

Scientists Are Turning to Trees to Repair the Greenhouse: Cutting ...

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Scientists Are Turning to Trees to Repair the Greenhouse

Cutting carbon dioxide levels is the worldwide goal.

By JOHN H. CUSHMAN Jr.

ON 80 acres of the wettest land in Catahoula Parish in Louisiana, an experimental crop of hardwood saplings is seizing carbon dioxide from the atmosphere and locking it up in wooden cells.

The foot-high seedlings of ash, oak, and pecan are barely two years old. Still overshadowed by annual weeds, they are struggling to establish roots under the perennial floods of the bayou. But on each acre, the trees probably take in as much carbon dioxide each year as a typical automobile puts out, according to the scientists at Louisiana Tech University who manage the project.

So while there are skeptics, this experiment in what scientists call the sequestration of carbon, if it can be replicated on a large scale, could represent a significant weapon against the risk of global warming caused by manmade carbon dioxide and other greenhouse gases.

To stop carbon dioxide from reaching dangerous concentrations in the atmosphere may require people to shift away from fossil fuels, according to most of the experts advising the nations who have signed the international treaty to combat the problem. In the meantime, the world's forests represent an enormous reservoir for carbon dioxide, which is naturally removed from the air when trees and other photosynthetic organisms grow and multiply.

The role of trees in mitigating carbon dioxide emissions can be expanded further if they can be used as renewable fuels, offsetting the use of

Loggers eagerly embrace calls to cut and replant.

fossil fuels, if wood products substitute for energy-intensive products like steel, and if shade trees are planted in cities and neighborhoods, reducing the demand for air conditioning.

"The carbon problem is very huge," said Neil Sampson, a forestry consultant who has extensively studied the role of wood in fighting global warming. "It looks to us like trees and forestry can handle perhaps 30 percent of it. That is a significant role, if you don't expect it to be the only role."

Pilot studies suggest that it will cost just a few dollars per ton of carbon — estimates range from less than \$1 to more than \$30, depending on the circumstances — to increase the sequestration of carbon dioxide in trees by expanding the planet's total forested area.

That is considerably cheaper than the costs some economists have projected for controlling industrial emissions of carbon dioxide. And if the new protocol to the climate change treaty that was negotiated in Kyoto in December goes into force, and the United States sets up a market-based system for encouraging the least costly steps to reduce net emissions of carbon, growing trees could be one profitable path to the goal.

The prospect, though, has stirred up a powerful debate over how to measure the complex cycle in which trees take carbon from the atmosphere and slowly release it after they

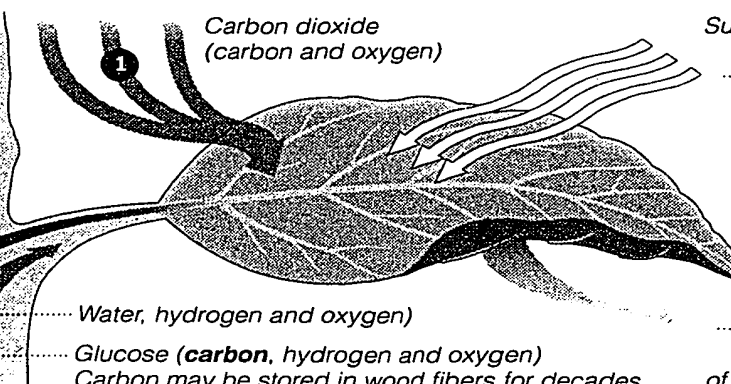
Reducing Carbon

Trees lower the levels of carbon dioxide in the atmosphere and could be used as a weapon against the risk of global warming.

HOW THE FORESTS ABSORB CARBON

Carbon is absorbed by growing trees when carbon dioxide is used in photosynthesis.

Carbon dioxide from the air (1) and water from the soil (2) are used to produce glucose, the energy source of plants (3).



