

Deforestation in the tropics linked to a reduction in rainfall

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Amazon forest. Credit: Dr. Jess Baker, University of Leeds

Deforestation is resulting in reduced rainfall across large parts of the

tropics, according to new research.

People living in tropical forest communities have often complained that the climate gets hotter and drier once trees are cleared but until now, scientists have not been able to identify a clear link between the loss of tree cover and a decline in rainfall.

A research team at the University of Leeds combined satellite data of deforestation and rainfall to show that the loss of tree cover in the tropics over the last 14 years was associated with reductions in rainfall.

They estimate that by the end of the century, if the rate of deforestation in the Congo was to continue, rainfall in the region could be reduced by between 8% and 12%, with major impacts on biodiversity and farming, and could threaten the viability of the Congo forests, which are among the world's largest stores of carbon.

Callum Smith, a doctoral researcher in the School of Earth and Environment at Leeds and the lead author in the study, said the investigation provides "compelling evidence" to protect forests from uncontrolled clearing.

He added, "Tropical forests play a critical role in the hydrological cycle through helping to maintain local and regional rainfall patterns. The reduction in rainfall caused by tropical deforestation will impact people living nearby through increased water scarcity and depressed crop yields.

"Tropical forests themselves rely on moisture to survive and remaining areas of forest will be impacted by a [drier climate](#)."



Deforestation in Southeast Asia. Credit: Dominick Spracklen, University of Leeds

The research paper, "Tropical deforestation causes large reductions in observed precipitation," is published today (Wed, March 1) in the journal *Nature*.

The researchers looked at the impact of forest loss in three areas of the tropics—the Amazon, Congo and Southeast Asia—which have all experienced rapid land-use changes. The study involved analysis of satellite observations from 2003 to 2017, to identify locations where forests had been cleared. Rainfall data in these areas, also measured by satellites, was compared to rainfall from nearby locations where forests had not been lost.

The study revealed that tropical forest loss caused reductions in rainfall

throughout the year, including in the dry season when any further drying will have the biggest ramifications on plant and animal ecosystems. The greatest absolute decline in precipitation was seen in the wet season with up to a 0.6 mm a month reduction in rainfall for every percentage point loss of forest cover.

Writing in the paper, the researchers warn that climate change will lead to increased drought and that will be exacerbated by continued deforestation.

It is believed the loss of tree cover disrupts the process where moisture from leaves—through a mechanism called evapotranspiration—is returned to the atmosphere where it eventually forms rain clouds.



Tropical forests in Southeast Asia. Credit: Dominick Spracklen, University of Leeds

As well as impacting natural ecosystems, a reduction in rainfall would be detrimental to agriculture and hydropower plants. That would have a strong impact both on the healthy functioning of the forests and on local communities.

The research team say, on average, crop yields declined by 0.5% for every 1% reduction in rainfall.

Professor Dominick Spracklen, from the School of Earth and Environment at Leeds who supervised the project, said, "Local people living near deforested regions often report a hotter and drier climate after the forests are cleared. But until now this effect had not been seen in rainfall observations.

"The study shows the critical importance of [tropical forests](#) in sustaining rainfall. Although there have been efforts to halt [deforestation](#), the loss of forest cover in the tropics has continued. There needs to be renewed efforts to stop forests being lost and to regenerate lost and degraded areas."

The scientists warn that a decline in [rainfall](#) has a negative impact on biodiversity, increases the risk of [forest](#) fires and reduces carbon sequestration, where nature removes carbon from the atmosphere and stores it.

More information: Callum Smith, Tropical deforestation causes large reductions in observed precipitation, *Nature* (2023). [DOI: 10.1038/s41586-022-05690-1](#).
www.nature.com/articles/s41586-022-05690-1

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