THE Journal OF THE AMERICAN CHESTNUT FOUNDATION

JANUARY / FEBRUARY 2013 | ISSUE 1 VOL. 27

TACF CELEBRATES 30 YEARS 1983 -2013

Planting American Chestnut Seedlings

Practical Advice on Grafting Chestnuts

Notes from Meadowview Research Farms

Mighty Giants: An American Chestnut Anthology

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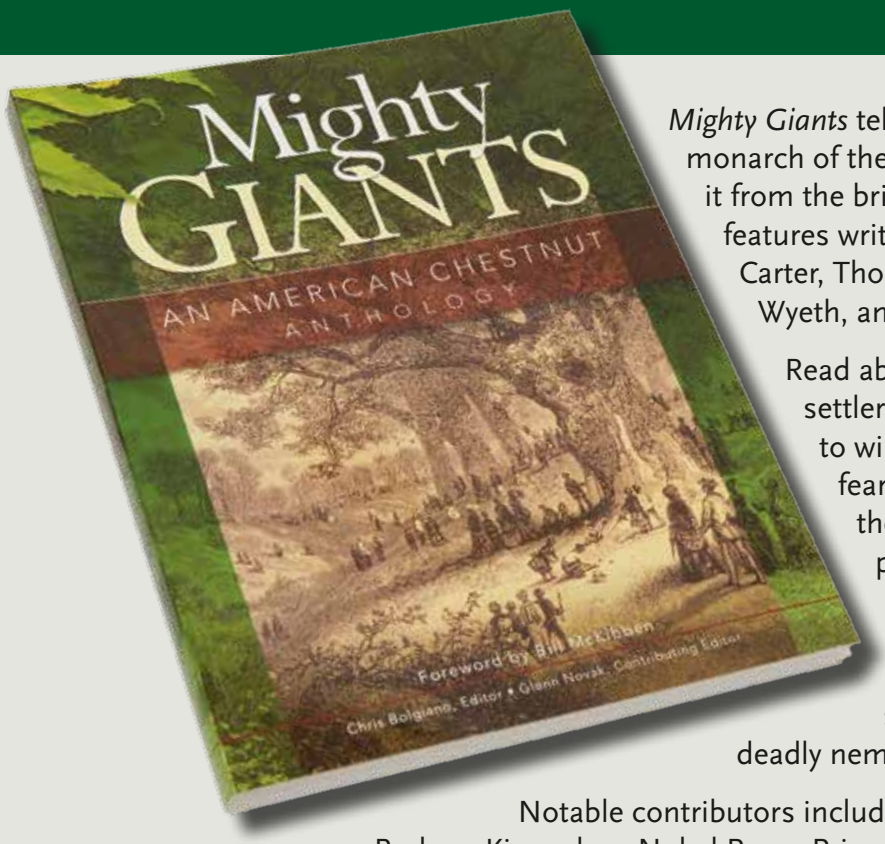

Mighty Giants tells the inspiring story of the once mighty monarch of the eastern forests and the struggle to save it from the brink of extinction. This full-color anthology features writings and artwork by Jefferson, Lincoln, Carter, Thoreau, Frost, Winslow Homer, Andrew Wyeth, and many more.

Read about the chestnut's importance to early settlers in the eastern wilderness and its value to wildlife and the ecosystem. Learn about the fearless plant explorer who tracked down the blight in war-torn China, and the plant pathologists and geneticists who labored long and valiantly to understand the blight and find a way to thwart it. It is a story of hope, of small but vital triumphs, as the secrets of the American chestnut and its deadly nemesis are gradually revealed.

Notable contributors include former President Jimmy Carter, author Barbara Kingsolver, Nobel Peace Prize laureate Norman Borlaug, and Bill McKibben, author of *The End of Nature*. Full Color, 296 pages.

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THE AMERICAN CHESTNUT FOUNDATION®

The Mission of The American Chestnut Foundation

Restore the American chestnut tree to our eastern woodlands to benefit our environment, our wildlife, and our society.

We harvested our first potentially blight-resistant nuts in 2005, and the Foundation is beginning reforestation trials with potentially blight-resistant American-type trees. The return of the American chestnut to its former range in the Appalachian hardwood forest ecosystem is a major restoration project that requires a multi-faceted effort involving 6,000 members and volunteers, research, sustained funding, and most important, a sense of the past and a hope for the future.

About Our Cover Image

While counting surviving American Chestnuts along the Appalachian Trail for the Mega-transect Project, Debbie Griffith encountered an early season snowstorm near Hot Springs, NC. The snow coated fall colors making for a beautiful -- if cold -- hike. Coming across this chestnut with its snow-covered golden leaves, Debbie could not resist taking a few pictures.

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THE Journal OF THE AMERICAN CHESTNUT FOUNDATION

INSIDE THIS ISSUE

JANUARY/FEBRUARY 2013 | ISSUE 1 VOL. 27

Background photo:
Chestnut leaf fringed with ice crystals
Photo by Debbie Griffith

Why bring back the American chestnut?

Dr. Kim Steiner and Bryan Burhans

Most readers do not need an answer to this question. They know the American chestnut is sometimes called the "redwood of the East" because of its rapid growth, the remarkable sizes that some trees attained, and the utility of their wood. Moreover, because chestnut trees were so much more productive of nuts than oaks, the chestnut was a critical source of mast for deer, bears, turkeys, grouse, and many other species of wildlife. Chestnut was understood to be a valuable, "keystone" species in the forests of Appalachia and adjacent regions. To many people, restoring the American chestnut will amount to restoring some of the natural wealth that has been lost from our forests.

This is a good reason for restoring this magnificent species, but not the only reason and perhaps not the best or most compelling. As the great conservationist, Aldo Leopold, wrote in *Sand County Almanac,*

> *"One basic weakness in a conservation system based wholly on economic motives is that most members of the land community have no economic value. Wild flowers and songbirds are examples. Of the 22,000 higher plants and animals native to Wisconsin, it is doubtful whether more than 5 percent can be sold, fed, eaten, or otherwise put to economic use. Yet these creatures are members of the biotic community, and if (as I believe) its stability depends on its integrity, they are entitled to continuance..."*

Leopold wrote for a pragmatic audience, one for whom the memories of the Great Depression and the privations of World War II were very fresh. But he expresses a message that is still important today – the benefits of conservation cannot always be tallied, enumerated, and evaluated in dollars and cents. Most of us assign what the economists call an "existence value" to nature, or at least parts of nature. This is the value whose loss we feel when we regret the extinction of the passenger pigeon and the Carolina parakeet, or the disappearance of the forest primeval that our forefathers encountered. We may never be able to preserve all of nature, but Heaven help us if we cannot even save the "best" of nature. American chestnut is in that class. Saving the American chestnut is as compelling a conservation goal as saving the whooping crane, California condor, or giant panda. For many of us there is no further explanation required. It is simply something that must be done.

The goal of TACF is to save a forest tree species through novel and ambitious methods and restore it to importance in our forests. This has never been done. TACF is charting new territory, and it is all the more inspiring because our successes are an affirmation of the power of the private, non-profit sector in America. Pioneering efforts like ours *always* are accompanied by doubters and naysayers, and the way forward is *never* crystal clear. Our successful efforts will be a milestone achievement for conservation because we will have created a path for others to follow, a model for success in other endeavors.

Diseases and pests will always threaten our forests, and new problems will arise as commerce and travel continue to spread insects and diseases to new places. In the last century, Dutch elm disease and white pine blister rust devastated populations of their new hosts in North America, though fortunately our species were found to possess some genetic resistance. Hemlock woolly adelgid, black walnut thousand cankers disease, butternut canker, and the emerald ash borer are recent introductions that represent serious threats to forest tree species.

Succeeding in our mission, one of the noblest conservation efforts ever witnessed in our country, will not only bring the return of the great American chestnut, it will also blaze a trail for future efforts to preserve our tree species in the face of devastating insect and disease threats. We must succeed, not only for chestnut but for the future of all of our other forest trees as well.

Newly Discovered American Chestnut in Maine Likely Tallest in State

Last fall, the discovery of a 95-foot American chestnut in Hebron, Maine, set off a wave of excitement throughout the chestnut community. The tree was nominated for the Oxford County Soil & Water Conservation District (OCSWCD) 2012 Big Tree Contest by landowners Ann Siekman and Roger Crockett. Realizing this could be a rarity, Jean Federico of OCSWCD alerted the Maine Chapter of TACF about the tree.

Alan Markert of the Maine Chapter visited the site and reported back to the chapter that the tree appeared to be healthy and free of blight. "There were several small dead limbs up high," he said, "but through the binoculars, I detected no sign of blight." The tree produces a prolific amount of flowers and burs, but the nearest known chestnut is hundreds of yards away, so it probably produces no fertile nuts.

"This spring," said Glen Rea, president of the Maine Chapter, "the Maine Chapter will be working with the landowners and OCSWCD to propagate offspring from the Hebron tree."

Despite being the tallest known American chestnut in Maine, the newly discovered Hebron tree does not hold the record for Maine State Champion chestnut. That distinction goes to a tree located near the town of Atkinson, which measures 20 feet shorter than the Hebron tree but nearly 30 inches wider in circumference, thereby snagging the champion title for the time being.

Hebron property owner Ann Siekman, right, gestures after learning last week that the American chestnut tree in the background is unofficially the tallest in Maine and possibly the country. At left is Jean Federico of the Oxford County Soil and Water Conservation District, who was in charge of the statewide big tree contest in which Siekman entered the American chestnut.
Photo courtesy of Russ Dillingham/ Sun Journal

Nashville Arboreta Host Multiple Ceremonial Plantings

Nashville, Tennessee (TN), has become a hotspot for Restoration Chestnuts 1.0 ceremonial plantings, due in part to efforts by Nashville resident Vicki Turner. Vicki's interest in the American chestnut began in 2008 when her mother, Vadis Pierce, put a conservation easement on her 33-acre property in Sumner County, TN. With the help of Tennessee forester Dwight Barnett, they identified 90 species of trees on the property and established a Level 4 arboretum.

In an effort to educate herself about rare and threatened trees, Vicki attended a meeting of the TN chapter of TACF where she met Hill Craddock and others and began to experiment with growing chestnuts.

