## Canada's Wildfires Were a Top Global Emitter Last Year, Study Says

The blazes produced more planet-warming carbon than almost any country, researchers found. That could upend key calculations on the pace of global warming.



Near Flin Flon, Manitoba, in May. High temperatures fueled blazes that burned for months.Credit...David Lipnowski/The Canadian Press, via Associated Press



By <u>Manuela Andreoni</u>

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The wildfires that ravaged Canada's boreal forests in 2023 produced more planet-warming carbon emissions than the burning of fossil fuels in all but three countries, research published on Wednesday has found.

Only China, the United States and India produced more emissions from fossil fuels than the Canadian fires, according to the study, which was <u>published in the journal Nature</u>.

The wildfires last year call into question how much carbon the forests will absorb in the future, scientists said. That, in turn, may make it necessary to reconsider calculations of how much more greenhouse gas humans can add to the atmosphere without pushing temperatures beyond current global targets.

The most ambitious limit set in the 2015 Paris Agreement was 1.5 degrees Celsius, or 2.7 Fahrenheit, above preindustrial times. Beyond that threshold, scientist say, it will be increasingly difficult for humans to adapt to a hotter planet.

The boreal forests have historically helped to slow climate change by storing carbon as trees grow rather than adding carbon dioxide to the atmosphere. While the hot and dry weather that fueled the fires in Canada last year was extraordinary when compared with historical records, climate projections suggest it will become common in the 2050s if the world continues on the current trajectory of global warming.

"This brings up a lot of concerns about whether these fires will happen more frequently," said Brendan Byrne, a carbon cycle scientist at NASA's Jet Propulsion Laboratory in Pasadena, Calif., and one of the authors of the study. "That could potentially have a big impact on the ability of these forests to store carbon."

This year's fires, while <u>bigger than average</u>, have so far not been as destructive as last year's, as some scientists had feared.

The hot and dry weather that fueled the 2023 fires was extraordinary in several ways. A separate study <u>published in the journal Nature</u> last week documented how exceptional weather patterns, such as early snow melt and so-called flash droughts, converged to fuel blazes that burned around 15 million hectares, an area almost the size of Florida, more than seven times the historical average.

Canada has been warming at about twice the global rate, and last summer's extreme temperatures were behind much of the exceptional weather patterns that fueled fires. The average temperature in the country between May and October last year was 2.2 degrees Celsius, or roughly 4 degrees Fahrenheit, above what was normal in the previous 30 years. The high temperatures fueled blazes that kept burning for months, many from April to October without respite, as well as so-called overwintering fires, those that can burn underground for several years.

"This idea of multiyear fires, they were kind of fairly anecdotal in the past," said Marc-André Parisien, a senior researcher at the Canadian Forest Service and an author of the latest study. But now, he said, researchers are seeing their potential to cause big damage. Though 2023 started with levels of soil moisture that were almost normal for the time of year, extreme temperatures rapidly dried the ground in what researchers are calling a flash drought. An example, Dr. Parisien said, were forests in Quebec, where scientists last year documented the <u>biggest fire scar</u> ever in Canada, 1.2 million hectares, roughly the size of Connecticut. "These so-called flash droughts can really change things rapidly," he said. "It dried up real quick, real quick, and then you had lightning at the absolute worst time imaginable." Forests absorb about a quarter of global carbon emissions. But ecosystems are changing in ways scientists are still working to understand. Parts of the boreal forests in Canada are <u>not regrowing after fires</u> as they have in the past, partly because blazes burn trees so frequently and intensely.

The 2023 fires have the potential to cause extensive regeneration failure in Canada's boreal forests because blazes engulfed large areas of young forest. Last year, for instance, a total area of forest the size of the Netherlands burned for at least the second time in 50 years, according to an analysis by Natural Resources Canada, a federal government department. Some other areas burned for the second time in 10 or 20 years.

"That's really surprising because those young forests don't burn very frequently because they have very little fuel," said Ellen Whitman, a fire researcher at the Canadian Forest Service and an author of last week's Nature study on the causes of the 2023 fires. That, she said, "is a major concern for me in terms of how that landscape will recover after fire." Researchers are now measuring how the fires affected the forest's ability to store carbon in an effort to improve the global models that forecast how climate change will affect the planet. It will be a challenge, said Dr. Byrne, the NASA scientist. "You just walk through a forest, it's very hard to turn that into just a few equations in a model," he said. But right now, the models are missing extreme fires like the ones in Canada in 2023, he said, and that "limits our ability to predict the future."

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