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TREES ON FOREST EDGES MAY GROW FASTER THAN THOSE INSIDE

Relevant for: Environment | Topic: Environmental Conservation, Sustainable Development, and EIA

Counting plantations: Following a trend noted in previous editions of the forest surveys, the increase in forest cover between 2019 and 2021 was led by growth outside the recorded area | Photo Credit: Getty Images

Is a tree in a forest the same as one outside it? The belief that it is, allays the conscience of government-backed afforestation programmes where dense forests are often razed for mines, and multiple saplings are commissioned in alternate locations that are usually outside forest boundaries.

Conservationists have on the other hand pointed out that this isn't the same because a loss of a section of forest means destroying an ecosystem that can't be easily substituted for. To account for these losses more minutely, Lucy Hutyra, a bio-geochemist and ecologist at the Boston University, Massachusetts, U.S., has been analysing the terrestrial carbon sink.

This is made up of the billions of square kilometres of forest in the world that are major storehouses of carbon. In net, forests store more carbon dioxide than they release and an estimated 30% of carbon emissions from emitting fossil fuels are absorbed by the forest, making them a terrestrial carbon sink.

Trees absorb carbon dioxide (CO_2), release oxygen by way of photosynthesis, and store carbon in their trunks. When they shed, soil microbes work to decompose the leaves and other organic matter that releases the trapped carbon dioxide. A major prong of countries' climate change strategy, including India's, is to increase the terrestrial sink area.

Hutyra, who has been researching the consequences of forest loss, examined if the same species of tree had different patterns of carbon dioxide storage when located at a forest edge or further away.

The textbook assumption was that trees at forest edges release and store carbon at similar rates as forest interiors, but Hutyra and her colleagues report this isn't true.

In two papers published in the peer-reviewed *Global Change Biology,* and *Nature Communications,* Hutyra's team found edge trees grew faster than their country cousins deep in the forest, and that soil in urban areas can hoard more carbon dioxide than previously thought.

Using data from the U.S. Department of Agriculture's Forest Inventory and Analysis program – which monitors tree size, growth, and land use across the country – Hutyra's team looked at more than 48,000 forest plots in the Northeast United States. They found trees on the edges grow nearly twice as fast as interior trees – those roughly 100 feet away from the edge.

"This is likely because the trees on the edge don't have competition with interior forest, so they get more light," says Luca Morreale, a PhD candidate in Hutyra's lab, in a press statement.

In another related study, Hutyra found differences even in the way soil in forests and outside released carbon dioxide. Warmer temperatures at the edge of the forest caused leaves and organic matter to decompose faster, as it forced soil microorganisms to work harder and release

more carbon dioxide than their cooler, more shaded peers in the forest interior. But, in urban forests, where the ground was significantly hotter and drier, those soils stopped releasing as much carbon, they note in a press statement from Boston University.

Though these studies were specific to Massachusetts, there are implications for India too. Conservationists have noted that plantations outside forests don't capture carbon efficiently and don't make up for biodiversity losses.

The India State of Forest Report (2021) released in January found that nearly 28% of the forest cover is outside the recorded forest area. About 12% of the forests classified as ‘very dense’ is also outside the recorded areas. Following a trend and noted in previous editions of the forest surveys, the increase in forest cover between 2019 and 2021 was led by growth outside the recorded area and the sharpest increase was in so called ‘open forest’ where any patch over a hectare and having a canopy density more than 10% counts as ‘forest.’ This brings in man-made plantations of cash crops such as tea and coffee plantations and mango orchards and even tree-lined avenues in densely built-up cities were being classified as ‘forest’.

Ecologists M. Madhusudan and T.R. Shankar Raman note: “In one stroke, just between the 1999 and the 2001, this redefinition helped raise India’s forest cover by over 38,000 sq.km.” They highlight research in the Western Ghats that finds plantations deplete groundwater, have higher surface water runoff, poorer soil infiltration, compared to trees in natural forests. They also report that carbon stocks in plantations such as teak and eucalyptus were 30% to 50% lower than in natural evergreen forests and were generally less stable and resilient. The biggest loss, however, was that species dependent on forests—from insects to primates—were ripped apart from their natural habitats and plantations, which were mostly monocultures, rarely had the capacity to support a rich, biodiverse system.

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