THE
Journal
OF THE AMERICAN CHESTNUT FOUNDATION

JANUARY/FEBRUARY 2012 | ISSUE 1 VOL. 26

Features

THE AMERICAN CHESTNUT FOUNDATION®

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THE AMERICAN CHESTNUT FOUNDATION®

The Mission of The American Chestnut Foundation

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

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

About Our Cover Image

This painting by noted nature and landscape artist Susan Bull Riley is titled "Chestnut Dreams: an artist's imagining of how Dunn's Gap in Warm Springs, Virginia will look when a new generation of American chestnuts has grown to maturity." American chestnut trees are one of Susan's favorite subjects. You can read more about her and her remarkable art starting on page 18.

Correction: Our November/December issue contained an error regarding the photo credit on page 21. The photo *American chestnut with blighted bark in Douthat State Park, Virginia*, was taken by Vicky Somma, the winner of the 2011 Photo Contest. Vicky won the contest with a different photograph, which will be the cover image in an upcoming issue of *The Journal*.

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Bluejay by Susan Bull Riley

When Can I Get a Tree?

by Glen Rea and Bryan Burhans

American chestnut seed sprouts. Quantities of Restoration Chestnuts 1.0 are currently limited, but increasing steadily as more orchards begin to produce.

One of the most frequent questions we hear at TACF is: "When will blight-resistant trees be available for planting in my forest?"

For nearly three decades, TACF volunteers and scientists have carried out an historic program with the goal of transferring blight resistance to the American chestnut. After all, how can you successfully restore the tree without making it blight resistant?

To help achieve this goal, TACF volunteers have developed over 300 backcross breeding orchards from Maine to Georgia representing over 125,000 chestnut trees. Pretty good for a group of volunteers! In addition to those orchards, our NY Chapter has been working with the State University of New York, College of Environmental Science and Forestry, to use biotechnology to develop resistance to blight in chestnut.

TACF has recently established test plantings of potentially blight-resistant chestnuts that have resulted from both the backcross breeding program and the biotechnology approach. As you can see from the report by Dr. Fred Hebard in this issue, test results from the backcross breeding program are promising, but only time will tell how well these early trees will be able to handle the blight in the long term.

Although mass distribution of blight-resistant seed, which we call our Restoration Chestnuts 1.0, is still years away, TACF continues to provide Restoration Chestnuts 1.0 to our long-term members, state chapters, Annual Sponsor members, and the partners that are helping us with our early testing and evaluation. The amount of seed available is purely a function of production levels at our Meadowview Legacy Tree Orchard, and, in years to come, through our state chapter orchards.

It is also important to remember that our current Restoration Chestnut 1.0 is not an "end product," but rather represents the *beginning* of a long road of further breeding, evaluation and planting. An early goal has been to create a chestnut tree with enough resistance to be able to reproduce in the wild. If testing shows that our Restoration Chestnut 1.0 has achieved that, then, one day, the American chestnut will be able to evolve through natural selection…a process that was halted after the introduction of the blight over a century ago.

Transferring blight resistance to *Castanea dentata* will take time, commitment, focus, technical expertise and vast resources. These requirements are exactly why The American Chestnut Foundation was established almost 30 years ago as a non-profit foundation. This long-term approach is necessary to achieve our historic mission and is only possible because of the long-term commitment of our volunteers and partners.

"Transferring blight resistance to *Castanea dentata* will take time, commitment, focus, technical expertise and vast resources. These requirements are exactly why The American Chestnut Foundation was established almost 30 years ago as a non-profit foundation."

TACF Launches Electronic Newsletter

TACF is excited to announce the release of a monthly electronic newsletter. With this new tool, we strive to bring you the most current news on TACF and the world of American chestnuts, including updates from our field staff, recent news articles and video clips, and a calendar of upcoming events.

