The Amazon has a point of no return

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A charred tree in the Amazon's Rondonia state on August 25, 2019.

Picture Credit:
IMAGE: ERALDO PERES / AP / SHUTTERSTOCK

The rise in fires set in the Amazon this year, stoked by Brazilian President Jair Bolsonaro's encouragement of large-scale deforestation for logging and agriculture, is emblematic of the region's persistent deforestation woes: Some fires are set to clear forest that has already been chopped down, many fires are the reburning of already deforested agricultural land, and some fires are escaped, uncontrolled blazes. This year has been the most active burning season since 2010. But it's not nearly on par with the extreme deforestation of the '90s and early aughts, a darker time, which Rhett Butler, a journalist who has reported on the Amazon for decades and is the founder of the conservation news site Mongabay, calls the "bad days."

Though deforestation has fallen over the last decade and a half, it certainly has not stopped. Around 20 percent of the planet's largest rainforest is now gone, explained Emilio Bruna, an Amazon biologist and director of the Florida-Brazil Linkage Institute at the University of Florida. That's about the size of two Californias, he said.

And at some still undetermined point — but a threshold we may soon meet — much of the Amazon will cease to be a vital rainforest. There won't be enough trees to exhale moisture, which is necessary to support the fantastically wet and complex

Amazonian climate system. Instead, the depleted Amazon will transition into a drier region, unable to naturally repair itself to its previously drenched glory.

"What we're talking about here is an irreversible switch," said Bruna. "And that's really worrying people."

That's why the recent uptick in fires is a notable problem. "It is quite concerning if you're worried about the state of the Amazon," said Butler, referencing this summer's boost in burning.

"It's shaping up to be a doomsday scenario," he added, but noted, fortunately, that we're not there, yet.

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Reaching the tipping point

When might we reach the Amazon's threshold? That's an open scientific question.

"It's a risk that we don't want to cross, whether it's 30, 40, or 80 percent [deforestation]" said Jim Randerson, who studies the human modification of biogeochemcial cycles at the University of California, Irvine.

ea"The [exact] tipping point may remain uncertain," he added. But the threat is clear. "We’re getting close to creating a cycle of feedbacks," said Christie Klimas, who researches tropical forest management and conservation at DePaul University.

The critical problem is that the rainforest's climate is inextricably tied to the rainforest's very existence. The Amazon's 390 billion or so trees naturally evaporate water vapor into the air. This feeds other parts of the forest. What's more, this warm, moist air also lifts into the higher atmosphere, producing unstable weather and towering storms that can tap into an entirely new source of water, the moisture zipping through the water-rich jet stream, miles up in the atmosphere, explained Randerson.

If enough trees are logged, the rainforest could lose this atmospheric firehose and become a profoundly drier place, unable to support the dense, tropical plant (and animal) biodiversity that it now sustains. At that point, regrowing the forest might become impossible. "There's a lot of concern that it might not be possible to reforest

the Amazon if we reach a tipping point," noted Randerson.

A 2007 projection found that if the Amazon reaches around 40 percent of forest converted into pastureland, the sprawling eastern Amazon will see a nearly 20 percent decrease in rainfall. Increasingly arid climes would likely mean that drier grassland savannah would replace rainforest, the research concluded.

But that 40 percent number may be overly optimistic. Carlos Nobre, a Brazilian scientist who researches the climate impacts of Amazon's deforestation, recently concluded that — when accounting for the potent confluence of deforestation, rising global temperatures, and fires — vast swathes of the Amazon may "flip" to drier, non-forest ecosystems at between 20 to 25 percent deforestation. That's near where we are now.

Indeed, the tipping point likely lies between 20 and 40 percent of the Amazon's deforestation, said Bruna.

If we do pass the tipping point, we won't know it right away. But we'll figure it out soon enough, as the region grows increasingly arid. "The problem with tipping points is you don’t know you’ve hit them until you’ve passed them," said Bruna.

Regrowing the Amazon?

To avoid crossing an irreversible threshold in the Amazon, a sensible thing would be to allow portions of the forest, without dispacing people, to regrow. Though, this can't be done just anywhere. And in many places, it can't be done at all. Much of this land has now been converted into productive agricultural economies.

"It's difficult to imagine changing the land-use patterns to allow for reforestation," said Randerson, noting that some recently deforested areas in the Iowa-like Brazilian state of Mato Grosso are well-established societies. "All of it is going into soybean agriculture with roads and well-tended fields," he said. "[Reforestation] would be a disruption to the economic system of the region."

Even so, there are formerly mined areas and abandoned pastureland that can and have been reforested. Bruna has worked in reforested parts of the Amazon that, left alone, have regrown by themselves. Just 15 years earlier, the trees there were "smoldering," he said.

Even though Amazon soils are naturally nutrient poor, forests can naturally blossom. "Yes, forests typically regrow after deforestation in the Amazon," said Sara Rauscher, an assistant professor of geography at the University of Delaware who researches climate change in tropical South America, among other places. She noted that Brazil experienced heavy deforestation in the 1970s after the construction of highways in the eastern Amazon, but forests there have regrown.

"The popular image we have of forest dying and never ever returning isn't really accurate," Rauscher added, citing the large-scale reforestation of the eastern U.S. where colonial farmlands have been reclaimed by woodlands.

