



## Plant trees or let forests regrow? New studies probe two ways to fight climate change

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Regrowing trees soak up carbon in Brazil's Atlantic Forest northeast of Rio de Janeiro. [ROBIN CHAZDON](#)

Forests are having their moment. Because trees can vacuum carbon from the atmosphere and lock it away in wood and soil, governments and businesses are embracing efforts to fight climate change using trees.

Nations have pledged to plant or restore forests over a combined area larger than India. [One corporate-backed initiative](#) has secured pledges to conserve or restore 855 million trees by 2030. Even President Donald Trump, an ardent climate change skeptic, endorsed a trillion-tree planting initiative at the World Economic Forum in January; [a companion bill](#) was introduced in the U.S. House of Representatives in February.

Scientists agree that new trees and forests can, in theory, cool the planet. But many have warned that the enthusiasm and money flowing to forest-based climate solutions threaten to outpace the science.

Two papers published this week seek to put such efforts on a firmer footing. One study quantifies how much carbon might be absorbed globally by allowing forests cleared for farming or other purposes to regrow. The other calculates how much carbon could be sequestered by forests in the United States if they were fully “stocked” with newly planted trees. Each strategy has promise, the studies suggest, but also faces perils.

To get a worldwide perspective on the potential of second-growth forests, an international team led by ecologist Susan Cook-Patton of the Nature Conservancy (TNC) assembled data from more than 13,000 previously deforested sites where researchers had measured regrowth rates of young trees. The team then trained a machine-learning algorithm on those data and dozens of variables, such as climate and soil type, to predict and map how fast trees could grow on other cleared sites where it didn't have data.

In 2017, a TNC-led team had calculated that some 678 million hectares, an area nearly the size of Australia, could support second-growth forests. (The total excludes land where trees might not be desirable, such as farmland and ecologically valuable grasslands.) New forests growing throughout that area could soak up one-quarter of the world's fossil fuel emissions over the next 30 years, [Cook-Patton and colleagues report today in Nature](#). That absorption rate is 32% higher than a previous

estimate, based on coarser data, produced by the Intergovernmental Panel on Climate Change. But the total carbon drawdown is 11% lower than [the 2017 estimate](#).

The study highlights “what nature can do all on its own,” Cook-Patton says. Although reforesting the full area of opportunity is unrealistic, she says, reforestation planners can use her team’s results to estimate how much carbon sequestration to expect.

The study represents “a lightning step forward” in precision compared with earlier studies, says geographer Matthew Fagan of the University of Maryland, Baltimore County, who was not involved in the work.

But, Fagan adds, “Natural regrowth is not going to save the planet.” Young forests are easier to cut down or burn than old ones, Fagan cautions, making them frequent targets for farmers and ranchers. Second-growth forests in the Amazon typically last only 5 to 8 years, according to studies, though trees on slopes or near streams often survive longer. Even in Costa Rica, renowned as a reforestation champion that has doubled its forest cover in recent decades, half of regrowing forests fall within 20 years.

In many places, grazing cattle or growing crops is simply more profitable than allowing trees to come back, notes Pedro Brancalion, a forest expert at the University of São Paulo in Piracicaba, Brazil. Policies that promote reforestation and better markets for both carbon and forest products are needed, he says, to give trees a boost. Right now, “Nobody will abandon cattle ranching or agriculture for growing carbon.”

Robin Chazdon, a University of Connecticut, Storrs, ecologist and study co-author, urges conservationists to help farmers grow both trees and crops or cattle—a concept, she notes, that has a long history of success. “If you look at the history of Indigenous peoples, you will find many, many examples of how they managed and modified the forest for their own uses,” she says. “It doesn’t have to be completely left alone.”

Some advocates promote expanding tree planting in existing forests. To boost that concept, a team of researchers at the U.S. Forest Service (USFS) quantified how many additional trees U.S. forests could hold. Drawing on a federal inventory, they found that more than 16% of forests in the continental United States are “understocked”—holding fewer than 35% of the trees they could support. Fully stocking these 33 million hectares of forest would ultimately enable U.S. forests to sequester about 18% of national carbon emissions each year, up from 15% today, [the team reported](#) this week in the *Proceedings of the National Academy of Sciences*. But for that to happen, the United States would have to “massively” expand its annual tree-planting efforts, from about 1 billion to 16 billion trees, says lead author Grant Domke, a USFS research forester in St. Paul, Minnesota.

Planting trees might make sense in some places, Cook-Patton says. But she cautions that adding trees in fire-prone areas could increase fire risk. And although tree planting often gets the hype, cheaper natural regeneration usually results in a more diverse mix of species and provides more carbon bang for the buck. “For any given site,” she says, “we should always ask ourselves first: ‘Can the forest regenerate naturally, or can we do something to help?’”

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