To receive The American Chestnut Foundation e-newsletter, simply provide us with your email address on the homepage of our website www.acf.org in the field that reads "Join our Mailing List." You can also join the mailing list on our Facebook page.

2011 TACF Annual Report Now Available

The TACF 2011 Annual Report has just been published. Based on the 2011 fiscal year (July 1, 2010 to June 30, 2011), the TACF Annual Report is designed to give the reader a fast, easy-to-read overview of TACF's projects, goals and progress for the year. The 2011 report is full of interesting information on what we are doing and where we are headed. If you would like a copy of the report, please call the National Office at 828-281-0047. You can also obtain a digital copy online at: **http://www.acf.org/pdfs/financial/2011_Annual.pdf**

Fox National News broadcast a Christmas Eve report on chestnuts roasting over an open fire

Fox News Channel Broadcasts TACF Story Coast-to-Coast

TACF got a last-minute Christmas present when Fox News Channel called our headquarters on December 19 wanting to do a piece on "chestnuts roasting on an open fire." Fortunately for TACF, Fox News Producer, Jonathan Wachtel is a tree lover and was familiar with the story of the loss of the American chestnut and TACF's efforts to restore the species. As he worked with our staff, a story started taking shape that focused on the seasonal joy of roasting chestnuts, but also related to the work that TACF has done to restore the American chestnut. Fox wanted to video a chestnut orchard within an easy drive of their New York City headquarters, and then show people roasting chestnuts in an attractive setting.

"As it began to look like they could complete the piece by Christmas," says TACF Director of Communications Paul Franklin, "things got very busy. The number of TACF staff and volunteers that helped make this happen was truly inspiring." Science coordinators Sara Fitzsimmons, Katy McCune and Kendra Gurney helped locate suitable orchards. The site chosen was the Pike County orchard in Blooming Grove, PA. Orchard manager and TACF volunteer Robin Wildermuth handled ground logistics as well as being interviewed on camera. Local family Jane and Rusty Lewis generously opened their home to TACF and Fox News, provided chili and hot cider and helped set up the roasting scene around their lovely outdoor fireplace. TACF Director of Development Mark Banker was also interviewed by Fox, and his family (wife Sara, and kids Luke and Clare) had fun roasting chestnuts for the camera. The next morning, the Fox crew arrived at the New York Botanical Garden to interview New York member Dale Travis and view the Restoration Chestnuts 1.0 that the New York Chapter recently planted there. The final result? Fox News was able to finish the piece and broadcast it on December 24th in two versions that reached an estimated combined audience of almost two-million viewers.

Migrating Whooping Cranes Make a Stop in Alabama Chestnut Orchard

In January, Alabama chapter member and orchard manager Jerry Howard was sitting down for breakfast when he saw a strange white object on the path beside his chestnut orchard. Looking closer, he realized it was an *ultra-light aircraft*.

Two years earlier, Jerry had seen a similar aircraft—a motorized hang glider—soaring over his Franklin County farm. With a little research, he learned that his farm was on the migratory route of a unique flock of whooping cranes. For 11 years, the non-profit Operation Migration has played a leading role in the reintroduction of whooping cranes into eastern North America. Each spring, they raise the chicks from birth, nurture them through the year, and guide the juvenile cranes south for wintering.

On that January day, two members from Operation Migration dropped by to express interest in using a field located next to the chestnut orchard as a holding place for the cranes while awaiting better weather conditions. Jerry and his wife Shirley readily agreed.

Whooping cranes are North America's tallest bird, with an adult male reaching 1.5 meters in height with a wingspan of 2 meters or more. Over the past century, these majestic birds have experienced a huge decline in population due to loss of habitat and unregulated hunting. Records show that in 1941, the species reached an all-time low of 15 birds, but it was not until 1967 that the whooping crane was added to the endangered species list. Thanks to the efforts of organizations like Operation Migration, the whooping crane has had a remarkable recovery over the last several decades.

