SPRING 2021 ~ ISSUE 2 VOL. 35

Chestnut

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American Chestnut Leaf Sculpture ~ Growing a Nursery ~ Chestnut and Daikon Radish ~ Controlled Pollination

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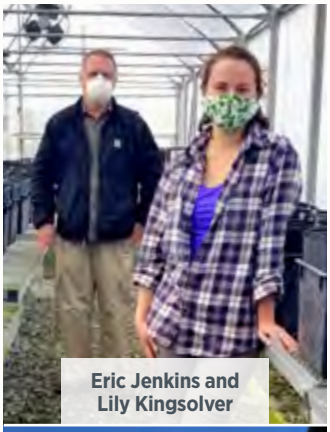
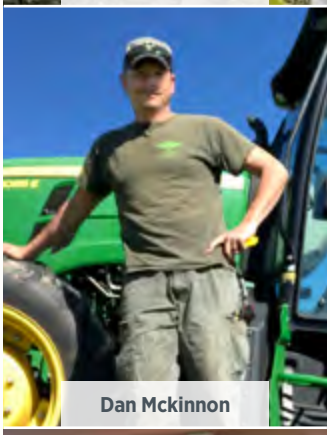
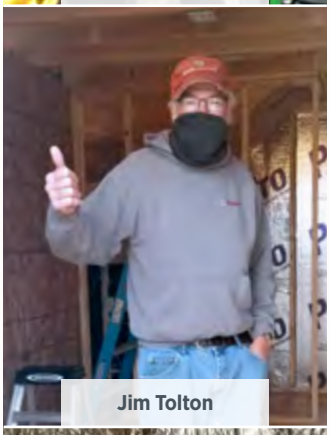
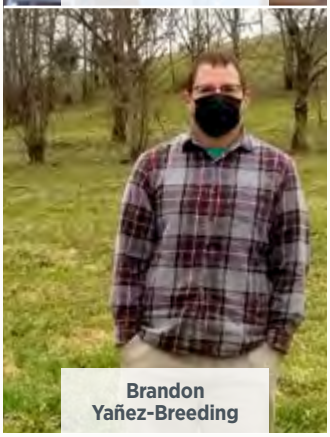

Eric Jenkins and Lily Kingsolver


Dan Mckinnon


Jim Tolton


Brandon Yañez-Breeding

DEAR CHESTNUT FRIENDS,

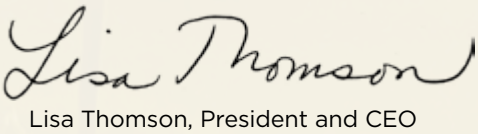
As we begin a new growing season, it is a time of hope and renewed energy. The past year was challenging for TACF, yet we emerged remarkably intact thanks to the generous loyalty of our donors, members, foundations, and public partners. TACF staff and volunteer leaders remained focused, creative, and productive. We could not have weathered this storm without everyone's dedication and support.

It was almost exactly one year ago we instituted COVID safety protocols in order to keep our staff and volunteers safe. In-person meetings shifted to virtual platforms to ensure we kept our community involved and engaged. The popular Chestnut Chat series was born, along with other Zoom-based board and committee meetings to establish and continue close communication with one another.

I would like to pay special tribute to TACF staff and chapter volunteer orchard managers who strived to maintain our field operations. The regional science coordinators traveled sparingly, but made a handful of mission-critical trips. At Meadowview Research Farms, the teams' responsibilities did not often translate to work-from-home scenarios as land management, orchard, and nursery maintenance do not stop because of a pandemic. Please join me in heartfelt thanks to Meadowview staff members (pictured) Eric Jenkins, Lily Kingsolver, Dan Mckinnon, Jim Tolton, and Brandon Yañez-Breeding for their dedication, careful attention to COVID safety, and cheerful flexibility. I recently visited the farm and it was a joy to see the newly culled orchards, greenhouses (with thousands of baby chestnuts poking their heads skyward!), and our new high light growth chamber, all looking fantastic and poised for another growing season.

This summer, we will welcome three new permanent staff members: Tamia Dame, communications coordinator; Vasiliy Lakoba, director of research at Meadowview; and Jamie Van Clief, southern regional science coordinator. Tamia and Jamie will be based in Asheville. We will profile these conservation professionals in a future *Chestnut*. On a sad note, after 11 years of faithful service, we say goodbye to Chief Operations Officer Betsy Gamber on May 28. I have relied on Betsy for her calm leadership, wise counsel, and solid competence that has kept all of us steady in the winds of change. We wish her happy trails as she spends more time with her family and plans adventure travel!

Best wishes,



Lisa Thomson, President and CEO
The American Chestnut Foundation

The American Chestnut Foundation has received a 4-star rating, the organization's highest ranking, seven years in a row.

Chestnut Sunset

The sun sets behind this young American chestnut tree in Spafford, NY. Photo by Andrew Newhouse, winner of TACF's 2020 American Chestnut Photo Contest.

THE AMERICAN CHESTNUT FOUNDATION™

WHAT WE DO

The mission of The American Chestnut Foundation is to return the iconic American chestnut to its native range.

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An Opportunity for Field Work

BRINGING BACK POLLINATION ACTIVITIES

By Sara Fitzsimmons, TACF Director of Restoration

For 2021, an essential and very rewarding field work priority is performing controlled pollinations. When TACF and its chapters first formed, controlled pollinations were a primary activity for volunteers and generated most of the chestnuts planted by partners and members.

Jack LaMonica, VA-TACF Chapter, pollinates dozens of chestnut trees every year. "It keeps me young," he says. Photo by Tom Saielli.

WHY CONTROLLED POLLINATIONS?

From 1989 through 2009, when traditional breeding efforts for the organization were at their height, TACF created over 109,000 control-pollinated nuts (**Figure 1**). The years 2004, 2006, and 2007 showed the highest production from controlled pollinations, yielding over 16,000 nuts each year.

The original intent of TACF's traditional breeding program was to harvest control-pollinated seeds, select the best trees from among them to be planted in seed orchards, and allow those trees to then be open-pollinated. A distinct switch to relying on open pollination can be seen between 2011 and 2012 in Figure 1. Open pollination is much easier than controlled pollination; nature is more efficient than humans in creating chestnuts. In a given year, TACF typically harvests 10 or more times the number of open-pollinated nuts than those created by controlled pollination. Overall, TACF, its chapters, and partners have harvested and distributed close to 1.5 million chestnuts, 1.25 million of which have been created via open pollination.

Even though they are less efficient than open pollinations, there are reasons to continue controlled pollinations, including the following priorities for this summer's work:

