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The Amazon's record-setting drought: how bad will it be?

Scientists tell *Nature* why the rainforest has dried out, and what to expect in the coming months.

- [Meghie Rodrigues](#)



Rivers that cut through the Amazon rainforest are falling to their lowest levels on record. Credit: Bruno Kelly/Reuters

Last month, a portion of the Negro River in the Amazon rainforest near Manaus, Brazil, shrank to a depth of just 12.70 metres — its lowest level in 120 years, when measurements began. In Lake Tefé, about 500 kilometres

west, more than 150 river dolphins were found dead, not because of low water levels, but probably because the lake had reached temperatures close to 40 °C.

These are symptoms of the unprecedented drought gripping the Amazon rainforest this year. Climate change is involved. But researchers who study the rainforest say other factors have come together to exacerbate this crisis, which has cut river communities off from supplies including food, and has forced Indigenous residents to use dirty, contaminated water, resulting in gastrointestinal and other illnesses.

The drought is the sum of three things, says Luciana Gatti, a climate-change researcher at Brazil's National Institute for Space Research (Inpe) in São José dos Campos. The first is deforestation, “which is killing the rainforest’s resilience and turning it into a drier, hotter place”, she says.

Fire season

Deforestation in the Brazilian Amazon dropped between January and July this year — by 42.5% compared with the same period in 2022, [according to data from Inpe](#) — but this follows a number of years of record destruction. The main culprit, say researchers who spoke to *Nature*, is agribusiness. Ranchers and farmers have cleared trees

to expand Brazil's agricultural area by about 50% over the past four decades, mostly in the Amazon, [according to a report from MapBiomas](#), a consortium of academic, business and non-governmental organizations that monitor land use in the country.

About 20% of the Amazon rainforest is deforested, and 40% is degraded — which means trees are still standing, but their health has faded and they are prone to fire and drought, Gatti says. “That was all done by humans.”



Researchers study a freshwater dolphin (*Inia geoffrensis*) found dead in Lake Tefé amid a record drought in the Amazon rainforest. Credit: Gustavo Basso/NurPhoto via Getty

Making matters worse is the second factor contributing to the drought: an El Niño climate pattern has begun this year.

El Niño is a phase of a phenomenon called the El Niño–Southern Oscillation, and occurs every two to seven years. During El Niño, winds that usually blow east to west along the Equator weaken or reverse, and warm water pushes into the eastern tropical Pacific Ocean. Precipitation patterns change in South America, causing dry air in the north, where the rainforest lies, and damp air in the south. As a result, Uruguay is currently being slammed by heavy rains. In the past few months, Paraguay, Argentina and southern Brazil have experienced floods that have killed dozens of people and left thousands of others without shelter.

But in northern and northeast Brazil, eight states have [had the lowest July to September precipitation levels](#) in 40 years, according to the Brazilian National Center for Early Warning and Monitoring for Natural Disasters (Cemaden) in São José dos Campos. These months are the peak of the ‘fire season’ in most of the Amazon.



Oil from the Amazon? Proposal to drill at river's mouth worries researchers

Dry spells in the Amazon have consequences in addition to low water levels. Ranchers and others clearing the rainforest don't burn trees when it's rainy or when the air is humid, says Erika Berenguer, an ecosystems researcher at the University of Oxford, UK. But because El Niño has made the rainforest's air dry, those who are clearing trees have been burning them, Berenguer says. This has added to the harsh conditions and has sparked some uncontrolled fires — something she experienced at first hand when she visited the town of Belterra in the northern state Pará in September.

“We would sleep and wake up surrounded by smoke,” Berenguer says. Ironically, she was there with a team to study how vulnerable the rainforest is to fire. Things got

so bad that she had to evacuate for 10 days. “I was shorter of breath than when I got COVID — and I am among those who can leave and get medicine. What about those who can’t?” she asks. “This is collective poisoning.”

A visible pattern

The third factor responsible for the Amazon’s severe drought is an unusual warming of the water in the northern Atlantic Ocean. Climate change is contributing to this anomaly, says Maria Assunção Dias, a climatologist at the University of São Paulo in Brazil. The warming of these waters has affected the intertropical convergence zone. This region, which circles Earth close to the Equator, “is one of the main meteorological systems acting in the tropics and is a region of intense cloud and rain formation”, says Karina Lima, a geographer at the Federal University of Rio Grande do Sul in Porto Alegre. The zone has shifted north, taking the storms with it, away from northern Brazil.



When will the Amazon hit a tipping point?

All of this adds up to a record-setting year for the Amazon. The rainforest has experienced dry spells in the past, but severe droughts “are becoming more frequent”, Dias says. There is a visible pattern, she adds, citing extreme droughts in 1912, 1925, 1983, 1987, 1998, 2010, 2016 and now 2023.

One big problem is that the current El Niño is just getting started. So “things are not going to get any better”, Gatti says.

It might even turn into a ‘super’ El Niño, Dias says. This could occur if the sea surface temperature in the tropical Pacific reaches 2.5 °C higher than average — a possibility, given that 2023 looks [set to be the hottest](#)

[year ever recorded on Earth](#). Last week, the World Meteorological Organization [issued a statement](#) that there is a 90% likelihood that El Niño will persist at least until the end of April.

Although it is hard to predict when the next drought might grip the Amazon, studies have shown that climate change is messing with the timing of El Niño. “The tendency is that we have stronger and more frequent episodes,” Lima says. This could be catastrophic for the Amazon rainforest, already battered by deforestation and a warming and drying climate. “The forest’s tipping point is coming closer — and it’s coming quick.”

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