In the following days, the field beside Jerry's chestnut orchard became the camp of the whooping cranes. Jerry, who was asked not to approach the field, later learned that the cranes had never seen a human or any trace of human society up close. From birth they interacted only with handlers in white suits, equipped with adult crane puppets and mp3 players broadcasting natural crane calls.

A costumed "parent" leads the whooping crane Class of 2011 to the newly erected travel pen near TACF member Jerry Howard's chestnut orchard. Image courtesy of www.operationmigration.org

Once the weather cooperated, the cranes and the pilots, who generously thanked Jerry and his family for their hospitality, took flight. "Hopefully, more endangered cranes will stop by next year," said Alabama Chapter board member, Dr. Jimmy Maddox. "They'll need to check on the progress of their newly found friend, the American chestnut."

For more information about Operation Migration and to follow this year's migration, check out their website at www.operationmigration.org.

TACF Jazzes Up Merchandise

TACF rings in the New Year with an expanded merchandise selection. Still offering the same great standbys like baseball caps and the ever-popular botanical t-shirts, we have boosted our selection with new sweatshirts, polos, fleece vests and jackets in more color options than ever before. Many items are now available in both men's and women's sizes.

To see our new merchandise and vibrant color selections, check out TACF's website at http://shop.acf.org/clothing-t-shirtssweatshirtsandjackets.aspx or call 828-281-0047.

One of two Restoration Chestnuts 1.0 that were planted at the New York Botanical Garden in 2011. They will be joined in 2012 by transgenic chestnuts developed by the SUNY College of Environmental Science and Forestry (SUNY-ESF).
Photo by Dale Travis

April Planting Brings Transgenic Trees to New York Botanical Garden Where Chestnut Blight Was First Identified in 1904

On April 18, 2012, test trees produced by the New York State American Chestnut Research & Restoration Program at the SUNY College of Environmental Science and Forestry (SUNY-ESF) will be planted at the New York Botanical Garden in the Bronx, NY. The garden is just across the street from where chestnut blight was first identified in 1904.

For the past 25 years, SUNY scientists Dr. William Powell and Dr. Charles Maynard, with the support of the NY Chapter of The American Chestnut Foundation and others, have been researching and developing transgenic techniques to produce a blight-resistant American chestnut. Currently they have more than 100 varieties either in field trials or waiting to be tested.

The event will begin at 3:00 pm in the Ross Lecture hall with a talk by Drs. Powell and Maynard; this will be followed by a planting at 4:30 pm and a dinner and reception at the garden's lovely old Stone Mill on the Bronx River at 6:00pm. Reservations are required. If you would like to receive an official invitation or sponsorship information, contact the SUNY-ESF Alumni Office at 315-470-6632, or email alumni@esf.edu.

Submitted by Dale Travis

In Memory of and In Honor of our TACF Members November-December 2011

In Memory of

D'Arcy Brent
Duffy Brent

Dr. Martin Kurtz Heine
Wayne Hearn

Russell G. Vermillion
Julia Vermillion

Virgil R. Beary
Eileen Evans

In Honor of

Alan and Anne Johnson
Carol Leonard

Essie and Harold Burnworth
Leslie Darrell Hines, Jr.

Keith Robb
Tavia Robb

Nancy Kyle
Anonymous

Pam Clark and Bobbie Johnson
Carol Leonard

Wes Waters and Tommie Pratt
Elizabeth Gamble

William Gooch
Keith Gooch

Katharine Frase and Kevin McAuliffe
Richard Frase

Perched in a bucket truck, Gary Robertson pollinates a tree that is not far from the New Hampshire state champion American chestnut tree in Canaan, New Hampshire.
Photo by Kendra Gurney

TACF Honors Its Volunteers

Gary Robertson

by Dan Hale

Gary Robertson had been finding surviving American chestnut trees in the wild and reporting their location to TACF for years before he officially became a member in 2009. Since joining, TACF, Gary has been contributing to the organization in a variety of ways. His skills are put to use in the field –locating, pollinating and harvesting wild trees; and working in orchards. He also serves as an active board member for the Vermont/New Hampshire Chapter.

