

Old-growth forests store a treasure trove of carbon

As climate change legislation plows its way through the U.S. Congress, one of the hot-button issues is how to award greenhouse gas offset credits for storing carbon in forests. Some timber industry advocates argue that cutting trees can lead to more sequestration of carbon than leaving forests unmanaged. But a growing body of research shows that old-growth forests are best left alone, since they store two to three times the carbon of typical managed forests.

Because trees absorb and store CO₂ from the atmosphere as they grow, the Intergovernmental Panel on Climate Change recognizes reforestation, afforestation (converting fields into forests), and avoiding deforestation as ways to mitigate climate change. However, some industry advocates say that because young forests sequester carbon at a faster rate than old forests, offset credits should be awarded for replacing old slow-growing forests with young intensively managed plantations.

“The old view is that once a forest passes its peak rate of growth, everything starts dying and carbon just fluxes back into the atmosphere,” says Bill Keeton, a forest ecologist at the University of Vermont. But nothing could be further from the truth, he notes.

Data from temperate forests around the globe reveal that not only do old-growth forests continue to sequester carbon for centuries, they also store 30–50% more carbon than middle-aged forests and much more than young forests, Keeton reported at the Ecological Society of America annual meeting on August 5.

His findings join a host of papers published over the past several years demonstrating that old-

growth forests globally have carbon storage value.

By comparison, when a forest is cut, the regenerating young forest is an annual source of carbon, according to research by Bev Law, an ecosystem scientist at Oregon State University, because CO₂ re-



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This 300-year-old forest in the Adirondack Mountains of New York hoards vast amounts of carbon in above-ground live wood, roots, dead wood, and soil.

lease from soil and decomposition outweighs the carbon taken up by young trees for an average of 15 years. “When you harvest an old forest, you create a source of carbon immediately,” says Law, “and the total amount of carbon that was removed won’t be replaced by regrowing forest for over 100 years.”

When a forest is logged, a great deal of carbon can be lost because of accelerated decomposition of woody debris and losses during manufacturing, adds Mark Harmon, a forest ecologist at Oregon State University. “Thus, it may be eventually possible to gain carbon by converting an older forest to a younger biomass energy plantation, but it may take many decades or even centuries for this to occur. This is time we do not have,” he said in testimony before Congress on March 3.

When managing forests for carbon storage and other ecosystem services, such as biodiversity and

watershed protection, the best thing is to avoid deforestation, says Law.

But people still need wood, says Jared Nunery, a forest ecologist at the University of Vermont. So he and Keeton have been testing the effect of different silvicultural methods on carbon sequestration.

Even when taking carbon storage in durable wood products into account, intact northeastern forests store more carbon than harvested ones, Nunery says. Compared to an untouched forest, clear-cutting retains only 45% of the original carbon reservoir, and harvesting selected trees retains 79% of the carbon. But managing for old-growth characteristics by less frequent cutting, which maintains a multilayer forest canopy and leaves lots of dead tree trunks and limbs on the forest floor, preserves 90% of the carbon sequestration.

Because such old-growth silviculture boosts carbon stores compared to “business-as-usual” cutting methods, it has the “additionality” needed to qualify for offset credits, Keeton says. This holds true as long as reduced harvest does not lead to substitution of energy-intensive products such as concrete and steel, or increased logging abroad.

The next step is totaling up the value in carbon credits of old-growth silviculture. “California is the first governmental body in the world to provide a system for quantifying emissions reductions that are created through changes in forest management,” says Laurie Wayburn, president of Pacific Forest Trust, a conservation organization. “Landowners must conduct a full life-cycle assessment in order to qualify for an emission reduction project,” she says.

Wayburn's group is managing the van Eck Forest Project in Humboldt County, the first forest carbon project registered with the California Climate Action Registry. To achieve CO₂ emissions reductions, the forest's redwood trees will be allowed to grow older and therefore larger than under a

business-as-usual forestry scenario. The amount of timber harvested from the property will always be less than the volume of new forest growth. The changes will allow the land to sequester an additional 500,000 metric tons of CO₂ over the next 100 years.

"But keep in mind that the most important thing is to take quick action to stop pumping greenhouse gases into the atmosphere," Law warns.

—JANET PELLELY