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## **Saving the American Chestnut - David Bingham does his part in Salem**

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Think of Connecticut and trees, and the Charter Oak comes to mind. But time was when the giant of the forest, the mighty American chestnut, dwarfed the oaks, maples and other hardwoods. It was the 19th century first choice for buildings and barns, rail fences and railroad ties, even furniture and musical instruments. Connecticut's iconic tobacco drying barns were made of it.

The majestic tree was a keystone to forest ecology across the eastern United States. It grew from Maine to Florida, from the Piedmont west to the Ohio Valley. Trees growing in the Appalachians topped 100 feet tall and had diameters approaching 15 feet. One tree could fill an entire rail car.

Chestnuts were one of the fastest growing trees. The wood was straight-grained and easily worked, lightweight and highly rot-resistant. Entire rural communities depended on its nuts as a cash crop and livestock feed. Wagonloads of the nuts were carted into New York and Philadelphia, sold as a Christmas delicacy.

Although structures still exist and the wood is respectfully recycled by knowing carpenters, the majestic stands of chestnuts are gone. They were felled by a blight brought in on Asian varieties of the tree. The native species had no natural resistance to the introduced soil-borne fungus. It hit quickly and decimated the live tree stands. First discovered in 1904 in New York City, by 1950, it had destroyed roughly four billion chestnut trees on some nine million acres of eastern US forest. This was roughly one-fourth of the hardwood tree population.

Today, chestnut restoration is part of a national effort to promote healthy forests, according to The American Chestnut Foundation (TACF), the source of the tree facts above. The fast-growing trees could help counter global warming by taking up and storing carbon. They also could speed reforestation of coal mining tracts.

Founded in 1983 by a group of plant scientists, the non-profit organization has quietly been breeding back successive generations of hybrid trees, using a blight resistant Chinese chestnut parent and multiple American chestnut trees that have been found in the wild or are offspring of controlled pollination techniques.

The process, called backcrossing, aims to produce hybrid American Chestnuts that have just about all of the beneficial traits of the American tree, plus the blight resistance of the Chinese tree.

The parent tree of the future American chestnut, at least the Connecticut strain, could be growing in the back yard of Dr. David Bingham, 67, a retired OB-GYN.

“I grew up in Salem, I have always known about the Chestnut blight because it happened in my father’s childhood,” said Bingham, one of 11 children. “We still had the monster tree stumps in the woods, and the long railing atop the stone walls was often from one tree. It was such beautiful wood, perfect for carpentry.”

Thirty to forty years ago, stuck in New York City while studying medicine at Columbia University, the self-taught naturalist sought out experts who shared his interests.

“I hungered for the sounds and what was there,” he said. “Birds, frogs, crickets, all the sounds of nature. I’ve been an avid birder for many years.”

In addition to being a naturalist, he figured he knew a thing or two about reproductive biology. So, he joined TACF early on.

A runner and hiker, he noticed that chestnut sprouts were spread all over the Connecticut woods. These sprouts were the attempts of hundred-year-old chestnut trees to send up new growth.

The blight is a wound pathogen, Bingham explained. It enters through a fresh injury in the tree's bark, killing the underlying vascular cambium and wood. The tree is choked off, section by section, as the flow of nutrients stops.

But the tree roots don’t die. Tree breeders have sought out and tried to grow the sprouts, hoping for a naturally resistant tree. The battle has gone on for years, he said, and some day might yield a blight resistant American chestnut.

Starting in the 1920’s, the U.S. Department of Agriculture and the Connecticut Agricultural Experiment Station (CAES) attempted to breed blight-resistant chestnuts. They used the Chinese and Japanese species, which are shorter, bushier trees that don’t live as long or produce as much timber. But the offspring didn’t pass muster.

For the last 20 years, Bingham has been nursing an American chestnut that he discovered. He has achieved flowers and fruit, or nuts, which become little trees.

“Of course, all of the offspring eventually die because they have this blight sensitivity,” he said. “But I have learned a lot about growing chestnuts in that time.”

Bingham’s tree is one of six “mother trees” found in Connecticut and being cross-bred by TACF, which has been breeding hybrids at its main facility, Meadowview Research

Farms in Virginia. It is conducting similar breeding programs, providing hybrid pollen to mother trees found in other states in the tree's native region.

The success of the program relies on getting the genetics right plus working with local breeders in different states to develop American chestnuts that are acclimated to each region, its soils, daylight patterns and temperatures.