Though he has been a member for just a few years, his background with chestnuts extends much further. As a child living in Bradford, Pennsylvania, his grandparents would often talk of bountiful chestnut groves and the subsequent sudden death of the chestnuts. A lifelong naturalist, Gary frequently found chestnut trees, but it was not until he was twenty, attending The Pennsylvania State University, that he found some viable American chestnuts near campus. Gary earned his degree in experimental physics and has since moved to Gilford, New Hampshire, where he's been supervising the design of electrical connectors for nearly thirty years. In addition to chestnut-related activities, Gary enjoys exploring the New England landscape through human-powered sports such as biking, hiking, and canoeing.

Gary says, "It has been a special privilege to be a member." TACF is likewise privileged to have him as a member.

Blair Carbaugh

by Mila Kirkland

Blair Carbaugh first became involved with American chestnuts in the 1990s when a friend invited him to a meeting of Chestnut Druids in Roaring Spring, Pennsylvania. At that meeting, Blair met several volunteers who have been instrumental in growing the Pennsylvania Chapter of TACF, and have since become his good friends.

Retired from Lock Haven University as a professor of biological sciences, Blair and his wife Mary joined the Pennsylvania Chapter in 1996. They wasted no time becoming active growers, leaders, and educators within the Foundation. In addition to a pure American chestnut orchard, the Carbaughs also planted a chestnut orchard on their 120-acre property in Danville, Pennsylvania. Blair has also been instrumental in establishing plantings on mine lands in the anthracite region of Pennsylvania, an area that still needs significant reforestation work. Currently, Blair serves on the Board of Directors for the Pennsylvania Chapter of TACF.

In addition to his chestnut orchards, Blair is known for firing up his "little rustic sugar shack" in late February for a neighborhood maple-sap boil. Blair taps roughly 30 sugar maples on his property, while his neighbors tap approximately 30 more. The maple sugar boil is usually completed by mid-March, just in time for his neighbors to observe Blair nurturing his chestnuts again in the spring.

Blair examines trees in his chestnut orchard in Danville, Pennsylvania. This tree was planted in 2005 and has survived two inoculations of chestnut blight.
Photo by Mary Carbaugh

Meadowview Notes 2009-2011

Frederick V. Hebard, William Y. C. White, Mila Kirkland, David Bevins and Eric Coalson

American Chestnut Foundation Research Farms, Meadowview, VA

A row of young chestnuts draws the eye towards the Glenn C. Price Laboratory at Meadowview Research Farms

Meadowview experienced good rainfall in 2009, 2010 and 2011, except that a dry spell in April, May and June of 2009 resulted in the low emergence of seeds planted late, in April. Trees from seeds planted during the dry years of 2007 and 2008 grew smaller in subsequent years than comparable trees planted during wet years. Leafout was early in 2010 and flower set was reduced by spring frosts that occurred around May 1. Our average frost-free date is around May 10-15, so these could not be characterized as late spring frosts.

Tree and Seed Inventory

In 2011 there were 56,194 trees and planted nuts at the farms (Table 1), which was down 958 from 2009 (Table 2), even though 19,009 nuts were planted. The planted nuts were offset by rogueing of trees that had insufficient blight resistance and American character and by rogueing of almost all the trees planted at the Wagner Farm prior to 2004. The Wagner Farm was rogued to prevent anything but B3-F2s from producing pollen in its Graves seed orchard. The rogueing resulted in many of the decreases of a few hundred trees in the counts in Table 2.

