

# *Science You Can Use*

Jack K. Horner

**Dear Science:** What effects will the huge Amazon rain forest fires have where I live? The fires are thousands of miles away in a different country (Brazil). Shouldn't I be more concerned about forest fires that are much closer to home? -- Carlos T.

**Dear Carlos:** It's a good question. Here's the short answer. Most of the fires currently burning in the Amazon rain forest were set by humans in order to clear land for agricultural purposes. If the burning of the Amazon continues at its present rate, the forest will be gone in 20 years. Your life, no matter where you live, is deeply affected by these fires. Why? If left as is, the Amazon generates a significant fraction of the oxygen we breathe. It also helps to limit forest fires throughout the US, sustain food production, and has been the source of many important pharmaceuticals. If a large fraction of the Amazon is destroyed by burning, human life will become harder everywhere for a very long time.

Here's some detail.

*The Amazon generates a large fraction of the oxygen we breathe.* The Amazon rain forest generates about 20% of the oxygen in the air across the globe. Replacing the Amazon forest with agricultural land would reduce that fraction to about 5%. All else being the same, losing the entire Amazon rain forest would have the same effect as forcing people who are now living 5,000 feet to move to an altitude of about 10,000 feet, at which most humans have substantial difficulty breathing. About 10% of the world population living right now without supplemental oxygen would have to have supplemental oxygen 24 hours a day in order to survive such a change.

*The Amazon helps to reduce forest fires in the US.* The Amazon forest traps about 20% of the carbon dioxide produced worldwide. If the Amazon forest were eliminated by burning, the carbon dioxide produced would remain in the air for at least 100 years, resulting in a decrease, due to the greenhouse-gas effect, in precipitation in US forests. All else being the same, burning the entire Amazon forest would increase the US forest acreage burned in wildfires every year by more than 30%.

*The Amazon helps to sustain food production across the planet.* By capturing about 20% of the carbon dioxide produced on the planet, the Amazon forest helps to limit the rate at which the average global temperature is increasing. As the average global temperature increases, the yield of several critical crops drops. Burning all of the Amazon forest will increase the carbon dioxide concentration in the air enough, due to the greenhouse-gas effect, to raise the average global temperature about 2 degrees Celsius. It has been estimated that if the average global temperature increases above its current value just 2 degrees Celsius, worldwide wheat and corn yields will drop 10%. Economists say this reduction in the global food supply would increase prices for breads, cereals, and meat everywhere by at least 20%.

*The Amazon has been and is likely to remain, the source of important pharmaceuticals.* Rain forests worldwide are the source many important pharmaceuticals. About 25% of all western medicines are derived from plants found only in rain forests. The Amazon rain forest contains by far the largest diversity of plants and arguably is, as a result, the largest potential source of plant-based pharmaceuticals. Some plants that grow only in the Amazon rain forest contain compounds that are used to treat cancer, bronchitis, rheumatism, and diabetes.

Many drugs, such as vincristine, that are used to treat cancer are, or were originally, derived from rain forest plants. About 70% percent of all cancer medicines in use today were first discovered in or come from rain forests.

Theophylline, a drug used to treat asthma, is derived from a particular species of the cacao tree, *Theobroma cacao*, which grows only in rain forests.

Both lovastatin (a member of a closely related family of cholesterol-lowering drugs prescribed to about 30% of the US adult population) and cyclosporine (an anti-rejection drug wisely used for organ and tissue transplants) are derived from fungi that grow only in rain forests.

In short, whether the Amazon rain forest survives directly affects the well-being of everyone on the planet.

For further information, see Atanas G. Atanasov et al., “Discovery and resupply of pharmacologically active plant-derived natural products: A review”, *Biotechnology Advances* 33 (2015), 1582-1614, and Intergovernmental Panel on Climate Change, *Land. Special Report on Climate Change, Desertification, Land Degradation, Sustainable Land Management, Food Security, and Greenhouse gas fluxes in Terrestrial Ecosystems, 2019*, <https://www.ipcc.ch/srccl-report-download-page/>, and Intergovernmental Panel on Climate Change (IPCC), *AR5 Synthesis Report on Climate Change 2014*.

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