WINTER 2017 ~ ISSUE 1 VOL. 31

Chestnut

THE JOURNAL OF THE AMERICAN CHESTNUT FOUNDATION

A BENEFIT TO MEMBERS

THE AMERICAN CHESTNUT FOUNDATION®

Chestnuts in the Pacific Northwest ~ Monongahela National Forest ~ American Chestnut Documentary

WINTER 2017 ~ ISSUE 1 VOL. 31

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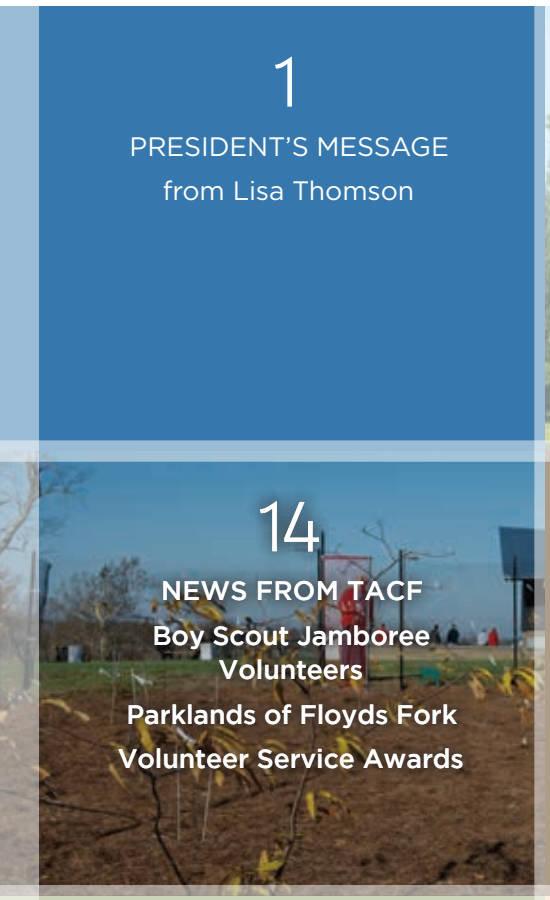
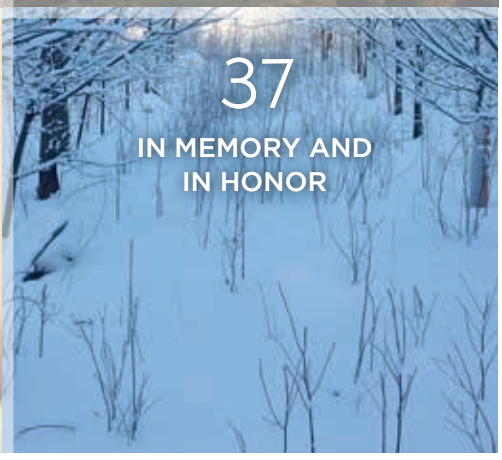




Lisa Thomson

President and CEO

DEAR CHESTNUT ENTHUSIASTS,

2017 is upon us! As we embark on our 34th year, we are gearing up for even greater, more ambitious goals in our efforts to restore the American chestnut. We hope our new discoveries and techniques will work across species' boundaries, so that our restoration methods may help other hardwood species in peril. Sadly, there are many that need urgent help.

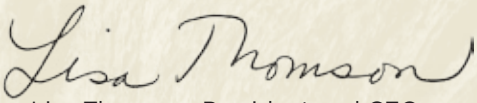
All organizations change and grow over time and TACF is no exception. As mentioned in my last President's letter, we are in the final phases of producing a comprehensive Strategic Plan to guide our work for the next 10 years. This plan was almost entirely volunteer-driven by leaders on our board of directors and committees. A final draft will be presented at the Spring board meeting this April and we look forward to sharing it more widely after then. In order to embrace all the efforts necessary to ensure recovery and restoration, we convened a committee to address the main 3 tools: Breeding, Biotechnology, and Biocontrol. This document, dubbed "3BUR" by chair Dr. William Powell of SUNY-ESF, was adopted by the board of directors at our Fall meeting in Louisville, KY. United for Restoration is the key to this effort, as we are stronger as a unified front to foster collaboration, not competition. The 3BUR document is now live on our website, so I hope you take the time to give us your feedback. Not one scientist, organization or agency, has the keys to the kingdom and working together with shared research and techniques is the best way to bring back the iconic chestnut tree in our lifetimes.

Another exciting development is the creation of a short documentary film about the life, death and rebirth of the American chestnut. Filmmaker Jake Boritt began working on this project at the Fall meeting. The film is currently funded and planned as a 15-minute short for education and awareness raising. If further funds can be secured, we hope it will ultimately expand to a full-length documentary. Read more about the project on p. 12 and stay tuned for updates throughout 2017.

I am delighted to report that the end of year direct mail and online campaign was a terrific success. We are truly grateful to those of you who gave as generously as your circumstances allowed. In fact, many of you gave the largest gift ever in your long and loyal annual support! We also received transformational grants from the Allegheny Foundation and the Colcom Foundation, totaling $300,000. These grants take us closer to funding critical, but costly, research such as sequencing and assembling an American chestnut reference genome.

I would especially like to thank our stalwart leadership donors who give 5- and 6-figure gifts, year after year, and those supporters who have generously included us in their estate plans. We would also not have mission success without our tireless citizen scientists who volunteer countless hours in the field. I am continually humbled and inspired by this strong show of support, as TACF exists almost solely on the generosity of individuals and family foundations.

With best wishes for a happy, healthy and prosperous New Year,



Lisa Thomson, President and CEO
The American Chestnut Foundation

Follow me on Twitter (@MadameChestnut).

Snowy American chestnut

Brasstown Bald Mountain in Georgia. Photo by Emeritus Board Member Joe Nicholson.

At The American Chestnut Foundation, we strive for accuracy in all of our publications. We regret any errors or omissions and appreciate those who bring them to our attention. In the fall 2016 issue of *Chestnut*, we have corrected the following information:

- *Chestnut* apologizes for not identifying Dr. Kim Steiner as a TACF Officer in the masthead on page 2.
- Oxalate photo captions for "Nut Production Orchards" story on page 13 were reversed.
- In the Chestnut Pioneer story "Enduring Enthusiasm," Rufin Van Bossuyt was incorrectly identified in photograph on page 38.

THE AMERICAN CHESTNUT FOUNDATION®

WHAT WE DO

The mission of The American Chestnut Foundation is to restore the American chestnut tree to our eastern woodlands to benefit our environment, our wildlife, and our society.

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American Chestnut Trees

IN THE PACIFIC NORTHWEST

By Doug Gillis, Carolinas Chapter President

There are American chestnut trees growing in the Pacific Northwest that are more than 150 years old, six feet or more in diameter, and nearly 100 feet tall. When planted near enough to one another so pollination occurs, the trees can produce abundant crops of sweet tasting nuts each fall.

How did the trees, native to eastern woodlands though not to western forests, find their way to Oregon, Washington and northern California? Pioneers traveling west along the Oregon Trail, some splitting off on to the California Trail, are thought to have brought the first American chestnut seedlings westward. Their knowledge of the American chestnut and its importance to pioneers settling in the eastern part of the country may have inspired them to bring seedlings west.

The larger of the two American chestnut trees at Mills and Mills Memorial Park in Tumwater, Washington. Photo by Lawrence Jacobson.

One wonders if the Conestoga and Prairie Schooner wagons some traveled west in were constructed partly of American chestnut wood, especially the beds, as wagon makers back east knew that American chestnut wood was two-thirds the weight of oak wood, just as strong and rot resistant. Reducing the weight of wagons was important for long distance traveling. Bacon eaten along the trail may have come from hogs fattened on chestnuts in Appalachia. Leather products and clothing essential to pioneers traveling west may have been processed with tannins extracted from American chestnut trees. Cabins back east, built of hand hewn American chestnut logs, may have been the model pioneers traveling west used to fell Redwoods, Douglas Firs, and Western Cedars to provide shelter needed once their trip was completed.

The early travelers who planted American chestnut seedlings could not have imagined that one day the large chestnut trees in the east would be devastated by root rot and chestnut bark blight introduced on Asian plant stock. Nor would they have thought that one day the west coast area would be one of the few locations where large, healthy American chestnut trees would be found.

Fortunately, root rot and chestnut bark blight have not affected west coast American chestnut trees due to efforts to ensure that neither is introduced into California, Oregon or Washington. Shipment of anything chestnut into the three states is prohibited except per strict regulations and only under permit. In addition, and to help further prevent the spread of pests and diseases, TACF has adopted a policy to restrict shipping chestnut materials west of the Mississippi. People visiting American chestnut (as well as European chestnut) trees need to be sure none of their clothing or equipment brought with them from the east has been exposed to root rot or chestnut blight which they could transfer to west coast trees if not careful.

Those of us in the east interested in American chestnut trees want our western friends to keep up their efforts to identify and help preserve American chestnut trees growing in their states. Given the restrictions, anyone buying or selling the trees in the Pacific Northwest should verify that they are pure American chestnuts. How does one know if a chestnut tree is American, European, Asian or a hybrid, all of which have been introduced into western states? Microscopic analyzes of hairs on the back side of chestnut leaves are a positive way to identify different species of chestnut trees sampled.

Doug Gillis standing between two American chestnut trees in Sherwood, OR.

Two American chestnut trees, Portland, OR.

Please visit http://acf.org/find_a_tree.php and click on "Download a Chestnut Identification PowerPoint Presentation" which explains leaf hair analyses. To tell TACF about your tree, submit a leaf sample along with a Tree Locator Form available at the website above. Call the National office at 828-281-0047 if you need assistance.

Some of the oldest known American chestnut trees in the Pacific Northwest are still thriving while some have died of old age or have been damaged by lightning strikes or storms. Examples are:

- Two American chestnut trees are growing in the traffic circle at Mills and Mills Memorial Garden in Tumwater, Washington. It is reported that Jesse Ferguson, part of the Simmons Party that traveled west on the Oregon Trail in 1844, planted the two trees. The Simmons party settled first along the Columbia River near present day Washougal and then later in Washington at a location named Bush Prairie after another member of the Simmons Party, George Washington Bush.
- Two American chestnut trees growing along Edy Road near Sherwood, Oregon were planted in 1885 by a farmer named Hicks. The trees were featured in the National Geographic Magazine in the February 1990 issue. The property where the trees are located is part of Hawks View Cellars. The picture shows the trees growing along the service entrance to the vineyards.
- One of two American chestnut trees located in Portland, Oregon survives. The age of the trees is not known. One was reduced to a 20 foot tall snag, cut back in early 2016 apparently due to worsening damage caused by a lightning strike some 20 years ago. The picture of the two trees was taken prior to recent removal of a majority of the one damaged by lightning.

The American Chestnut Foundation appreciates any help readers can provide to document how the earliest American chestnuts arrived in the Pacific Northwest. The Foundation would also like to know about other trees that have been identified as American chestnuts.

A ONE-OF-A-KIND Experience

Rebecca Cochran, Olivia Gabehart, Karen Guerrero
Students from Unity College, Maine

You can hear many sets of boots rustling through the grass as we haul the tough plastic pots towards the hillside at McKay Farm and Research Station, a greenhouse facility owned and operated by Unity College, where we intend to plant our young and promising chestnut saplings. As current Unity students, we set down the pots and stretch our arms as we begin to survey the grassy site that will soon be used by Unity students for years to come. The saplings, which were graciously donated by the Maine Chapter of The American Chestnut Foundation (ME-TACF), had been cared for by students during the previous semester, before we were able to meet at McKay Farm and begin our planting. We set each sapling down in its own strategically planned spot. In a few days' time each plant will leave the safety of its pot and be planted in the healthy soil of the hillside. Brightly colored flags are labeled and set out beside each pot to let us know which plant is which and what test they will undergo. Each tree gets its own hole and all receive a metal baffle to protect against nibbling rodents.