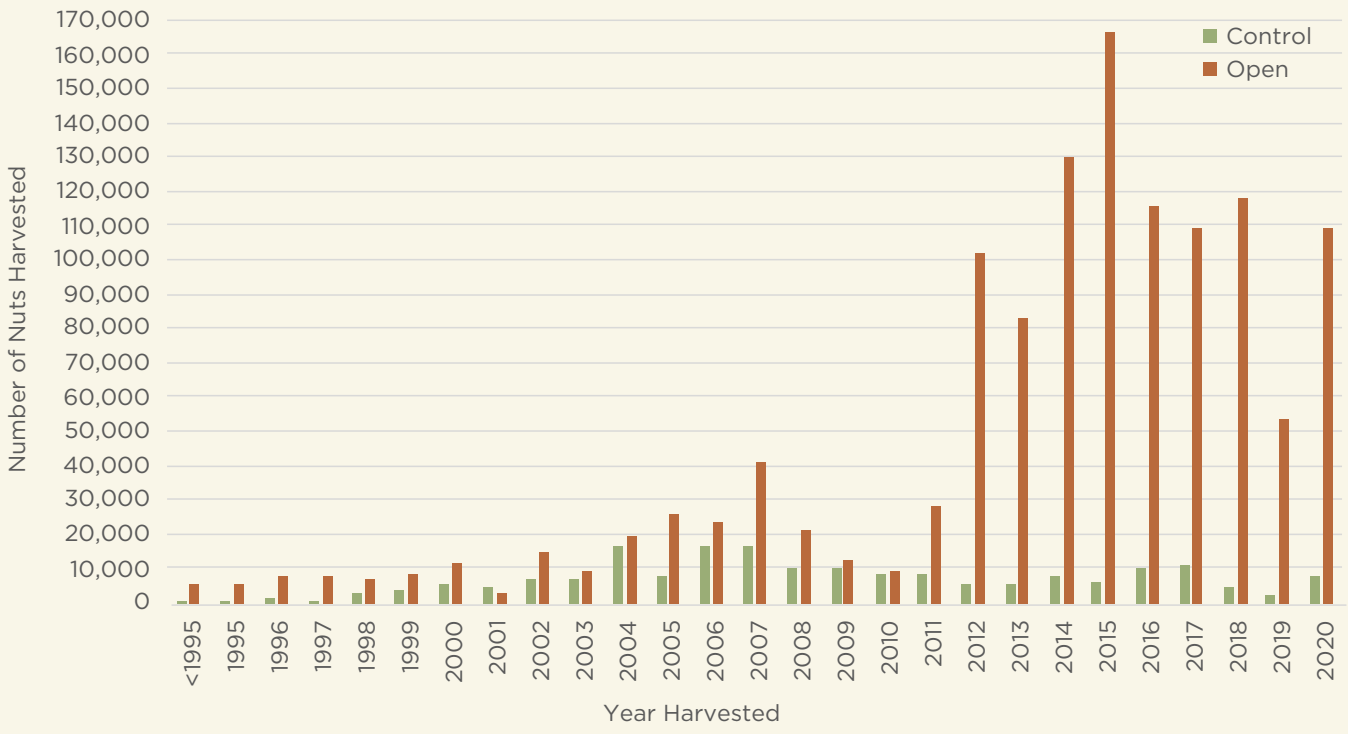
❶ **How Much Do Chestnut Trees Self-Pollinate, if at all?** The traditional thought on this question is that chestnut trees are completely self-infertile. We would like to test this hypothesis experimentally this year. If you have a flowering chestnut tree, this is an easy place to start practicing controlled pollination techniques and help us answer this question.

❷ **F_1 Crosses for Research:** Each year, TACF needs first generation (F_1) hybrids made by crossing Chinese and American chestnuts. F_1 crosses can be finicky: you are bringing together two different species and this is a primary reason TACF has a great need for them. These F_1 crosses are vital for providing baseline information about performance and phenotype for virtually every research study undertaken by the Foundation.

These crosses can be made on any tree that is flowering. You can bag an American, Chinese, Japanese, or other type of chestnut simply to learn the technique. This is one of the easiest areas to get involved.

❸ **Best x Best Crosses of Backcross Trees:** While the backcross breeding program has not yielded the level of resistance hypothesized via open

Figure 1: Total Chestnut Harvests across TACF, Chapters, and Partners



pollination, there is ample room for improvement via controlled pollination. We estimate up to a 25% gain in blight resistance by crossing the best backcross trees among themselves, through a process of recurrent selection. This process can be done via open pollination but will be hastened through controlled pollination.

4 Diversification of Transgenic Chestnuts: At the moment, because of the limitations of regulatory oversight, only a small number of these pollinations can occur (with special permits). Even though volunteers cannot participate in pollinations with the Darling 58 transgenic American chestnut this season, a reason to practice controlled pollinations this summer is to prepare for the distribution and diversification of these chestnuts. When Darling 58 reaches anticipated non-regulated status, seed and seedlings will be an extreme premium and in low supply. Pollen, however, will be easier to obtain and cheaper to ship to cooperators. For members of TACF interested in eventually growing transgenic trees, having flowering advance backcross trees and/or wild-type trees offer an opportunity to own trees for planting on your property.

Participate in Control Pollination Workshops this Summer

Through the summer of 2021, TACF and its chapters plan to hold a series of pollination workshops (timing and locations dependent on COVID guidelines and restrictions). If you have a flowering chestnut, and would like to participate in pollinations this summer, let your local chapter and/or regional science coordinator know! We may be able to send you supplies for reimbursement of shipping costs, or you can plan to join us at one or more workshops on dates to be determined. Announcements of these locations and times will be shared in TACF's e*Sprout* newsletter, chapter newsletters, event calendars, and/or email listservs.

Want to Know More about the Controlled Pollination Process?

Learn how to determine timing and perform controlled pollinations on chestnut by watching the Chestnut Chat #9, July 10, 2020 edition at: **http://bit.ly/chat_pollination_workshop**. Additional information and materials can be found here: **ecosystems.psu.edu/research/chestnut/breeding/pollination**

Peak male flower development with controlled pollination bags (bottom of photo) at Penn State South Arboretum Orchard in 2017. Photo by Stephen Hoy.

2017 Penn State intern Connor McInerney applies male pollen to female flowers before replacing pollination bags. Photo by Stephen Hoy.

PART 1
OF A 2-PART SERIES

Old and New Chestnut Lumber

RECYCLED CHESTNUT AND NEW NATIVE WOOD COME TOGETHER IN A UNIQUE BLANKET BOX

By Chris Becksvoort, ME-TACF Chapter

Back in the late 90s, a friend gifted me with three old wood panels. He said they were the backs of pews form a church in midcoastal Maine, and was told they might be chestnut. It was hard to identify the type of wood under a dark stain and several coats of old, alligatored finish. They stood in a corner, along with a few other odd native woods, that I would eventually get to when I had time.

Fast forward to summer 2020. I set aside a few days to make a blanket box and decided to see what was under that dark finish on those pew backs. I took them into a friend's shop to have them cleaned up on a wide belt sander. We knew that the finish would clog and gum up the belt, so an old worn belt was the answer. After a few passes, the grain became evident. We switched to a newer, finer grit to get a better look. The front sides were virtually clear on most of the panels, while the back sides had a few round patches.

Back in my shop, I noted that the wood was quite a bit softer than ash, and after consulting Bruce Hoadley's Identifying Wood: Accurate Results With Simple Tools (Taunton Press, 2000), I was sure these panels were indeed American chestnut.

I trimmed and sized the panels, selecting the best ones for the box sides, and one with lesser clarity for the bottom. Dovetailing the corners was a real pleasure. The wood was much softer than ash, but not at all brittle, considering its age. The sides were grooved to accept the bottom, and the chest was glued up and clamped. I decided on a black walnut base for the chest, as well as for the molding around

Front view of the blanket chest, with the church pew panels and walnut trim. All photos by Chris Becksvoort.


Hand forged hinge by Dereck Glaser.


Dovetailed and grooved panels ready for assembly.


Walnut dovetail molding to keep the top flat and allow for wood movement.


Dovetail groove in edge of the new chestnut top.

the top. The only problem was that I did not have enough wood for the top. Checking with several wood recyclers was a dead end. All available chestnut lumber was wormy, knotty, and had nail holes and stains; not fitting for this chest. I set it aside to look for other options.

When a customer and friend, Bob Seymour, came to pick up his chairs I mentioned my dilemma, and he had the answer. Bob is a retired Silviculture professor at the University of Maine, and said he knew of a chestnut in Penobscot County that had been cut a while back, sawn into planks, and dried. He offered me one plank at 6/4 x 11 x 97. Perfect. The plank was delivered a few weeks later, carefully cut in half, glued together, and sanded to about one inch. In the meantime, I had Dereck Glaser, a blacksmith in Monmouth, ME, make a set of split end blanket box hinges.


This three-quarter view highlights the new, locally harvested chestnut top.

I needed the extra thickness to incorporate dovetails into the ends to stabilize the top, without adding interior battens. It was a method I had used on previous blanket chests, and it worked well. The surrounding walnut molding and base were a beautiful contrast to the lighter chestnut.

With antique Maine church pew sides, a brand new local chestnut top, two coats of oil/spar varnish mix on the outside, and a 2020 silver dollar hidden in the chest, this was truly a one of a kind, never to be reproduced chest. Because it was such a unique piece, I raised the price by $1,000. Since Bob Seymour supplied the new wood for the top, and had followed the process, he agreed to buy it at the higher price, but only if I promised to donate the extra $1,000 to The American Chestnut Foundation. What a great idea. It was certainly a win, win, win situation for all!

Part 2 will cover the history of the special tree used to help build this blanket box.

