ScienceNews
INDEPENDENT JOURNALISM SINCE 1921

Forests help reduce global warming in more ways than one

01 April 2022

When it comes to cooling the planet, forests have more than one trick up their trees.

Tropical forests help cool the average global temperature by more than 1 degree Celsius, a new study finds. The effect stems largely from forests' capacity to capture and store atmospheric carbon (*SN: 11/18/21*). But around one-third of that tropical cooling effect comes from several other processes, such as the release of water vapor and aerosols, researchers report March 24 in *Frontiers in Forests and Global Change*.

"We tend to focus on carbon dioxide and other greenhouse gases, but forests are not just carbon sponges," says Deborah Lawrence, an environmental scientist at the University of Virginia in Charlottesville. "It's time to think about what else forests are doing for us besides just absorbing carbon dioxide."

Researchers already knew that forests influence their local climates through various physical and chemical processes. Trees release water vapor through pores in their leaves — a process called evapotranspiration — and, like human sweating, this cools the trees and their surroundings. Also, uneven forest canopies can have a cooling effect, as they provide an undulating surface that can bump hot, overpassing fronts of air upward and away. What's more, trees generate aerosols that can lower temperatures by reflecting sunlight and seeding clouds.

But on a global scale, it wasn't clear how these other cooling benefits compared with the cooling provided by forests' capturing of carbon dioxide, Lawrence says.

So she and her colleagues analyzed how the complete deforestation of different regions would impact global temperatures, using data gathered from other studies. For instance, the researchers used forest biomass data to determine how much the release of carbon stored by those forests would warm the global temperature. They then compared those results with other studies' estimates of how much the loss of other aspects of forests — such as evapotranspiration, uneven canopies and aerosol production — affected regional and global temperatures.

The researchers found that in forests at latitudes from around 50° S of the equator to 50° N, the primary way that forests influenced the global average temperature was through carbon sequestration. But those other cooling factors still played large roles.

Forests located from 30° N to 30° S provided alternative benefits that cool the planet by over 0.3 degrees C, about half as much cooling as carbon sequestration provided. And the bulk of that cooling, around 0.2 degrees C, came from forests in the core of the tropics (within 10° of the equator). Canopy topography generally provided the greatest cooling, followed by evapotranspiration and then aerosols.

Forests in the far north, however, appear to have a net warming effect, the team reports. Clearing the boreal forests — which stretch across Canada, Alaska, Russia and Scandinavia — would expose more snow cover during the winter. This would decrease ground level temperatures because snow reflects much of the incoming sunlight back into the sky. Still, the researchers found that altogether, the world's forests cool the global average temperature about 0.5 degrees C.

The findings suggest that global and regional climate action efforts should refrain from focusing solely on carbon emissions, Lawrence says. "There's this whole service that tropical forests are providing that simply are not visible to us or to policy makers."

The research shows that clearing tropical forests robs us of many climate-cooling benefits, says Gabriel de Oliveira, a geographer from the University of South Alabama in Mobile. But deforestation isn't the only way that humans impair forests' cooling ability, he says. Many forests are damaged by fires or selective logging, and are less able to help with cooling (*SN: 9/1/21*). It would be useful to consider how forest degradation, in addition to deforestation, impacts regional and global climate temperatures, de Oliveira says, to assess the impact of restoring and protecting forests (*SN: 7/13/21*). "It's cool to see beyond carbon dioxide, but it's also very important to see beyond deforestation."

Source: https://www.sciencenews.org/article/forest-trees-reduce-global-warming-climate-cooling-carbon