Students in the Unity College Biodiversity Capstone course prepare to plant seedlings as part of a class project examining ways to increase survival of newly planted chestnuts.

The saplings we are planting at McKay Farm are part of an experiment comparing different planting protocols. We are assisting ME-TACF by helping to identify best planting practices for the day when chestnuts will be reintroduced into the wild. In our senior level Biodiversity Capstone course, we have self-selected into three groups, each with a project that focuses on the American chestnut. We are using these projects to develop research studies that can be continued by future Unity students. One of the groups is working with Dr. Brian Roth of ME-TACF to analyze data from other experimental plots around Maine. Another group is in charge of planting the donated chestnut saplings and creating a protocol for future students so that they can continue the research being done by our class. My group and I are in charge of documenting this process, showing our class's commitment to the restoration of the chestnut.

Each group has been working all semester to develop and complete their various projects. The group that is working with Dr. Roth traveled around central Maine to different experimental plots to measure and assess the status of previously planted trees. Tori, a member of this group, was able to do her own part in this study. When asked about her individual experience she said, "I have participated in measuring trunk width along with checking survivorship. I am also helping with compiling the raw data into usable statistical results." After hearing about the meaningful work that Tori is doing, it's easy to see how much this project allows Unity students to practice the boots-on-the-ground conservation skills they have learned at our small environmental liberal arts college.

Members of the second group have been tasked with the experimental planting at McKay Farm and caring for the saplings at this early stage. They also played an essential role in making sure the class adhered to the experimental design we developed in class and that each sapling was planted in its proper spot. They spent hours on a Sunday morning digging holes to make homes for the saplings and made sure that each one was labeled with the experimental treatment it would receive. In our project, we are testing three different variables in a multifactorial design, including weed control, deer exclusion, and plant size. This group worked hard all fall creating the data collection protocols and taking preliminary measurements that will form the baseline against which future growth can be compared. Sarah, a member of this group, said it perfectly, "It will…offer a multi-disciplinary learning site for Unity College students for many years to come." The hands-on, experiential focus of the College means that there will always be an eager cohort of students ready to continue our experiment by collecting data or coming up with new questions that can be answered using these trees.

Given the real-world, problem-solving approach to learning that we are provided with here at Unity, we found this project to be a wonderful way of gaining experience we can use throughout our professional and personal lives. We are certain that future generations of students will look forward to working with the saplings we have planted this year. We would especially like to thank Dr. Roth and others at The American Chestnut Foundation for allowing us to participate in this unique and rewarding project. We would also like to thank our professor, Dr. Matthew Chatfield, for leading this project and encouraging each of us to take on a different aspect of the grand American chestnut restoration effort.

TACF VIRGINIA CHAPTER BOARD MEMBER

Receives National Award

By Joe Franzen, Environmental Education, Fern Creek High School

Ed Stoots (center) with Clark Sealy (right), current President of the Society of American Foresters, and Matt Menashes (left), Chief Executive Officer at the Society of American Foresters.

Regional Forester of the Virginia Department of Forestry Ed Stoots also serves on the Board of Directors with the Virginia Chapter of TACF. In early November, Stoots received the John A. Beale Award from the Society of American Foresters (SAF) at the organization's convention in Madison, WI. This prestigious award "recognizes outstanding efforts over a sustained period of time by an SAF member in the promotion of forestry through voluntary service to the Society". Stoots has served SAF continuously since 1984, providing a diverse perspective in leadership positions within the forest industry and the public sector.

In the early 2000s, Stoots began working for the Virginia Department of Forestry (VDoF). In his role as Regional Forester, he oversees the management and protection of one-third of Virginia's forestland. He has served SAF during his time in Virginia as chair of the Appalachian SAF, working with the planning committee for the 2013 National SAF Convention in Charleston, S.C., and serving as a member of the House of Society Delegates, all while continuing as an active member of his local SAF chapter. He was elected as an SAF Fellow in 2015.

"This year's national award recipients join a group of elite individuals who have demonstrated unusual dedication to the practice and promotion of forestry," said Matt Menashes, CEO of SAF. The awards process is a rigorous one. It begins with written nominations and references by professional peers. The Forest Science and Technology Board or the Committee on Professional Recognition then review the nominations. These bodies forward their recommendations to the SAF Board of Directors for its review and approval. The review process produces candidates with a national profile and a comprehensive history of sustained contributions to the forestry profession and service to the public. TACF congratulates Stoots on receiving this distinguished award!

An aerial view of some of the ripping in the Lambert Run watershed

Restoration

of the Red Spruce Ecosystem in the Monongahela National Forest

Michael French and Dr. Christopher Barton

TACF was proud to support the ongoing ecosystem restoration activities on the Mower Tract of the Monongahela National Forest this past spring. In May of 2016, 500 of TACF's potentially blight resistant American chestnuts were planted along with red spruce, black cherry, bigtooth aspen, quaking aspen, winterberry holly, mountain ash, arrowwood, hazelnut, elderberry, serviceberry, wild raisin, highbush cranberry, and numerous other native species. In 2016, nearly 30,000 trees and shrubs were planted across approximately 70 acres of the Mower Tract.

Students from Green Bank Middle School plant red spruce seedlings in ripped ground. Deliberately felled exotic conifers can be seen in the background.

Since 2010, the US Forest Service – Monongahela National Forest, Green Forests Work, Appalachian Regional Reforestation Initiative, West Virginia Division of Natural Resources, West Virginia Department of Environmental Protection, Natural Resources Conservation Service - Plant Materials Center, Environmental Protection Agency - American Rivers, Central Appalachian Red Spruce Initiative, the Arbor Day Foundation, American Forests, and others have performed restoration activities on nearly 500 acres of the Mower Tract within the 2,600 acre Lambert Run watershed in an effort to restore the red spruce forest type to the area. A holistic suite of restoration activities has been implemented, including soil decompaction, wetland restoration, woody debris loading, and planting of native trees and shrubs to restore habitat and improve water quality. More than 475 wetland areas have also been created throughout the project areas.

The Mower Tract is located on Cheat Mountain, which traverses the entire length of central Randolph County, WV. The landscape hosts one of the largest red spruce communities south of Maine. The Red Spruce – Yellow Birch Forest (*Picea rubens – Betula alleghaniensis var. alleghaniensis/ Bazzania trilobata* Forest) is a G2S2 community. The nearby Red Spruce – Southern Mountain Cranberry Forest (*Picea rubens/ Vaccinium erythrocarpum/ Dryopteris campyloptera* Forest) is a G2S1 community. Overall there are 145 state rare plant species, including 60 critically imperiled (S1) species, 56 imperiled (S2) species, and 29 vulnerable (S3) species known to be associated with wetlands in the High Alleghenies (Byers, et al. 2007). Revitalizing the damaged red spruce ecosystem is a key goal of this project. Red spruce forests once covered more than 500,000 acres of the West Virginia Highlands. After the industrial logging era of the late 19th and early 20th centuries, the red spruce ecosystem was reduced to less than 10 percent of what originally existed. Removal of the forest through extensive logging was linked to regional flooding and was one reason for the establishment of the Monongahela National Forest. In addition to logging, the Mower Tract was mined for coal in the 1970s. Reclamation regulations required the company to return the site to approximate original contour and control erosion. Erosion was controlled by compacting the soil and through the planting of non-native trees and grasses. Compacted soils and a non-native grass mat have prevented native species recolonization. More than 30 years have elapsed since reclamation and very few trees successfully seeded into the area. Much of the mined area remains in a state of "arrested succession," which can best be remedied with restorative intervention.

The U.S. Army Corps of Engineers identified Lambert Run Mine Site (WVAML #3744, strip bench 2) as being a substantial source of sediment to Lambert Run. Compacted soils with low organic matter content tend to limit infiltration and promote surface runoff of water. The surface runoff and lack of forest canopy cover have two major deleterious effects on water resources: 1) generation of soil erosion and sedimentation of surface waters, and 2) loss of thermal protection (via cutoff of interflow) and heating of downstream waters. Excess sediment and increased temperatures can affect stream communities through habitat burial and loss of dissolved oxygen. Restoration activities of the watershed project are implemented to control sedimentation in Lambert Run and revitalize key habitat for native brook trout and other stream inhabitants.

One of the created wetlands at Lambert Run. Hundreds of pools and wetlands have been created to benefit amphibians, water birds, and other animals.

In addition to watershed protection, this restoration project seeks to enhance forest habitat for a variety of fauna. The West Virginia northern flying squirrel (*Glaucomys sabrinus fuscus*) is imperiled throughout its range and is federally listed as an endangered species. The Cheat Mountain salamander (*Plethodon nettingi*) is a federally threatened species associated with spruce ecosystems. The southern water shrew (*Sorex palustris punctulatus*) is critically imperiled within West Virginia and is often found along rocky mountain streams within the red spruce forest. Three bird species with state-imperiled breeding populations in the red spruce ecosystem are Northern Saw-whet Owl (*Aegolius acadicus*), Pine Siskin (*Carduelis pinus*), and Northern Waterthrush (*Seiurus noveboracensis*). Re-establishment of the red spruce forest type will hopefully increase suitable habitat for these and other native animal populations.

Project partners utilized several techniques to restore the red spruce ecosystem and improve the hydrologic characteristics of the site. Heavy machinery was used to break up compacted soils, tear up the grass sod, and knock down non-native trees. This was purposely done in a "messy" way to imitate nature. This area was then planted with aspen, northern hardwoods, and red spruce - species historically found in the area. These actions created a new path for this land, one that starts with the creation of early successional habitat – an area covered with shrubs and tree seedlings. Over time, the area will change until red spruce once again dominates the forest.

Across this site, some areas were planted with non-native trees such as Norway spruce and red pine after coal mining in the 1980s. The compacted soils kept these trees from growing healthy roots and tall trunks. These stunted trees have little value for lumber or furniture, but they can still serve a valuable purpose when knocked down and left onsite. The dead wood will help create homes for plants and animals while new trees are growing. Dead wood provides nooks and crannies where insects, birds, and mammals live. Even mosses, lichens, and fungi will take root on top of a decaying tree log. The downed trees will also provide perches for birds to naturally spread native seed and encourage natural regeneration of native plants. As the wood decays, nutrients are provided to the soil that will help new plants and trees grow. Organic matter form the decaying wood further improves soil conditions and creates a more suitable environment for growing generations of red spruce and other native plants.

To mitigate soil compaction, many areas of the site were "cross-ripped" to break up the compacted ground and grass sod. Ripping is performed by a bulldozer pulling one or more ripping shanks that are immersed into the soil at least 3 feet deep, creating parallel rips across the site every 8 feet. Suitable areas are then cross-ripped, by dragging the ripping shanks perpendicular to the first set of parallel rips, again on 8 foot spacing, until the entire site has been ripped in two directions. Cross-ripping loosens soils to create a better rooting medium for trees and increases water infiltration and gas exchange and results in reduced surface runoff and erosion. Some exposed soil will result after ripping, which may be quickly colonized by native plant species, initiating the natural succession process. Tree seedlings are then planted at the intersections of the rips, which allows the roots to extend in multiple directions.

Fast growing trees, especially aspen, will quickly transform the open land into one that is covered with dense patches

of young trees. Wildlife including white-tailed deer, black bear, Ruffed Grouse, Saw-whet Owls, snowshoe hare, and American Woodcock will flourish in these young forests. Aspen grow quickly, but they don't live very long (for a tree). Red spruce and northern hardwoods, including chestnuts, will eventually overshadow the aspen and dominate the site. Over the following centuries, these trees will naturally change the land making it more like it was before mining. This more mature forest will create conditions suitable for at-risk wildlife like the Northern Goshawk and West Virginia northern flying squirrel which require red spruce habitat.