Vicki then initiated the creation of a second arboretum, Sugartree, in her Nashville neighborhood. During the Nashville Tree Foundation certification ceremony, Vicki spoke about the rare and threatened trees they were planting, especially the American chestnuts. Several other organizers asked how they could get American chestnuts for their arboreta. That's how Vicki met Tom Saielli, TACF's southeast regional science coordinator.

One planting led to another and this winter, Tom traveled to Nashville to plant trees in other certified arboreta. Sites include Belmont University, Bicentennial Mall State Park, Montgomery Bell Academy for boys and Harpeth Hall for girls, Historic West End neighborhood, Ellington Agricultural Center, Belle Meade Plantation, First Presbyterian Church, and Warner Parks.

Tom is returning in February to help Vicki launch a Nashville Restoration Branch. Vicki is excited about the future, saying, "It is just the beginning of many projects our community has planned to restore the American chestnut."

Asheville volunteer Juliet Blankenspoor was thrilled with the experience: "This was one of the highlights of my life! Yesterday my family joined other volunteers with the The American Chestnut Foundation to plant over 700 blight-resistant American chestnut saplings in the national forest in Georgia. Hopefully my daughter can return to the same spot with her grandchildren to harvest chestnuts from a forest of towering chestnut trees."
Photo Credit: Claudia Green

TACF Plants 3,500 American Chestnuts in Six National Forests

In a matter of days last November, scores of TACF volunteers and scientists collaborated with the US Forest Service to plant 3,500 American chestnuts in six national forests in the eastern United States. The project is funded in part by a $20,264 grant awarded to TACF from the National Forest Foundation's 2012 Matching Awards Program.

"Our station scientists have been long involved in the research needed to successfully get this new generation of American chestnut seedlings in the ground," says Rob Doudrick, Director of the Forest Service Southern Research Station. "We are pleased be a part of this coalition that includes private/public finance, personal commitments and scientific expertise to bringing this restoration effort to fruition on National Forest lands."

Planting American chestnuts on national forest lands fulfills an important goal of the US Forest Service to restore native trees to our forests. American chestnuts once made up 25% of the eastern hardwood forests, but were nearly wiped out by the chestnut blight in the twentieth century. American chestnuts will benefit the health of the forests by creating more diverse ecosystems and providing nutritious food for wildlife.

"We are thrilled to partner with the US Forest Service on this project," said TACF President and CEO Bryan Burhans. "The eventual reforestation of these lands with American chestnut will address both the economic and environmental issues that came about because of the loss of the chestnut."

MARK YOUR CALENDARS FOR THESE UPCOMING PLANTING WEBINARS!

TACF is hosting two free webinars geared toward planting and growing American chestnuts, led by Regional Science Coordinator Sara Fitzsimmons. The first webinar will take place on Tuesday, February 19th, at 12:00 noon and the second on Wednesday, February 20th, at 4:00 pm. If you can't make those dates, the recorded webinars will be available on our website after airing.

You can access the webinar site at our homepage www.acf.org. Or, you can go directly to the webinar site at https://meeting.psu.edu/chestnut/ and sign in as a guest. If you have any questions about the webinars, please contact Mila Kirkland at mila@acf.org or 828-281-0047.

TACF's Mid-Atlantic Regional Science Coordinator Matt Brinckman leads CCPS teachers during a half-day training covering topics such as chestnut site selection, planting requirements, and orchard management.
Photo Credit: Steve Haggblade

Partnership Strengthened Between TACF and Maryland's Carroll County Public Schools

For nearly a decade, Maryland's Carroll County Public Schools (CCPS) has incorporated the American chestnut into their elementary, middle, and high school curricula. Helping them in this effort has been TACF's Maryland Chapter and TACF's home office staff. CCPS teachers have designed lessons and activities that use the story of the chestnut to create real world learning experiences for their students, and the curriculum developed by CCPS is now included in TACF's American Chestnut Learning Box.

With assistance from the Maryland Chapter, thirteen schools have planted American chestnut orchards on site, adding a hands-on approach to their chestnut education program. But CCPS employees and students have also learned firsthand how difficult growing chestnuts can be, and many of the orchards planted in challenging areas are now in need of soil amendments or relocation. To get these orchards in shape and allow for proper selection of future sites, the Maryland Department of Natural Resources (DNR) is providing funds to Carroll County Public Schools.

In December, TACF's Mid-Atlantic Regional Science Coordinator Matt Brinckman conducted training for fifteen elementary, middle, and high school teachers with CCPS. In the coming months, Matt and Steve Haggblade, the Maryland Chapter education committee chair, will be working with CCPS and the Maryland DNR to conduct soil tests and site assessments to determine the remediation required to improve orchard performance at current and future locations.

"This project is already a great success for integrating the story of the American chestnut and outdoor classrooms with K-12 science education," said Matt Brinckman. "We look forward to continuing this productive relationship with CCPS and the Maryland DNR."

In Memory of and In Honor of our TACF Members
November-December 2012

In Memory of

William Holcombe
Martin Schulman

Frederick S. Johnson III
D. Lawrence and Joan Rayburn

Joseph Mitchell
Rick Ochs

William Palmer
David Palmer

William Peifer
Sara Fitzsimmons
John and Marguerite Ralph

Frederick S. Priebe
Barbara Fraticelli

Robert Rosenkrance
Carol Namkoong

In Honor of

Gary Carver
Howard County Garden Club

Mindy Newlin
Maurice Wilber

Wes Waters and Tommie Pratt
Elizabeth Gamble

Bruce Wakeland's passion for American chestnuts has been integral to the success of the Indiana Chapter. Here he stands by a large surviving American chestnut near South Bend.
Photo Credit: Sara Fitzsimmons

Bruce Wakeland

Contributed by Ben Finegan and Mila Kirkland

Among his many skills, Bruce Wakeland is a great storyteller. Those who know him have enjoyed his stories about traveling through the backwoods of Indiana, searching for surviving American chestnut trees or meeting old timers who remembered life with the mighty giants of the past.

Bruce's roots with TACF run deep; in the early 1980s he discovered a woodlot with American chestnut regeneration in a northwestern county in Indiana. As a forester, he became intrigued with the species and began meeting with some of TACF's founders. He was a vital player in establishing the Indiana Chapter in 1996, and the Indiana breeding program began primarily on his land.

In addition to working with the Indiana Chapter, Bruce serves on the TACF Board of Directors, Development Cabinet. "Bruce's knowledge about the American chestnut--breeding and identifying it, and his ability to organize people and captivate an audience are par excellence'" said Indiana Chapter President Ben Finegan. "There would be no American chestnut program in Indiana without him."

When asked what he enjoys most about TACF, Bruce replied, "The knowledge that we are going to succeed in doing something important. Restoring the American chestnut will have a positive effect on our environment far into the future."

Barbara Knapp

Contributed by Gary Carver and Mila Kirkland

Barbara Knapp of Germantown, Maryland, has a claim to fame in the chestnut world. Growing on her 10-acre property are rare, large surviving American chestnut trees. One of them, at 32 inches in circumference and 65 feet tall, is the Montgomery County champion. It was those trees that led Barbara to join TACF.

In 1956 she and her husband bought land in Germantown, built their home, and raised their children there. Then in 1988, a forester pointed out the chestnuts to Barbara. Intrigued, she made a visit to TACF's Meadowview Research Farms, and she was hooked. She went on to help establish the Maryland Chapter of TACF in 2002, and has served as its secretary ever since.

Barbara Knapp stands alongside the Montgomery County Champion American chestnut tree on her property in Germantown, Maryland. Barbara's trees have been used as mother trees in the Maryland Chapter breeding program.
Credit: Gary Carver

"Barbara is the 'Energizer Bunny' of our chapter," said Gary Carver, president of the Maryland Chapter. "She takes photos, brings our display to many events, helps in orchard maintenance, keeps the chapter's historical records, and promotes TACF at every opportunity. Barbara is also a Master Gardener -- and a master at inspiring our chapter and our volunteers."

Barbara has a four-year-old great-granddaughter who she is already telling about the American chestnut. Because her land is protected by a conservation easement under the Maryland Environmental Trust, Barbara has full assurance that the American chestnut trees will be forever protected for her great-granddaughter and generations to come.

Join TACF's Plant a Tree Program

imagine an american chestnut growing in the forest in your name

For JUST $10

we will plant a restoration chestnut in your name, or in the name of a friend or family member.

- A personalized card will be sent to the recipient letting them know of your generous gift.
- The recipient will receive a FREE copy of the current edition of ***The Journal of The American Chestnut Foundation***.

To restore the American chestnut, TACF must plant more than one million potentially blight-resistant trees in the next 6 years.

You can help us reach this goal.

donate online at www.acf.org
or call us at 828-281-0047

2012: The Year in Review

TACF Staff

What a remarkable year 2012 was for TACF; a year of amazing accomplishments and awesome events. Before we close the door on our twenty ninth-year and head into our thirtieth, we thought our readers might want to take a journey back through the year's highlights:

February: Glamour in Atlanta

It was a night of excitement and glamour in Atlanta, Georgia, in February, when the Carter Center hosted TACF Georgia Chapter's Gala Dinner. Guests of Honor included President Jimmy Carter, First Lady Rosalyn Carter, and rock n' roll legend Chuck Leavell. President Carter took to the podium and entertained the audience with stories of gathering chestnuts as a boy on the family's Georgia farm.

Former President Jimmy Carter, Musician Chuck Leavell and Shelli Lodge-Stanback at the Gala Dinner at the Carter Center on February 16.
Photo by Paul Franklin

April: Transgenic Trees Planted at New York Botanical Garden

In April, the New York Chapter of TACF participated in a planting of ten potentially blight-resistant transgenic trees at the New York Botanical Garden in the Bronx, NY. The trees were the result of 25 years of work by the New York State American Chestnut Research & Restoration Program at SUNY-ESF under the guidance of Dr. William Powell and Dr. Charles Maynard. They were just a sample of the more than 100 varieties of potentially blight-resistant trees that the program has developed, which are either in field testing or waiting for field testing. The NYBG is a particularly fitting site for planting blight-resistant chestnuts, as it is located just across the street from the site where chestnut blight was first identified in 1904.