BIO: Chris Becksvoort has run a small furniture shop in Maine for more than three decades. He is a contributing editor to *Fine Woodworking* magazine, and author of *The Shaker Legacy, With the Grain*, and *Shaker Inspiration*. After creating over 900 pieces, Chris is now retired.

American Chestnut Leaf Sculpture seen from aerial drone image. Photo by Frank Sauer.

American Chestnut Leaf Sculpture

A COLLABORATION WITH FRIENDS OF PRINCETON OPEN SPACE

By Susan Hoenig, Eco-Artist

On May 13, 2020, ArcheWild, a landscape restoration firm, planted eight 100% native American chestnut trees for Friends of Princeton Open Space in its 18-acre forest restoration project at the Billy Johnson Mountain Lakes Nature Preserve in Princeton, New Jersey. The trees, which were six feet tall when planted, are third-generation blight-resistant specimens raised from orchard-grown seed. The eight chestnuts planted at Mountain Lakes were placed within the eight-foot enclosure fence that protects them from deer browse.

On the other side of the fence from the chestnuts, I created a leaf sculpture on the forest floor, using river stone to simulate the leaves of the American chestnut (*Castanea dentata*). The five leaves are oblong lanceolate with coarsely serrated edges, one leaf blade per stalk. The leaf at the apex goes beyond the fence. Volunteers assisted in gathering large, pointed stone to compose a 'breaking wave' pattern characteristic of this species of chestnut.

'Art can be a vehicle to engage people in nature.'

The design of the American Chestnut Leaf Sculpture is based on a watercolor painting I created to imagine how the leaves would be situated. On site, I cleared the invasive plants, then laid out sticks and branches to demarcate the five leaves with straight, lateral veins. A hard-working crew helped transport stone from the Belle Meade co-op to the site. The American Chestnut Leaf Sculpture was assembled, drawing attention to the beauty of the restoration project.

The prototype for my collaboration with Friends of Princeton Open Space began in 2016. For many years, I walked the trails of the Bunker Hill

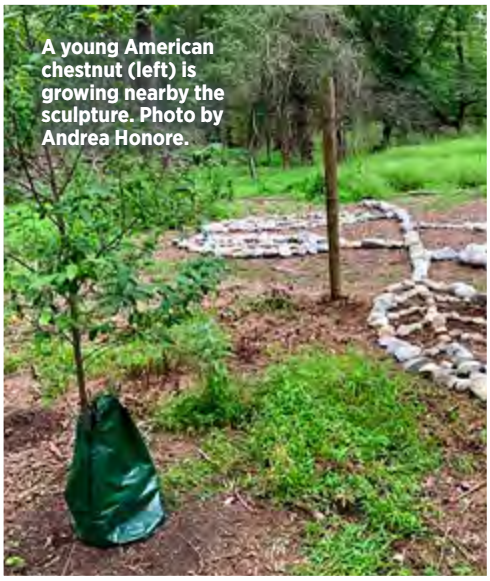
Environmental Center at Graeber Woods Preserve in Franklin Township, New Jersey. I love to observe wildlife and envisioned how an art project could draw attention to the importance of native trees. I created eleven "Ecological Leaf Sculptures" situated beneath the trees they represent, outlined with local river stone, basalt, glacial boulder, diabase, goose egg stone and shale. Red oak, bigtooth aspen, American beech, black birch, tulip poplar, shagbark hickory, red maple, sassafras, flowering dogwood, Liberty elm, and black walnut leaf sculptures, eight to thirty-five feet in diameter, are interwoven within the understory of the forest, alongside 96 acres of trails that meander through forest, meadow, stream and marsh. Please view photos on my website: www.susanhoenig.com

I lead walking tours of the leaf sculptures at Graeber Woods and Mountain Lakes Preserve for students, professionals, and people who have never set foot in the forest to see the relationship between themselves and the environment that sustains them. Along the trail, each leaf sculpture is a focus, to learn about what goes on within the habitat of each sculpture and the surrounding area. This experience raises firsthand awareness of forest ecology and a deeper understanding and appreciation of nature. As a result, the comprehension of habitat loss, climate change, and ecosystem degradation is not just an abstract thought, but becomes a lived experience.

At Mountain Lakes Preserve the restoration of the American chestnut is a reminder that there is hope and renewal for the natural world. My ambition is to arouse awareness, and to re-envision ecological relationships and new possibilities for co-existence and sustainability. We must think in terms of connectivity; the trees benefit us but how can we benefit the trees?

Watch this brief seven-minute documentary about the creation process of this collaborative project:

http://bit.ly/chestnut_leaf_sculpture



A young American chestnut (left) is growing nearby the sculpture. Photo by Andrea Honore.

Susan Hoenig stands by her sculpture as she poses for this photo taken from a drone. Photo by Frank Sauer.

BIO: Susan Hoenig connects earth and art to make visible the relationship between habitat, plant, and animal life. She studies the evolutionary impact of the forest understory and leads walking tours of her ecological leaf sculptures. Susan makes black walnut ink during mast years, collecting nuts, seeds, and acorns to print in forest compositions. Since 2006, Susan has worked at the Featherbed Lane Bird Banding Station in the Sourland Mountains of New Jersey. This experience has greatly inspired her to learn about what a healthy habitat means for the forest ecosystem.

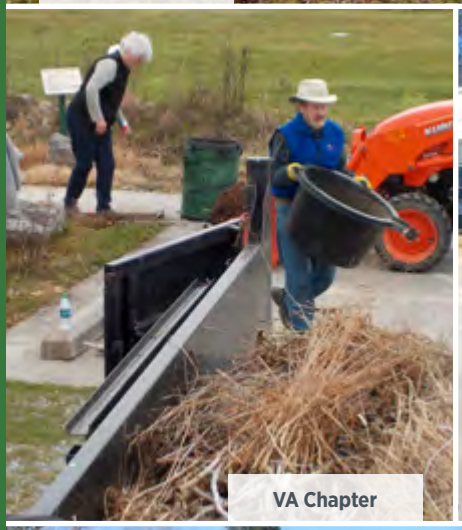
The true meaning of life is to plant trees, under whose shade you do not expect to sit.

~ Nelson Henderson

TACF's thousands of volunteers are the perfect representation of Henderson's quote. Their commitment to planting trees goes beyond the waiting, to a deeper unknown. They grow and care for one of the most revered, yet threatened, tree species in this country – the American chestnut. It is their steadfast dedication and determination that defines the message of hope in this iconic tree's future.

In honor of 2021 National Volunteer Week, which took place April 18-24, TACF proudly recognizes the multitudes who have come together for years, turned decades, to participate in our singular mission to rescue this extraordinary tree. It is the hands and hearts of these selfless do-gooders that make the difference, by planting trees under whose shade they do not expect to sit.

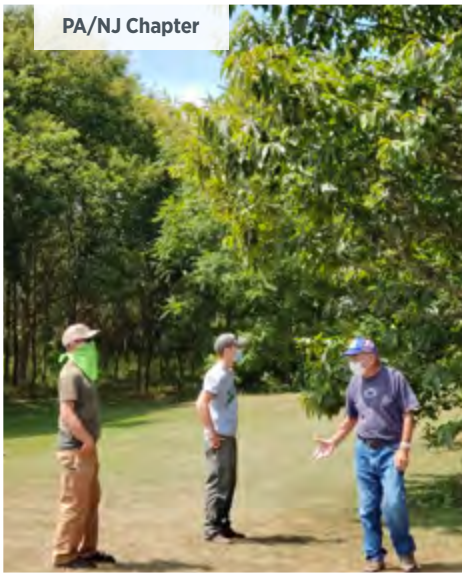

VT/NH Chapter


VA Chapter


Carolinas Chapter


GA Chapter


MD Chapter


PA/NJ Chapter

Chestnut Orchard Volunteers

RECOGNIZED AT SPIRIT OF NH VOLUNTEER AWARDS

By Carrie Deegan, Society for the Protection of New Hampshire Forests and Kendra Collins, TACF New England Regional Science Coordinator

Seed orchards are an important part of TACF's chapter breeding programs, and often finding the right site and the right partner is a challenge. With a mutual interest in partnering on a chestnut restoration project, the VT/NH-TACF Chapter determined that the Society for the Protection of NH Forests (Forest Society) was a good fit to host such a planting. Seed orchards require a site that is accessible and appropriate for growing an acre or more of densely planted chestnut for 30+ years. In addition, due to the more agricultural nature of these plantings, finding a partner to host who can assist with the day-to-day maintenance is often a key to success. Forest Society properties are secure for the long-term, and their staff and volunteer network is well-suited to help manage this more intensive project.