An additional $1.5M in funding was recently awarded to continue the restoration efforts on the Monongahela National Forest by the USDA Forest Service and the Natural Resources Conservation Service through the Joint Chiefs' Landscape Restoration Initiative. Restoration work at the Mower Tract will likely continue for another 5-7 years and may result in the reforestation of more than 1,000 acres. TACF looks forward to supporting the reforestation of another 120 acres in 2017.

LITERATURE CITED

Byers, E.A., Vanderhorst, J.P., Streets, B.P., 2010. Classification and Conservation Assessment of Upland Red Spruce Communities in West Virginia. WV Natural Heritage Program, WVDNR, Elkins, WV, 68 p.

For more information about the reforestation of mined lands, including TACF's work, please visit the ARRI and GFW websites at: http://arri.osmre.gov/ and http://greenforestswork.org/

AN EDUCATIONAL DOCUMENTARY: The American Chestnut Story

The American Chestnut Foundation is extremely excited about its collaboration with New York-based filmmaker Jake Boritt. Some of you may remember Jake from the TACF annual meeting in Louisville where he began creating a short documentary film on the life, death and rebirth of the American chestnut. Since that time, Jake has caught the chestnut bug, like many of us, and he has taken this project on by storm.

To provide a little background, FutureStake, Inc. generously sponsored Jake to create a 15-minute educational and awareness-raising film on the American chestnut. Jake met the owner of FutureStake through his film work on land conservation and his project The Gettysburg Story (PBS, 2013). Jake was raised in Gettysburg, PA and FutureStake is a PA-based company. Both Jake and FutureStake's owner knew immediately that this compelling chestnut story needed to reach a wider audience.

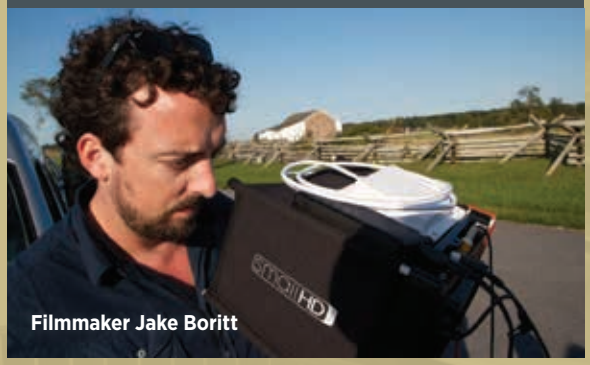
Currently, Jake is conducting extensive research and interviews with key champions in chestnut history. He will produce the film throughout 2017. Its working title, The American Chestnut Story is currently funded as an educational short documentary, thanks to the generosity of FutureStake. However, we are hopeful that the story's richness will ultimately expand to a full-length documentary, provided additional backing can be found.

WHAT WE NEED:

1) Historical images of chestnut trees, snags and structures

2) Locations of dramatic looking American chestnut survivor trees, snags, stumps

3) Memories of the trees and the onset of the blight



Filmmaker Jake Boritt

To those of you with extensive chestnut background and collections, Jake could use the following: 1) historical images of chestnut trees, snags and structures; 2) locations of dramatic looking American chestnut survivor trees, snags, stumps; and 3) any older folks who grew up with chestnut and are willing to speak about their memories of the trees and the onset of the blight. You can reach filmmaker Jake Boritt via email Chestnut@boritt.com, website GettysburgStory.com/chestnut or 717-500-1863.

TACF looks forward to sharing ongoing production updates, and we appreciate your willingness to participate in this meaningful educational initiative.

2016 TACF

Photo Contest Winners

TACF's 2016 photo contest was a competitive and successful one! We would like to thank everyone who submitted a photograph and encourage your participation in our next contest coming this spring.

The winner of last year's contest is

JEANNINE KAZACOS

whose entry made the judges "ooo and ahh" with her photograph of a small hedgehog standing beside an American chestnut seedling. Jeannine's photo will appear on an upcoming cover of *Chestnut* and she will receive a complimentary, one-year membership to TACF.

Second place winner is Kathy Desjardin.

Third place winner is David Lent.

Xena, the African pygmy hedgehog meets the American chestnut seedling
Photo by Jeannine Kazacos, Mount Vision, NY

Heavenly scent, American chestnut bloom
Photo by Kathy Desjardin, Uxbridge, MA

A bright and colorful fall in New England
Photo by David Lent, Westboro, MA

Volunteers Needed

TACF BOOTH AT THE 2017 BOY SCOUT JAMBOREE

By Sam Muncy, West Virginia Chapter Treasurer

TACF has been invited to operate a booth on the Conservation Trail at the 2017 Boy Scout Jamboree at Summit Bechtel Reserve (SBR) National Boy Scout High Adventure Base near Beckley, West Virginia. This is exciting news to TACF's West Virginia's chapter, having planted a small orchard of potentially blight-resistant chestnuts at SBR in 2014 and maintaining the orchard since then. This is a great opportunity to get many of the 25,000 to 45,000 Boy Scouts attending the Jamboree involved with our mission to restore the American chestnut tree but we need your help.

The event takes place July 19-27 (set-up on July 16 and take-down on July 29). A team of 3-4 people is needed to manage TACF's booth, which will offer exhibits, information, and games. Volunteers will have 3-4 hours of free time each day to experience the Jamboree. This is a rare chance to see firsthand SBR and the activities there. The Jamboree is the biggest event in scouting and only happens every four years. The SBR is more than 10,000 acres and is adjacent to the New River Gorge National River. Activities include boating, rock climbing, zip-line, skateboarding and mountain biking.

The theme of the Jamboree is **SUSTAINABILITY**. The American chestnut fits that theme perfectly. Our hope is that this effort can meld TACF with scouting groups and encourage the search for wild American chestnut trees and maintenance of new and existing orchards of the potentially blight-resistant chestnuts.

We are trying to get at least six large potted American chestnut trees for display. Please contact Sam Muncy if you can provide one.

Summit Bechtel Reserve (SBR)
National Boy Scout High Adventure Base
near Beckley, WV

July 19-27

VOLUNTEERING IS EASY!
Pick your day(s) and sign up online: http://bit.ly/2h6kUKA

Or contact Sam Muncy at sam.muncy@msesinc.com or call (304) 669-9659.

TACF's booth will offer the following:

STEM - The WV Chapter of TACF will be administering a special station to provide thought problems related to the American chestnut as part of a camp-wide Science, Technology, Engineering, and Mathematics (STEM) award. Scouts can earn a special campaign patch performing problem-solving exercises in each of the events.

CHESTNUT TOKENS - Generous TACF members cut tokens culled from orchards and stamped on one side with the TACF leaf logo. Tokens will be distributed for various activities.

GIANT PACHINKO BOARD - A chestnut dropped through the board and landing in the winning slot, will earn the scout a chestnut token. Scouts could see their chestnut eaten by a mouse or munched up by a deer!

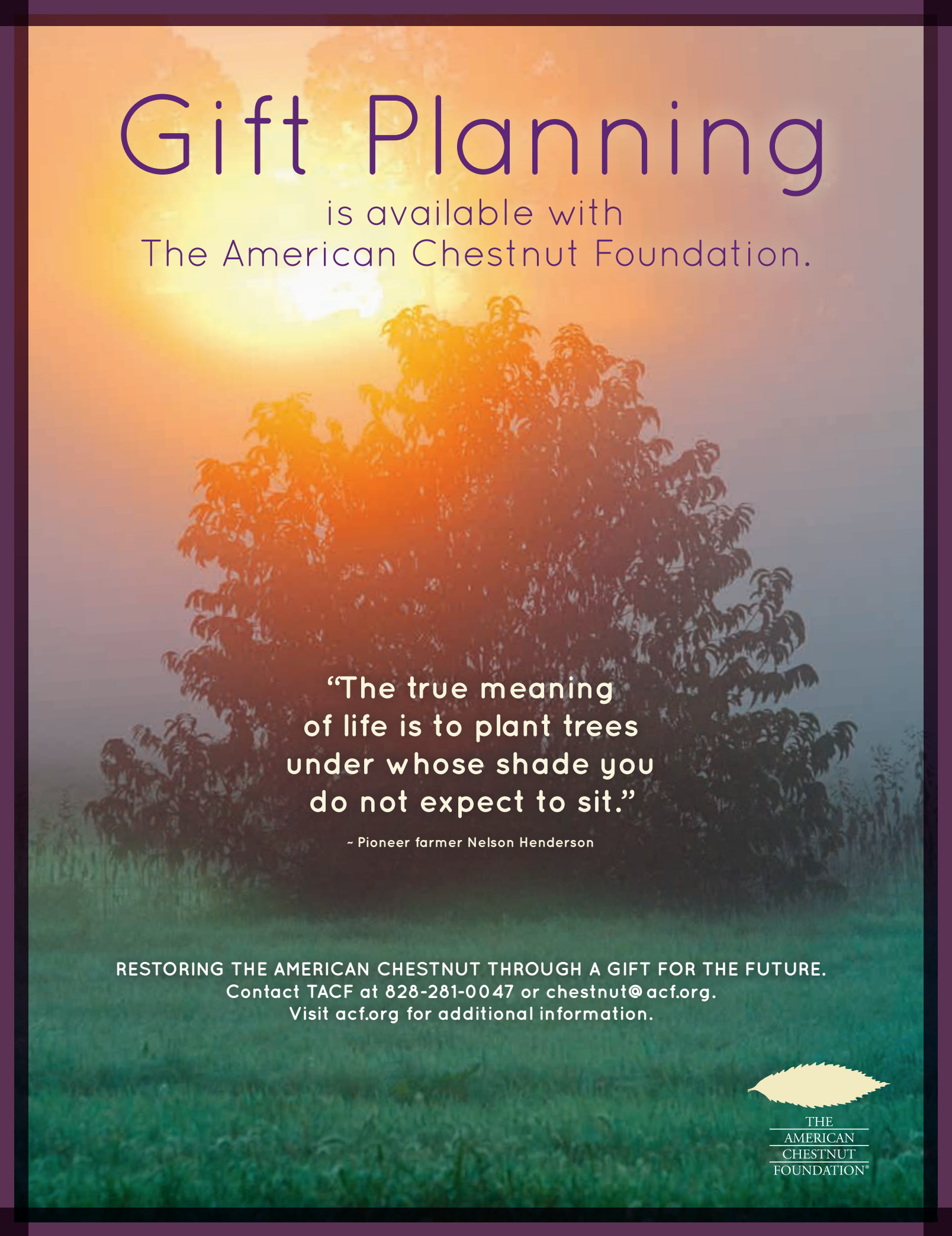
MULTIPLE CHOICE - Answers to the multiple choice questions can be discovered by reading the booth displays and information. A scout who successfully answers the questions can enter into a daily drawing for either a free membership to TACF for the scout or a potentially blight-resistant chestnut seed or seedling to be presented to the winning Troop.

ALBERT - The scout who finds Albert, a specific tree in the potentially blight-resistant chestnut orchard that the WV Chapter planted and maintains in SBR, can get his campaign token stamped with "I FOUND THE ALBERT TREE."

DIORAMA - West Virginia University will provide a display showing American chestnut history, examples, and its legacy.

AMERICAN CHESTNUT BLIGHT HISTORY DISPLAY - Seven posters tell the history and range of the American chestnut and spread of *Cryphonectria parasitica* from 1904 to present.