NY Chapter Member Dale Travis Helps plant a transgenic, potentially blight-resistant American chestnut at the New York Botanical Garden.
Photo by Sigrid Freundorfer

Artists rendition of the Flight 93 Memorial Wall of Names and Ceremonial Gateway the Crash Site. Image courtesy of :bioLINIA and Paul Murdoch Architects

April: Restoration and Remembrance at the Flight 93 Memorial

Also in April, TACF volunteers were among the 600 people who participated in a planting of thousands of hardwood trees, including 72 Restoration Chestnut 1.0 seedlings, at the Flight 93 Memorial in southwestern Pennsylvania. Among the crowd of volunteers were several who had lost family friends or co-workers in the crash. TACF was honored to be able to participate in the plantings that took place on four separate days. Seventy percent of the site is flat grasslands that mark a reclaimed coal mine site. The reforestation project was organized by the National Park Service, the Office of Surface Mining, TACF, and the Appalachian Regional Reforestation Initiative and will eventually reforest 100 acres around the site.

TACF members Judy Sutton and Judy Coker help plant a seed orchard near Asheville, North Carolina. Photo by Paul Franklin

May – June: First Seed Orchards

Three state chapters--Massachusetts/Rhode Island, Maryland, and the Carolinas--planted their first seed orchards. The final step in each state chapter's breeding orchard process, seed orchards generate Restoration Chestnuts 1.0, which will be used to restore the American chestnut to the forests of the states or regions in which the orchard is located. The forest plantings will be monitored for many years so that we may assess the performance of the trees and the effectiveness of the restoration process.

Internationally renowned entertainer Dolly Parton and her uncle, singer songwriter Bill Owens (here planting chestnuts at Dollywood) recorded a song dedicated to the American chestnut and its restoration. TN Photo by Meghan Jordan

July: Hello, Dolly Internationally renowned singer and entertainer Dolly Parton took time out of her busy schedule to join her uncle, musician Bill Owens, in the studio to record a song specifically for TACF and the restoration of the American chestnut. The song was written by Owens, who has been a member of TACF for 25 years and has overseen the planting of hundreds of American chestnuts, including Restoration Chestnuts 1.0, at Dollywood. The song is available as a free download on TACF's website: www.acf.org.

September

TACF Website Gets a Facelift

In September TACF redesigned the home page of its website to make it more engaging and user-friendly. The development was the first step of a longer range project to rebuild the aging TACF website from the ground up. 2012 also saw the launch of TACF's new e-newsletter, which now has more than 4,000 subscribers.

A Bountiful Harvest!

This was an all-around great year for production of Restoration Chestnuts 1.0. In 2011 our harvest in topped out at about 22,000 nuts. In 2012 (drum-roll, please) the number hit 80,000! Hats off to Mother Nature, Dr. Fred Hebard, and the hardworking team at Meadowview Research Farms.

October: The American Chestnut Summit Rocks!

The 2012 American Chestnut Summit in Asheville set attendance records and brought awareness of the American Chestnut Foundation to a wider audience. The weekend event included more than 20 workshops and presentations, two field trips, some new events that included a Critical Needs Workshop, and a poster session that received "thumbs up" from a host of participants. "By any measure the Summit was a huge success," said Betsy Gamber, TACF VP of Operations and the event coordinator. "And it will be a model for future events."

Summit attendees Fred and Christine Clodfelter examine wood samples during a workshop on chestnut wood identification given by Sara Fitzsimmons and Kendra Gurney. Photo by Paul Franklin

October: TACF Adopts Restoration Plan

This was also the year that TACF's board approved the American Chestnut Restoration Plan. The restoration of the American chestnut is one of the largest and most complex species restoration efforts ever undertaken. This comprehensive, flexible roadmap will guide TACF and its partners in the restoration of the American chestnut over the next several decades.

November: 3,500 Restoration Chestnuts Planted on Public Lands

Late in the year, a veritable army of TACF and USFS volunteers gathered across several weekends to plant over 3,500 Restoration Chestnuts 1.0 on National Forest lands. This planting was sponsored by a grant from the National Forest Foundation and brings our total progeny forest plantings of Restoration Chestnuts 1.0 to over 9,000. For more about this see TACF News on page 5.

Forestry Employees and TACF volunteers prepare to plant Restoration Chestnuts in a National Forest. Photo by Jon Taylor

November: That's One Big Chestnut!

The month of November brought us reports of a new large surviving American chestnut in the tiny burg of Hebron, Maine. The tree was discovered on the wooded property owned by Ann Siekman; it is 78 inches in circumference and tops out at about 95 feet, according to Maine TACF board member, Alan Markert. That makes it Maine's tallest chestnut tree.

A group examines a 75' American chestnut, believed to be the tallest in Maine. From right to left: property owner, Ann Seikman; Oxford County Soil and Water Conservation District employee Jean Federico, Maine state forester Merle Ring, and TACF Maine Chapter member Alan Markert. Photo courtesy of Russ Dillingham/Sun Journal

December: TACF Gets Noticed

2012 was also a banner year for TACF in the press. Articles on TACF and the American chestnut were featured in over 200 media outlets ranging from the *New York Times*, *Wall Street Journal*, and *USA Today*, to regional newspapers, magazines, TV stations, and online news outlets. A single article written by AP reporter Alan Breed in December was picked up by over 70 publications, reaching a total audience of about 2.5 million.

Planting Chestnut Seedlings

by Paul Franklin and Tom Saielli

A few weeks ago, TACF Southern Regional Science Coordinator Tom Saielli held a training session for volunteers who were learning to plant chestnut seedlings. Anyone who enjoys planting trees has his or her favorite tricks, but Tom's system is particularly effective for planting small numbers of containerized chestnuts. So we asked him to do his demonstration one more time for the Journal cameras, and he kindly obliged.

"The most important step in planting a chestnut," says Tom "is choosing a good site. It's like the old real estate slogan, location, location, location." Sunny, gently sloping, well-drained sites with mildly acidic (pH 4.5-6.5) soil are best (chestnuts love sun and definitely don't like to get their feet wet!).

1 Protection of young seedlings is important and for a small number of trees, individual cages are a great option. Start with a section of sturdy 4-foot high welded wire fencing that is about 9 1/2 feet long to create a circle of about 3 feet, securing it with electrician's zip ties. "A tip" says Tom, "is to encircle a full square of fencing with the tie, then if you have to cut it later, it's easier."

2 Place the circle of fencing on the ground around where the tree will be planted. Use the fence as your guide as you cut out a turf circle with a spade, the same diameter as the fencing.

3 Cut the turf out in sections, turning it over and placing it back around the perimeter of the circle. This can serve as a weed barrier of sorts. In the center of the circle dig a bowl-shaped hole about twice the diameter and just slightly deeper than the pot.

4 You can test the depth of the hole by placing the potted seedling in it. The edge of the hole should be at least level with the dirt in the pot, or slightly deeper. When the hole is deep enough, use a garden fork or hand trowel to dig into the sides and bottom of the hole and pry, cracking and roughing up the soil so that roots will be able to easily grow into the soil beyond the hole. Otherwise the hole becomes like a pot, and the seedling can become root-bound in it.

5 Remove the seedling from the pot and shake it gently, patting the root ball to begin dislodging the potting soil. Work the root ball with your hands to break it up, being careful not to damage the roots. Do this next to the hole, creating a pile of potting soil that you will later mix with the native soil to refill the hole as you plant. Keep shaking and patting until most of the soil has fallen away, leaving the roots bare.

6 This seedling had been in the pot long enough for the tap root to hit the bottom of the pot and bend at 90 degrees. Called a "J" root, it is best to cut this off so the tap root will continue growing straight down.

Mix some loose dirt from the hole with the potting soil and place it in the bottom of the hole. Then place the root mass into the hole, gently spreading the roots outwards. Asked if we should add fertilizer to the hole Tom replied, "I recommend adding fertilizer in the spring for the first year or two, as long as the seedling is at least 10 inches tall. Choose a fertilizer blended for acid-loving plants like Miracid 30-10-10, or its equivalent. You can also top dress with compost if you prefer."

7

8 Work soil in around the roots, continuing to gently spread them outwards. Also keep an eye on the stem's root collar (the bulge at the base of the seeding where the trunk and roots meet). You want the final level of planting soil to come at or a little below the root collar. As you fill the hole, watch to make sure that the seedling remains upright and not leaning.

9 Use your foot to tamp the soil down firmly around the seedling.

10

You may also choose to use a weed barrier of some sort. "For ceremonial plantings," says Tom, "I like to use bark mulch, which looks nice and helps retain moisture, but you must keep the mulch at least 3" away from the trunk." Another option is to lay down a square of competition mat. Once again, treating underneath the mat or mulch with vole repellent and/or use of a vole shelter is essential to keep voles from traveling underneath to the tree trunk.

Keeping Voles at Bay

Tom says "Voles can be very damaging, feeding on young bark, stems and roots. When it comes to dissuading voles, nothing works as well as keeping grasses and other vegetation low, especially right around the seedlings, particularly going into autumn."

