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From sapling to forest: Harvard joins effort to combat an older epidemic

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Something is missing in the woods today.

The American chestnut tree once dominated the eastern woodland—some 4 billion trees spread through forests stretching from Maine to Mississippi. Full-grown, they stood taller than oaks. Some had trunks 10 feet in diameter. In June they were topped with a mass of cream-colored (but bad-smelling) flowers. When the chestnuts were in bloom, some Appalachian peaks looked as if they were capped with summer snow.

But the American chestnut was almost completely wiped out by a blight that began around 1900, brought to New York with imported trees. Despite desperate efforts by botanists and foresters to stop it, the blight spread inexorably from state to state. By the 1950s the native chestnut was "functionally extinct"—that is, there were (and are) still living chestnut trees, but they do not reproduce. The fungal blight kills the tree above ground, but its roots survive, often for decades. When a new sapling springs from the old roots, the blight usually destroys it before it produces seed.

Even after the chestnut seemed beyond rescue, however, several generations of stubborn researchers and everyday tree-lovers have gone on fighting to save it. And Harvard is about to become a battle site in that century-long war.

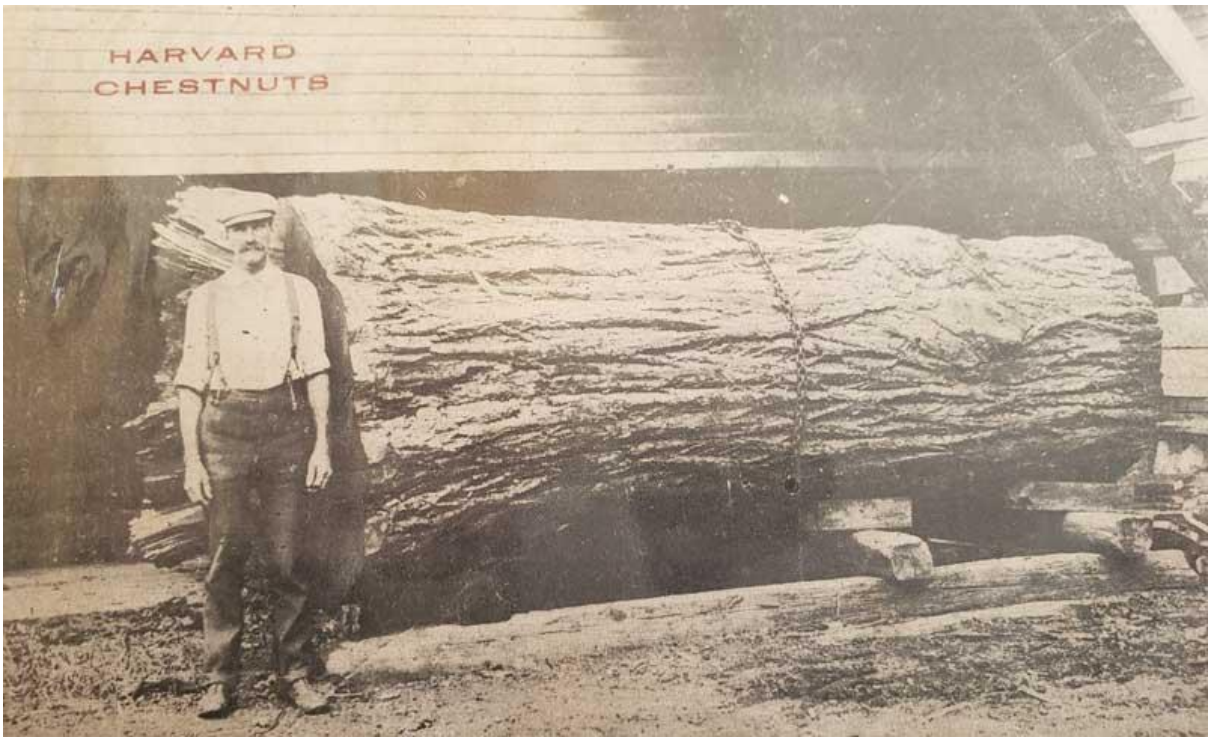
Last November, Harvard resident Brian McClain brought a proposal to the Conservation Commission, seeking permission to create a nursery orchard for American chestnut seedlings on the Powell conservation land along East Bare Hill Road. McClain, who serves on the commission's Land Stewardship Subcommittee, laid out a schedule for raising 100 chestnut seedlings in two plots on the open land where the Boy Scouts once raised Christmas trees.