Sam Muncy, treasurer of the WV Chapter, is serving as chair of the TACF Jamboree booth planning committee. Co-chairmen include Bob Sypolt, WV Chapter president; Dr. Bill MacDonald, West Virginia University and co-founder of the WV Chapter; Dr. Mark Double, West Virginia University and co-founder of the WV Chapter; and Tom Saielli, regional science coordinator for TACF's Mid-Atlantic region.


Gift Planning
is available with
The American Chestnut Foundation.
"The true meaning
of life is to plant trees
under whose shade you
do not expect to sit."
~ Pioneer farmer Nelson Henderson
RESTORING THE AMERICAN CHESTNUT THROUGH A GIFT FOR THE FUTURE.
Contact TACF at 828-281-0047 or chestnut@acf.org.
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Recovery of the American Chestnut

AT THE PARKLANDS OF FLOYDS FORK

By Anna Rosales-Crone, Communications Coordinator, The Parklands of Floyds Park

The Parklands of Floyds Fork is a nearly 4,000-acre donor-supported public park system within the Floyds Fork watershed in eastern and southeastern Louisville, Kentucky. As the nation's largest, new urban park system, The Parklands hosted over 2.5 million visitors in 2016 making it one of the fifty most visited urban parks in the nation. Its infrastructure includes playgrounds, trails, an education center, meeting facilities, pavilions, bridges and trails. Shaping and growing the park's landscape will be ongoing for the next century as staff intentionally establish and steward meadows, riparian corridors and forests.

George and Betty Gibbs standing in the George and Betty Gibbs American Chestnut Grove at the November 2012 opening of the northern section of Beckley Creek Park. Photo by John Nation.

Natural Areas Team Leader Evan Patrick prepares an American chestnut for planting in the new "wild" site at The Parklands, outside of the Chestnut Grove.

Trees in the Chesnut Grove produced their first nuts in the summer of 2015. Photo by Evan Patrick/The Parklands

Since 2012, the Grove has seen many improvements to enhance soil and provide an environment optimal to chestnut growth. Photo by Anna Rosales-Crone/The Parklands

A wide variety of oaks, hickories, maples and other hardwoods comprise forests presently found in the outer bluegrass region where The Parklands resides. Thanks to a generous gift from George and Betty Gibbs in 2012, The Parklands is now working with The American Chestnut Foundation to bring the American chestnut into the park's forests.

"Restoring the American chestnut brings complexity and challenges that we would not be able to manage without the resources and support of the Gibbs' and The American Chestnut Foundation," said Parks Director Scott Martin. "We are proud to be part of a much larger effort to establish a blight resistant strain of chestnuts that will thrive in the outer bluegrass region of Kentucky."

George Gibbs, a retired United States Forest Service forester, and his wife Betty, an avid angler and lover of Kentucky's outdoors, introduced The Parklands to the chestnut recovery community. George also brought with him experience and passion, sharing important insights on forest planning and management, while helping to develop a vigorous partnership between The Parklands and The Kentucky Chapter of The American Chestnut Foundation (KY-TACF).

The first phase of work began four years ago when The Parklands established the George and Betty Gibbs American Chestnut Grove in Beckley Creek Park. The team planted 16 native chestnuts and 20 B3F3s, also known as 15/16th American/Chinese hybrids. The Grove has since been manicured and carefully tended by The Parklands Natural Areas Team. In addition to enclosing the grove last summer, the team has made significant improvements to the soil profile throughout the years, including soil that was dredged from the Ohio River by the Nugent Sand Company. A layer of pine mulch is spread across the grove annually to improve acidity at the site.

During warmer months, work in the Grove is supported by Parklands volunteers, including frequent visitor Joel LeGris. Tending to the Grove is a role that comes naturally to LeGris who spent 31 years as an agronomist with the Natural Resources Conservation Service. He now works as a part-time land manager, but makes time to visit the grove each week to water and remove invasive species.

According to The Parklands Director of Horticulture Tom Smarr, "The Grove is a special project that supports the growth of only chestnut trees. Various ages and breeding generations of trees exist there, providing ample opportunity for crossing to develop more resilient seeds (nuts) for continued propagation efforts."

The surviving chestnuts show promise. Even after infection, the trees can survive for some time, producing nuts that can be planted. In 2015, trees in the Grove produced their first nuts, one of which matured and was potted. It's now in an on-site nursery along with fifty potted American chestnuts that The Parklands received after sponsoring a Legacy Tree with The American Chestnut Foundation.

While the Grove works well as a study site, The Parklands long-term goal is the sustained establishment of chestnuts in a natural, forest setting. In December 2016, the second and most exciting phase of the chestnut initiative began in Broad Run Park when "oaks, hickories and other hardwoods" were planted at a special "wild" site where the team discovered silt loam containing acidity favorable for chestnut growth.

The new site already contains oaks, hickories and hornbeam. Together these trees will create a forest with the complexion of a classic chestnut forest. Once planted, the site will be monitored, similar to the Chestnut Grove. If successful, additional "wild" plots will be established in other locations of The Parklands where soil is favorable.

Over the next couple of years, Parklands staff will continue working with KY-TACF to gain knowledge of best practices for chestnut growth. **For more information on The Parklands and its horticultural initiatives, please visit theparklands.org or call (502) 584-0350.**

Thank You

to our volunteers for making 2016 great!




Dear TACF Volunteers,

All of us at The American Chestnut Foundation are extremely grateful for the amazing individuals who participate in this long-range mission to restore an American icon. TACF volunteers are worth their weight in gold, and we owe it to each of you to express our heartfelt gratitude. You are one of the most critical parts of this restoration initiative.

2016 has been a tremendous year of outreach, collaboration, planning, and new initiatives, and we thank our volunteers for sharing their precious time and extraordinary talents. Constituents, members, volunteers, and partners play a critical role in our organization. It's a big job, and TACF cannot do it alone. We are thankful for the passion you share to achieve our mission and we cannot tell that enough.

With heartfelt gratitude,

Lisa Thomson

Lisa Thomson
President and CEO
The American Chestnut Foundation






The American Chestnut Foundation Honors 2016 Volunteer Service Award Recipients in Louisville, Kentucky at its 33rd Annual Meeting

The American Chestnut Foundation (TACF) hosted its 2016 Volunteer Service Awards Dinner on Friday, November 11, 2016 during the Foundation's 33rd Annual Meeting in Louisville, Kentucky.

This annual celebration recognizes and honors the Foundation's most dedicated and inspiring volunteers. Recipients profoundly symbolize TACF's mission to restore the American chestnut tree to our eastern woodlands to benefit our environment, our wildlife, and our society.

2016 TACF volunteer recipients (left to right): Scott Freidhof, Dr. Joseph Nassif, John Wenderoth, and Starling Childs, accepting the award for Ellery "Woods" Sinclair.

Scott Freidhof: Southern Region

Scott Freidhof has contributed more than 1750 hours of service as a member of Kentucky Chapter of The American Chestnut Foundation. He helped form the Chapter in 2001. In addition, Scott has served as president and vice president of the Chapter, as well as breeding and orchard coordinator for 13 years. In his many roles, Freidhof establishes backcross orchards throughout eastern Kentucky; locates wild pure American chestnuts and collects seeds and pollen; manages controlled pollinations and seed collections (pure Americans and backcross seeds), and provides numerous education programs about chestnuts. He is also a frequent visitor at the Foundation's Meadowview Research Farms in Virginia, helping annually with pollinations. He always brings experience, know-how, and a great attitude. He has been integral to the chapter's success.

Dr. Joseph Nassif: Mid-Atlantic Region

Dr. Joseph Nassif is an American Chestnut Foundation volunteer who combined two of his passions: the great American chestnut tree and his hometown of Rowlesburg, West Virginia. In doing this, Nassif has created The West Virginia Chestnut Festival, a unique one-day event that is both fun and educational. Nassif joined TACF in the early 2000s when he saw an ad for the Foundation in a newspaper. In 2006, he was living in Alexandria, Virginia and along with other members from the state, formed the Virginia chapter. There was not yet a West Virginia chapter, so when it was formed in 2009, Nassif's wife joined the West Virginia chapter while he stayed with the Virgina chapter. However, he keeps up with both chapters. He is also very invested in his hometown of Rowlesburg. Built on the main line of the Baltimore railroad, it was once a very important small town. As a founding member of the Rowlesburg Revitalization Committee, Nassif became interested in developing a festival to celebrate the American chestnut. With the help of many co-chairs and volunteers, Rowlesburg created a plan for successfully hosting a one-day festival of interest to both the public-at-large and the scientific community. For Nassif, one of his greatest accomplishments has been starting the great tradition of an annual chestnut festival in Rowlesburg, West Virginia.

John Wenderoth: North Central Region

John Wenderoth's passion for nature developed at an early age. After retiring in 2009, he began looking for a way to engage in something meaningful. When he read *American Chestnut: The Life, Death, and Rebirth of a Perfect Tree* by Susan Freinkel, he was inspired to join the PA/NJ chapter of The American Chestnut Foundation in 2010. At the end of 2016, Wenderoth completed his second and final year as president of the PA/NJ Chapter. Currently, he volunteers in the chestnut orchard at Tyler Arboretum and as a garden assistant at Scott Arboretum. During his first year as president, Wenderoth visited more of Pennsylvania than ever before, and he became keenly interested in learning about genetics and understanding how to promote public appreciation of the significance of the loss and restoration of the American chestnut. He brings an amazing level of dedication to the organization. He continues to pour his heart and soul into this work whether it's boot-on-the-ground labor or fundraising. He is an outstanding contributor to the overall mission. His other interests include gardening, particularly in establishing self-sustaining landscapes, and spending time with his six children and ten grandchildren.

Ellery "Woods" Sinclair: New England Region

Ellery "Woods" Sinclair has given a decade of extraordinary service to the Connecticut Chapter Board of Directors. One of his first initiatives in this role was to develop plans for a local backcross breeding orchard, leveraging relationships with the Housatonic Valley Regional High School and connections with the Great Mountain Forest Corporation to source both a suitable location and the manpower required to turn a former Christmas tree farm into one of the Chapter's premier orchard locations. He played an active role in the orchard's layout and supervised construction of a gorgeous and successful fence. He also ensured the Chapter provided financial support to maintain the orchard that had the excellent benefit of acquainting high school age students with the site and the foundation's mission. As a lifelong teacher, Sinclair knew the tremendous value of this initiative. In addition, Sinclair provided access and a connection between the community and the orchard through hosting an annual Housatonic Heritage Tour. As a great sounding board for ideas, Sinclair continues to be a trusted voice at Board Meetings and a broader voice through the authoring or articles for print and web.

IN VITRO PROPAGATION OF Ozark chinquapin

MAY HELP CONSERVE AND RESTORE THIS AMERICAN CHESTNUT RELATIVE

Scott Merkle, Ryan Tull and Jeremy Tubbs

Figure 1. Leaves and clusters of burs on an Ozark chinquapin source tree at The Nature Conservancy's Nickel Preserve. Photo by J. Tubbs.

While most TACF members are no doubt very familiar with the American chestnut story, fewer may be familiar with close North American relatives of the tree that also were devastated by the introduction of chestnut blight, the Allegheny chinquapin (*Castanea pumila* var. *pumila*) and the Ozark chinquapin (*Castanea pumila* var. *ozarkensis*). Chinquapins (or chinkapins) are shrubs or small trees commonly found throughout the southeastern U.S. Besides their smaller stature, they can easily be distinguished from American chestnut by their burs, which are two-valved and only contain one nut, rather than being four-valved with three nuts. There has long been disagreement with regard to how many chinquapin species exist, with some taxonomists separating them into eight or more distinct species, while at the other end of the spectrum, the different forms have been reduced to a single species, with two varieties, *pumila*, and *ozarkensis* (Payne et al. 1994).