Orchard volunteers gather next to newly installed signage designating the Tom Rush Forest Chestnut Orchard, fall 2020. Photo by Gabe Roxby.

Chestnut seedlings growing in the Tom Rush Forest Orchard, fall 2019. Photo by Carrie Deegan.

Volunteers Gary Samuels (left) and John Roxby measure chestnut seedling heights, fall 2019. Photo by Carrie Deegan.

The best chestnut orchard site the Forest Society had to offer was in Deering, NH, a part of the state without many active VT/NH-TACF members nearby. While this might normally be a considerable obstacle, the Forest Society tapped into their extensive volunteer network to develop regular support for the orchard. Field Forester Gabe Roxby and Community Engagement & Volunteers Director Carrie Deegan worked with TACF New England Regional Science Coordinator Kendra Collins to learn the needs of the orchard and, from there, assembled a dedicated crew.

In May 2019, TACF staff and volunteers joined with Forest Society staff and volunteers for the initial planting at the Tom Rush Forest in Deering. While VT/NH-TACF volunteers were able to travel some distance to help kick off the new orchard, it was not realistic for them to take on regular upkeep. Thankfully, over the past two years, a small group of volunteers have worked to keep the nearly 600 chestnut trees planted, healthy, and thriving. Although the work, which includes a lot of weeding, watering, and mowing is not the most glamorous, it is the group's commitment that makes their job all the more impressive. "It's pretty easy to get a lot of people to come out for something fun like planting chestnuts," Gabe Roxby says, "but those who take on the drudgery of ongoing maintenance work are the real heroes. That work is vitally important to the success of this project, and we just could not do it without these volunteers." From VT/NH-TACF's perspective, having a seed orchard with a built-in maintenance team frees up their limited volunteer resources to focus on other orchards and initiatives, which is a true gift.

Volunteers with The Forest Society and VT/NH-TACF Chapter work together to install the initial planting at the Tom Rush Forest seed orchard, spring 2019. Photo by Kendra Collins.

The group's ongoing effort was not lost on the Forest Society and other organizations, however. On December 9, 2020, they were recognized for their remarkable service at the 17th Annual Spirit of NH Awards, livestreamed from the Bank of NH Stage in Concord. Organized by the nonprofit Volunteer NH, the event "recognizes those who go above and beyond the call to serve throughout the Granite State, shining a spotlight on the often unsung heroes among us in front of an audience of their families, friends, colleagues, and the greater community."

Most of the chestnut orchard volunteers are members of the Deering Conservation Commission (DCC), and some are also volunteer land stewards who help monitor the many Forest Society conservation properties in Deering. "We were proud and happy that the Forest Society decided to place the chestnut nursery in our town," Gary Samuels, chair of the DCC, says. "We took on care of those little seedlings as our personal responsibility… [and] our own adopted treelets."

COVID-19 protocols and precautions made tasks at the orchard a bit more challenging but the volunteers, armed with masks and hand sanitizer, persevered and got the work done. They even managed to have a bit of fun while doing so, including at least one physically distanced morning weeding session with mimosa beverages! "We take a fair amount of pride in seeing the success of the project," Samuels notes. "We also accept a responsibility for ensuring that these young trees have a part in reestablishing some sort of presence of American chestnut in our eastern forest."

The ultimate goal of the seed orchard project is to produce trees that are resistant to the blight. Over time, these blight-resistant American chestnuts would eventually be reestablished in New Hampshire's forests, in addition to other forests along the Atlantic seaboard. The Tom Rush Forest orchard project is still in its infancy, with as many as 2,400 chestnut trees still to plant and tend over the next three decades, but the volunteers are driven by what they can accomplish now. "I may not live to see the end of this experiment," volunteer Kay Hartnett says, "but I'm okay with that." That sentiment sums up the definition of selfless volunteer service and is something the Forest Society and TACF are truly grateful for.

MEADOWVIEW RESEARCH FARMS

Growing a Nursery

By Lily Kingsolver, TACF Meadowview Nursery Manager

Spring is my favorite season on the farm. The Meadowview hills are returning to green, the days are getting longer, and it is time to wash a few thousand pots. Okay, that may not be anybody's favorite part of spring, but it is one of those not-so-glamorous jobs that is so important to TACF's mission. There are plenty of those, and to ready our chestnuts for their experimental destiny, we spend a lot of time carefully preparing and maintaining the nursery space where they will spend their first season.

Beyond chestnut blight, there are a plethora of organisms that can infect, eat, or out-compete a seedling chestnut. To limit that potential, we sanitize pots and tables with Physan 20, a gentle chemical which kills bacteria and fungi, but will not harm other organisms. Pot washing is an odious task – ask any chestnut grower – and takes many days of soaking and scrubbing to clean as many as we need, but is a good this time-consuming task provides a chance to reflect on the things we do for the love of chestnuts.

After sanitizing, we prepare to sow. American chestnuts like a slightly acidic substrate with good drainage (chestnuts are not fans of soggy roots) so we use a combination of organic materials and porous minerals. We fill the pots and sow the seeds just under the growing medium, flat side down. With a little warmth and watering they will send down a long root called a radicle, so it is important to sow in vessels that can accommodate that immediate growth.

Now our seeds are settled, working on their first leaves and acting the way trees are supposed to act. The next task is to convince predators that our baby chestnuts are not the easy meal they appear. To do this we rely on integrated pest management (IPM), a system of combining biological, physical, and chemical processes to manage the risks of traditional pest control. We

Washing pots to prepare for sowing.

Seedlings shortly after germination.

Greenhouse full of seedlings.

Nasturtiums growing in greenhouse.

hope to create an approximated ecological system and support it with as little invasion as possible. One way we do this is by breaking up the monoculture with companion planting. Companion plants usually either attract predator insects, draw pests away, or both. For example, we grow nasturtiums – an herb garden staple and a spicy addition to salads, soups, and aphid diet. They are a "trap crop," drawing aphids away from our chestnuts and taking the brunt of the damage. Nasturtiums also attract hoverflies, a predator of aphids. In this way we encourage a natural predatory system by only having planted flowers. Nasturtiums are also notoriously hardy growers, and I never complain about some color in the greenhouse.

Additionally, we have birds to thank for being part of our IPM plan. We are situated in an incredibly diverse region of Appalachia, and the pest management often comes to us, as in the case of our resident American kestrel. Our smallest native raptor, the American kestrel is cute as a button and a fierce hunter. Kestrel prey varies widely but ours has found a nearly inexhaustible source of beetles – the greenhouse. By allowing her to live on site, we have seen a significant reduction in the number of invasive Japanese beetles on our trees. Similarly, our greenhouse became home last spring to a family of song sparrows, who tucked their nest into a pot. While these fervently territorial visitors had complaints about my presence, they had no concerns about food availability. Song sparrows eat seeds but also insects, especially when feeding hatchlings. This couple had a predator-free nest and a month of all the aphids they could eat. There is much to be said for befriending beneficial predators.

There is no perfect system for cultivating functionally extinct plants, so all we can do is pay careful attention to what these little ones need. They are both frustratingly fragile and amazingly resilient, and I am lucky to be their babysitter until they set out on their missions: germplasm conservation, inoculation, and many others. In a greenhouse filled with trees, flowers, bugs, and birds, it is one of the best babysitting gigs I have ever had.

FREE ONLINE AMERICAN CHESTNUT COURSE

Have you been wanting to brush up on your knowledge of American chestnut or learn more about this invaluable tree species?