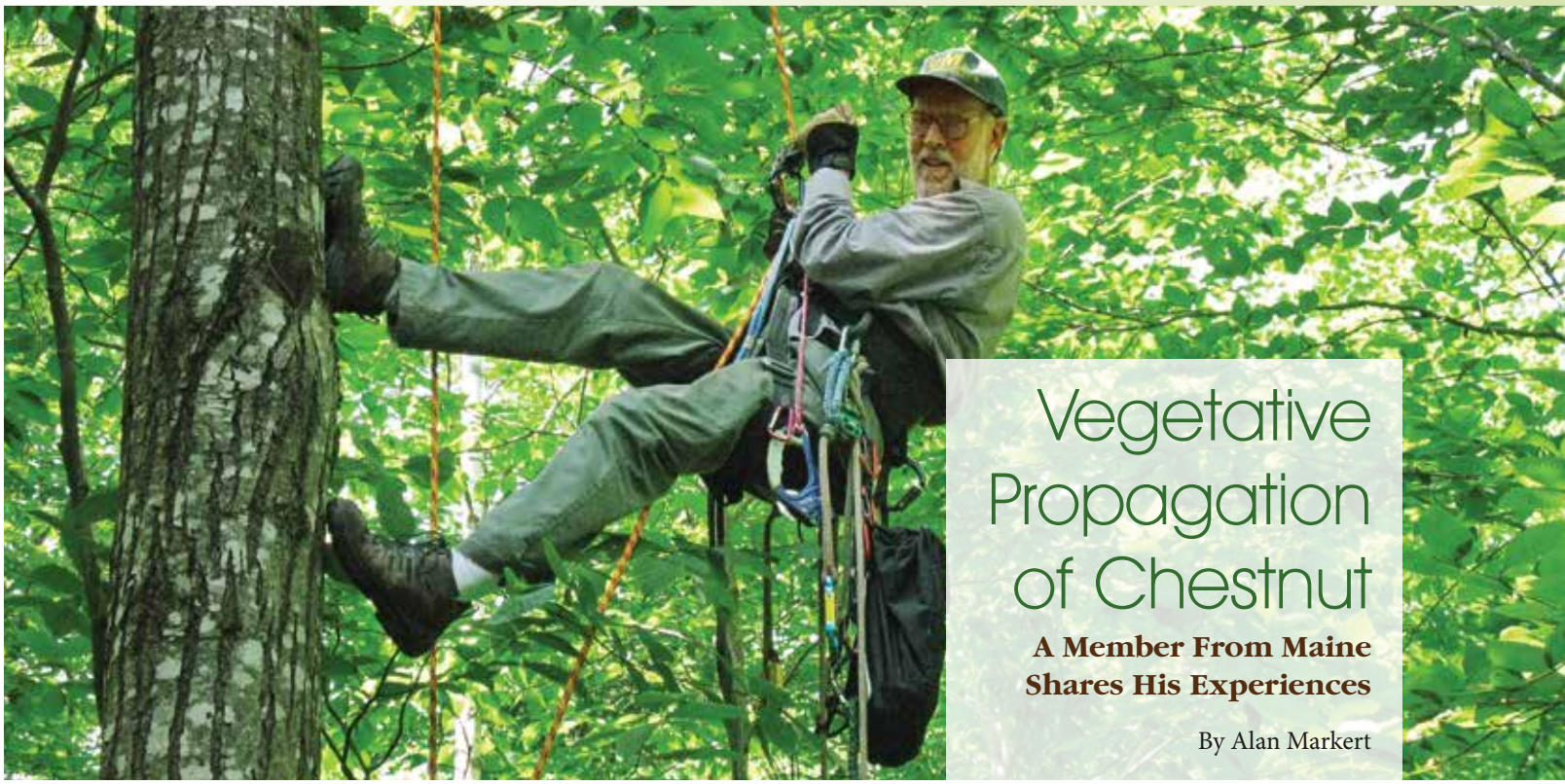
There are several ways to dissuade voles and other small mammals from gnawing on chestnuts. A sprinkling of vole repellent is fairly effective, or you can use a short tree shelter or guard, which can be sunk into the ground a few inches around the base of the seedling to act as a physical barrier. If voles are particularly tenacious, you can use both methods.

11

Pound two long stakes into the ground, one on each side of the fencing and secure the fencing to the stakes with zip ties. A cover of chicken wire across the top, secured with zip ties, will help keep out determined deer and other hungry critters.

12

The bottom of the fencing should be secured with ground staples or stakes (available at nursery and landscape supply houses), This adds additional stability in high winds.



Vegetative Propagation of Chestnut

A Member From Maine Shares His Experiences

By Alan Markert

The author climbs a large surviving Amercian chestnut tree in Embden, Maine, to collect scion wood for a chip bud graft.
Photo by Valerie Huebner

Anyone interested in raising chestnuts will find that vegetative propagation offers a number of benefits, including enabling growers to create stand-alone trees that are perfect copies (clones) of their parents. Cloning a desirable tree allows the grower to preserve its genotype, and by means of repeated propagations, preserve it indefinitely.

Other benefits include the fact that a single tree with one or more scions from unrelated trees can, in effect, cross-pollinate itself. Grafting can also help shorten reproduction times in chestnut. Young seedlings can be reproduced by taking scion stock from them far earlier than they would bear seed, and by taking mature scion from a tree already bearing nuts, a new graft produced with that scion can possibly make nuts in the first year. In TACF's fifth-generation seed orchards (B_3F_2), only one tree in 150 will be selected for further breeding. These few remaining trees could be multiplied in number through vegetative propagation. The cloned trees could be planted and grown out wherever it was suitable and, in particular, in much smaller plots than the original seed orchard, even in someone's back yard.

Cuttings: The Challenge of Chestnuts

The simplest method of vegetative propagation is through cuttings. A small, growing branch is cut off the mother tree and planted in the ground. Eventually roots form at the cut end of the branch producing a perfect copy of the original tree. There are some trees where it is just this easy, but chestnut is not one of them; in fact chestnut cuttings are notoriously difficult to root.

One of the most reliable ways of rooting cuttings on shy-rooting trees like chestnut is the method called air layering. I have tried this on a few of my trees, but even after several months the best result I have attained is a few feeble root hairs completely inadequate to support the leafy branch. Even if this could be made to work, which might well be a two-year procedure, it would be much too costly in material and labor to be practical.

Grafting Chestnuts

Fortunately, chestnuts can be propagated using the same method used by most commercial growers of apples and other fruit and nut trees: grafting a scion onto a rootstock.

There are several ways to graft a scion that has desirable traits onto rootstock that is well suited to local conditions. One of the most popular and simple methods, and one that seems to work very well with chestnut, is called the chip bud graft.

This graft, on a branch of one the chestnut trees in my yard, is about 10 weeks old. The union of host and bud is well healed.
Photo by Alan Markert

To make a chip bud graft, a bud on a sliver of wood, complete with bark, is carefully cut from the scion tree (called the "ramet" - the tree whose traits you wish to reproduce), and is inserted into a matching notch on the rootstock. The best time to do this for chestnut is in late July or early August.

Near my home in Maine is a massive American chestnut, the Embden tree, that is about 75 feet tall and 20 inches in diameter at breast height. Because it has a near twin 30 feet away, it produces a large nut crop every year. Since this tree would be a desirable specimen for our gene bank, I decided to climb it to collect material for a chip bud graft. This project became somewhat more pressing this year, as the tree has developed a blight infection about 40 feet up where the first live branches begin.

To make my chip bud graft, I climbed the Embden tree and collected a bud from a sucker growth just above the blight infection. Next spring the branch will be severed just beyond the bud so that the grafted bud becomes the terminal bud on its branch. It should sprout to form a new branch, and because of its terminal position, should grow very vigorously. The new branch, genetically identical to the parent Embden tree, would then become a ready source of fresh healthy buds and scions for further propagation efforts.

Nut Grafting - Tricky but Rewarding

Another grafting method known to work with chestnut is a seldom-used technique called nut grafting. A sprouted nut with a radicle an inch or so long is used for the rootstock, and a short twig with one or two dormant buds is the scion. Photo A below shows some nuts and prepared scions ready for grafting. The scions are tapered on two faces to form a long wedge that will be inserted into the nut to form the graft.

Photo A: Nuts and scions

Photo B: Scion in place

Photo C: Scion bonded, root growing

The nut is prepared by cutting off the radicle and a bit of the nut with a sharp knife or razor blade. The dark outline of the embryo can be seen when the nut has been cut to the proper depth. A steel wedge is driven into the embryo to prepare a space for the scion, and then the scion is pressed into place, as shown in photo B. If all goes well, the embryo will send out new roots and bond to the cut surfaces of the scion. Photo C above shows a typical nut graft after about 3 weeks. The new roots have emerged from the cut surface of the embryo, and the bud is starting to open.

I believe that this method holds a lot of promise for chestnut growers. Yet in spite of the fact that I created over 100 of these, I had limited success. My total lack of experience was probably a major factor, but poor-quality scion material, incompletely dormant scions, growing conditions that were too cool, and fungal and bacterial attacks also caused a lot of failures.

Advantages of this technique (once one achieves a moderate success rate) are that it is relatively easy, it can be performed in late winter before anything is growing outdoors, it can be done entirely indoors, the

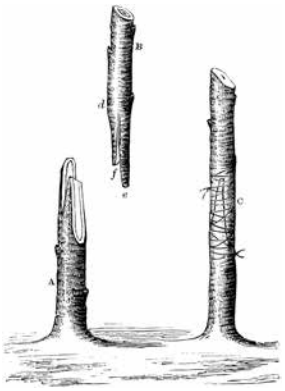


Figure 1:
Whip and Tongue Graft

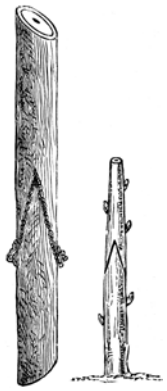


Figure 2:
Saddle Graft

Art courtesy FCIT, http://etc.usf.edu/clipart

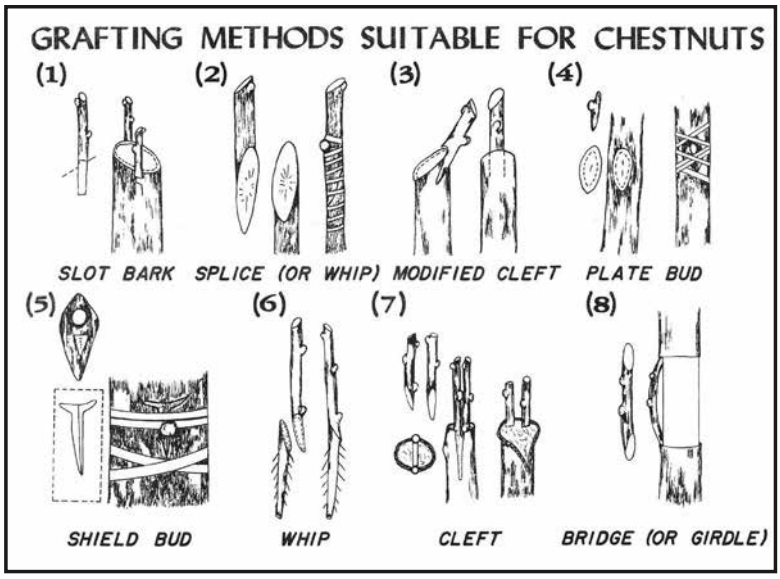


Figure 3: Chestnut Grafting Methods Source: TACF files

grafted nuts take up very little room, and the successful seedlings can be grown out and delivered in small peat pots.