Like many people who thought the chestnut was completely gone from local woods, McClain was taken by surprise when he first saw a sapling in the wild. "I was on a hike," he said in a phone interview, "and I saw these leaves, and I jumped up and down!" Not long afterward, he realized that the 15-foot "volunteer" growing up through a rhododendron was also a young chestnut.

In developing the plan for the Powell land, McClain credits the help he has received from Wendy Sisson, who helped write the proposal, and Jim Lee, who mows the field at the conservation area. John Lee has also supported his efforts and taken an active interest in the project, McClain said.

Building in a resistant gene

In the proposal to the commission, McClain explained the primary goal of the Powell land planting: "To grow chestnut saplings from seed to get 'mother trees' to the female flowering stage" in about three to seven years. Once the trees are old enough to flower, McClain and other volunteers will hand-pollinate those flowers from a stock of pollen with a blight-resistant gene. When the trees bear nuts that fall, about half those nuts will carry the resistant gene. And from those nuts will come a new generation of resistant trees.



Many chestnut trees were cut in an effort to create a "firebreak" to stop the spread of the blight. Others were cut to harvest their lumber before the blight killed them. This photo was taken at a lumber mill on Mill Road. The Press welcomes any information on this Harvard chestnut farmer. (Photo courtesy of the Harvard Historical Society)

The blight-resistant pollen is "transgenic"—that is, it has been given a gene from another plant, in this case wheat. Wheat and a wide range of other plants as diverse as rice, bananas, and tomatoes all share this specific gene. They are not affected by the fungal pathogen that kills the chestnut, because this one common gene allows them to break down the lethal acid that the pathogen secretes and make it harmless.

The resistant pollen comes from a line of transgenic trees grown by the Environmental Science and Forestry College at the State University of New York in Syracuse. ESF-SUNY is currently asking federal regulatory agencies to approve the transgenic trees (and by extension their pollen) for public release. That approval is expected well before the Powell land trees reach the age to flower.

ESF-SUNY also wants to grow three more lines of transgenic trees to ensure that future generations of chestnut trees retain their blight resisitance. With several pollen sources and a wide variety of "wild-type" flowering chestnuts like those McClain hopes to grow, the new, resistant generation of chestnuts will have more genetic diversity—and less vulnerability to future threats—than if they had all come from a single parent line.

Under the auspices of the American Chestnut Foundation, the Powell land orchard would be part of a much larger project in which similar orchards are being planted in several states where the chestnut once thrived.

McClain explained that the young trees tend to survive longer in an orchard setting than if they were planted in the forest. For one thing, forests are damp, which favors the blight spores. And it is easier to protect the young trees from wildlife out in the open. He plans to

use plastic tubes and wire cages as protection until the saplings are about 5 feet tall. Deer are a problem, he said, but racoons—"They're the worst!"

This is a long-term project. McClain plans to plant his stock of chestnuts (from the American Chestnut Foundation) this spring, despite delays caused by the coronavirus outbreak. Between 2024 and 2030, the trees should flower and be ready for pollination. By 2030, the 100 young trees will be outgrowing their original close spacing. With luck, they will have produced hundreds of blight-resistant transgenic nuts by then, from which the next generation of chestnuts will grow.

But, because the Powell land trees would not themselves be transgenic, many would already be succumbing to the blight by 2030. So this planting was never expected to be a permanent one. Around that year, McClain wrote in his proposal, the orchard could be thinned to a well-spaced stand of 20 trees at most. Or all could be cut down and the field returned to its present state.

Eventually, of course, the goal is not to grow little orchards of chestnuts, but to return them to the forest where they can once more grow to full size and become a self-sustaining population. The American Chestnut Foundation says, "Our mission is to return the iconic American chestnut to its native range."

For more information, see the American Chestnut Foundation website, www.acf.org

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