Reviving American chestnuts may mitigate climate change

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Douglass Jacobs examines a young hybrid of the American chestnut. He expects the trees could be reintroduced in the next decade. Credit: Purdue University file photo/Nicole Jacobs

A Purdue University study shows that introducing a new hybrid of the American chestnut tree would not only bring back the all-but-extinct species, but also put a dent in the amount of carbon in the Earth's atmosphere.

Douglass Jacobs, an associate professor of forestry and natural resources, found that American chestnuts grow much faster and larger than other hardwood species, allowing them to sequester more carbon than other trees over the same period. And since American chestnut trees are more often used for high-quality hardwood products such as furniture, they hold the carbon longer than wood used for paper or other low-grade

materials.

"Maintaining or increasing forest cover has been identified as an important way to slow climate change," said Jacobs, whose paper was published in the June issue of the journal *Forest Ecology and Management*. "The American chestnut is an incredibly fast-growing tree. Generally the faster a tree grows, the more carbon it is able to sequester. And when these trees are harvested and processed, the carbon can be stored in the hardwood products for decades, maybe longer."

At the beginning of the last century, the chestnut blight, caused by a fungus, rapidly spread throughout the American chestnut's natural range, which extended from southern New England and New York southwest to Alabama. About 50 years ago, the species was nearly gone.

New efforts to hybridize remaining American chestnuts with blight-resistant Chinese chestnuts have resulted in a species that is about 94 percent American chestnut with the protection found in the Chinese species. Jacobs said those new trees could be ready to plant in the next decade, either in existing forests or former agricultural fields that are being returned to forested land.

"We're really quite close to having a blight-resistant hybrid that can be reintroduced into eastern forests," Jacobs said. "But because American chestnut has been absent from our forests for so long now, we really don't know much about the species at all."

Jacobs studied four sites in southwestern Wisconsin that were unaffected by the blight because they are so far from the tree's natural range. He compared the American chestnut directly against black walnut and northern red oak at several different ages, and also cross-referenced his results to other studies using quaking aspen, red pine and white pine in the same region.

In each case the American chestnut grew faster, having as much as three times more aboveground biomass than other species at the same point of development. American chestnut also sequestered more carbon than all the others. The only exception was black walnut on one site, but the American chestnut absorbed more carbon on the other study sites.

"Each tree has about the same percentage of its biomass made up of carbon, but the fact that the American chestnut grows faster and larger means it stores more carbon in a shorter amount of time," Jacobs said.

Jacobs said trees absorb about one-sixth of the carbon emitted globally each year. Increasing the amount that can be absorbed annually could make a considerable difference in slowing climate change, he said.

"This is not the only answer," Jacobs said. "We need to rely less on fossil fuels and develop alternate forms of energy, but increasing the number of American chestnuts, which store more carbon, can help slow the release of carbon into the atmosphere."

Carbon dioxide is considered a major greenhouse gas, responsible for rising global temperatures.

Jacobs said that since this study looked at aboveground carbon sequestration, future studies would seek to understand more about how forests that contain American chestnuts store carbon below the ground. The Stry Foundation, Electric Power Research Institute, and Hardwood Tree Improvement and Regeneration Center funded the research.

Source: Purdue University (news : web)