

Hopes for Chestnut Revival Growing

Engineered Versions of the Once-Common Species, Long Ago Wiped Out by a Fungus, Take Root

By **HEATHER HADDON**

Scientists are on the brink of engineering a blight-resistant American chestnut tree, renewing hope for a comeback of a long-celebrated species that is valued by business for its sturdy hardwood.



Claudio Papapietro for The Wall Street Journal
Thom Almendinger, right, director of stewardship at New Jersey's Duke Farms, inspects a chestnut seedling along with Steven Handel, left, a Rutgers University professor.

For the first time, techniques used to genetically engineer sturdier farm crops are being tapped to bring back a devastated native species—one that once numbered in the billions and covered much of the East Coast. Entire forests were laid to waste by an Asian fungus introduced around 1900, and healthy chestnuts now exist only in a smattering of places in the American West, where the blight didn't reach.

Now, chestnut trees whose lives began as smudges on a Petri dish are growing in upstate New York, their genes infused with a wheat DNA that appears to kill the fungus that attacks the tree's trunk and

limbs. Unlike chestnuts in nature, these trees haven't succumbed so far to the blight—even when scientists directly infect them with it.

The experiments are the culmination of decades of research by scientists at the State University of New York College of Environmental Science and Forestry in Syracuse. At the same time, a separate effort was under way to splice the American chestnut with a Chinese version, producing a potentially blight-resistant tree dubbed the "Restoration chestnut." Both efforts have given hope to supporters who want the chestnut to reclaim part of its share of the forest.

"I didn't think they would ever do it," said Kim Steiner, a professor of forest biology at Pennsylvania State University. Now, he said, "I'm sure it's going to happen."



Ohioan Greg Miller spraying an American chestnut tree that was growing wild near Braceville, Ohio, in 2007.

It remains to be seen whether scientists and foresters can replenish the American chestnut to its once glorious, widespread population, as the trees will take decades to mature. In addition to the tree's strong wood being used for barns, shingles and telephone poles, the tree's nuts sustained forest animals and were sold throughout Appalachia. They were lauded in Mel Torme's "The Christmas Song," and Henry David Thoreau frequently wrote about hunting for autumn chestnuts in the forests surrounding Walden Pond.

"It was a cornerstone species," said Stacy Clark, a research forester for the U.S. Forest Service. "It was probably the most versatile tree in the woods." The American chestnut tree, which has saw-teeth-edged leaves, shouldn't be confused with horse- or buckeye-chestnut trees, which come from separate tree families and produce inedible nuts.

The Asian fungus that crippled the species was first detected in New York's Bronx Zoo in 1904. The disease starved the tree of water and nutrients and spread rapidly despite a quarantine effort. By 1940, billions of trees had died. "I don't think there's been anything nearly as extensive as the chestnut blight," said Thomas Holmes, a Forest Service researcher.

American elms also have suffered from a blight triggered by Dutch elm disease, a fungus spread by beetles and first detected in the U.S. in the 1920s. Scientists have had some success in selecting varieties of elms that are resistant to the disease, including the Princeton Elm. Beginning in 2005, the varieties have been planted across the country to assess for the best resistance.

Attempts to restore the American chestnut began in the 1930s, when scientists unsuccessfully tried to breed the tree with a Chinese variety that was immune to the fungus. Federal funding dried up by the 1960s.

The efforts were picked up again in the 1980s by scientists and plant lovers who founded the American Chestnut Foundation. They

applied a new method, called backcross breeding, which was first used for corn that imparts preferable traits over several generations.

The foundation started planting their new chestnuts—one-sixteenth Chinese and the rest American—in Virginia in 2006. More than 100,000 of the trees are growing across 19 states, with plans for millions more in what the group calls the country's largest ecological restoration effort. Thousands of trees were inoculated with the fungus in June 2011, with 20% showing strong resistance and 40% with a more moderate amount, foundation president Bryan Burhans said. Scientists will select for the strongest resistances when breeding future generations, he said.

Meanwhile, scientists at Syracuse's forestry college began experimenting in 1990 with a technique called transgenics, which was traditionally used to create genetically modified crops. They inserted a fungus-resistant wheat gene into an American chestnut embryo and grew a tree from a single cell in a Petri dish.

By 2006, Syracuse scientists had planted the first genetically modified trees, and they hope to gather their first nut crop this fall. The results are promising so far, as the trees haven't succumbed to blight halfway into the study. "It's just a matter of time giving us the combination of genes we want," said William Powell, the project's co-director.



Close

Today, nearly all chestnuts sold as food are grown from the Chinese variety. But the American version is smaller and considered sweeter, although there aren't enough trees yet to sustain a food industry.

Returning the chestnut to American forests in large numbers could depend on help from the mining and timber industry. Federal law requires mining companies to restore land they strip through means that include forestation. Chestnuts thrive in the loose, sandy soils left after mining.

The chestnut foundation is working with mining and energy companies such as Alpha Natural Resources Inc., Peabody Energy Corp., and American Electric Power Co. to plant the chestnuts, said the foundation's chief scientist, Fred Hebard. The nuts are expensive, but industry has pledged to plant more of them when the prices fall, said Patrick Angel, senior forester for the U.S. Office of Surface Mining, which oversees the restoration of mine lands.

Wood companies including MeadWestvaco Corp., Arborgen Inc., and Georgia-Pacific Corp. also have donated land to plant Restoration Chestnuts, Mr. Hebard said.

"The tree represents an important part of our American heritage," said Meg Gallagher, a spokeswoman for Peabody, which has planted 250 Restoration Chestnuts on former mine lands in Indiana since 2011.

The breeding techniques used to save the chestnut hold promise for other hardwood trees succumbing to pests, including the American elm, white walnut and eastern hemlock.

"We have to be proactive," said Steven Handel, a professor of plant ecology at Rutgers University, who is researching blight-resistant chestnuts planted at Duke Farms, a nature sanctuary in New Jersey. "The statement that nature takes care of itself—if only it was true."