TACF Science Coordinator Sara Fitzsimmons comments: "There are many advantages to nut grafting, but it is tricky to master, so give yourself time to practice. One of the best ways to improve success is to keep the new grafts in a humidity chamber. This can be as easy as putting a Ziploc™ or other plastic bag over the new graft. Many of our growers have noticed increased success doing this."

More Grafting Techniques

There are other popular methods of grafting that can be used on chestnut. A whip-and-tongue graft is a well-known technique for joining two small stems end-to-end in late winter when rootstock and scion are dormant. The upper end is the scion and it should have two or three healthy buds. The rootstock is typically a seedling tree cut off a few inches above the soil. A long diagonal cut at the top of the rootstock and an identical cut at the bottom of the scion produce two matching oval faces that are taped or tied together to produce the graft.

This graft however will have little mechanical stability unless the grafter makes matching longitudinal "v" cuts in the graft faces of the scion and rootstock (Figure 1). The two parts will now "lock" together making a strong and stable graft. A similar and sometimes more effective graft is called saddle graft, which involves making large matching "v"- or "u"- shaped cuts on the scion and rootstock. This maximizes the graft area and increases chances for success (Figure 2). Figure 3 shows a number of other grafts suitable for chestnuts.

Grafting in a Chestnut Orchard

Working in a relatively controlled nursery or orchard environment makes creating and caring for the grafts much easier. A grower can start by planting the rootstock seedling in the desired location and grafting it there. In the case of a chestnut seed orchard, for example, a grower could select a number of the best trees slated for culling and use them instead as rootstocks. The grower would already know that the site was good and that the tree was healthy with good roots. Transplanting a 2- or 3-year-old grafted tree from the nursery, on the other hand, involves moving a large root ball that will experience serious transplant trauma.

For chestnut growers, grafting offers a good way to propagate the best trees in a seed orchard environment. Since we still have 3 or 4 years before we would be ready to propagate any seed-orchard trees, there is time to work out the kinks in the most promising propagation protocols using material from pure American trees. To this end we will need to collect vigorous scion wood from promising trees during late summer, and we will need to maintain perhaps 50 seedlings from various sources and of various ages to be used for seedling grafts. Successful grafts of valuable trees during this phase of the work could be transplanted to a suitable gene bank, such those found at major arboreta.

Alan Markert has been a member of TACF since 2006 and currently serves on the TACF Maine Chapter Board of Directors.

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Meadowview Notes 2011-2012

Frederick V. Hebard, Laura Georgi, Jeff Donahue, David Bevins and Eric Coalson

American Chestnut Foundation Research Farms, Meadowview, VA

Meadowview experienced good rainfall in 2011 and 2012. Emergence of seeds in 2011 was good to excellent, but a mid-spring frost in late April, 2011, reduced the nut harvest. Most of the summer of 2011 was wet and cool, which favors the chestnut tree over the blight fungus, and many cankers did not expand very much. Results for the orchard progeny test of B_3-F_3 trees in 2011 were given in the last year's Meadowview Notes (*Journal of The American Chestnut Foundation*, 26(1): 8-16). The 2012 growing season was a more normal one, warm, but not excessively dry. The exception to this was the period between June 15 to July 15, when an extremely dry heat wave occurred, with daily high temperatures between 35 and 40 C, and no rain. That June-July weather very much favored the blight fungus over the chestnut. Overall, the 2012 season was more "neutral" with regard to canker expansion.

Tree and Seed Inventory

Table 1 presents the current holdings of trees and planted nuts as of May, 2012, at TACF's Meadowview Research Farms, and the changes from last year. The first few lines of the table serve also as a glossary of TACF breeding terminology. For instance, what we call a B_1 is the backcross of a Chinese x American F_1 hybrid to an American chestnut.

Although in 2012 we added 1,182 F_1 hybrids and 1,932 B_3-F_3 Restoration Chestnuts 1.0, the total number of trees at the Farms declined by 7,428, primarily because we culled 10,033 B_3-F_2 trees from our Legacy Tree seed orchards. The number of B_3-F_2s had been above 30,000 since 2008. Additional rogueing between May, 2012 and January, 2012, has reduced the number of B_3-F_2s to about 15,000. The ultimate plan is to reduce the number of B_3-F_2 trees for the 'Clapper' and 'Graves' sources of blight resistance at Meadowview to about 500 trees total. As we approach that goal, the blight resistance of the progeny produced by the remaining trees should increase, as explained in last year's Meadowview Notes (26(1):8-16).

Spring planting underway at Meadowview in 2012.
Photo by Jeff Donahue

There also was a small increase in the number of B_3-F_3 trees, from about 3800 to 5700, which reflected continued planting of progeny tests in orchards at Meadowview. The purpose of the orchard progeny tests is to make final selections for blight resistance among their B_3-F_2 parents. Preliminary selections are made by inoculating the B_3-F_2 and selecting for small canker size, followed by assessing the severity of naturally occurring cankers on the remaining trees.

There was a large increase in the number of F_1s. Those were planted to serve as uniform substrates for measuring the pathogenicity of progeny of crosses of the chestnut blight fungus. We would like to genetically map those factors associated with pathogenicity to try to identify them. Our previous measurement, while adequate, was not very precise due to large variation in rates of canker expansion from branch to branch within trees. Because we will be inoculating single stems of these progeny, we expect that the variation within each one of rates of canker expansion will be lower, thereby increasing the precision of genetic mapping.

The 2011 nut harvest reflected the planting results, with an increase in harvest of B_3-F_3 nuts from about 18,000 to 22,000 (Table 2) and a decrease in harvest of B_3-F_2 nuts. The preliminary count of B_3-F_3 nuts from the 2012 harvest was about 80,000. We continue to advance other sources of resistance, including progeny of large, surviving American chestnut trees, for distribution of pollen to TACF state chapters.

Aside from orchard progeny tests, B_3-F_3s also have been planted widely in forest progeny tests, beginning in 2009. Through 2012, more than 9,000 progeny in 249 families have been planted. The key questions to be answered by these forest tests are whether or not the

Table 1. Type and number of chestnut trees and planted nuts at TACF Meadowview Research Farms in May, 2012, with the number of sources of blight resistance and the number of American lines in the breeding stock and changes between May, 2011 and May, 2012.

Type of Tree	Number in 2012 of			Difference from 2011 to 2012		
	Nuts or Trees	Sources of Resistance	American Lines	Nuts or Trees	Sources of Resistance	American Lines
American	1392		222	-183		-1
Chinese	373	34		-641	4	
Chinese x American: F_1	1599	19	50	1182	1	-7
American x (Chinese x American): B_1	646	11	22	0	0	-2
American x [American x (Chinese x American)]: B_2	1619	16	67	303	3	24
American x {American x [American x (Chinese x American)]}: B_3	2027	10	90	-131	0	-2
Am x (Am x {Am x [Am x (Ch x Am)]}): B_4	889	4	16	1	0	2
(Ch x Am) x (Ch x Am): F_2	213	5	5	0	0	0
[(Ch x Am) x (Ch x Am)] x [(Ch x Am) x (Ch x Am)]: F_3	5	1	1	0	0	0
[Am x (Ch x Am)] x [Am x (Ch x Am)]: B_1-F_2	626	7	10	1	0	0
{Am x [Am x (Ch x Am)]} x {Am x [Am x (Ch x Am)]}: B_2-F_2	590	9	12	-77	0	0
B_2-F_3	31	1	1	0	0	0
(Am x {Am x [Am x (Ch x Am)]}) x (Am x {Am x [Am x (Ch x Am)]}): B_3-F_2	25361	2	54	-10033	0	3
B_3-F_3	5758	2	27	1932	0	5
Clapper B_3 x Graves B_3: B_3-I_1	110	1	9	0	-1	0
Chinese x [American x (Chinese x American)]: Chinese x B_1	167	3	7	0	0	0
Ch x {Am x [Am x (Ch x Am)]}: Chinese x B_2	72	1	2	0	0	0
Ch x (Am x {Am x [Am x (Ch x Am)]}): Chinese Test Suite x B_3	286	5	16	0	0	0
Chinese Test Suite x Chinese	1309	67		-162	0	
Chinese Test Suite x Japanese	46	2		0	0	
Chinese Test Suite x European	43	1		0	0	
Chinese Test Suite x Large, Surviving American	149	7		0	0	
European x American: F_1	2	1	1	0	0	0
Japanese	3	1		0	0	
Japanese x American: F_1	8	1	1	0	0	0
[(Japanese x American) x American]: B_1	5	1	1	0	0	0
{[(Japanese x American) x American] x American}: B_2	142	1	1	0	0	0
Japanese x European	80	1	1	0	0	0
Japanese x Large, Surviving American	27	5	5	0	0	0
Castanea ozarkensis	21	1		0	0	
Castanea pumila	44	3		0	0	
Castanea seguinii	48	3		0	0	
Seguin x American: F_1	34	2	2	-20	0	0
Large Surviving American: F_1	486	12	36	0	0	-1
Large Surviving American: B_1	506	8	15	0	0	1
Large Surviving American: B_2	82	4	5	10	1	1
Large Surviving American: B_3	161	1	1	0	0	0
Large Surviving American: F_2	266	7		0	-6	
Large Surviving American: F_3	270	1		0	0	
Large Surviving American: I_1	1666	32		0	0	
Large Surviving American: I_2	404	13		101	2	
Large Surviving American: I_3	104	2		0	0	
Large Surviving American advanced: F_1	1093	16	44	289	4	19
Other	3				0	
Total	**48766**			**-7428**		