“You can see these huge cankers on it, it has been very sick,” he said of his tree. Every once in a while, a major stem will die back, but he has been able to keep the tree alive through mud packs, which introduce competing fungi that change the bark so it is harder for the disease fungus to kill off the tree, and plastic wrap to hold on the mud.

When he retired two years ago, Bingham volunteered to put in a 1 and ½ acre chestnut orchard in his back yard, making it one of a handful in Connecticut. There are others in Guilford and Fairfield County. He estimates he has planted about 350 chestnut trees, including 50 or 60 hybrid offspring that came from nuts from his own mother tree and the TACF program in the past two years.

Bingham's plot isn't just a tree orchard, though.

“For years, I have been working to expand the biodiversity in my back yard to restore some of the balance of nature we humans have upset,” he wrote in the April edition of the TACF Connecticut Chapter newsletter. One of his major interests is the interconnection between all species.

Bingham is taking a naturalist's approach, helping to convert his land back to a Connecticut meadow with diverse habitat and species. There came the tall fencing to keep out the deer, now at disproportionately high populations. They would love to eat his trees and any chestnuts. He hand-picks off the bugs, including Japanese beetles, instead of using herbicides or insecticides. Mowing is minimal.

Bingham pollinates his mother tree by hand, using pollen from a TACF tree. Paper bags placed on the flowers to prevent any other pollination. In the fall, the chestnut burrs are collected, the seeds are refrigerated to simulate winter, and then planted in the spring. It takes seven years for a nut to grow out to a chestnut tree that flowers and can be bred.

This third year will be the last for Bingham's mother tree to be pollinated for the TACF breeding program to keep up the genetic diversity of the Connecticut offspring.

Despite all of this loving care, Bingham knows the vast majority, if not all of his seedlings, are doomed to disease.

“In 4 or 5 years, we will infect them all with the blight, and 85 percent or more will be culled out,” he said. “It will be difficult, but it's really a key portion of the process.”

The most resistant survivors will be allowed to flower. Although they will still carry some of the disease, the breeders predict that the next generation – the grandchildren of Bingham’s mother tree – should be the disease-free generation.

Only one out of 120 of the nuts are expected to be fully blight resistant, Bingham said, yet carrying most of the American chestnut traits.

“It’s not until that generation of trees grows up, gets infected and culled out that we’ll know,” he said. “It’s at least a 14 year commitment for my orchard.”

Don’t expect to see any American Chestnuts in a garden center any time soon. If the genetics work out, the first truly resistant trees, from stock in Virginia, won’t be ready until 10 years from now. The Connecticut trees could come a generation, or about 5 to 7 years later.

In the meantime, Bingham has to explain that he is not in the nut business.

“People want my nuts,” he said. “But I can’t sell or give them away.”

One of the things he had to do was sign a germ plasm agreement. All of the nuts he produces belong to TACF. In fact, it has the right to come in and destroy all of his trees in the odd chance that they determined his trees had some trait that would be bad to get into the gene pool of American chestnuts.

Bingham has been on the Salem planning and zoning commission for about 30 years, getting the Salem Land Trust established. He also has been very involved with getting 8 Mile River Watershed declared a Wild and Scenic River, which protects up to 20,000 acres. He is a member of the League of Conservation Voters and on state board of Directors for state Sierra Club.

His wife, Annie, serves on the Salem Library Board.

They have three children. Anne Bingham is an OB-GYN in Middletown, David is a pathologist Stanford Medical Center, Calif., Tiffany Cunningham and her husband Jim are hay farmers in Salem.

### **Old Lyme’s American Chestnut**

Yes, that is an American Chestnut tree in front of Old Lyme’s Phoebe Griffin Noyes Library. That tree, found in the wild and transplanted near the library, is diseased with chestnut blight, but is surviving thanks to the work of Dr. Sandra Anagnostakis, head of the chestnut breeding program for CAES breeding program since 1983. She has been working on chestnut blight disease since 1968.

This tree has been vaccinated with chestnut blight virus after the virus was made hypovirulent, or weakened by being infected with another virus.

“The state of Connecticut can be proud that it has been working on this ever sense the blight started,” Bingham said.

Even though the tree is seriously diseased, it has grown enough to flower the last 5 to 10 years. Bingham and other volunteers pollinated the tree last year and will be doing it again in July to produce hybrid offspring. Look for the tell-tale signs of bags.

*For more information, see TACF and [www.acf.org](http://www.acf.org), CT Chapter at [www.ctacf.org](http://www.ctacf.org) and CT Agricultural Experiment Station and [www.ct.gov/CAES](http://www.ct.gov/CAES)*