For love of a tree
Chestnut 'marriages' may bring back Appalachian native
By Pam Sohn
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Hill Craddock and his UTC biology students study the intimate details in the love life of a chestnut tree. You might even say they take part in it.

On Thursday morning near the soccer fields behind Signal Mountain Middle/High School, Craddock and Kristen Stanfill, a senior at the University of Tennessee at Chattanooga, took turns rubbing the pollen from a Chinese-American chestnut tree in Lincoln County onto the stigma of a young-but-doomed American chestnut tree.

It's a first in Hamilton County -- the pollinating of a true American chestnut tree.

The goal is an American chestnut tree that retains no Chinese characteristics other than resistance to an Asian fungus that has all but made the once towering and dominant American chestnut extinct.

Come October, Craddock and Stanfill will come back to collect the offspring: shiny hybrid chestnuts that will serve as seeds for trees to produce a line of fungus-resistant American chestnut trees.

"This is a lucky tree," Craddock said as he prepared his field notes before beginning the pollination. "When they built the parking lot here, they just missed it by about 10 feet. With the trees in front of it gone, it got plenty of sun and shot up. Then it got lucky again when Sam Powell found it."

Powell, a Signal Mountain resident, naturalist and legend, is the man whom teachers and students went to when the tree was the only one they couldn't identify in a science project.

Powell, widely hailed as the founder of the Cumberland Trail, thought he recognized the sapling as a true American chestnut, and he called Craddock.

It turned out he was right. And on Thursday, he waited patiently in the parking lot nearby to watch the "marriage."

"I really wanted to see this," Powell said.

If the tree remains lucky, it soon will become a mother, progenitor and contributor to Appalachian forests restored with a new crop of American chestnut trees.

Changing history
Nearly annihilated by a fungus blight, the American chestnut once grew more than 100 feet tall and made up about one-fourth of the trees in the Appalachians. With a range from Maine to Florida, it was one of the nation's most valued hardwood timber trees.

But around the turn of the 20th century, the Asian bark fungus accidentally was introduced into North America on imported Asiatic chestnut trees. The disease was first noticed in the Bronx Zoo in 1904. By the middle of the 20th century, the American chestnut giants were gone.

To learn more, or to help, contact the American Chestnut Foundation at www.acf.org.
Where some had stood, sprouts still may rise from the roots. But the upstarts rarely reach more than 20 feet in height before b light infection returns and kills them.

Chinese chestnuts had evolved and developed a strong resistance, but in America, the airborne fungus spread 50 miles a year and meant certain death. Within a few decades, it had killed up to 3 billion American chestnut trees.

The fungus continues to live to attack new sprouts because it also attacks, but doesn't kill, oak trees, Craddock said. The Signal Mountain chestnut tree is one of those remaining root sprouts.

Though healthy now, the young mother tree doesn't really look like much.

Standing maybe 25 feet tall in a line of giants, her only standout quality is brighter green leaves with a distinctly different shape.

Powell said that, last year, the tree had flowers and then burrs -- the covers of precious nut seeds. But the burrs were empty.

With no pollination there were no nuts, Craddock said.

Now the mission is to use generations of hybrids -- each with decreasing amounts of Chinese chestnut heritage -- to "backcross" with American chestnut trees.

Craddock describes backcrossing as a series of "arranged marriages" between trees of rising levels of American chestnut heritage.

"We're going to have to grow the grandchildren of these trees to get a fully blight-resistant tree. But in doing that, we will have preserved the Tennessee gene pool -- a Tennessee population of trees. The father is already part American. The mother is pure American. ... By the time we've done three or four backcrosses, we dilute the Chinese genome by one half."

**Fruits of science**

So Thursday morning, Craddock and Stanfill, with the help of recent UTC biology graduate Taylor Perkins, collected pollen from the Signal tree to use on other trees, and they spread the pollen from Middle Tennessee hybrids to father some little nuts here.

Over each pollinated flower, they placed a translucent white bag to prevent the unlikely possibility of an unwanted second pollination to protect the maturing nuts from insects, birds and squirrels.

The complexity of genetics will require years of patience and planning.

"The children of this marriage will inherit some blight resistance from their dad, but they're going to inherit some susceptibility from their mom. So the genes for blight resistance will be partially hidden," Craddock said.

"Then we will arrange a second marriage between the children of this tree and the children of a similar tree elsewhere. And the grandchildren will have the reappearance of some of the grandparents' traits. Some of them will have the full blight resistance that their Chinese ancestor had," he said.

The example he uses is his blue eyes. His mom and dad both had brown eyes, he said, but both of his grandfathers were blue-eyed men who married brown-eyed women, so his parents carried the blue-eyed gene.

"There was a one-in-four chance their children would have blue eyes, and I got the blue eyes," he said, as he watched Stanfill ascend in the platform of a borrowed Hamilton County bucket truck to pollinate the mother chestnut on county school property.

"We don't want to replace Tennessee's chestnut trees with some exotic thing, so what we're doing is we're adding the genes for the blight resistance to it. That's why it's important to breed these local trees," Craddock said. "So we've got a tree in Grundy County, a tree in Lincoln County, a tree in Monroe County, etc., etc. This is the first tree from Hamilton County."

But the mother American chestnut tree isn't the only chestnut science project on the Signal school property.

Near her are 15 "advanced" 1- and 2-foot-tall hybrids that Powell obtained and donated.

"Those are from Virginia, and they are known as 'restoration chestnuts,'" Craddock said, noting that the Virginia work is about 10 years ahead of Tennessee's hybridizing effort.

"They are 94 percent American chestnut and blight resistant," he said.

They will look and "hopefully" grow just like the American chestnut -- straight and tall like a timber tree, not spreading like the Chinese orchard variety, he said.

But only time will tell. And that's something for today's biology students to validate in coming decades, said Craddock, grinning toward Stanfill and Perkins.