Stacy Clark (pictured), research forester with the U.S. Forest Service Southern Research Station, worked with a number of organizations, including The American Chestnut Foundation, to develop this free, interactive course. It is designed for everyone, from the general public to forestry professionals, through a simple registration process. Participants will be introduced to the basic ecology and silvics, historical significance, and the demise of this species that once occupied 200 million acres in the eastern United States. The course contains a glossary and links to dendrology tables, external webpages, and published scientific papers. A certificate of completion available at the end of the course qualifies for 1 CFE credit with the Society of American Foresters. Please visit this website (srs.fs.usda.gov/products/courses/#chestnut) or contact Stacy Clark (stacy.l.clark@usda.gov / (865) 318-8391) to learn more and get registered.

Marty and his dad in front of their garden, about 1963.

Marty Cipollini

CHESTNUT HUNTER; BRIDGE BUILDER

By Scott Carlberg, Carolinas-TACF Chapter

"Chestnuts and mushrooms, they are part of my ancestry. Part Italian, and the way I grew up with my dad, Don Cipollini, Sr." TACF volunteer Marty Cipollini grew up on what was essentially a subsistence farm in a tiny western Pennsylvania coal-mining town.

"As a boy, we had large gardens that helped support our family, and I played a big part in keeping them looking good. We grew vegetables, had Chinese chestnuts from way back. We also had chickens and some cattle, not a lot because it was only a few acres. My mother would sometimes preserve hundreds of jars of tomatoes a year."

Marty finds a chestnut tree along the Danube River. Photo by Kathy Patrick.


We are
growing in
a growing
season.

THE AMERICAN CHESTNUT FOUNDATION®

It is an exciting time of year as spring exhibits growth and new beginnings. TACF is also growing, and we are grateful for your support toward our on-the-ground, practical needs which are essential for mission success. Your contribution to our 2021 Spring Appeal will allow us work more efficiently by investing in better technology as we continue to expand. In past appeals your generosity has provided much needed infrastructure upgrades such as greenhouses, farm vehicles and equipment, and IT enhancements. Because of you, we can now focus on accelerating the science by utilizing commercial drones and pilots to locate wild-type American chestnuts, enhancements to robust field data collection and *dentata*Base, and replacing aging vehicles or equipment to ensure staff and volunteers work safely. Your thoughtful donation will go directly to these urgent needs!

Don Cipollini is now 86, still in Pennsylvania with his wife Betty, and tends five chestnuts from Georgia himself. He has shared pollen with the GA-TACF Chapter for research.

Father-son walks in the woods often became chestnut tree hunts. "We would sometimes try to clear around trees as a means of helping them survive and reproduce," says Marty. "He told me how chestnuts had vanished, why we want to save them."

Lessons of those walks stuck. An adage that Marty proved is, "A mind that is stretched by new experiences can never go back to its old dimensions."

"I kept the chestnut story in mind as I pursued my career in evolutionary ecology," he says. "As the Dana Professor of Biology at Berry College, I teach a variety of courses in the fields of biology, ecology, biodiversity, and conservation."

In Georgia's Chapter, "My main role, since our first breeding attempts in the state in 2005, has been as the science coordinator for the chapter – the program facilitator and main liaison with TACF science staff." He has also been treasurer, database manager, website manager, handled social media, and – this is special – Marty and his students have grown almost all the trees for the chapter at Berry College's nursery. Marty's wife, Kathy Patrick, is the current chapter president, and his son and daughter have also participated.

The Cipollini family is all-in on chestnut restoration.

Marty is also grooming the next generation of professional scientists. "In addition to involving my students year-round on the chestnut project, I have also directed their restoration work on the Berry College Longleaf Pine Project, curating our herbarium and arboretum, and finishing up a more than 30-year study on sexual dimorphism in Spicebush (*Lindera benzoin*)."

Berry College's campus (just over an hour drive northwest of Atlanta) is an ecologist's dream because it is the largest college campus in the world (26,000 acres), and aside from the college buildings there are thousands of acres of native and commercial forests, hay fields, and animals.

Marty's whole workplace is his lab. His longleaf pine project will re-establish a fire-maintained mountain longleaf ecosystem on Lavender Mountain, north of Rome, Georgia. The mountain is on the college's campus and harbors some of the last remaining stands of old growth longleaf pine in the world.

Chestnut burs at the Berry College backcross orchard, fall 2016. Photo by Marty Cipollini.

Typical family photo when there were five Cipollini kids. A cornucopia of vegetables from the garden in the early 1970s. Left to right, Liz, Marty (holding Henrietta one of the hens), Priscilla, Bridget, and Susie. In the future, Don, Jr. and Colette would join them.

"I was harvesting chestnut burs in our Berry College orchard using a long pruning pole. One bur fell and hit me in the face. I had spines in my face for weeks afterward."

Biodiversity is the big reason for the project. Longleaf pines are less susceptible to regional diseases and pests, including the southern pine beetle. Also, healthy stands must be maintained by frequent prescribed burns to reduce the chance of devastating wildfires while enhancing the biodiversity of flowering plants, grasses, and other components of the biota.

Human growth is also a factor. "Our project involves students and community members in the conservation process. They learn about the advantages of longleaf pines and proper fire management," says Marty.

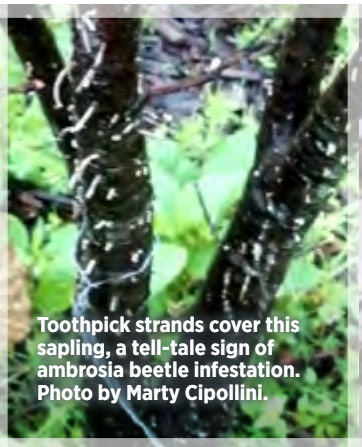
Students are involved in other projects, too. About seven years ago, all trees on the main campus were mapped and inventoried as part of the college's arboretum project. "Student researchers and I collected records for more than 1,400 trees from some 100 species and named varieties," he says. The College can now track the trees and ensure a healthy urban and field forest.

TACF has a thoughtful researcher and conservator in Marty's work with the GA Chapter. "Three things have presented big challenges to our work in Georgia. First, extreme rarity of flowering or nut-bearing American chestnuts in the state, which renders our breeding program difficult. Second, persistent Asian ambrosia beetle attacks in our research orchards. Third, widespread contamination of field sites with *Phytophthora cinnamomi*, the cause of lethal Phytophthora root rot (PRR). Although some of these issues presented opportunities – for instance, we have long been involved in efforts to select for PRR resistance in our breeding program – at times it has been a bit disheartening."

The American chestnut is moving, too, and Marty is tracking it. Actually, the Georgia climate is changing. "In Georgia we are concerned about conserving southern chestnut genotypes, which have adapted to the conditions in the south. Those conditions are migrating northward and so will the range of the chestnut."

Marty is a bridge from theory to real-life. "Much of my research had generally been rather theoretical – basic research – asking questions because of a desire to know and understand. But I had always wanted to be involved in projects that have directly beneficial purposes – applied research. So, when the opportunity came to help the newly formed GA Chapter restore the American chestnut to the wild, I was more than happy to help out."

Using a bucket truck to harvest burs from a wild American Chestnut at Springer Mountain, GA, 2019. This effort yielded just one viable seed. Photo by Marty Cipollini.



Toothpick strands cover this sapling, a tell-tale sign of ambrosia beetle infestation. Photo by Marty Cipollini.

Blackened root system of a tree seedling infested with *Phytophthora cinnamomi*. Photo by Marty Cipollini.

Marty stands by a pollinated chestnut tree in Berry College's backcross orchard. Photo by Kathy Patrick.

Chestnut and Daikon Radish:

A UNIQUE AND BENEFICIAL PLANTING PARTNERSHIP

By Tom Saielli, TACF Mid-Atlantic Regional Science Coordinator

By late winter the radishes will die back and the shoots and roots will add rich compost to the now-broken soil. Photo by Dave Gill.

Get a handle on hard-packed orchard soils while adding valuable nutrients by planting daikon radish. Radishes can alleviate soil compaction, scavenge nutrients, provide soil cover, and suppress weeds. Unlike the more popular small red radish, daikon radish is a pungent, white, carrot-like vegetable that grows up to 12 inches in the ground and several inches above, and the greater fibrous root system can extend several feet deep, breaking up hardpans and clay soils, adding nutrients that will give any orchard a boost. Radishes are cool-season crops that grow fast, forming a dense groundcover in the fall and die back when temperatures hit freezing, leaving the soil loose and providing nutrient-rich compost to feed the incoming chestnut root system (Gruver, et al., 2013; Chen and Weil, 2010).

