Chestnut experiment aims to revive American tree

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RICHLAND TWP.

It once dominated America’s eastern hardwood forests, growing fast, tall and straight, and its loss is considered North America’s greatest ecological disaster.

Sometime around 1900, a fungus arrived with imported Asian chestnut trees, showing up first at what is now the Bronx Zoo. Within a few decades, three billion trees were wiped out by the chestnut blight. (See related story on page 7 of today’s Print Edition or click on the Other News tab.)

In spite of the blight, American Chestnuts are still out there. Some survive as stumps and roots, sending out new shoots only to be blighted and die back again.
American traits more suitable for forests. CLARION NEWS photo by Tom DiStefano.

St. Petersburg, George Freeman is planting American chestnuts on his tree farm. These are special trees, however; they are part Chinese, and many will be sacrificed for the cause.

The cause is a widespread effort to revive the American chestnut by developing trees resistant to the chestnut blight fungus.

The Chinese chestnut can catch the blight, but is resistant and can survive it well. The idea is to crossbreed the Chinese with the American to develop a tree with the good qualities of the American (Castanea dentata) and the blight resistance of the Chinese (Castanea mollissima).

At Freeman's tree farm, a visitor is likely to be greeted by a very friendly and somewhat fuzzy white and brown dog, and the sight of a big red barn, a peaceful pond and an abundance of handsome trees.

On a day in early September, Freeman and Gary Micsky, of the Penn State Extension out of Mercer County, were eager to talk about the experiment going on there.

On the other side of a stand of planted pines, Freeman and Micsky gave a talking tour of grassy lanes cut through heavy vegetation.

Along the sides of those lanes, chestnut trees grew in protective tubes surrounded by wire fencing – defense against deer, rabbits and other foragers that see the saplings as tasty breakfast.

The chestnut likes welldrained, acid soil, and pine trees create acidic soil with their fallen needles. Freedman cut down a pine plantation and created a perfect place to plant his chestnut experiment.

He sees it as a good trade. The pine had little commercial value beyond pulpwood. A blight-resistant chestnut, on the other hand, is priceless.
The former stand of pine quickly regenerated into heavy brush, impenetrable thickets of rabbit habitat. Freeman cut lanes for access, and he keeps them mowed.

Every 15 feet or so there is another chestnut sapling. Some barely peek out of their cardboard tubes. Others push as much as ten feet into the sky.

**Hybrid & backcross**

Micsky keeps a chart of these lanes, with numbered codes for the location of each sapling, each number denoting a different strain of the "BC-4."

Micsky talks often of "BC-3" and "BC-4" and "F-1." These aren’t aircraft, but the various stages of the crossbreeding experiment.

The idea is to cross the blight-resistant Chinese chestnut with the American to create the F-1 — the first generation hybrid.

That hybrid is then "back-crossed" with another American chestnut to create the BC-1. This is crossed again with American chestnut to create the BC-2, then the BC-3, and the BC-4.

After all this work, many of these trees are doomed. At each step, the tree is allowed to mature to a certain size and then deliberately infected – actually injected – with the blight fungus.

The trees showing the most resistance are kept to produce nuts for the next breeding step, the rest are destroyed.

The most-resistant back-crossed trees might then be “intercrossed” with resistant Chinese trees, until at some point, a fullyresistant chestnut showing mostly American traits is created.

The Chinese chestnut is an orchard tree, rounded and not as tall. Freeman pointed out a few Chinese chestnuts on his farm, showing the characteristic Y-branching that produces a shorter more rounded tree, good for nut production and easy harvest.

The American is more of a timber tree – growing straight, tall and fast – better for competing for sun in the wild forest. As a bonus, the Americans produce a sweeter, tastier nut.

The plan is to produce a tree that is 1/16th Chinese and 15/16ths American, ideally showing all the American traits and only the Chinese trait for blight resistance.
Cross breeding is a slow process, with each generation taking several years. The effort, Micsky says, has been going on since the early 1980s.

