Carbon capture is substantial in secondary tropical forests

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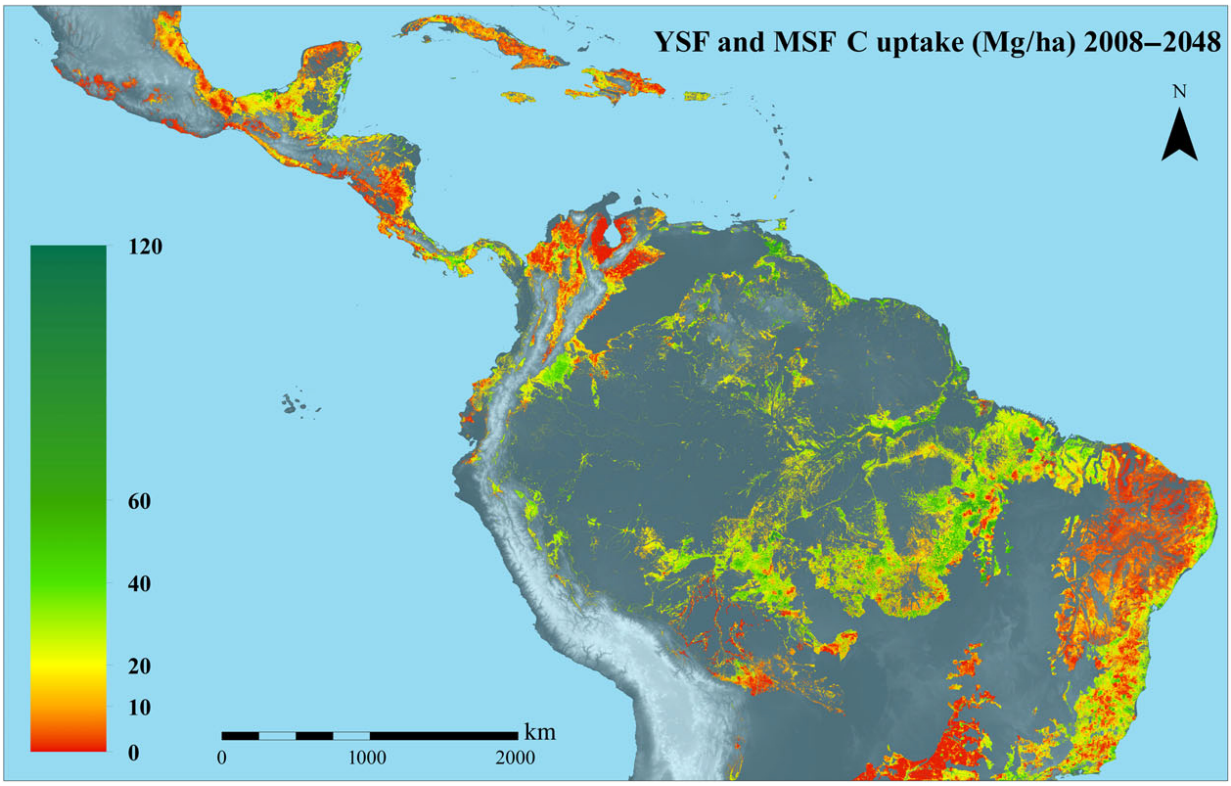

Secondary tropical forests consume substantial amounts of carbon, but are often neglected in climate change policy. Credit: Robin Chazdon et al

One of the most effective methods for capturing carbon from the atmosphere in the tropics of Latin America requires doing very little. In fact, researchers say, just protecting natural forest regrowth can help

reduce climate change.

Carbon uptake by secondary tropical forests is substantial.

If left alone to regrow for 40 years, the young secondary forests (YSF) and middle-aged secondary forests (MSF) that existed in 2008 would capture the equivalent amount of carbon emissions generated in all of Latin America and the Caribbean between 1993 and 2014.

A study published May 13 in *Science Advances*, shows that when land is left to regrow after forests have been cleared, these "secondary forests" could play a substantial role in removing carbon from the air even without costly tree plantings or promotion of land abandonment.

However, the practice of protecting regrowing forests has been overlooked by policy-makers and global organizations aimed at reducing climate change.

"The mantra has been, 'we need to protect old-growth forests'," said Saara DeWalt, an author of the study and an associate professor of biological sciences at Clemson University. "Protection of old-growth forests, which store substantial amounts of carbon, is absolutely needed, but we need to look to secondary-forest protection as well."

Protection of secondary forests have not been as highly valued, so after land is cleared once, it might not be considered for protection.

"Policies to mitigate climate change should include land abandonment and natural regeneration as part of an overall plan, with protection of old-growth forests and reduction in the use of fossil fuels," DeWalt said. "If we also start to promote protection of second-growth forests, or promote land abandonment, we will get a big payoff."

DeWalt is part of a 60-member international team of scientists investigating the benefits of secondary forests for reducing global warming. In February, a study by the team published in Nature reported that forests in wetter areas of the Neotropics—Central and South America and the Caribbean—regrow more quickly than those in drier areas. (See previous article.)

The *Science Advances* study first used a 2008 map of forest biomass to determine the extent of secondary forests of different ages across the Neotropics. The researchers estimated that of 8.7 million square kilometers studied more than 2.4 million square kilometers were made up of young secondary forests (aged 1 to 20 years) and middle-aged secondary forests (20-60 years). Then, they projected how much carbon these forests would store in above-ground biomass (trunks, limbs and leaves) between 2008 and 2048 based on rates of recovery they had reported in the Nature study. These rates take into account the effects of rainfall and seasonality on forest regrowth.

They found that if all of the young and middle-aged secondary forests were left alone between 2008 and 2013, they would have taken up more carbon than was put into the air by fossil fuel consumption and industrial processes in the Neotropics between 2010 and 2014.

To account for changes in the secondary forests over the projected 40-year period, the researchers also looked at how much carbon would be stored in the above-ground parts of the trees if only 20, 40, 60 and 80 percent were left alone to regenerate. If only 20 percent of the secondary forests were allowed to continue developing, more carbon would be released than would be captured because of carbon released when clearing forests. But a net carbon gain starts to appear when just 40 percent of secondary forests are allowed to persist.

The study assumed the secondary forests would be protected from fire,

but did not account for possible changes in climate that might affect rates of growth. However, the researchers say their estimates are conservative for various reasons, including the fact that they did not include carbon stored below ground in soil and roots, which could make up 25 percent of the total carbon captured by forests.

The importance of secondary forests is beginning to take hold among scientists thanks in part to the two recent studies by this research team and activities by individual scientists, like the University of Connecticut's Robin Chazdon, the lead author of the *Science Advances* paper. Chazdon brought attention to secondary forests when she presented some of the team's research in Paris in 2015, DeWalt said. But there's still much research to do.

"The next step is to go beyond carbon and biomass and look at other benefits of secondary forests," DeWalt said. The research team will continue to work with the network of land plots to determine the patterns in tree species diversity and composition.

"We need to understand more details about benefits of secondary forests and which conditions promote resilience of secondary forests," DeWalt said.

"There's not going to be a one-answer solution to slowing climate change," DeWalt said. "It's going to take a lot of different parts. If we can promote secondary forests and their protection, then we can go part of the way. Let's add that to the tool box."

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