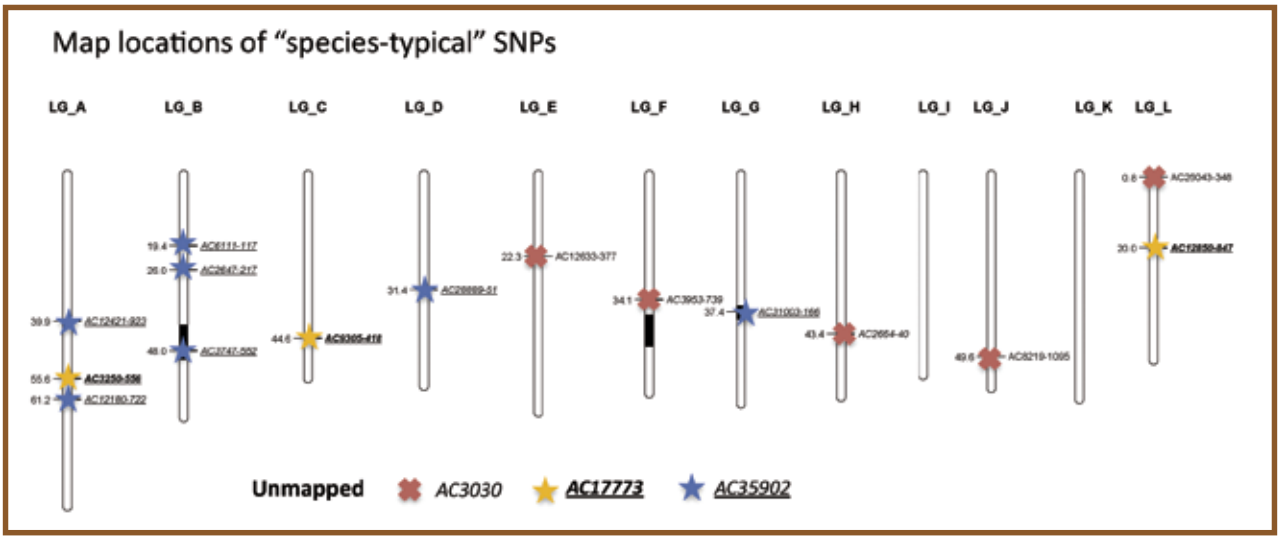

Figure 1. As part of the Forest Health Initiative project, hundreds of "single-nucleotide polymorphisms," or SNPs, were evaluated for their potential to distinguish Chinese from American chestnut. This figure shows the genetic map locations of 18 SNPs that looked promising. The black regions on linkage groups B, F and G were identified as containing genes for resistance to chestnut blight. At Meadowview, we converted these "SNPs" to "SSRs," another type of marker more amenable to low-budget analysis. The markers successfully converted at Meadowview are underscored. Blue stars denote markers with forms specific to American chestnut; gold stars, markers with alternate forms that occur in both species. Markers with a red "x" either could not be tested or gave unsatisfactory results.

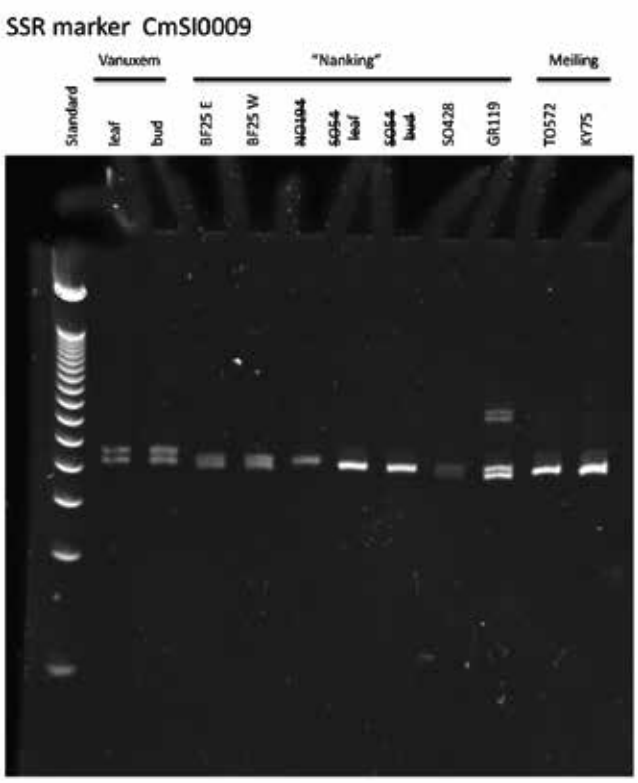

Figure 2. Photograph of a gel after electrophoresis of a particular marker, simple sequence repeat CmSI0009, developed during the NSF-funded project, "Genomic Tools for the Fagaceae." The marker was amplified from DNA of a number of Chinese chestnut trees. One use for this class of markers is to detect mis-identified trees. Price Farm trees NO194 and SO54 clearly differ from the other 'Nanking' trees in that only one band is present rather than two. The fact that BF25E, BF25F, SO428 all showed the same-sized doublet as the true 'Nanking,' GR119, does not mean they are 'Nanking,' but is compatible with that hypothesis. However, the lack of the doublet in NO194 and SO54 indicates they are not 'Nanking.' This gel also shows that useable DNA can be extracted from buds as well as leaves, which is advantageous since bud tissue is available at times of the year when leaves are not.

Dr. Laura Georgi performs an experiment in the Price Lab at Meadowview. This year we have begun to adapt DNA markers for use in our breeding.
Photo by Jeff Donahue

Restoration chestnuts 1.0 grow with the same forest competitiveness as pure American chestnut, and whether or not they have sufficient blight resistance to survive and reproduce over extended periods. The results may also assist with selection in the B_3-F_2 parent seed orchards.

Lab Activities

In cooperation with Emory and Henry College, we have begun to identify small molecules released by the blight fungus while it is growing on chestnut bark medium. The small molecules induce the tree to release the plant hormone, ethylene. These molecules are produced in the bark broth by enzymes secreted by the fungus. Better understanding of how the fungus attacks the tree and how the tree responds may provide critical insights into understanding the disease process, perhaps leading to better screens for blight resistance.

We have also begun to adapt DNA markers for use at Meadowview Research Farms. These markers will help identify trees that should be true-breeding for blight resistance and also determine how much Chinese chestnut DNA is present in our hybrids and whether a tree is correctly identified, among other uses. Figures 1 and 2 illustrate this process. Identification of B_3-F_2 trees homozygous for blight resistance would greatly ease the process of selection at that generation.

Phytophthora root rot resistance in B_3-F_3 Restoration Chestnut Trees

Since 2006, Paul Sisco, Joe James of TACF and Steve Jeffers of Clemson University have been laboriously measuring the resistance to Phytophthora root rot (PRR) of selected TACF breeding stock. It became clear in 2012 that resistance to PRR is controlled by a single gene in pedigrees derived from the 'Mahogany' Chinese chestnut tree and its B_1 offspring, 'Graves,' since it segregated with susceptibility at frequencies of 1:1 in backcross progeny. The data also indicated that we are not selecting for PRR resistance, as it declined by a factor of ½ with each backcross generation, occurring in approximately one-eighth of 'Graves' B_3s. At that frequency under Hardy-Weinburg assumptions, we expect that 15/64ths of our B_3-F_2 and subsequent filial generations would possess the trait, without selection. Current data on the occurrence and severity of PRR in 'Graves' B_3-F_3 progeny fit the expected frequencies. Thus it should be fairly easy in two generations to eliminate the allele for susceptibility to PRR from 'Graves' breeding stock. Since B_3-F_2 individuals homozygous for resistance occur at frequencies of 1 in 64, extremely rigorous selection, perhaps marker assisted, could eliminate it one generation earlier.

Blight Resistance in B_3-F_3 Restoration Chestnut Trees in 2012 compared to 2011

Using an experimental design, orchard progeny tests are established at 15 or 20 feet between rows and 2 feet within rows. At two years of age, all trees are inoculated once each with two strains of the blight fungus (Ep155 and SG2-3). Ep155 is highly pathogenic and SG2-3 weakly pathogenic, although it is virulent and capable of encircling and killing stems of American chestnut.

We inoculated our second formal progeny test in 2012, and the canker sizes and distributions for the various cross types are shown in Table 3. Since some breeding materials were included in the test, it was planted using a completely randomized design. For mean canker sizes, the results were similar to last year (Table 4 is reproduced from the *Journal of The American Chestnut Foundation*, 26(1): 16); the mean canker size on B_3-F_3s was smaller than that on American chestnut, but among the larger of the cross types with intermediate levels of blight resistance.

However, in 2012 (Table 5), the difference in mean canker size between American chestnut and B_3-F_3 was not statistically significant, unlike 2011 (Table 4). One reason for the lack of significant difference was a very wide dispersion of Ep155 canker sizes on American chestnut in 2012, with cankers in all size classes except for the smallest, and little concentration in one size class. In contrast, in 2011 most American chestnut had Ep155 cankers in the 15-20 cm class, which concentration is a result more typical of most seasons. Additionally in 2012, the Ep155 cankers on American chestnut in were not significantly larger than those on any other cross type except Chinese chestnut. For SG2-3 cankers, the exceptions were Chinese chestnut and the F_1 hybrids.

The test inoculated in 2012 was also bedeviled by poor emergence of planted nuts, about 35%. The nuts were planted late for Meadowview, around April 20, 2010. They did not have as high a priority as nuts critical to the breeding program itself, such as B_3-F_2s, and weather strongly delayed planting in the spring of 2010. Weather also interfered with the emergence of these nuts, as it became dry and hot shortly before plastic was laid and remained so, hampering proper emergence. Usually we get 80-90% emergence and assume we will get 75%. A further 10% of the total were lost subsequent to emergence. The low numbers of tested trees, including American chestnut controls, contributed to the low numbers of significant differences between cross types and led to no significant differences between B_3-F_3 families, unlike 2011.

Whereas weather in 2011 favored the tree, weather in 2012 was more neutral, not favoring the chestnut tree

Table 2. The American Chestnut Foundation Meadowview Farms 2011 nut harvest from controlled pollinations and selected open pollinations.