Variety *pumila* is the more widespread of the two, with a range extending from southeastern Pennsylvania to north central Florida and west to eastern Texas, eastern Oklahoma and southwestern Missouri. The range of variety *ozarkensis* is much more restricted, being located in the Ozark Highlands of eastern Oklahoma, southwestern Missouri and Arkansas. This variety was also previously found in north-central Alabama, but was apparently extirpated from that region by chestnut blight (Johnson 1988). Besides some differences in leaves and bark, Ozark chinquapin can be distinguished from the Allegheny chinquapin by the fact that Allegheny chinquapin is often stoloniferous, meaning that it can sprout from underground stems, while Ozark chinquapin is never stoloniferous (Johnson 1988). Also, unfortunately, Ozark chinquapin is even more severely affected by blight than Allegheny chinquapin, and most individuals now exist as stump sprouts of variable size and age (Johnson 1988). The fact that the tree has completely disappeared from part of its range is an indication that its genetic base is probably narrowing and immediate steps need to be taken to conserve the remaining germplasm before it is further eroded by losses to blight (Dane et al. 1999).

Over the past 25 years, we have developed an *in vitro* clonal propagation system for American chestnut using somatic embryogenesis (SE), which produces large numbers of embryo-like structures (somatic embryos) that can be germinated like seeds to produce clonal plantlets (somatic seedlings). Our work with American chestnut embryogenic cultures has been described in previous TACF Journal articles (Carraway et al. 1994, Holliday and Merkle 2000, Merkle et al. 2008, Maner and Merkle 2010) and elsewhere. The embryogenic cultures can be used for different applications, such as target material for genetic transformation, or, as we are now doing in collaboration with TACF, clonal propagation of promising genotypes generated by conventional breeding. Over the past few years, we applied our SE system to propagate TACF BC3F3 genotypes and have been able to produce embryogenic cultures and BC3F3 somatic seedlings for clonal testing by TACF scientists (Holtz et al., in press). Some of these clones may eventually be the basis for new elite chestnut varieties for TACF.

At the suggestion of colleague Dr. Bill Powell (SUNY-ESF), the Merkle Lab at UGA made contact with Mr. Jeremy Tubbs, Director of the Nature Conservancy's Nickel Preserve in the Ozarks of eastern Oklahoma, and established cooperation to try to establish embryogenic cultures of Ozark chinquapin. Several Ozark chinquapin trees grow on the Preserve (**Figure 1**). The trees reach a height of 20-25 feet before dying due to blight. As with American chestnut, the trees then re-sprout and the growth cycle starts again. Unopened, green burs were collected from five Ozark chinquapin mother trees growing on the Nickel Preserve in early August 2015 and shipped overnight on cold packs to the Merkle Lab. There, the burs were opened, and nuts were removed and surface-disinfested using a Clorox solution, just as we do with American chestnuts. Then, the nuts were dissected and the immature seeds were removed and cultured on the same tissue culture medium (IMM) we use to start American chestnut cultures, which is a modified Woody Plant Medium. IMM contains a very low concentration of 2,4-dichlorophenoxyacetic acid (2,4-D), which induces somatic embryogenesis from the embryo in the seed. Overall, 25 embryogenic cultures were initiated from the seeds, with at least one culture from each of the mother trees (**Figure 2A and 2B**). The cultures were grown on IMM for several months until those cultures showing the best growth were selected for somatic embryo production. These culture lines were inoculated into flasks of liquid IMM and grown on a shaker for approximately 40 days. Then, the cultures were spread on plates of gelled embryo development medium (EDM), which is the same as IMM, but lacking 2,4-D, to encourage somatic embryos to develop. Somatic embryos developed on the plates within six weeks (**Figure 2C**). Individual embryos were picked off the plates, transferred to fresh plates of EDM and given a cold pre-germination treatment at 8°C for 12 weeks. This is the same treatment

Figure 2. Somatic embryogenesis plantlet production in Ozark chinquapin.
A. Newly initiated embryogenic culture with cluster of somatic embryos arising from seed explant. Bar = 1 mm.
B. Established embryogenic culture proliferating on IMM culture medium. Bar = 1 mm.
C. Somatic embryos developing from plated embryogenic suspension culture. Bar = 1 mm.
D. Somatic seedlings from somatic embryos germinated in GA7 vessel.
E. Somatic seedlings in hardening-off chamber following potting.

our chestnut somatic embryos receive, since regular chestnut seeds require a cold treatment to germinate. Following cold treatment, the embryos were transferred to GA-7 vessels containing EDM with activated charcoal and placed in a lighted incubator for germination. We were surprised at how vigorously the Ozark chinquapin somatic embryos germinated and grew (**Figure 2D**). Since we regenerated these first somatic seedlings, we discovered that Ozark chinquapin nuts, unlike those of American chestnut, actually have no cold stratification requirement in order to germinate (Johnson 1988). So, we will soon be testing whether germination of our Ozark chinquapin somatic embryos is improved by a pre-germination cold treatment or not.

To date, somatic seedlings have been produced from seven different embryogenic culture lines representing four of the five source trees. Some of these somatic seedlings have been removed from *in vitro* conditions and transferred to potting mix, where they have continued growth (**Figure 2E**). With regard to conserving Ozark chinquapin germplasm, we have already applied our chestnut cryostorage protocol (Holliday et al. 2000) to store copies of all the Ozark chinquapin embryogenic cultures in liquid nitrogen in our cryofreezer. We recently attempted to recover three of these cultures following two months in cryostorage. Only one of the three lines recovered and re-grew, so we will try recovering additional cryostored cultures and modify our protocols to obtain higher recovery rates, if necessary. While these results with Ozark chinquapin somatic embryogenesis are preliminary, we believe they are promising evidence that this tool can be applied to conserve Ozark chinquapin germplasm and help with future restoration efforts.

ABOUT THE AUTHORS:
Scott Merkle is Associate Dean for Research and Professor and Ryan Tull is a Research Technician at the Warnell School of Forestry and Natural Resources at the University of Georgia. Jeremy Tubbs is Director of The Nature Conservancy's J.T. Nickel Family Nature and Wildlife Preserve in Cherokee and Adair Counties, OK.

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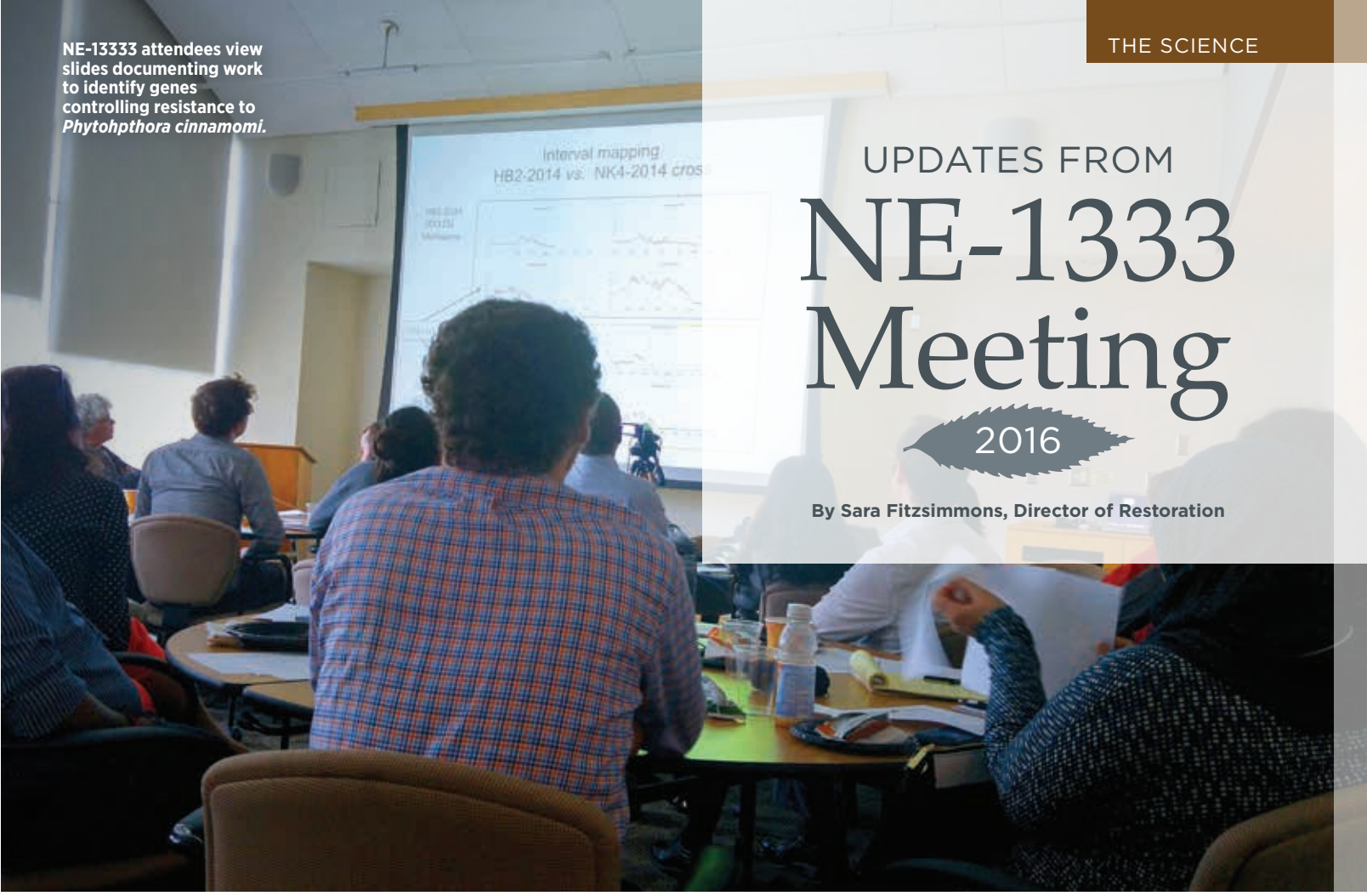


NE-13333 attendees view slides documenting work to identify genes controlling resistance to *Phytohpthora cinnamomi.*

UPDATES FROM NE-1333 Meeting 2016

By Sara Fitzsimmons, Director of Restoration

This year's NE-1333 meeting was hosted in the fall by Dr. William Powell and his research group at the State University of New York, Environmental Sciences and Forestry School (SUNY-ESF) in Syracuse, NY. Approximately 40 chestnut research colleagues attended the meeting which ran for two days.

The breadth of expertise and research performed by members of NE-1333 group may be unmatched in hardwood species conservation. During the indoor presentation sessions highlights included:

- A preliminary study using Illumina sequencing to document the fungal species colonizing chestnut trees showed too much background noise. This research suggests characterizing these species is still best done the old-fashioned way – growing out the fungi and identifying them from cultures.
- Recent work on the genetics of *Phytophthora cinnamomi* resistance suggest that more than one gene for resistance exists across the *Castanea* genus, and also that different loci may exist across different cultivars.
- The latest "superdonor" strain of hypovirulent fungus shows promise in being able to convert all 64 *vic* genes, genes which hinder the transmission of viruses between fungal strains. Because this "superdonor" is classified as "genetically modified," the next steps are to undergo extensive controlled testing in the wild as part of a regulatory process, and to develop a "delivery" device to operationally use the strain.
- Preliminary research into the use of "chemical fingerprinting" for determining disease resistance in chestnut trees appears promising. Infrared spectroscopy and subsequent statistical analysis techniques of the results may offer the capacity to evaluate chestnut materials for resistance in a non-destructive fashion and at a seedling stage.
- Having started her career in 1966, Dr. Sandra Anagnostakis retired from the Connecticut Agricultural Experiment Station (CAES) in 2015. Now Emeritus Scientist, she continues to stay involved in various aspects of research and historical documentation. At this meeting, Dr. Sandy presented on "Important Stuff at the CAES," including countless historical records of USDA chestnut importations, decades of chestnut breeding records, multiple fungal herbaria, photographs, etc.