In fact, research at the University of Maryland has shown that radishes planted in late summer can use their deep root systems to scavenge nitrogen (N) from both the topsoil and deeper soil layers, storing the N in their large tap roots and shoots (Dean and Weil, 2009). Radishes are also excellent at capturing and storing phosphorous (P) and potassium (K) in roots and shoots. According to White and Weil (2011), daikon radish roots commonly contain elevated levels of soil P (0.5% P) and more than 4% K has been measured following radish cover cropping, particularly within 1–1.5 inches of radish root holes.

As an additional benefit, radishes can form a dense bed of shoot biomass that can suppress weed growth during late summer and early into the following season. Best when planted early (5+ weeks before first frost), the thick mat of dead leaves will suppress weeds into early April. The benefits wear off by summer, but the early season weed suppression can give orchard managers a leg up on vegetation management.

To ensure successful establishment and decent growth of your radish cover crops, take the time to prep your rows properly by following these steps:

1. Daikon radish should be planted by direct seeding in early August. The radishes will continue to grow until a hard freeze, but don't delay planting, as radishes need time to get big. It is not recommended that you plant your radish in early spring, since that will lead to more shoot biomass versus root biomass, and the plants will bolt early and go to seed.

MD-TACF Chapter volunteers prep rows to plant radishes by tilling, raking, and spreading seed. Photo by Dave Gill.

In Maryland, every new row of chestnuts to be planted in the spring, get pre-planted first with daikon radish cover crops. Photo by Dave Gill.

❷ Before sowing seeds, mow and/or herbicide the rows.

❸ Rototill the rows, then use a rake to remove clods of grass, rock, etc. and smooth out the rows. Do not toss seeds directly on hard soils or you will get suboptimal results.

❹ Draw two troughs down the center of each row, 6-8 inches apart and about 1-inch-deep, then drop seeds into each trough, about 6 inches apart. Alternatively, spread the seeds lightly over the entire row by hand. Do not overseed or the radishes will become overcrowded and the roots will not have room to grow as well. Aim for no more than 4-5 plants per square foot.

❺ Once seeded, rake over to cover with a thin layer of soil.

❻ Optional: Adding fertilization when sowing seeds can aid in more rapid growth of your radishes.

❼ Plant chestnut seeds or seedlings early in the spring after radishes winter-kill or even in autumn while radishes are actively growing. You can also add radish seeds around existing chestnut seedlings.

Daikon radish cover crops can do wonders for your orchard – improve success rates, limit chemical amendments, and minimize some of the early season maintenance requirements. Ultimately, the radishes will compost back into the soil, adding valuable nutrients, but if you are feeling adventurous, harvest a few for the dinner table. Some folks eat them raw. They can be delicious in soup, and are often used to make kimchi! Even if daikon radish doesn't make it to your dinner plate, try planting them in the orchard. You may find they are the secret ingredient you have been looking for.

Rewards for a hard day of fieldwork – Maryland Chapter volunteers pick a few radishes to take home after helping at the seed orchard.

ACKNOWLEDGEMENTS

Thanks to Dave Gill, MD-TACF Chapter and Lynn Garrison, KY-TACF Chapter for helping raise awareness about the value of daikon radish as a soil amendment, and for providing scientific insights and scholarly papers, as well as their review and participation in this article.

Dave is well informed about the benefits of radishes as a cover crop. His brother Stanton Gill is a principal agent at the University of Maryland College of Agriculture and Natural Resources, where research on daikon radish is ongoing. Dave has devoted years of independent research to using daikon radish as a cover crop.

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A BRIEF HISTORY OF Camp Rhododendron AND THE CIVILIAN CONSERVATION CORPS

By Mark Double, WV-TACF Chapter President

Franklin Delano Roosevelt was elected the 32nd president of the United States in 1932. His predecessor, Herbert Hoover, failed to deliver on his 1928 promise that "We in America today are nearer to the final triumph over poverty than ever before in the history of any land[1]." Hoover made attempts to turn around the economy, but it was no use. The economy was in ruins, falling faster with each passing day. Millions of workers lost their jobs, but Hoover was a moderate Republican and he thought the responsibility to care for those suffering from hunger should come from local government[2]. Leaders of the Democratic Party made the most of the situation. They accused Hoover of not caring about the common man. They said Hoover was willing to spend money to feed starving cattle for businessmen, but not to feed poor children[2]. Tired of seeing the economy fall to its lowest level in the history of the nation, Americans voted in large numbers for Roosevelt; he carried 42 states[2,3].

FIGURE 1. The overlook that offers a view of the Cheat River. All photos by Mark Double.

During the campaign of 1932, Hoover said: "We are at the end of our rope. There is nothing more we can do." And across the country, Americans waited – worried, uncertain, afraid. What would the new president do[4]? The Civilian Conservation Corps (CCC) was the first of the New Deal agencies created in 1933 by President Roosevelt to address the problems of the Great Depression[5]. The CCC was designed to put the nation's unemployed youth to work on reforestation and similar projects throughout the country. Members had to be males between the ages of 18 and 25, unmarried, and employable, although the rules were later relaxed for war veterans[5,6]. Enrollees were selected on the basis of family need and were paid $30 per month for their work, with $25 of each pay sent home to the enrollee's family[6]. The boys were provided with food, clothing, shelter, medical needs, and work training. Each CCC camp – made up of a company of 200 men – was administered by military and naval officers, with forest or park project supervisors teaching the enrollees forest and land conservation skills[5].

West Virginia boasted 65 CCC camps and two summer camps housing 55 different companies. The men worked on: reforestation and conservation projects; fought forest fires; built shelters, fire towers, roads, and trails; strung electric and telephone lines; and planted thousands of trees[7]. Educational activities also played a major role in the men's daily routine. Camps were furnished with libraries, and classes were held to teach enrollees vocational skills and provide basic educational needs, as high school and college classes were available. The CCC was a great opportunity for mobility, because a lot of the men never got out of their hometown before. Some didn't know how to read and write, and they learned how in the CCC[7].

More than 55,000 men participated in the CCC in West Virginia between 1933 and 1942[7]. While in the CCC, the men essentially functioned like they were in the military: they wore uniforms, had inspections and woke up to reveilles. About 60 percent of CCC men served in World War II. Gen. Mark Clark said after the war that "we didn't realize it, but the CCCs were a wonderful training program to train these guys to be non-commissioned officers[7]".

One of the CCC camps in West Virginia was Camp Rhododendron at Cooper's Rock State Forest, located 12 miles east of Morgantown. It is the largest state forest in West Virginia with 12,713 acres[6]. Cooper's Rock State Forest gets its name from a legend about a fugitive who hid from the law near what is now the overlook. A cooper by trade, he resumed making barrels at his new mountain hideout, selling them to people in nearby communities. He lived and worked in the forest for many years[8].

During the early to mid-1800s, the forest was the site of several iron furnaces that took advantage of iron ore deposits, limestone, and abundant timber to fuel the furnace fires. When the iron industry declined, the forest's remaining trees were cut for telephone poles, railroad ties, and shingles[8]. By the mid-1930s, the southern Appalachians had been heavily logged and the dominant hardwood, American chestnut, had succumbed to the chestnut blight fungus.

Construction work at Cooper's Rock began in May 1936 with some road and trail development. By the spring of 1937

FIGURE 2. One of two pavilions at Cooper's Rock built by the CCC in 1937.

FIGURE 3. The precipitous rock face that challenged the CCC men during construction.

the men were at work on the permanent structures in the main overlook area (**Figure 1**), using logs from American chestnut killed by chestnut blight[6]. To supply logs and lumber for the various structures, the CCC men had their own logging operations. The camp owned a small tractor to facilitate skidding logs[6]. Many logs were peeled and used for log-cabin-type construction. Others were sawn, on contract, by a local mill that used horse teams for skidding[6]. The camp was occupied for a total of five years and their projects included road and trail development, picnic shelters (**Figure 2**), staff residences, fireplaces, water foundations and other recreational amenities. Eleven of these structures, including the rustic picnic shelters near the overlook, have been included on the National Register of Historic Places[9]. The structures, built with American chestnut logs between 1937-1942, are still in use today. The precipitous overlook (**Figure 3**) provides a magnificent view of the Cheat River (**Figure 4**) and draws visitors from across the country who marvel at the beauty of the Appalachians. American chestnut provided the CCC men a sense of purpose, spurred the economy from the Great Depression, and provided a testament to a long-lasting, valuable species.