Nut Type*	Female Parent	Pollen Parent	Pollinated			Unpollinated Checks			No. of Crosses
			nuts	bags	burs	nuts	bags	burs	
B_1	F_1 Mahogany	American	540	219	362	2	16	26	1
B_2	American	B_1 mollissima11	26	214	291	1	21	24	11
B_2	American	B_1 mollissima12	140	148	239	2	14	16	10
B_2	B_1 mollissima12	American	81	47	73	0	5	7	1
B_2	B_1-F_2 MusickChin;MusickChin	American	83		47	2	3	6	1
B_3	American	B_2 Nanking	37	30	63	0	3	7	2
B_3	B_2 Mahogany	Amer chapter	199	165	409	5	18	43	6
B_3	B_2 Nanking	American	20	14	17	0	1	1	1
B_3-F_2	B_3 Clapper	op	3720	1	2444	0		0	23
B_3-F_2	B_3 Graves	B3 Graves	1593	466	964	6	27	111	2
B_3-F_2	B_3 Graves	op	1069		615	0		0	12
B_3-F_3	B_3-F_2 op Clapper	op	11833		5314				141
B_3-F_3	B_3-F_2 op Graves	op	10919		4650				133
B_4	B_3 Clapper	Amer chapter	1164	666	1184	5	62	83	12
B_4	B_3 Graves	Amer chapter	484	251	546	5	26	61	7
B_4	B_3 Nanking	American	0		2	0	1	0	1
F_1	Chinese Kuling	American	91	217	412	6	18	1	1
F_1	Chinese Nanking	American	781	411	833	2	39	64	2
F_1	Chinese Vanuxem	American	404	190	268	9	15	14	2
LSA B_2	American	LSA B_1 NCChamp	10	19	18	0	4	0	2
LSA I_1-F_1	American	LSA I_1 NCChamp;Ort	63	73	72	0	4	7	3
LSA I_1-F_1	American	LSA I_1 NCChamp;ScientistsCliffs	145	37	86	0	4	3	3
LSA I_1-F_1	American	LSA I_1 Ort;ScientistsCliffs	376	124	205	0	16	16	7
LSA I_2	LSA I_1 NCChamp;ScientistsCliffs	LSA I_1 Ort;ScientistsCliffs	0	3	10	0	1	0	1
LSA I_2	LSA I_1 Ort;ScientistsCliffs	LSA I_1 NCChamp;ScientistsCliffs	101	58	84	0	7	4	3
Total Controlled Pollinations, w/o Chapter			**4690**	**2435**	**4455**	**35**	**217**	**350**	

*LSA denotes Large, Surviving American, defined as an American chestnut over 13 inches in diameter at breast height (54 inches) that has blight but has survived it longer than approximately 10 years.

Table 3. Mean, standard deviation and distribution of canker size classes (length in cm) for cankers incited by two strains of the blight fungus on cross types of American and Chinese chestnut in 2012.

Cross Type*	Fungus Strain	N	Least Squares Mean*		Standard Deviation	Length Class					
						0-5	5-10	10-15	15-20	20-25	25-
American	Ep155	9	13.9	A	6.1		2	3	2	1	1
Japanese B2	Ep155	7	13.0	A	6.0	1	1	3	1	1	
B3	Ep155	43	12.5	A	4.7	3	7	26	3	3	1
B3-F3	Ep155	353	12.3	A	4.9	12	74	203	42	12	6
B4	Ep155	16	11.2	A	3.7	1	3	11	1		
B2-F3	Ep155	20	10.3	A	1.9		7	13			
F1	Ep155	19	9.9	AB	2.9	1	8	9	1		
B2	Ep155	20	9.7	A	3.8	3	8	7	2		
B1	Ep155	24	9.5	AB	4.7		10	9	4	1	
Chinese	Ep155	11	4.0	B	1.2	9	2				
American	SG2-3	9	11.2	A	2.2		3	6			
Japanese B2	SG2-3	7	9.7	ABC	1.4		4	3			
B3	SG2-3	42	8.6	ABCD	3.0	3	19	20			
B3-F3	SG2-3	356	8.5	AB	3.4	66	156	130	3	1	
B4	SG2-3	16	9.5	ABC	3.0	1	10	5			
B2-F3	SG2-3	20	6.2	BCD	2.4	7	12	1			
F1	SG2-3	19	4.8	DE	2.5	12	7				
B2	SG2-3	20	5.9	CDE	3.3	10	8	2			
B1	SG2-3	22	6.4	ABCDE	4.5	7	9	3	3		
Chinese	SG2-3	13	2.3	E	0.8	13					

* Means followed by the same letter are not significantly different at p<0.05 by a Tukey HSD test. The declarations are suspect for strain SG2-3 due to heteroscedasticity.

Table 4. Mean, standard deviation and distribution of canker size classes (length in cm) for cankers incited by two strains of the blight fungus on cross types of American and Chinese chestnut in 2011.

Cross Type*	Fungus Strain	N	Least Square Mean*		Standard Deviation	Length Class					
						0-5	5-10	10-15	15-20	20-25	25-
American	Ep155	20	17.4	A	3.4		1	4	11	4	
B2	Ep155	44	14.5	AB	6.6	4	2	19	15	2	2
B3-F3	Ep155	583	11.7	BC	6.3	95	71	219	151	32	15
B1-F2	Ep155	171	10.9	BC	6.4	35	23	70	30	10	3
F1	Ep155	8	10.0	ABCD	3.6		4	3	1		
B1xC	Ep155	39	8.3	CD	5.0	12	9	16	2		
CxC	Ep155	38	3.2	D	2.3	27	11				
American	SG2-3	17	11.0	A	7.8	3	5	7			2
B2	SG2-3	45	5.3	B	5.6	32	5	6		2	
B3-F3	SG2-3	592	4.9	B	4.3	402	111	65	10	3	1
B1-F2	SG2-3	172	3.0	BC	3.9	126	26	18	2		
F1	SG2-3	7	3.3	BC	1.7	5	2				
B1xC	SG2-3	39	1.8	BC	2.6	35	3	1			
CxC	SG2-3	38	1.6	C	0.6	38					

* Means followed by the same letter are not significantly different at p<0.05 by a Tukey HSD test. The declarations are suspect for strain SG2-3 due to heteroscedasticity.

Table 5. Mortality as of January, 2013, of cross types of Chinese and American chestnut partitioned into canker length classes in 2011 after inoculation in 2011.*

Cross Type*	2011 Ep155 Canker Length Class (cm)						Total**		Mortality %
	0-5	5-10	10-15	15-20	20-25	25-30			
American		1/1	4/4	10/11	3/3		18/19	A	95
B2	1/3	2/2	18/19	14/15	2/2	2/2	39/43	AB	91
B1-F2	13/31	15/23	67/70	28/30	9/10	2/3	134/167	AB	80
B3-F3	32/87	42/69	180/218	135/150	25/32	15/15	429/571	B	75
F1		2/4	3/3	0/1			5/8	B	63
B1xC	4/10	4 /9	10/16	2/2			20/37	B	54
CxC	0/23	1/11					1/34	C	3

* There are some differences in the total numbers of trees in various size classes in Table 5 compared to Table 4 that reflect difficulty in counting dead trees in the second season of canker expansion.

** Fractions followed by the same letter are not significantly different by Pearson contingency tests.

as much, as discussed above. However, the weather did not strongly favor the blight fungus as evidenced by canker sizes on F_1s being closer in size to cankers on Chinese than American chestnut. The lessened favoring of the tree was reflected in the many fewer numbers of trees with cankers in the 0-5 cm size class in 2012 than 2011. The percentage of B_3-F_3s with cankers similar in size to those on Chinese chestnut dropped from 16% in 2011 to 4% in 2012. The percentage of trees rated similarly to Chinese chestnut dropped from 30% in 2011 to 17% in 2012..

Prospects for Survival of Restoration Chestnuts 1.0

Not all backcross F_2 and backcross F_3 chestnut trees that have cankers as small as Chinese chestnut in the first season of canker expansion survive as well as Chinese chestnut. This has been discussed previously for earlier generations of crossing (see Hebard, F. V. 2006. Pages 61-77 in http://ecosystems.psu.edu/research/chestnut/information/conference-2004/conference/hebard), and is illustrated for Restoration Chestnut trees in Table 5. For instance, 32 of 87 B_3-F_3 in the smallest canker size class in Table 5 died between 2011 and the end of 2012. Canker lengths in any one growing season are a metric we use to assess blight resistance, but are not perfectly correlated with the underlying trait. For one thing, as we have seen above, they depend strongly on the season. This seasonal dependence is one reason we wait until the second season of canker expansion has begun before making final selections for blight resistance in straight backcross. However, in the second season, factors that affect tree vigor start to influence canker expansion, so length becomes less correlated with genetic resistance as measured by correlations with molecular markers. So we are left with canker expansion during the first season as the source of the best metrics of blight resistance, despite its imperfections.

Canker length is strongly correlated with survival, but survival can extend to trees with intermediate canker sizes and intermediate levels of blight resistance, such as F_1 hybrids. This is illustrated in Table 5, but also in plantings made by the Connecticut Agricultural Experiment Station that have living F1s more than 60 years old, still with their original stem. Those include plantings in forested as well as orchard settings. Therefore, based on current data, we can project that many B_3-F_3 Restoration Chestnut 1.0 will survive for extended times. They should be able to resume evolving. That in itself will be a victory; the species will have a chance of persisting, and further improvement need not be carried out in the nursery or orchard, but rather the forest; it will be rather akin to releasing captive-bred condors back into the wild. But will the B_3-F_3s become dominant forest trees and how many will do so? That question will have to be answered by progeny tests conducted in the forest. Long time periods are required to answer some of these questions, making it imperative to have started forest progeny tests now, as we have.

Acknowledgements

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Dr. Fred V. Hebard is TACF's Chief Scientist

One Man's Trash . . .

By Jon Taylor

The piano, built in New York City in 1915, was abandoned by the roadside when Jon found it. Photo: Jon Taylor

By the time TACF's Annual Chestnut Summit had come and gone in Asheville last October, I found myself in a predicament I hadn't been in for years: I was completely out of usable chestnut lumber. My last purchase the year before included only one board, but it was a BIG board, some four inches thick, thirteen inches wide and sixteen feet long. With the last five feet of that board I was able to make all thirteen picture frames that TACF needed for their annual awards. But then I was out, with no idea where to find more good, dry chestnut lumber.

Just a week later, however, fate intervened. My wife and I were driving to a grocery store located right next to the Crowne Plaza where the Summit had been held. As we drove under the highway overpass, I noticed an old upright piano lying on its back. I immediately thought of my friend, fellow woodworker and chestnut enthusiast Don Surrette, who told me that old pianos often contain chestnut lumber. As I backed up to it, I noticed the previous owner had stripped off the keys and a few other parts that must have seemed valuable and then dumped it under the bridge. Without any tools, I tore off the lid and returned home with our groceries. A few passes through the planer removed the veneer, leaving a substantial and solid piece of American chestnut.