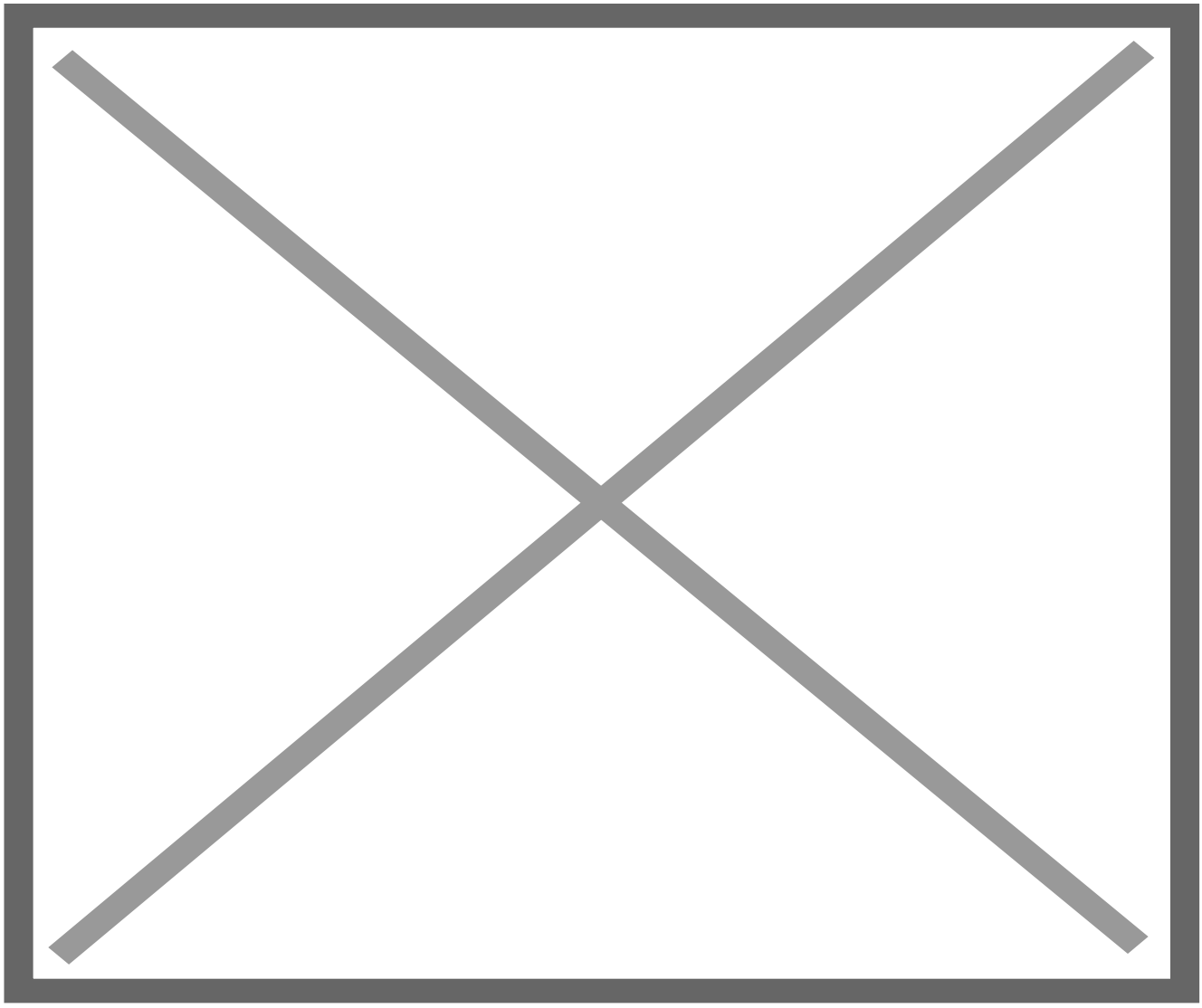
If the Brazilian government facilitates more regrowth, the forests, though not the pristine old-growth forests of the past, could help avert breaching a tipping point, among countless other benefits.

"The number one priority is to retain intact forest," emphasized DePaul's Klimas. "But we shouldn't discount the value of secondary forest."

Regrown, secondary forests will look and feel different, Klimas said. Particular plant species will be the first to colonize the cleared land, and can grow more dominant, outcompeting other species. But, it will still be forest — forest that evaporates water and can contribute to the Amazon's moist, humid, climatic system.

And, critically, more forested land would make the Amazon a more potent carbon sink, meaning a region that naturally absorbs carbon dioxide — the potent heat-trapping greenhouse gas — from the air. Atmospheric carbon dioxide emissions, currently at around 410 parts per million, or ppm, are now at their highest atmospheric levels in *at least* 800,000 years, though more likely millions of years. Forests, particularly tropical forests, will play a vital role in curbing CO2 levels this century.

"Forests are really important," emphasized Klimas. "You can’t talk about staying below 450 ppm without talking about maintaining intact forests."



Earth's skyrocketing CO2 levels. | *IMAGE: SCRIPPS INSTITUTE OF OCEANOGRAPHY*

The new Brazilian administration — led by a president who has called the Brazilian space agency's deforestation statistics "lies" — certainly isn't putting the Amazon on a road that would veer away from a disastrous threshold.

"They have weakened all environmental law enforcement and all environmental law," said Mongabay's Butler.

For now, at least, the Amazon's notoriously heavy rains are expected to arrive in October, which will douse this year's flames. Unless, of course, the rains come late. "If the rains get delayed that can be really scary," said Butler.

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