FIGURE 4. View of the Cheat River from the Cooper's Rock overlook.

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FOREST DENIZENS, LIKE HUMANS, DESERVE

The Best Remedy Science Can Offer

By Mike Aucott, PA/NJ-TACF Chapter and Department of Chemistry at The College of New Jersey, and Rex Parker, Research and Development, Bristol-Myers Squibb (retired)

If approved for public distribution, pollen from genetically engineered blight-tolerant trees could be used to pollinate surviving wild American chestnuts, producing regionally adapted blight-tolerant offspring. Photo by Hannah Pilkey.

As many readers of *Chestnut* know, an application for public release of the Darling 58 genetically engineered American chestnut tree is now under review by USDA, EPA, and FDA. The long-term survival of the American chestnut may now rest in the intersection where scientific evidence and compelling biological need meet community and institutional perception.

Genetic engineering (GE) has recently driven major advances in botany and even greater progression in human biomedical sciences. GE products developed for agriculture or forestry have faced opposition but those targeting human afflictions have mostly found broad acceptance and approval. This disparity is no longer tenable; GE-modification may be essential to the health and survival of threatened species. A look at the contribution of GE to human medicine provides a perspective to the use of transgenic plants to restore forest health and bring back vulnerable species such as the American chestnut (Aucott and Parker, 2020).

GE and human health

Advances in molecular and cell biology have fostered a paradigm shift in human medicine. The pervasiveness of GE in biopharmaceutical discovery and development cannot be overstated. The invention of new medicines depends almost entirely on genetically modified cell lines, transgenic animals, and related biotechnology (Belfield and Delaney, 2006). Biologic drugs, which cannot be produced at scale without intensive GE technology in their production, accounted for 59 of 213 new FDA approvals (28%) over 2014-2018 (de la Torre and Albericio, 2019).

The advent of nucleic acid and recombinant adenoviral vaccines received an unanticipated boost from the COVID-19 pandemic. These vaccines directly introduce mRNA into human tissue or induce its transcription from corresponding DNA sequences in engineered adenovirus vectors, causing expression of the key protein antigen (e.g., coronavirus spike protein) to elicit host immune responses (Liu, 2019). The speed of development of these vaccines is evidence of the power of new genetic knowledge and engineering techniques.

The new class of antisense RNA-based drugs, which suppress specific gene expression in targeted tissues, is another example of the precision of modern genetic engineering. Introducing therapeutic genes offers hope for genetically linked diseases such as cystic fibrosis. In

Biotechnology Risk Assessment Grants (BRAG) orchard, summer 2020. Photo by Jeff Zarnowski.

William Powell, director of SUNY-ESF's American Chestnut Research and Restoration Project, plants a chestnut seedling. Photo by Linda McGuigan.

gene therapy, viral or plasmid DNA vectors or mRNA-based formulations induce expression of an inserted gene to correct underlying biological defects causing disease (Dunbar and High, 2018). Also promising is the rapidly expanding use of CRISPR technology, capable of site-specific modifications of DNA to correct inherited defects or alter targeted gene expression. Clinical trials of CRISPR-based therapeutics are underway for several serious human diseases (Golkar, 2020).

An important difference between GE approaches to human medicine and endangered tree species is that human therapeutics avoid modifying germ line DNA. But it is impossible to treat trees individually in the manner of humans, so the modification must be heritable. The evaluation of transgenic trees therefore must carefully consider potential effects across generations.

An overarching reason for acceptance of biotechnology in human medicine is that society views human health as too important to forgo the benefit of the best that science offers. The time has arrived to accept the idea that forest ecosystems and the survival of major tree species are also highly important and in great need, and that in carefully selected cases the benefits of transgenic trees outweigh the risks.

GE and forest health

Forests today face a variety of threats from invasive organisms such as chestnut blight (*C. parasitica*). Human activity and commerce are largely responsible for introducing invasive organisms and for vast alterations of the environment. It is essential to maintain Earth's biological systems in today's post-wild world. The claim that "minimizing human intervention in forest ecosystems may be the best medicine we can offer" (Smolker and Petermann, 2019) risks ignoring human responsibility to manage and protect forests. An analogous "hands-off" approach to human disease would mean needless suffering and death. GE technology has been employed successfully to treat human diseases for over 40 years, in a careful and targeted manner which has not opened the door to abuse. The same can be true with GE plant technology applied to clear and specific threats to forest health, such as the looming extinction of an ecologically and economically valuable species like the American chestnut.

No apparent downside

A blight-tolerant American chestnut placed into today's forest where *C. parasitica* fungal spores are present should behave similarly to the highly susceptible original chestnut in its pre-1890 environment devoid of these spores. The tolerant tree would likely slowly recolonize suitable habitat, but it would not displace the susceptible chestnut or the blight fungus. The transgene in the GE chestnut that codes for the OxO enzyme does not represent a threat or destructive agent to *C. parasitica.* The fungus is prevalent in Eastern forests where chestnut sprouts still survive and is present on scarlet oak and post oak as well (Baird, 1991; Bryan, 1960; Nash and Stambaugh, 1982; Torsello, Davis, and Nash, 1994). The emergence and gradual spread over many decades of a blight-tolerant American chestnut could help stabilize the forests of the future, and the tree might again become a keystone species in some areas.

The painstaking review and approval process that has delivered safe genetic technology to human health is now being applied to the GE American chestnut. GE has been used judiciously for over 40 years in medicine and medical technology with great benefit to human health. With care and foresight and robust science, GE techniques can similarly be applied to protect forest health by rescuing important trees like the American chestnut from the path to extinction.

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Is Controlled Pollination Really Controlled?

By Thomas Klak, ME-TACF Chapter Gene Conservation Committee Chair and Professor, University of New England, Biddeford, Maine; and Vernon Coffey, Research Support Specialist, State University of New York College of Environmental Science and Forestry

Figure 1

Wild-type chestnut tree holding many controlled-pollination bags with unbagged burs very nearby and sometimes touching. All of the fertile nuts were gathered and tested to determine if there was transgenic pollen drift. Blight has killed the branch at 11 o'clock on the tree. All photos by Thomas Klak.

In chestnut breeding, it is often important to know who the dad is, i.e. the pollen source. Chestnuts are primarily wind-pollinated, making paternity ID difficult. When performing controlled pollination, we try to exclude wind-borne pollen by placing pollen-proof bags over immature female flowers. These bags are temporarily removed when flowers are receptive to the target pollen. This method has proven effective for creating known crosses within pollination bags. Less is known about whether there is drift of the target pollen to female flowers outside of the pollination bags. In the summer of 2020, we designed an experiment to determine if pollen drifts in this way. How safe and effective or foolproof is controlled pollination?

Researchers have been performing outdoor controlled crosses using transgenic pollination since 2011 in an effort to develop a blight-tolerant American chestnut. Controlled breeding with non-native chestnut species for blight resistance goes back to the first years after the blight was discovered in 1904. Before that, American chestnuts were crossed with non-native species to produce agricultural hybrids. The European chestnut, the first non-native species in the genus *Castanea* introduced to North America, has been here since at least 1776 (Brooks, 1937). In over two centuries of breeding, how often has target pollen escaped to the wind and pollinated other flowers? To our knowledge, there is no previous quantitative study of controlled-pollen drift for chestnuts.

In controlled pollination, pollen can be applied to female flowers using either a fresh catkin or pollen that was previously collected from catkins. In either case, catkins or pollen can be frozen for long-term storage, then thawed for pollination. An effective method, used for chestnut pollination since at least the 1980s (Rutter, 1990), deploys a glass microscope slide coated with pollen. Pollen is loaded onto the glass from a vial by covering the vial's mouth with the slide and then shaking the contents to coat the slide. Around 2018, Hannah Pilkey and other researchers at SUNY College of Environmental Science and Forestry (ESF) developed a protocol for collecting, drying, and storing pollen directly on the slide, skipping the vial as a pollen reservoir, as was done in this study (**Figure 2**). This technique allows greater use of scarce pollen, because less pollen is left behind on the vial walls.

