Chestnut's Revival Could Slow Climate Change

Grows larger, lives longer than oaks

By Phil Taylor | July 1, 2009

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The American chestnut tree, which towered over eastern U.S. forests before succumbing to a deadly fungus in the early 20th century, appears to be an excellent sponge for greenhouse gases, according to a new study.

If scientists can develop a fungus-resistant version of the tree, the chestnut could play a key role in the battle against climate change, Purdue University scientists say.

"Maintaining or increasing forest cover has been identified as an important way to slow climate change," said Douglass Jacobs, whose chestnut tree study appears in the June issue of *Forest Ecology and Management*.

In a study conducted at four sites in southwestern Wisconsin, the American chestnut grew much faster and larger than the black walnut and northern red oak, allowing it to soak up more carbon dioxide, the study found. The tree's higher carbon capacity makes it an ideal candidate for forest restoration projects and carbon offset schemes, particularly on marginal farmland in the Midwest.

"Generally, the faster a tree grows, the more carbon it is able to sequester," Jacobs said. "And when these trees are harvested and processed, the carbon can be stored in the hardwood products

for decades, maybe longer."

The chestnut also compared favorably when cross-referenced to studies of quaking aspen, red pine and white pine.

The trees eventually absorb the same amount of carbon, but the fast-growing chestnut can store more carbon in a shorter amount of time, Jacobs said. The tree was found to carry up to three times the biomass of the others at various points in its growth cycle.

Moreover, the chestnut is a prime species for furniture and housing products, which allow it to store carbon for extended periods after harvest. By contrast, carbon stored in newsprint is stored for an average of six months, said Bryan Burhans, CEO of the American Chestnut Foundation in Asheville, N.C.

"It's simply taking atmospheric carbon and turning it into a compound that is stored in the tree," said Burhans, a biologist who was not part of the Purdue study. Chestnuts that are not harvested, he said, can live between 250 years and 300 years, compared to an oak's average lifespan of 100 years to 150 years.

Worldwide, trees store a sixth of the CO2 emitted each year, but they could be managed to store much more, scientists say.

A sweeping climate and energy bill passed by the House last week would create opportunities for investing in reforestation projects to offset carbon emissions. The legislation sponsored by Democrats Henry Waxman of California and Ed Markey of Massachusetts requires half of the 2 billion tons of carbon offsets allowed each year to be purchased in the United States.

Reintroducing the American chestnut

Once known as the "redwood of the east," the American chestnut represented up to 45 percent of the forest canopy in parts of its native range, which extended from southern New England and New York southwest to Alabama. The tree is all but wiped out by a red fungus known as the "chestnut blight," which was first discovered in 1904 after being imported in the chestnut's Asian variety. One thousand American chestnuts are believed to remain in the wild.

The tree's survival depends on the development of a hybrid that can withstand the fungus while retaining most of the American chestnut's qualities. Scientists at the American Chestnut Foundation say they are close to developing a blight-resistant hybrid and plan to begin full reintroduction of the plant within the next five years.

"We're making real progress right now," Burhans said.

At a southwest Virginia farm, American chestnuts are being cross-bred several times with a Chinese variety to create a fungus-resistant species with 94 percent American genes. Already, thousands of the seeds have been planted in three national forests in the Southeast to test the hybrid's growth.

Wider production of the seed is limited by the two-year period scientists must wait for new trees to produce their first fruits and prove their resilience to the fungus. While full restoration could take more than 100 years, Burhans believes the reintroduction programs could see significant progress in a matter of decades.

The tree's nonresistant variety has already been shown to grow well in an otherwise inhospitable environment: reclaimed surface mines.

The Appalachian Regional Reforestation Initiative, a five-year partnership between the foundation and the Interior Department's Office of Surface Mining Reclamation and Enforcement, was announced last October as a way to prevent soil erosion on abandoned coal mines (*Greenwire*, Oct. 10, 2008). Companies that are normally required to compact abandoned surface mines and plant grasses are being asked to break up soil to reintroduce native hardwood forests that include the American chestnut.

"The American chestnut has proven a very successful survivor on these dried, unwelcoming sites," Burhans said, adding that initial results from the program suggest the fungus-immune hybrid could eventually be used for more extensive mine reclamations.

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