**Planting chestnuts**

Unlike most trees, chestnuts get the best start by planting the seeds directly in the ground rather than growing seedlings in a nursery bed and then transplanting.

Chestnuts, once started, simply don’t like to be moved, Micsky said. “From the time you put the seed in the ground, it’s home.”

Freeman said his lanes through the brush allowed him to bring in a backhoe to easily dig holes for the chestnut plantings. He filled those holes with a potting mix of vermiculite, peat moss and fertilizer.

The seeds were harvested in the fall and stored over winter in refrigeration, Micsky said. In January, the nuts sprout a root; by planting time, the root is four to six inches long.

These are planted directly in the ground, no more than about an inch and a half deep in the potting soil mix.

A cardboard tube is placed directly over the seed to protect the young sprout, and a metal stake is driven in to hold the tube in place. All this is surrounded by wire fencing for extra protection.

Freeman tried starting some seedlings in boxes, prepositioning the tubes over the seeds to facilitate transplanting.

He considers the effort a failure since the transplanted seedlings grew no better grew than seeds planted directly outside.

But Micsky considers the effort a success, since Freeman’s efforts worked better than any other indoor start he’s seen.

**Multiple fronts**

The crossbreeding is just one of several strategies to bring back the chestnut.

Another involves finding mature American chestnuts with natural blight resistance and breeding those. Micsky said not much progress is being made along these lines.
Showing more promise is an effort to genetically engineer the American chestnut, introducing genes for blight resistance derived from wheat.

This effort, led by researchers with the State University of New York College of Environmental Science and Forestry, must be done cautiously to avoid any unintended consequences of genetic modification.

All work with genetically modified trees must be done indoors to keep pollen out of the wild, or with even more difficulty, by removing reproductive structures from outdoor trees so they do not produce pollen.

Micsky says some researchers had hoped modified chestnuts would be approved for release this year, but this has been delayed until scientists and regulators are sure it is safe.

Finally, researchers are looking into ways to attack Cryphonectria parasitica – the fungus causing the blight.

There is a virus that slows the growth of the blight fungus enough that the chestnut tree can form a canker that grows on the outside of the tree and protects the tree from the blight.

There has been some success with this approach, but the blight spreads faster than the virus, some strains of blight resist the virus, and sometimes protective cankers turn into bad, fast-growing sunken cankers that can kill the tree.

Micsky seems most optimistic about the crossbreeding program and the genetic modification effort.

**Helping chestnuts**

Chestnuts seeds, roasting over an open fire or in a gas oven, are tasty good – but those we buy for the holidays are European or Chinese chestnuts – good, but not great.

American chestnuts, Micsky says, are great. “They’re just so sweet, there’s no comparison.”

Micsky promised to give this reporter some American chestnuts to taste this fall. I said I’d like that, but on reflection, I think I’ll decline. I’d rather see them planted, and possibly thrive and spread though American forests once more. I’m fat enough already.

There are better ways than dieting to help bring the chestnut back to our forests.
Freeman has had the local Lions Club in to help plant experimental chestnuts, and he often hosts educational programs at his farm.

Chestnut restoration programs are partnering with foundations and government agencies to plant blight-resistant chestnuts at mine reclamation sites. This introduces chestnuts where they won't compete with oaks or other existing species, while giving the chestnuts a base from which to spread naturally.

The American Chestnut Foundation (www.acf.org) is the umbrella organization working to revive the American chestnut and reestablish it in the eastern forests.

The Pennsylvania chapter of the American Chestnut Foundation is a 501(c)(3) non-profit based at Penn State’s Forest Resources Lab. The chapter and researcher Sara Fitzsimmons are leaders in the crossbreeding program and maintain a website at www.patacf.org with information on the crossbreeding program and its other activities.

The website has information on the chapter’s research projects and events, on making donations, on volunteering to help, and submitting information if you think you’ve spotted an American chestnut in the woods.

Someday, our woods may again be full of those majestic trees and those sweet and tasty nuts roasting over an open fire.

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