Planting of American chestnut clones, half with the oxalate-oxidase gene and half without, which were challenged with chestnut blight in the summer of 2016.

Thankfully, attendees don't talk chestnut exclusively for the entirety of the meeting. For the Friday night social activity, the group was treated to a dinner and tour of the Rosamond Gifford Zoo in Syracuse, NY.

Because the meeting was hosted by Dr. Powell and his lab, and because recent results from testing genetically modified American chestnut trees have been promising, a large majority of the meeting focused on the research at SUNY-ESF. Six members from the lab team presented on various methods employed in the research including *ex vitro* rooting of tissue cultured shoots, assays to determine presence of oxalate oxidase in chestnut tissue, the hurdles presented in the regulatory process, as well as possibilities for incorporating the CRISPR/CAS9 technique for genome editing into American chestnut restoration work.

The meeting attendees then toured the SUNY-ESF labs and greenhouses, the Biotech Accelerator Building in which the group's growth chambers reside, and then headed out to two separate field sites to observe the results of recent field plantings, inoculation trials, and pollinations on genetically modified American chestnut trees.

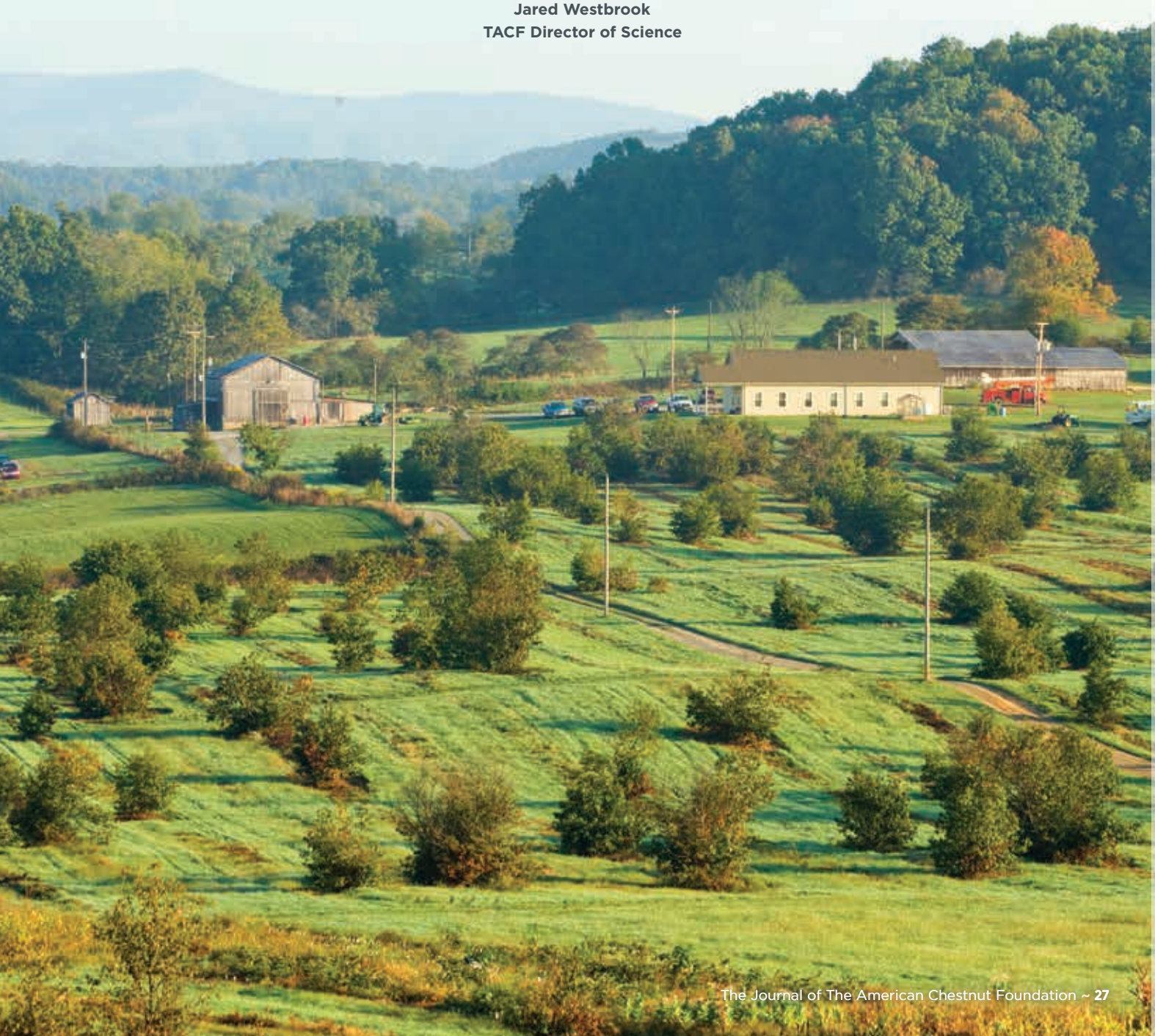
Next year's meeting will be hosted in western North Carolina and showcase one of TACFs breeding orchards. More information on all USDA CSREES Northeast Regional Projects – Chestnut is available online at: http://ecosystems.psu.edu/research/chestnut/meetings/crees-ne-projects

Andy Newhouse demonstrates a metal mesh bag, which is required to be placed over chestnut flowers to guarantee no germplasm escapes the site.

2016 UPDATE FROM
TACF'S MEADOWVIEW RESEARCH FARMS:

Progress towards breeding disease-resistant American chestnuts

Jared Westbrook
TACF Director of Science



Breeding to introduce resistance to chestnut blight and *Phytophthora* root rot (PRR) into American chestnut populations involves screening large numbers of American chestnut backcross progeny for disease resistance. The goal is to identify the few trees that inherited the requisite disease resistance from Chinese chestnut to survive and reproduce in Eastern forests.

Since 2002, The American Chestnut Foundation has been intercrossing third backcross (BC_3) American chestnut trees to generate large BC_3-F_2 populations for disease resistance screening. Over 60,000 BC_3-F_2 trees that descended from the Clapper and Graves resistance sources have been planted in seed orchards at TACF's Meadowview Research Farms. To date, over 50,000 of the most susceptible BC_3-F_2 trees have been culled from these orchards after artificial inoculation with *Cryphonectria parasitica*. The final objective is to cull these populations down to about 600 BC_3-F_2 trees that are most resistant to chestnut blight or PRR. A second round of intercrossing among the most disease-resistant BC_3-F_2 trees is expected to generate BC_3-F_3 trees with enough disease-resistance to continue to evolve in self-sustaining populations in the forest.

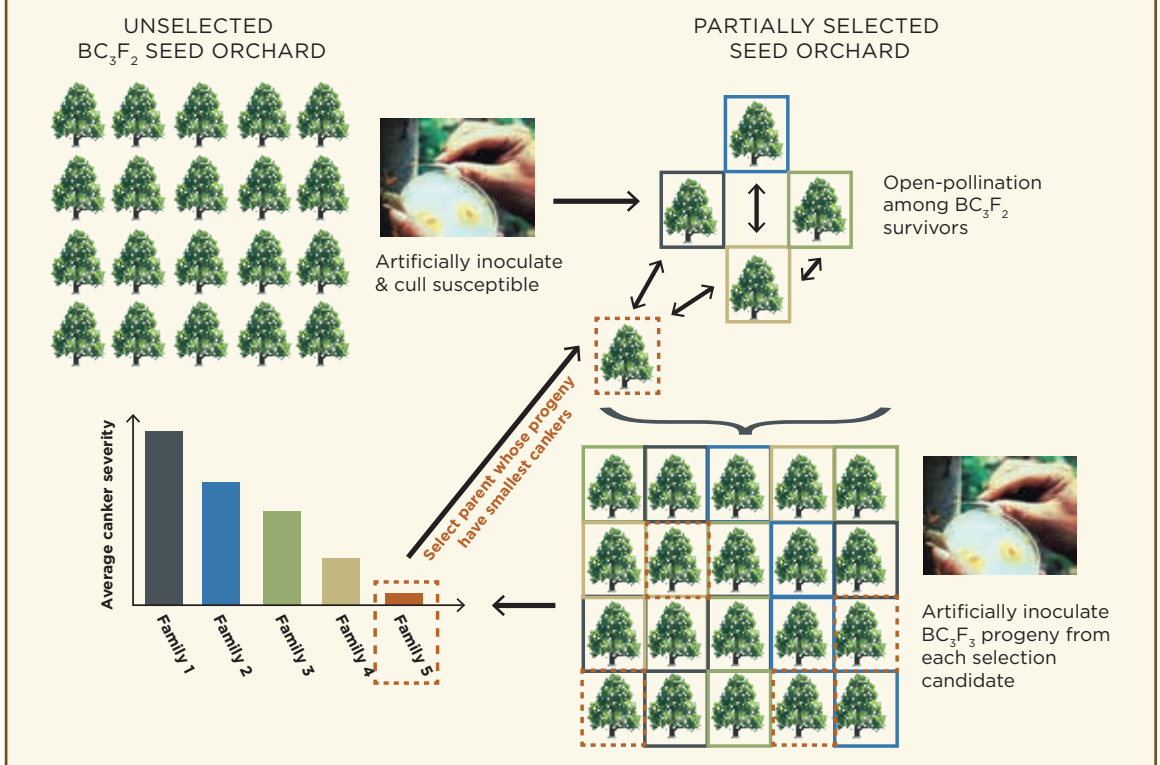
Rogueing BC_3-F_2 seed orchards:

Currently the blight resistance of BC_3-F_3 seed generated from random mating of the 8,200 remaining BC_3-F_2 parents in Meadowview orchards is limited by susceptible trees contributing to the pollen cloud. This winter, we are culling the BC_3-F_2 populations further to 5,000 trees based on the progression of natural blight infection. As we rogue inferior trees from the orchard, we expect that average blight resistance of BC_3-F_3 seed coming from those orchards will continue to increase.