OFFSETTING THE GREENHOUSE EFFECT

Several proposed forestry-related programs would reduce carbon dioxide levels. The figures show the range of current estimates:

ESTIMATES OF MILLION TONS OF CARBON DIOXIDE REMOVED FROM ATMOSPHERE

	LOW	HIGH	132	481	558	771	37	110	367	730	44	139	11	26	73	301	TOTALS
Planting more trees on marginal crop and pasture land.																	1,222
Making existing forests grow faster.																	2,558
Reducing the number and size of wildfires.																	
Growing more fast-growing trees to replace slower-maturing trees.																	
Planting more trees in urban areas.																	
Planting more trees for uses like shelter belts and snow fences.																	
Recycling more wood and using more wood substitutes.																	
																	million tons of carbon dioxide, that would offset an important part of the U.S. total emissions (5,484.5 million tons in 1996).

Sources: Neil R. Sampson; Energy Information Administration; "The Visual Dictionary of Plants."

die, how to verify that reductions are actually achieved, and how to encourage foresters to capture the largest possible benefits.

Doubters say that allowing emissions in one place to be offset by trees grown somewhere else is unfair and unreliable. Even its advocates say that forestry can only handle a fraction of the greenhouse gas problem.

And adding to an already heated debate, some United States lawmakers who have not previously supported action on global warming, but who favor expanded logging on public lands, have been arguing that it makes the most environmental sense to cut down mature forests, which are no longer growing quickly, and replace them with vigorous saplings, which bulk up more quickly.

"Science has proven to us that carbon dioxide, the leading greenhouse gas, can be taken out of the atmosphere by properly managing our forests," said Representative Don Young, Republican of Alaska, the chairman of the House Resources Committee. "Carbon dioxide is kept out of the atmosphere by harvesting the forest before it begins to decompose or burn, thus storing the carbon in wood products that are environmentally friendly, as well as providing an economic benefit to society."

Other experts said that Mr. Young has oversimplified the situation. And indeed, the question of how best to use the world's forests to fight global warming has only begun to be addressed in detail.

At the Kyoto talks, where the world's industrial nations pledged to reduce net emissions of carbon dioxide and other greenhouse gases by an average of 5 percent below 1990's levels over the next 10 to 15 years, they agreed to count additions and subtractions of carbon dioxide caused by "direct human-induced land use change and forestry activities, limited to afforestation," or turning land into forest, "reforestation, and deforestation since 1990."

But they left to a specialized committee the task of setting up accounting rules, and there is likely to be scientific and political debate before important questions are settled.

"If sequestration is done correctly, it can produce many benefits," said Michael Oppenheimer, a climate scientist at the Environmental Defense Fund, an advocacy group based in New York. "It can enhance ecosys-

tems and remove carbon dioxide from the atmosphere. But done poorly, it can make the greenhouse problem worse and do a lot of damage to the ecosystem."

Dan Becker, the head of climate programs at the Sierra Club, is more dismissive.

"In order to offset U.S. industrial emissions, you would need to plant a new forest on an area the size of Australia," he said. "You are taking carbon that is safely sequestered underground, as coal or oil, and bringing it up, and adding it to the atmosphere. And then you are temporarily storing it in a closet made of trees. I am all for preserving forests, and I am against cutting down forests. But is it a good thing to pollute more because you have done that? No."

Mr. Becker and other skeptics said that it would be almost impossible to verify the amount of carbon being set aside in forests, especially if the projects are widespread and if international conservation programs are used to offset domestic emissions in the United States, as is already being ventured.

But Steven P. Hamburg, who teaches environmental studies at Brown University and has been closely involved in the United Nations research into forestry's role in global warming, said that the difficulties of estimating the amount of sequestration are exaggerated.

"The bottom line is that we have been assessing the growth of forests for a century, and we have very well-established methods for doing it," he said. "We can measure with confidence the carbon in trees with an uncertainty of plus or minus 10 percent, without any difficulty." In carefully controlled studies of forests in Russia, he said, the standard formulas used by American scientists predicted actual carbon content of trees within an accuracy of 3 percent.

