



THE LOSS OF TROPICAL FORESTS

The Impact of Deforestation
on Precipitation

Written by Hanna Velicer

We all know the stories of animals losing their homes across the world due to deforestation. One day they wake up to the sounds of chainsaws and suddenly the forest that provides them shelter and food is gone. Instead of a lush canopy, they are now faced with a barren wasteland of tree stumps and somehow have to find a way to survive. As tragic as habitat loss is, deforestation causes many other problems that impact not just the animal kingdom, but humans as well.

Simply put, deforestation is the cutting down and removal of forests for the benefit of human activities. Some of the main offenders for this process include agriculture, logging, mining, and urban expansion. Deforestation occurs all over the world and has a detrimental impact on the wildlife, climate change, soil, and even the local communities who rely on the resources found within the woodland. An overlooked consequence of deforestation is its impact on local and global water cycles.



Tropical forests play a key role in the surrounding climates. More specifically, they are vastly important for precipitation. Through a process called evapotranspiration, they directly control how much rain falls in a certain area by releasing water vapor into the air, which then turns into rain. These forests rely on rain to keep them healthy and thriving. When they start to be cut down, it lowers the amount of water vapor going back into the atmosphere and changes the amount of rainfall in that region. A recent study found that tropical deforestation over the next 85 years will reduce local precipitation levels by at least 10% and that even small amounts of forest loss can have large reductions in precipitation.

No More Trees, No More Rain

In March of 2023, a study was done at the University of Leeds in the UK to further investigate the true impact of deforestation on local rainfall amounts.

A research team utilized past satellite data of precipitation and deforestation to show a correlation between the two. Using their results, lead author Callum Smith - a doctoral researcher in the School of Environment and Earth at the university - makes an excellent argument to protect and conserve tropical forests.

The study focuses on regions in the Congo, Amazon, and Southeast Asia. An important aspect the team notes is that the effects on precipitation vary depending on the amount of deforestation. "Small-scale deforestation over the southern Amazon has been shown to increase precipitation frequency." In contrast, deforestation at larger scales minimizes that frequency, which can be seen in places like Indonesia and the Congo. This is what the study focuses on - the reduction of precipitation.

The team used satellite datasets from 2003 to 2017 to establish where forests had been cleared in these regions. They then looked at 18 different datasets focused on rainfall in those areas and compared it to areas that dealt with forest loss and areas that did not. These comparisons displayed a statistically significant correlation between precipitation and forest loss, showing a decline in median annual precipitation in areas that suffered from deforestation.

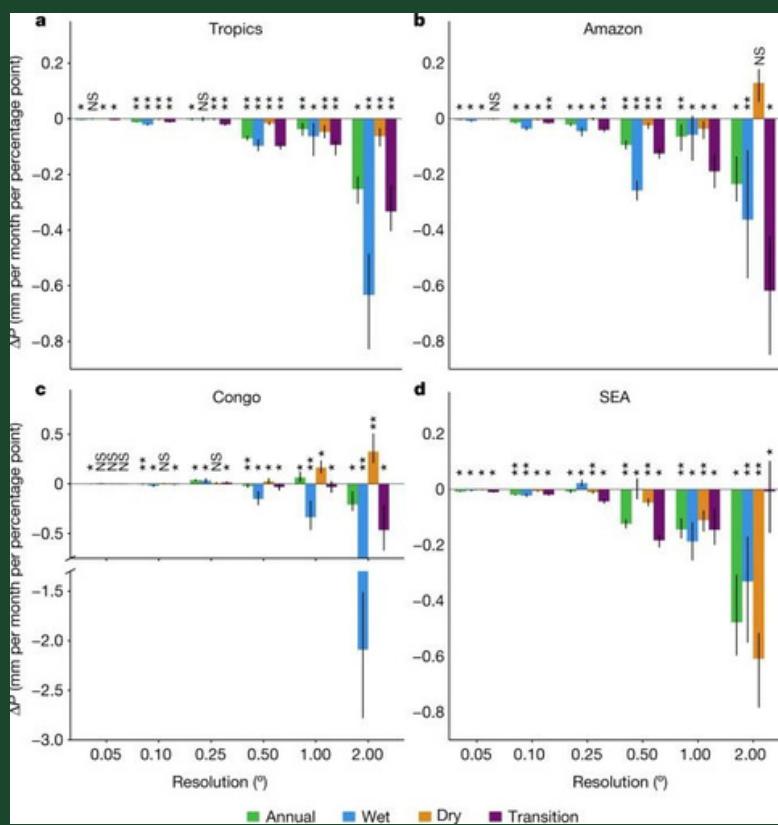
Constraints of the Study

In any scientific study, there will always be exceptions and factors to take into account. With this topic of research, the majority of constraints have to do with geographical location. For example, the team talks about how in Southeast Asia it is thought that the “proximity to the ocean and the replacement of tropical forest with plantations as opposed to pasture or cropland may cause reduced sensitivity of precipitation to deforestation.” This is contested by the study’s results, as they found that forest loss in Southeast Asia has the same - if not greater - precipitation response as that in the Amazon or Congo.

Another factor for this study is past weather patterns, due to the fact the team used past satellite datasets spanning 14 years. A highlighted component in their paper is El Niño. Many people know the term but not the actual definition. In plain terms, El Niño is a climate phenomenon that causes the water in the Pacific Ocean to be much warmer than usual, and this affects weather patterns all over the world. This event lasts for many months at a time, but is very irregular in the years it occurs. Coincidentally, there was an El Niño period in 2015 and 2016, during the team’s range for the study. They discuss the impact on their results during that time frame, stating that for the Amazon and Southeast Asia they found a “stronger reduction in precipitation over regions of forest loss during El Niño years.”



FIGURE BELOW: THIS FIGURE DEPICTS THE MEDIAN CHANGES IN PRECIPITATION (MM PER MONTH) PER PERCENTAGE POINT OF FOREST COVER LOSS IN THE AMAZON, CONGO, AND SOUTHEAST ASIA.



However, the Congo was not strongly impacted by the effects of the weather phenomenon and they did not see a stronger reduction in the region.

Future Consequences of Deforestation

Knowing that there is a correlation between forest loss and precipitation is a helpful discovery, but what does it actually mean? The Congo is expected to experience the most extensive deforestation out of the three regions focused on for the study, where “mean forest cover is projected to decline by 40 percentage points” between 2015 and 2100. The team states that if deforestation continues at that rate for the next 85 years, the Congo will experience precipitation declines ranging from 8-10%. That loss of rainfall can have detrimental effects for not only the environment, but also humans.

These reductions in precipitation can significantly impact the agriculture industry in these regions.

According to the research team, crop yields decline on average by 0.5% for every percentage point of reducing rainfall. Put in other words, they state that every 10% loss of forest cover, crop yields can diminish by 1.25%. Damaging crop yields directly affects local communities and people that rely on those crops to put food on their table and for their income. These statistics show that although humans may be cutting down forests for our own benefit, it will end up being our own downfall if we continue at this rate.

Additional harmful impacts of this precipitation decline include an increase in forest fires, decrease in biodiversity (the variety of species and life in the area), worsened seasonal droughts, and a prolonged dry season. All of these reasons and more make it easy to realize that deforestation needs to end. You can help stop forest loss by avoiding single-use packaging, choosing recycled products, and educating others. We must come together to protect the remaining forests before it's too late and these essential ecosystems are lost forever.