Progeny Testing:

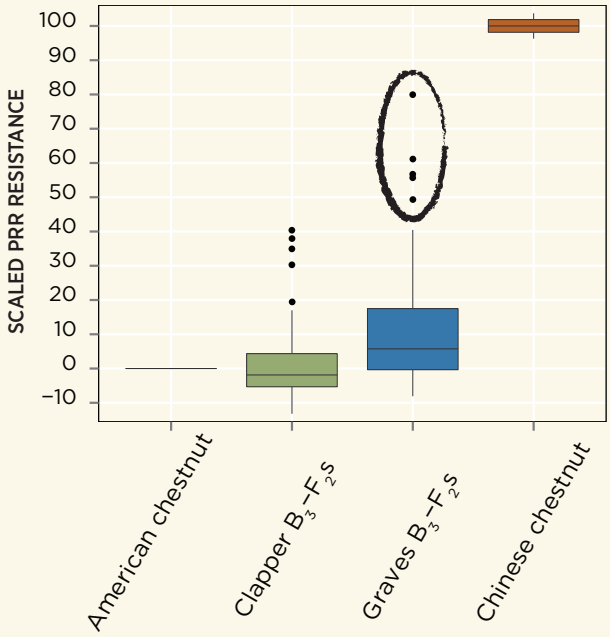
As obviously susceptible BC_3-F_2 trees are rogued from seed orchards, it becomes increasingly difficult to distinguish highly resistant trees from those with intermediate resistance based on visual inspection alone. The expression of a tree's disease resistance is a function of the number of resistance genes it inherited and the environment in which it is growing. Walking through BC_3-F_2 seed orchards at Meadowview, the effects of environment on blight resistance become apparent. Trees growing in the well-lit edges of the orchard and in well-drained upland microsites tend to appear more blight resistant. Trees in less well-drained depressions in the center of the orchards appear less resistant. Environmental factors like the degree of tree to tree competition and soil drainage are suspected

Figure 1



Method of progeny testing for blight resistance

Figure 2



Screening BC_3-F_3 progeny from Meadowview seed orchards for resistance to *Phytophthora cinnamomi*. A) Rice grain inoculation with *P. cinnamomi* (top photo). Mortality from root rot is starting to occur 4 weeks after inoculation. B) Genetic resistance of Clapper and Graves BC_3-F_2s to *P. cinnamomi* relative to Chinese chestnut and American chestnut. Resistance of the BC_3-F_2s was inferred from inoculating their BC_3-F_3 progeny with *P. cinnamomi* and measuring the percentage of the stem that had wilted 16 weeks after inoculation. Genetic variation in PRR resistance (the inverse of percentage stem wilt) was scaled from 0 = mean of American chestnut and 100 = mean of Chinese chestnut. Highly resistant Graves BC_3F_2 mothers are circled. The PRR resistance screening pictured here was performed by Dr. John Frampton at North Carolina State University.

to affect the expression of resistance because trees from the same families planted in different microsites appear to have more or less resistance depending on the microsites' suitability for American chestnut.

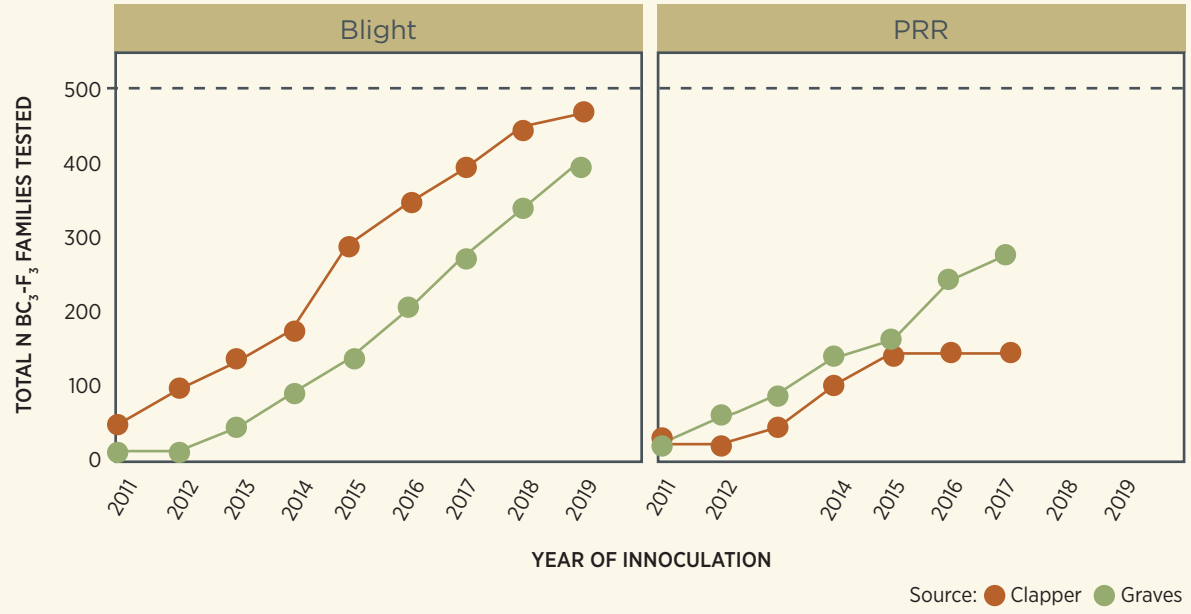
Screening BC_3-F_3 progeny for disease resistance is one method to estimate the genetic component of disease resistance for the BC_3-F_2 trees that remain in seed orchards. Progeny testing consists of planting 30+ BC_3-F_3 progeny of open pollinated BC_3-F_2 mother trees in randomized field trials. After trees are large enough to detect differences in disease resistance, they are inoculated with *Cryphonectria parasitica*, the fungus that causes chestnut blight or with *Phytophthora cinnamomi*, the organism that causes root rot. The relative genetic resistance of BC_3-F_2 mother trees is estimated from the average chestnut blight canker severity or root rot severity of their BC_3-F_3 progeny (**Figure 1**). Progeny testing is more accurate than visual inspection of BC_3-F_2 trees for identifying the most genetically resistant BC_3-F_2 individuals. It is also slow and laborious. Chestnut trees in orchards do not typically reach reproductive maturity until at least age 5. Since the BC_3-F_2 orchards were initiated in 2002, only a subset of 1142 BC_3-F_2 trees have produced seed.

Progeny testing of 500 BC_3-F_2 mother trees per resistance source and pathogen combination will be adequate to represent a wide range of disease resistance and breeding lines. By 2020, TACF's staff and collaborators intend to screen progeny from at least 500 BC_3-F_2 mothers from both the Clapper and Graves sources for resistance to chestnut blight. We are focusing additional progeny testing for root rot resistance on the Graves source of resistance. In progeny tests completed thus far, Graves BC_3-F_2s are more resistant than their Clapper counterparts (**Figure 2**). We are well on the way to reaching our goal of progeny testing 500 BC_3-F_2 mother trees per resistance source and pathogen combination. After the 2016 seed harvest, BC_3-F_3 progeny from 470 Clapper and 393 Graves BC_3-F_2 mothers from Meadowview will be represented in ongoing progeny tests for blight resistance. Progeny of 272 Graves BC_3-F_2 mothers are represented in progeny tests of *Phytophthora* root rot resistance (**Figure 3**).

Seedling Inoculations:

This summer, Meadowview staff and volunteers conducted a pilot study to determine if genetic variation in average chestnut blight canker sizes among BC_3-F_3 families was

Figure 3



Progress toward screening 500 Clapper and Graves BC3-F3 families from Meadowview for resistance to chestnut blight and *Phytophthora* root rot.

detectable at the seedling stage. In field trials, the standard method at Meadowview has been to inoculate BC_3-F_3 progeny in their third growing season. Progeny test results may be obtained within one growing season by inoculating containerized seedlings using the small stem assay (SSA) developed by Dr. William Powell at SUNY-ESF (http://www.esf.edu/chestnut/resistance2.htm). Seedling inoculation requires far less labor and land than field trials. Survival to inoculation age and family sample sizes are typically higher with using containerized seedlings as compared with field grown plants. Seedling progeny of 88 BC_3-F_2 mother trees were inoculated with a weakly pathogenic strain of *C. parasitica*. Canker lengths and subjective ratings were obtained from between 15 and 54 BC_3-F_3 progeny (average 27) per BC_3-F_2 mother 15 weeks after inoculation. As expected, seedling Chinese chestnuts had smaller cankers on average than American chestnuts. The most blight resistant BC_3-F_3 families had average canker severity that was intermediate between Chinese chestnut and American chestnut. The least resistant BC_3-F_3 families had cankers as severe or more severe than American chestnut. A similar range of canker severity among BC_3-F_3 families has been observed in field trials conducted over the last six years (**Figure 4**). These promising results suggest that genetic differences in blight resistance are detectable among BC_3-F_3 families using the seedling inoculation method. We also planted BC_3-F_3 progeny from these same 88 families in a field trial. In two years, we will compare if family blight resistance rankings in field trials is correlated with resistance as assessed with seedling inoculations.

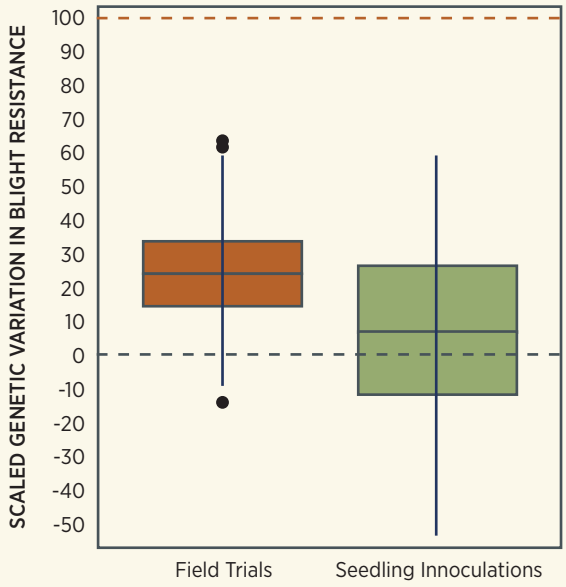
Genomic Selection:

TACF is collaborating with Dr. Jason Holliday at Virginia Tech to sequence DNA from all BC_3-F_2 mother trees that have been progeny tested for disease resistance. The objective of this research is to estimate relationships between DNA sequence variation and genetic variation in disease resistance. Once these relationships have been determined, the resistance of the remaining trees in Meadowview seed orchards that have not been progeny tested may be predicted from DNA sequence alone (**Figure 5**). Due to the recent revolution in DNA sequencing technology, it is becoming easier, cheaper, and faster to sequence DNA to predict disease resistance than to inoculate large numbers of progeny in field trials. Using a method called restriction associated digestion sequencing (RAD-seq), more than 20,000 single nucleotide polymorphisms (SNPs) have been sequenced in about 500 Graves BC_3-F_2 trees. Additional DNA sequencing in BC_3-F_2 populations is ongoing. We are currently estimating how accurately these SNPs predict genetic variation in disease resistance within BC_3-F_2 populations.

Best x Best Crosses:

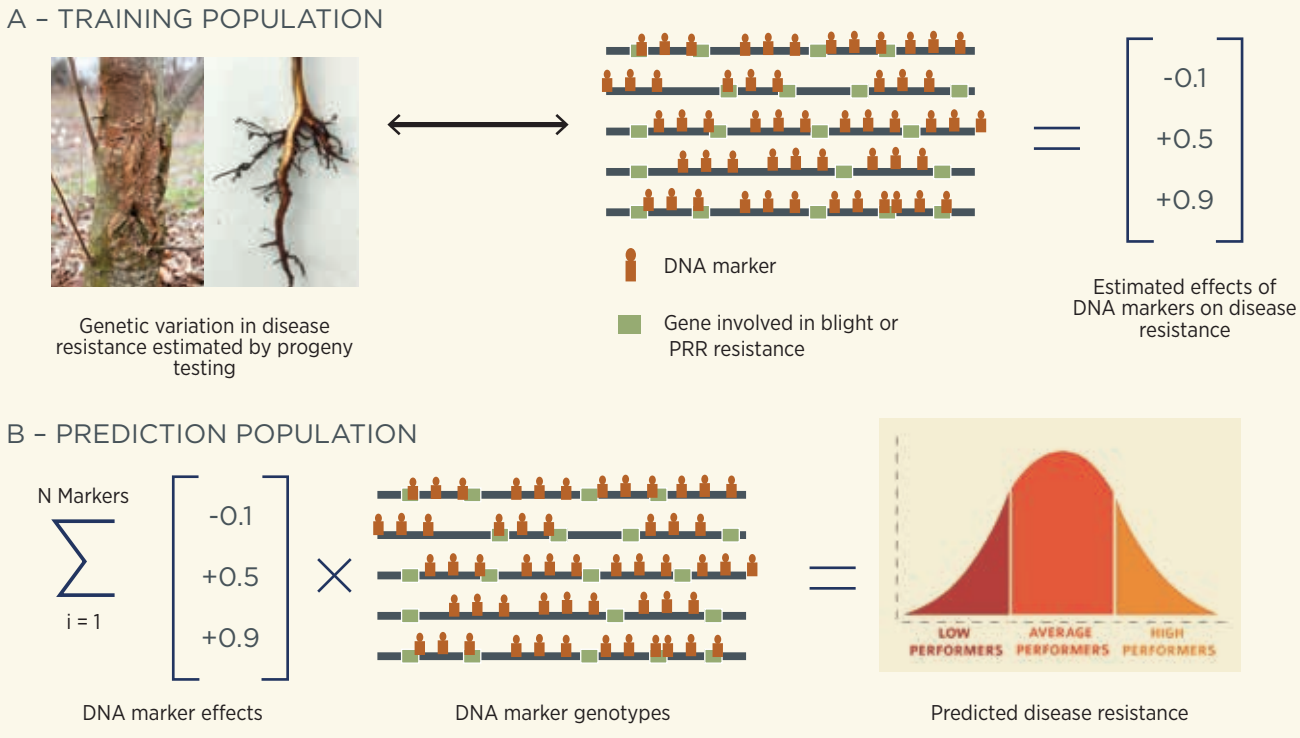
In 2016, controlled pollinations were conducted among 16 Clapper and Graves BC_3-F_2 trees that are among the most resistant to either chestnut blight or *Phytophthora* root rot based on progeny test results from previous years. More than 600 BC_3-F_3 seed from best x best crosses were harvested in 2016. We are planning to plant these seeds at locations away from other susceptible trees at Meadowview. As these trees reach reproductive age and begin intercrossing, we expect they will become a reliable source of disease-resistant seed before completing selection in seed orchards at Meadowview.