Perfecting the estimates is one objective of the small experiment in Louisiana. But other goals include figuring out what methods work best in turning abandoned bean fields back into bottom land hardwood wetlands. For the past few decades this type of wetland has been disappearing fast, but with changing farm policies there are opportunities to restore trees to vast areas of the Mississippi River Valley.

Like other forestry projects across the country and around the world, this plot of land, managed by scientists at the School of Forestry at

Louisiana Tech in Ruston, is being paid for by companies that usually produce watts, not woods. Electric utilities, which voluntarily promised the Energy Department that they would reduce their emissions of carbon dioxide by 2000, are using tree projects as one way to meet that commitment.

Utilitree Carbon Company, a consortium of utilities, has projected that the \$176,000 project in Louisiana will remove tens of thousands of tons of carbon dioxide from the air over the next several decades: just seven tons an acre per year, but hundreds of tons per acre by the end of the 70-year growing cycle.

There are other benefits to growing trees in wetlands.

The Louisiana tract is part of a 7,000-acre area trees can be grown next to a state wildlife refuge, and quite aside from its role in offsetting the emissions of greenhouse gases far away, putting it into trees will provide important wildlife habitat and other environmental benefits.

And there is a lot of similar land available for forestry projects. Over four million acres of bottom land hardwood forests were cleared in the Mississippi River Valley in the 1970's for agriculture, even though the land was poorly suited for that purpose.

Mr. Sampson, who edited a two-

Critics say the focus on the forest is misplaced.

volume collection of research for American Forests, a conservation organization, has estimated that the forests offer ways to reduce net carbon emissions in the United States by 314 million tons to 695 million tons per year, or between 21 and 46 percent of estimated annual emissions of 1.5 billion tons. He bases his estimate on a diverse package of forestry-related programs: planting trees on marginal land, altering forest management practices to speed growth of existing timber, increasing the use of renewable wood fuel, and planting trees in cities and near houses, where they can reduce energy consumption for air conditioning.

In Congress, pro-logging lawmakers have suggested that the best way

to maximize sequestration might be to cut down mature forests and replace them with fast-growing plantations of trees, keeping the carbon locked up in the wood for decades after it is harvested, in the form of homes, telephone poles, books and the like.

In October, the House passed a nonbinding resolution calling on the United States "to manage its forests to maximize the reduction of carbon dioxide in the atmosphere, among many other objectives."

That wording was a compromise to mollify environmentalists and their supporters in the House. But the resolution was pressed by Mr. Young, Representative Helen Chenoweth, Republican of Idaho, chairwoman of the forestry subcommittee, and other pro-logging lawmakers.

They draw their argument from researchers like John Perez-Garcia, an associate professor of forestry at the University of Washington, who has argued that some forest conservation efforts have perversely added carbon dioxide to the atmosphere by depressing logging. That, he argues, leads to the use of steel and other substitute materials, while allowing forests to get overgrown to the point that they burn.

Indeed, there have been estimates that managing a Douglas fir forest in the Pacific Northwest as a monoculture plantation, and harvesting all the trees every 60 years, could sequester more carbon in the wood and in wood products while the tree farm's growth is at its peak than could be accomplished through other approaches. The alternatives studied included leaving the forest alone, or harvesting parts of the forest year to year while leaving its complex ecosystem more or less intact.

But this kind of calculation ignores important facts about the carbon cycle and the overall health of forests. For example, when a forest is clear-cut, the carbon in its soil begins to dissipate almost right away, a source of carbon dioxide emissions that lasts for decades. And the other benefits of a forest, such as watershed protection, rich habitat, and recreational use, are destroyed.

"In general, I don't think that is good management," said Dr. Hamburg of Brown. "I don't think you could come up with any data to suggest that you could intensively manage those forests and increase carbon sequestration."

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