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# FORESTS: Debate grows over tree planting's carbon-offset impacts

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As governments, companies and the public at large come to terms with possible strategies for reducing or mitigating greenhouse gas emissions, the concept of "tree carbon banking" is rising in popularity. But as with other forms of carbon offsets, the effectiveness of planting or maintaining forests to sequester carbon dioxide is increasingly being called into question.

In the simplest ecological terms, it makes sense. Basic biology tells us that plants absorb CO<sub>2</sub> and expel oxygen, making tree planting, theoretically, an ideal means to bank carbon emissions in the forest. This elementary principle has been the backbone for a number of programs that corporations have used in an attempt to offset their CO<sub>2</sub> emissions, the main contributor to global warming. For example, Dell Computers launched its "Plant a Tree for Me" initiative last month, which enables the company's customers to make a donation at the point of purchase to The Conservation Fund and Carbonfund.org. The nonprofit groups will plant trees to offset the CO<sub>2</sub> produced when customers power up their computers (*Land Letter* Jan. 10).

While in principle the idea of planting trees to offset carbon emissions is sound and beneficial, the extent of forest carbon banking may only be "marginal," according to several experts.

"It's part of the puzzle, but not the whole solution," said Laurie Wayburn, president of the Pacific Forest Trust in San Francisco.

Exactly how much of a positive effect on climate change that forest carbon banking might offer has been called into question by recent research. Ken Caldeira, an atmospheric scientist with the Carnegie Institution's Department of Global Ecology at Stanford University, introduced data at the American Geophysical Union meeting in San Francisco last December suggesting that the increase in size of dense, dark forests at higher latitudes across the globe could actually cause a warming effect.

The phenomenon, called the "albedo effect," occurs when dark surface masses such as dense forests retain more of the sun's heat than they reflect, causing regional temperatures to be higher than normal. In higher latitudes, a majority of the heat that hits boreal, or northern, forests is reflected due in part to snow and open spaces of lightly colored land like prairies. By afforesting higher latitudes to make them look more like the densely forested regions in the tropics, Caldeira explains, the effects of any kind of efforts to lower global temperatures would be regionally negated.

"Any project that would plant trees in higher latitudes is diverting people away from more important things," Caldeira told *Land Letter*.

## Losses and gains

Forest loss is considered one of the leading causes of man-made CO<sub>2</sub> emissions, not just because of the lost capacity for absorbing carbon dioxide but also for the CO<sub>2</sub> released during deforestation. According to the Pacific Forest Trust, forest loss accounts for roughly a quarter of all man-made CO<sub>2</sub> emissions today and may have been as high as 40 percent in the past. In the United States, 1.5 million acres of forest are lost every year to development and logging, releasing 275 million metric tons of CO<sub>2</sub> per year. Beyond the United States, the loss is far greater as rampant economic development cuts away large swaths of forests in South America while in Indonesia illegal logging threatens millions of acres of forests and jungles. Carbon offsetting via tree planting works under the principle that by planting trees, you could offset emissions caused by other factors like transportation or energy production. Forests could provide a "bank" for carbon as a hedge against climate change, but there is disagreement about how effective such a strategy may be.

The Climate Trust, one of a multitude of companies and organizations around the world that specialize in different options to help offset carbon emissions, has

contracted to buy carbon offsets from two reforestation projects. The Deschutes Riparian Reforestation project is assisting landowners that replant native trees in barren areas of Oregon's Deschutes River Basin, an effort that is expected to offset 234,000 metric tons of carbon dioxide, the equivalent to taking 46,614 cars off the road for a year. Farther south, Ecuadorian Rainforest Restoration will offset 65,500 metric tons of carbon dioxide, the equivalent to taking 13,048 cars off the road for a year.

Michael Burnett, executive director of Climate Trust, said forest carbon banks have the added benefit of promoting healthier ecosystems, including water quality and habitat development. He said that ecosystem development will become increasingly important as the effects of climate change threaten natural habitats and biodiversity.

"The situation is carbon dioxide up and biodiversity down, so I think we're smart to use money to solve the climate change problem and the biodiversity problem at the same time," Burnett said.

While companies like Climate Trust and Carbon Neutral invest in forest offsets, other groups are not as convinced. Boulder, Colo.-based Sustainable Travel International, which helps travelers find means to make their journeys carbon-neutral, does not offer the offsets because of the uncertainty of the offset amounts. According to the group's Web site, STA will offer select forest offsets when "international standards for certifying the carbon offsetting amounts related to reforestation and afforestation are developed and globally accepted by those organizations that certify the quality of emission reduction projects."

These kinds of standards are already evolving on a limited scale with initiatives like the California Climate Action Registry, an independent entity that keeps track of and makes protocol for carbon offsets.

But the effects of the carbon offsets can take decades to come to fruition and may not amount to much in the end.

Mike Cloughesy, director of forestry for the Oregon Forest Resources Institute, said that the full amount of carbon that would be offset by the planted trees could take between 40 to 60 years, too late by some climate models to help turn the tide on climate change. Even with wide-scale planting, it is unlikely the efforts could keep up with the escalation of nationwide emissions, Cloughesy said. "There's no way you are going to offset all the fossil fuel use in the United States by planting trees, you're talking to maybe 10-15 percent."

Planting trees for carbon banking generally falls in the two categories: reforestation, where an area that was cleared of its forest is replanted, and afforestation, where open land like prairies or grasslands is planted to form a

forest. While it makes sense to restore native forests, experts warn that afforestation could actually take away from the carbon benefit of natural vegetation like wild grasses and could have unforeseen effects on the local ecosystem.

Afforestation "is not going to make climate change sense. It's not going to make economic sense. It's not going to make biodiversity sense," said the Pacific Forest Trust's Wayburn. "Reforestation makes terrific sense."

### Counterintuitive results?

In the most extreme scenarios, some data suggests widespread planting could actually heat up the Earth rather than cool it down, at least at higher latitudes.

Stanford's Caldeira explained that the data in his "albedo effect" study was not to discourage tree planting but rather to show that planting in specific areas like tropical zones, which already experience warm temperatures, would make better sense. He emphasized, however, that the effects on climate change would be minimal.

"While it's good to restore forest and it's not bad to plant trees anywhere, it's not a quantitative solution to the climate change problem," Caldeira said.

Even if trees were planted to offset CO<sub>2</sub>, there is no guarantee that those trees would even be there after all that time.

According to a report released last year by the Pew Center of Global Climate Change, it remains unclear to what extent forest carbon sequestration can be used as part of a larger strategy for combating climate change because of the permanence of the offset. After the trees have been planted, threats such as invasive species, natural disaster or wildfires may destroy those trees down the line, nullifying the carbon they offset.

In a recent OFRI report, Climate Trust's Burnett and Bettina von Hagen of Ecotrust concluded that self-insurance and vintaging -- pacing the time of the forest offset credits to a date when they have absorbed their full carbon value -- could help insulate offsets from permanence.

"That's the Achilles heel of forest projects," Burnett said. "When you think about it, [forest offsets] should probably be worth less because of permanence."

*This story was corrected March 13; Laurie Wayburn is president of the Pacific Forest Trust. Land Letter apologizes for the error.*