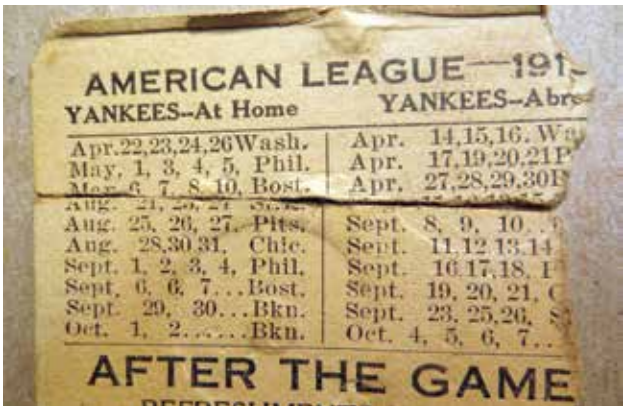
I returned with my toolbox and spent about an hour dismantling the piano and loading all the pieces into the back of my truck. Back at my home shop, I realized that the majority of the piano was made of other woods like oak, beech, maple and pine. The two large side panels and the lid were the only pieces that were veneered chestnut lumber, but still it was a good haul.

There are a few good reasons why chestnut lumber was used in this application. When chestnut lumber is properly dried it is extremely stable, making it perfect for veneer core. Before the chestnut blight, the lumber was readily available and very inexpensive. At the time, it was not considered a beautiful wood, as it is today, and so it was veneered with more popular species like cherry and mahogany.

One of my favorite aspects of woodworking is learning about the history that goes along with the material. Most of the time when you purchase lumber from a lumber yard the most you might know is the country it came from and a rough estimate of the tree's age when it was cut down. Chestnut is different as there is almost always a good story attached to it, and I was eager to learn more about this piano.

The large cast-iron plate inside the piano was inscribed with the name S.G. Lindeman, Melodigrand of New York, Inc., and the serial number 63185. My initial internet search gave me only a rough estimate of the piano's age so I ordered a copy of the 12th edition of the Pierce Piano Atlas. From that I learned that the Lindeman family is the second oldest piano manufacturer in America and was established in 1836. Based on the serial number, this piano had been made in a factory on the corner of 140th street and 5th Avenue in New York City in 1919. So now I knew I had chestnut lumber from a piano that was built just fifteen years after, and only six and a half miles from where the chestnut blight was first discovered on an American chestnut at the Bronx Zoo in 1904.

In addition to the different types of wood, there was a surprising amount and variety of metal in the piano.


AMERICAN LEAGUE—191-

YANKEES--At Home | YANKEES--Abro

Apr.22,23,24,26Wash. | Apr. 14,15,16. Wa
May, 1, 3, 4, 5, Phil. | Apr. 17,19,20,21P
Mar. 6, 7, 8, 10, Bost. | Apr. 27,28,29,30P
Aug. 25, 26, 27, Pits. | Sept. 8, 9, 10. .
Aug. 28,30,31, Chic. | Sept. 11,12,13,14
Sept. 1, 2, 3, 4, Phil. | Sept. 16,17,18, P
Sept. 6, 6, 7...Bost. | Sept. 19, 20, 21, C
Sept. 29, 30...Bkn. | Sept. 23, 25,26, S
Oct. 1, 2.....Bkn. | Oct. 4, 5, 6, 7..

AFTER THE GAME

A section of a 1915 NY Yankees schedule that Jon discovered inside the piano. Photo: Jon Taylor

Bronze foot petals, brass screws, steel tuning pins and strings, and a one hundred and seventy pound cast iron plate were all worth twenty-two dollars at the metal recyclers. As I removed the brass screws that attached a piece of maple on which the keys of the piano sat, I noticed some thin pieces of paper used to shim the board to the right height. Among the blank white paper was a faded New York Yankees schedule. Since the last digit of the year was ripped off I assumed it was for 1919, but after a few minutes on the internet I found the dates matched the 1915 schedule.

Through the whole process of dismantling the piano, I kept imagining the conversations that might have taken place on the factory floor. Did the workers talk of the new silent killer of the chestnut trees or share plans to take the kids to the next Yankees game?

In retrospect, I still don't know if taking the piano apart was worth all the labor, or what I'll make out of that chestnut lumber, but I'm glad that all that great material was saved from the landfill. And as a project, it was both a fun and educational history lesson.

A skilled woodworker and craftsman, Jon Taylor is a member of TACF Carolinas Chapter, where he has a well -deserved reputation as a dedicated volunteer.

Jon displays the chestnut planks he salvaged from a 1915 upright piano he found beside the highway. Photo: Jon Taylor

Sweet Chestnut and Cranberry Pancakes

Recipe and photo contributed by Jo Hodson of Including Cake. Find more of Jo's recipes at includingcake.com.

Ingredients

4 pancakes

Pancakes:

1/3 cup mix of wholemeal spelt flour

1 tbs ground flax plus 2 tbs hot water

1/3 cup chestnut puree

¾ tsp baking powder

Pinch of salt

½ tsp vanilla extract

½ tsp cinnamon

1 tbs agave (omit if you prefer a more savory pancake base)

Approx. ½ cup milk of choice (more or less to achieve batter that pours thickly)

Topping:

2 large handfuls fresh cranberries

1 tbs rapadura or other sweetener

4 tbs water

Yogurt

Maple syrup

Cinnamon

Directions

To make the cranberry compote, add the fresh cranberries to a small sauce pan along with the rapadura and water. Simmer and stir every minute or so for approximately 10 minutes.

Meanwhile, to make the pancakes, mix the flax with the hot water and set aside to gel for a couple of minutes. Mix the chestnut puree, vanilla, agave, and milk in a small bowl then add the flax mix. Combine the dry ingredients in a separate bowl then add the wet ingredients and mix to get a thick but smooth batter. Add more milk if necessary. Spoon large dollops on a lightly oiled hot frying pan and cook till golden for a minute or so each side.

Serve topped with yogurt and cranberry compote along with maple syrup and a dusting of cinnamon as desired.

Chestnut Moments

**I am the heat of your hearth,
the shade screening you from the sun;**

**I am the beam that holds your house,
the board of your table;**

I am the handle of your hoe,

the door of your homestead;

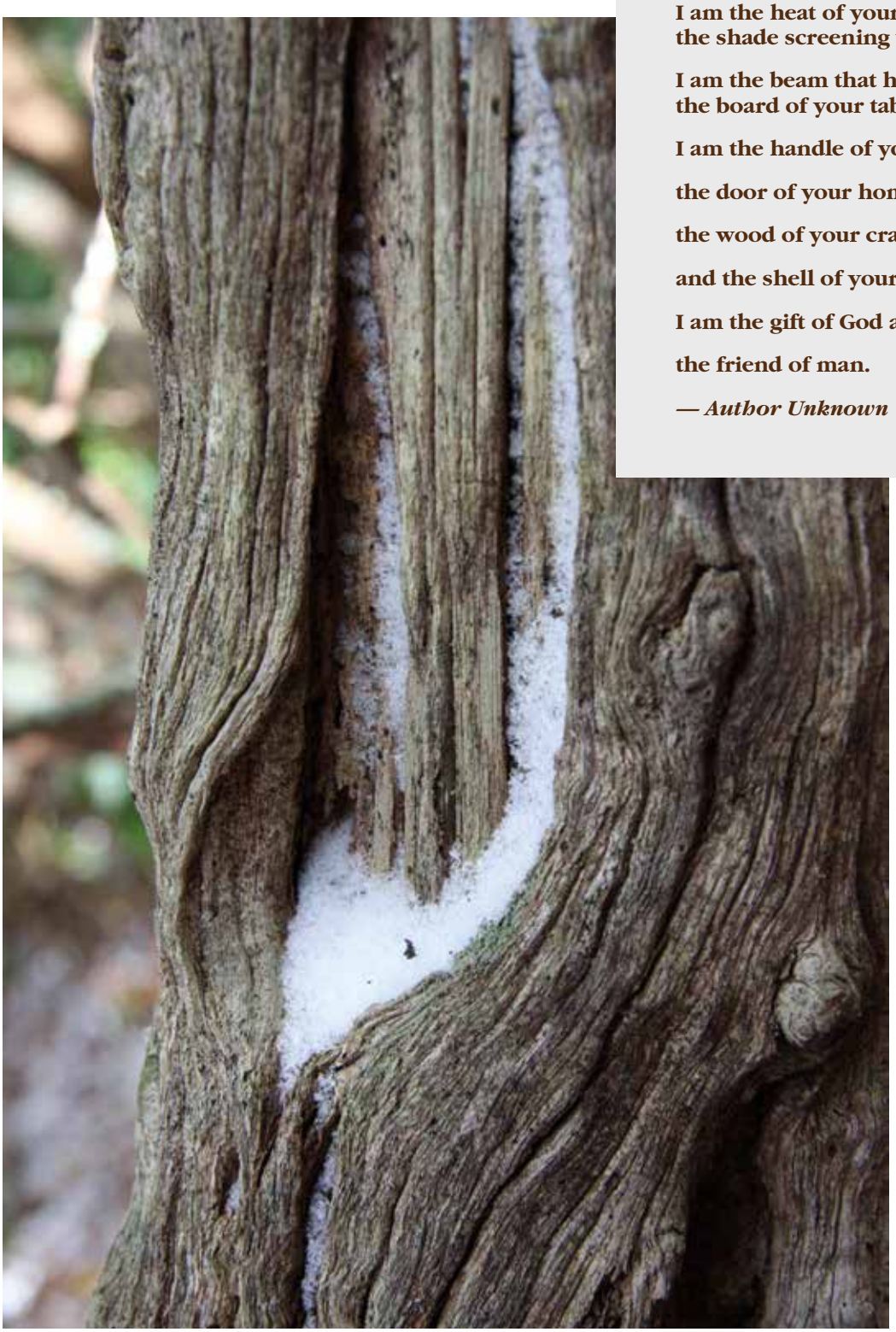
the wood of your cradle,

and the shell of your coffin.

I am the gift of God and

the friend of man.

— Author Unknown



American Chestnut Log in Snow, Brasstown Bald Mountain, Georgia. Photo by Joe Nicholson

http://www.fs.fed.us/r8/chestnut/