Figure 4



Inoculation of containerized seedlings with *Cryphonectria parasitica* as a method of progeny testing for blight resistance. A) Representative cankers of relatively susceptible (top photo) and resistant (bottom photo) trees approximately 8 weeks after inoculation with *C. parasitica*. B) Genetic variation in blight resistance among BC_3-F_2 mother trees observed in 2011-2015 field trials (419 BC_3-F_3 families) versus 2016 seedling inoculations (88 BC_3-F_3 families). Genetic variation in blight resistance was scaled to 100 = Chinese chestnut and 0 = American chestnut.

Figure 5



Genomic selection for disease resistance in BC_3-F_2 populations. A) The effects of DNA markers on genetic variation in disease resistance is first estimated in a training population. B) The same DNA markers are sequenced in individuals that have not been progeny tested. The effects of these DNA variants are summed across the genome to predict genetic variation in disease resistance.

Mary Belle Price

VITAL TO OUR SUCCESS

by Emily Nowels

Mary Belle at the Harvest Celebration at Meadowview Research Farms in 2010.

THIS PAST AUGUST, THE AMERICAN CHESTNUT FOUNDATION (TACF) LOST A LONG-TIME MEMBER AND BENEFACTOR, MARY BELLE PRICE, at the age of 98. She was once called "TACF's American Chestnut Champion." She was an enthusiastic supporter of the organization and her contributions ranged from helping to form the Georgia Chapter to funding the Glenn C. Price Laboratory and Research Farm in Meadowview, VA.

When you ask someone about Mary Belle, a story about TACF's farm in Meadowview is usually what's mentioned first.

Mary Belle was already in her mid-70s when she hopped in the pickup truck next to then TACF staff pathologist Dr. Fred Hebard and bounced along the backroads with him to tour the property we now know as the Glenn C. Price Research Farm. At the time, she was on a mission to fulfill a request from her husband, Glenn Price, who had recently passed away.

Glenn had been inspired to learn more about TACF after reading a 1980 article in National Geographic about the tree, which featured a few photographs of Meadowview farms. Interested, Glenn reached out to Hebard for a tour of the property not long before he passed away. Prior to his passing, he urged Mary Belle to see that their charitable giving went to support the continued growth of TACF. And as Emeritus Board Member, Bill Lord put it, "Her (Mary Belle's) comment about her husband: He didn't throw his money away to different causes, they had to be the genuine article. They had to be doing something really worthwhile, and he was sold on what the chestnut foundation was doing through this backcross breeding program."

Mary Belle then called Hebard and asked, "How many acres do you need?" And the search began for a roughly 30-acre plot of land. But farms that size were hard to come by, and after a year they still hadn't found anything. There was, however, one farm for sale just up the road from TACF's Wagner Farm. It also happened to be 93-acres. Nonetheless, Hebard proposed an idea to Mary Belle. Buy the whole property, donate the back half to TACF, and then subdivide the front for resale.

Hebard said that afternoon when they toured the property is one of his favorite memories of Mary Belle. "We went to look at the farm, and I drove her around, and we got up on a hill with a pretty view looking north, and she said, 'Well, do you think you could use the whole thing?'" Hebard recalls amidst frequent chuckles, "and I said yes. And that was really our crown jewel as far as farms went."

This farm wasn't the end of Mary Belle's impact in TACF, only the beginning. The Former Executive Director of TACF, current Board Emeritus President, and Mary Belle's friend, Marshall Case said, "She told me many times, it was Glenn's dream, and then she became part of it." But that didn't make her enthusiasm for the project any less. "If she made a commitment, she made a commitment," Case said. "Anything she tackled, she tackled with a quiet gusto."

> As Dr. Fred Hebard put it: "We couldn't've gotten to where we did without her. I don't know how to say it any better than that. She was vital to our success."

Mary Belle was well known for her dedication and pragmatism. Hebard called her a "no nonsense lady, who spoke her mind, and got things done." She liked results and knew what it took to achieve them.

Hebard recalled one day shortly after TACF had purchased a new tractor for the farm: "One member of the board of directors said to a couple of boys who worked on the farm that he wanted to see that thing spic-n-span," Fred said. "And he said it in front of Mary Belle, and bless her heart if she didn't say, 'I'd rather see that tractor muddy and dirty because that means it's been doing some work.'"

After purchasing the land, she continued to show her support by donating her and Glenn's beach house to TACF in order to set up an endowment to sustain the farm.

Soon it became obvious that the scientists at Meadowview had outgrown the old farmhouse they had been using as a lab. They were in need of a space better equipped to handle some of the newer technologies and processes that were being used in the effort to save the chestnut. So, Case, Hebard and Mary Belle began planning the Glen C. Price Laboratory. Hebard said this lab made possible new avenues of research that previously had been too unsafe to attempt without the proper lab equipment.

Case said the groundbreaking of the laboratory is his favorite memory of Mary Belle. It was a brutally cold and snowy day when they met in front of an old, dilapidated barn at the site for the new research facility. A farmhand had lit a fire in an old barrel. "We packed this ridiculously silly situation in front of the condition of the building–a fire in a barrel... And there's Mary Belle just sitting there having a fine time," Case said. "And then we go outside, and she's there helping put the shovel in the ground with the snow coming down."

She eventually moved to Georgia to be close to family. There she became instrumental in founding the Georgia chapter of TACF, both through funds to get the chapter off the ground and, as Hebard stressed, by inspiring others to become a part of the project.

Case still has a picture of Mary Belle hung on his refrigerator. She used to say to him, "When you came to us we were in a basement, and when

Mary Belle always stressed the importance of a good education. She supported internships with The American Chestnut Foundation for Berry College students. Shown above, Mary Belle attended the very first chestnut planting at Berry College in 2006.

When CEO Lisa Thomson visited with Mary Belle in 2016, she proudly displayed the Abingdon newspaper article from 1998 announcing the research center which she funded at Meadowview.

In 1995, member Mary Belle donated to the Foundation the 93-acre Glenn C. Price Research Farm, named in honor of her late husband. The gift enabled us to expand our breeding programs.

you left we were in a penthouse," referring to his instrumental work in expanding TACF.

"She was not afraid to say what she really felt and encourage.[...] I told her many times, you're my cheerleader, Mary Belle. You're always there to support me. No matter what we're trying to tackle, you're there." Case said.

Current President and CEO Lisa Thomson had the privilege of meeting Mary Belle just once, "and it was an unforgettable visit." Along with her niece Dianne Smith and her husband Jerry, they met in her cozy kitchen sharing chestnut stories, hopes and dreams. "She was practical, kind and extremely sharp. I loved her vitality and generous spirit. She will be sorely missed by all who knew and loved her."

As Hebard put it: "We couldn't've gotten to where we did without her. I don't know how to say it any better than that. She was vital to our success."

Mary Belle clearly made a lasting impact on the people in her life and on the future of the chestnut tree. TACF will continue to feel her legacy for years to come.

REMEMBER ME

If you love me as you say,
Plant a tree every Arbor Day.

Not for three years, nor four,
But for evermore.

It need not be big or tall,
It could be a seed, not a tree at all.

Any species it may be,
But my preference, the American chestnut tree.

It will surely put a smile on God's face,
And, make the world a better place.

Ron Griffith
Kentucky Chapter
July 7, 2016

Squash with Brussel Sprouts and Chestnuts

By Elana Ansterdam, Elana's Pantry (elanaspantry.com)

Ingredients

2 tablespoons olive oil

1 large onion, diced

½ pound butternut squash, cut into 1-inch cubes (about 1 ½ cups)

½ pound brussel sprouts, cut in half (about 3 cups)

2 tablespoons water

1 cup cooked chestnuts, cut in half

¼ teaspoon Celtic sea salt

Instructions

1. In a large skillet, heat olive oil over medium heat
2. Caramelize onion, sautéing 10-15 minutes until golden brown
3. Add brussel sprouts and squash to skillet, cook for 15 minutes, stirring occasionally
4. Add water to skillet, cover, and cook for an additional 4-6 minutes, until vegetables are fork tender
5. Stir in chestnuts and salt
6. Serve

IN MEMORY AND IN HONOR OF OUR TACF MEMBERS

AUGUST 26, 2016 – JANUARY 9, 2017

IN MEMORY

Dr. George Abdo
from:
David Clay

David S. Darrow
from:
Mas and Caroline Iwata
Oliver Moles
NSA Civilian Welfare Fund
Heather and Douglas Shors

Kenneth A. DeRoche
from:
Paul and Linda Andrea
Bruce Howes
Ken and Karen McIver
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Gregory Dozier

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Edwin Swatsell

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from:
Catherine Millar

Jane Chandler Walker
from:
Ivy Farber

Alan Willoughby
from:
Nancy Willoughby

HONORARIUM
(in honor of)

Marshal Case
from:
William Lord

Herb Darling
from:
Lisa Thomson

Eileen Evans
from:
Daniel and Rachel Chandler

Vic Hutchinson
from:
Blue Ridge Naturalist Network

Martin Schulman
from:
Wildflowers Garden Club

George Thompson
from:
Citizens for Fauquier County

Lisa Thomson
from:
Alyce and Lowell Fritz

Jared Westbrook
from:
Massachusetts/Rhode Island Chapter, TACF

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

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TACF's Pure American Program

AVAILABLE FOR 2017

The American Chestnut Foundation has a limited supply of pure American seedlings available for members. These trees will eventually succumb to the blight fungus, but growing them is a wonderful learning experience and a lot of fun! Plus, pure American chestnut trees can survive up to 10 years.

QUALIFICATIONS TO PURCHASE SEEDLINGS:

You must be a current TACF member. If not, you may join when placing your seedling order ($40 minimum donation).

Distribution range is limited to states east of the Mississippi (no exceptions).

Phone orders ONLY will be accepted between February 1 and March 31, 2017, or while supplies last.

PRICING FOR PURE AMERICAN SEEDLINGS

(only sold in quantities of 10, 25, 50 – includes shipping)

10 seedlings - $50.00
25 seedlings - $125.00
50 seedlings - $250.00

Beginning February 1, please call 828-281-0047
to place your order.