farm, and where there are farms, there is fire.

Fire risks

In the Amazon, where weeds and insects run rampant, burning is the most cost-effective way for small farmers to control ticks in cattle pastures and unwanted [plants](#) in cassava fields, says Miguel Pinedo-Vásquez, director of international programs for the Columbia University Center for Environmental Research and Conservation, who also works with the Center for International Forestry Research.

Fire will limit development and poverty reduction efforts while increasing greenhouse gas emissions and food insecurity in the region, said Pinedo-Vasquez, who grew up in a small farming community outside Pucallpa, in Peru's Amazon basin. "The risks will increase as we face climate change and demographic shifts, and as land-use changes are becoming more

evident."

Drought in the Amazon has long been associated with the large-scale [weather](#) pattern known as the El Niño-Southern Oscillation in the Pacific Ocean. During an El Niño year, the winds that usually blow from east to west across the Amazon weaken, so less moisture is carried over the basin. Drier forests pump less moisture back into the atmosphere, exacerbating the effect.

But 2005 and 2010, both record drought years in the western Amazon, were not El Niño years.

Atlantic Ocean is key

Researchers now think the key lies not in the Pacific – or, at least, not entirely – but in the north tropical Atlantic Ocean, off Brazil’s northern coast.

When sea surface temperatures in that area warms, moisture-bearing winds shift northward, said Katia Fernandes of Columbia University’s International Research Institute for Climate and Society. Heavier rains fall in the northern Amazon, while the southwest gets a drought.

Fernandes thinks she can predict those droughts. Looking at droughts over the past few decades, she found that ocean temperatures rose about three months before the dry spell set in – enough time for scientists to issue a warning so governments can prohibit burning during especially dry periods.

That could help farmers tip Amazonian forests back to the carbon sink side of the scale.

In Moyobamba, Pinasco and her colleagues have launched a fire observatory to map hot spots and try to predict high-risk areas. They also teach farmers safer burning techniques, although they would like to see the San Martín region – which has seen an influx of newcomers seeking to cash in on coffee and cacao booms – ban burning altogether.

Pinedo-Vásquez is skeptical about the practicality of going fire free. He and other researchers are studying the behavior of both humans and fire, to make recommendations for better land-use management.

The areas near Moyobamba and Pucallpa are magnets for migrants from the Andean highlands who are new to Amazonian farming. Because escaped fires are most common in areas settled by newcomers, those are the places where fire education should focus, Pinedo-Vásquez said.

"Just blaming them, and telling them they're the sources of fire won't help," he said.

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