Figure 2

Transgenic pollen collected in the lab on slides and used later for controlled pollination in the field.

In July 2020, we pollinated three mature chestnut trees in Maine with transgenic pollen. These trees have been growing for several decades within a large estate in southern Maine. They are large trees with significant blight infections, but were able to produce hundreds of female flowers (**Figure 1, previous page**).

Because of the uncertainty of pollen escaping, USDA/APHIS permit regulations require us to collect every fertile nut on trees pollinated with transgenic (GE) pollen – including the flowers that were not control-pollinated. In previous years when transgenic pollinations were conducted, every female flower on wild-type mother trees were bagged and control-pollinated (ESF), or unpollinated female flowers were removed before maturity (at University of Vermont). In Maine 2020, some flowers were allowed to be open-pollinated and grow to maturity. Every seed was then collected for testing.

We collected 360 open-pollinated nuts from the three trees, in addition to the 1,342 nuts that were control-pollinated with transgenic pollen (**Figure 3**). Nuts were tested for the presence of the OxO transgene using a histochemical test described previously in this journal (Kingsolver, 2021). We sliced a small sample from each nut (being careful not to damage the embryo) and placed it in a solution that turns the nut tissue black if the OxO enzyme is present. This same test was performed on the nuts from the controlled pollinations to determine if they had inherited the gene. We expected roughly half the control-pollinated nuts

Figure 3

Transgenic pollen on a microscope slide being applied to receptive female flowers. Immediately afterwards, the controlled-pollination bag is returned to protect the flowers from open pollination.

Figure 4

Unbagged chestnuts whose cotyledons were sliced, sampled, and placed, five at a time, in solutions containing oxalic acid (red top) and the control (black top). Chestnuts with the OxO gene turn the oxalic acid solution dark when they emit hydrogen peroxide, so these and all other unbagged nuts tested negative.

to inherit the gene (because the father tree has the gene on only one of its paired chromosomes), and we got 47% – well within the margin of error.

Of the 360 open-pollinated nuts tested, none were positive for OxO activity (**Figure 4**). In other words, we detected zero transgenic pollen drift. This gives us confidence that the slide application of pollen is highly controlled, and does not allow pollen to escape and pollinate nearby flowers. Other techniques, such as using whole, fresh catkins, may well allow pollen to escape to the wind.

Conclusion

This study provides evidence that the microscope slide method for applying pollen produces no nontarget pollination. Based on these results, we will continue to favor the slide method for controlled pollinations with transgenic pollen. It conserves scarce pollen, is an easy and effective way to transfer the pollen to the receptive flower stigmas, and, as demonstrated here, is unlikely to release pollen to nearby non-target flowers.

REFERENCES

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2021 American Chestnut Photo Contest

TACF's annual American Chestnut Photo Contest evaluates incredible photo submissions of American chestnuts and American chestnut hybrids. Our 2021 contest is now underway! Have you captured an amazing photo of a wild-type tree while hiking? Have you picked up photography as a new skill? Make an American chestnut tree your subject and enter your favorite shots. The winner will receive a free one-year membership to TACF and the photo will be featured on a future cover of *Chestnut* magazine.

HOW TO ENTER & CONTEST TERMS

All entries must:

- **be submitted digitally via e-mail or a link to a cloud drive by September 1, 2021;**
- **relate in some way to the American chestnut;**
- **be at least 2500 x 3430 pixels and submitted in a jpeg or tiff file format;**
- **include name of photographer and contact information;**
- **include a full caption including names of subject(s), location, and title;**
- **be limited to five entries per person;**
- **be previously unpublished and cannot be entered into another contest.**

EMAIL ADDRESS FOR SUBMISSIONS: jules.smith@acf.org
MORE INFORMATION AT: http://bit.ly/2021tacfphotocontest

Finding the Beauty in a Utility Pole

By Sara Fitzsimmons,
TACF Director of Restoration

Why do most people visit Cape Cod? Typically, it is to capture the quintessential view of New England, stroll the lovely beaches, or peruse its quaint village shops. If you are a real chestnut nerd – and I wear that badge proudly – you should also include a visit to one of the last American chestnut utility poles still in use!

In the spring of 2019, former PA/NJ-TACF Board member Susan Smith (pictured) and I had the pleasure of visiting this historic monument. The pole was installed in 1928 in the town of Harwich, located in the center of Cape Cod's arm. A real treat is to view the inspection tags nailed to the pole (left). These tags have documented the history of its 100+ years existence. Two tags, from the 1940s and 1920s, have ostensibly been lost to the elements but survived by the pole.

Long-time TACF member and retired Massachusetts utility forester Rufin Van Bossuyt guided me to the pole's location. While all the surrounding poles have been replaced, this one remains as a testament to the American chestnut's fortitude. The work of TACF's members, volunteers, and colleagues aims to return this amazing resource to the ecology and economy of the eastern U.S. and beyond. Imagine what amazing American chestnut artifacts people in 2128 or even 2228 will enjoy in their lifetimes!

Crème de Marrons Blondies
(Caramelized Chestnut Blondies)

Submitted by Yvonne Federowicz, MA/RI-TACF Chapter

Crème de Marron is a well known and loved treat in France; a traditional, very sweet, caramelized chestnut product. It has a special flavor that I love, and is not just chestnut puree with sugar. French children (and adults!) often eat this straight from small tubes.

The French word "marron" usually refers to the inedible horse chestnut, but in some recipes (often desserts), "marron" can instead mean large chestnuts, usually called "châtaigne" in France.

I have not tried all brands of Crème de Marron, but I use one from Clément Faugier. He is credited with popularizing marron glacé in 1882, then the creamed product based upon these candied chestnuts in 1885 – Crème de Marron. Marron glacé may go all the way back to the court of Louis XIV, or possibly 16th century Italy.

Try searching online for "Fondant à la crème de marrons" to see one of thousands of authentic French chocolate-chestnut desserts, or visit the Ardèche chestnut museum in France and research the history of this chestnut treat further!

Ingredients

1 stick butter (1 TBSP reserved to butter the pan)

1/3 cup brown sugar

pinch of salt

4 eggs

1 TBSP vanilla

1 can Crème de Marrons (500g)

1/3 cup white whole wheat flour
(or try 1/3 cup oat bran, for a different texture)

3/4 cup semisweet or dark chocolate chips

Method

Cream brown sugar and butter together. Add in eggs one at a time, beating well after each. Then, add in the Crème de Marrons, salt, and vanilla. Gently stir in the flour and/or oat bran. Open the chocolate chip bag. Some might spill. Quickly eat those!

Stir the rest into the batter.

Bake in well buttered 8x8 pan at 350 around 25-35 minutes until middle is slightly set.

Note: I am not an expert on French language or culture. Web browser-based translation can help those of us unable to visit and learn from the experts!

Source: france-voyage.com/gastronomy/chestnut-cream-candied-chestnuts-321.htm

IN MEMORY
OF OUR TACF MEMBERS
DECEMBER 14, 2020 – MARCH 24, 2021

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Jeremy Wyatt

We regret any errors or omissions and hope you will bring them to our attention.

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Joe Armstrong

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THE
AMERICAN
CHESTNUT
FOUNDATION™

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Take a Walk on the Wild Side

The American Chestnut Foundation needs your help locating wild-type American chestnuts.

Our breeding program requires findings from a broad range to ensure a robust, genetically diverse population of potentially blight-tolerant trees. If you live in the eastern U.S., be on the lookout for this keystone tree species the next time you venture into the woods, and let us know about your discovery!

HOW TO GET INVOLVED:

Field Guide for locating trees
(acf.org/resources/field-guide/)

Tree ID and Sample Submission
(acf.org/resources/identification/)

Download the TreeSnap app
to document your find (treesnap.org/)

Contact TACF's regional science coordinator
in your state (acf.org/contact-tacf/)