A much larger decrease occurred in the number of B3-F2s in our Graves and Clapper seed orchards. These declined by 2,964 trees between 2009 and 2011, as we started to reach the point where more were rogued than were replaced by new plantings. Offsetting the decline in numbers of B3-F2s was an increase in the number of B3-F3s by 2,559 (Table 2). Those trees are planted in an orchard setting to be screened at a young age for blight resistance in order to pick out the best B3-F2s in the orchards.

The decline in number of B3-F2s will be much more precipitous by the spring of 2012, since many more trees were rogued. Rogueing seed orchards was the primary activity of the farm crew between late July and December, 2011. That rogueing is critical to the blight resistance of the Restoration Chestnuts produced in the seed orchards, as will be discussed below in the section on the blight resistance of the Restoration Chestnuts.

Rogueing

The large effort expended this year at Meadowview to rogue two seed orchards also is a concern for volunteers planting seed orchards in our state chapters. One bright spot is that we recommend volunteers grow only one block of one seed orchard, rather than the 18 we have in two seed orchards. An 18-fold reduction in labor is important! However, a more efficient method of rogueing also needs to be considered. The method of rogueing we settled on in 2005 was to pluck trees out of the ground with a backhoe or front-end loader and chain. We thought this method would be safer than cutting trees and applying herbicide to kill the stump, as the herbicide could travel through root grafts to neighboring trees. It might be helpful if research on this issue were pursued. However, at Meadowview we have now passed over the hump of the rogueing needed at the seed orchards, as they are almost filled and most of the trees have undergone initial screening for blight resistance and subsequent rogueing. So the method of rogueing is no longer a bottleneck.

Nut Harvests and Increasing the Number of Sources of Blight Resistance

One of our goals is to increase the number of sources of blight resistance to about 20 so we are not relying solely on 'Clapper' and 'Graves,' which might be too narrow a base for long-term stability of resistance. At Meadowview we have been backcrossing a third source of blight resistance from the Nanking cultivar of Chinese chestnut into 20 American lines. We have almost completed advancing those to B3 and will be screening the first batch for blight resistance in 2012. We previously

had intended to use 'Nanking' only in Meadowview and to have chapters work with additional sources of blight resistance. Since we do not have the capacity at Meadowview for more than three sources of resistance in 20 American backgrounds, we planned instead to supply the chapters with pollen from backcross F2s with good blight resistance, and reasonably homozygous for the trait. The F2s could then be backcrossed by chapters for two generations into populations of American chestnut without a need for large numbers of progeny from the first generation of backcrossing.

Our efforts to make backcross F2s for sources of blight resistance other than Clapper and Graves were more successful in 2010 (Table 4) than any year since 2004. In 2010 we obtained nice crops of backcross F2s for the Musick Chinese, Douglas, and R11T14 sources of blight resistance. Including R1T7 B2-F2s obtained in 2004, we now have decent populations of backcross F2s for four sources of blight resistance. The next step will be to obtain selections and pollen. Because we did not have pollen from backcross F2s to give to chapters, for the past few years we have been sending pollen from Nanking backcrosses to those chapters that have wanted to start working on another source of blight resistance. Soon there should be more sources of blight resistance available to chapters.

The harvest of B3-F3 nuts continues to increase (Tables 3 and 4). In 2009 it totaled 13,371 and 17,312 in 2010. The increase occurred despite a late-spring frost that decreased the crop in 2010.

The Rationale of Screening B3-F2s and B3-F3s for Blight Resistance

We use a gradual process to select for blight resistance in our B3-F2 seed orchards. Our initial screen for blight resistance is not precise enough to identify all trees homozygous for blight resistance and would kill too many good trees if it was more stringent.

We start by inoculating 2-year-old seedlings with the SG2-3 strain of the blight fungus and selecting those with small cankers. Although virulent and capable of killing American chestnut trees, the SG2-3 strain is considerably less pathogenic than the Ep155 strain. Previous tests indicated that even 2-year-old Chinese chestnut trees are killed by Ep155, whereas most 2-year-old trees survive inoculation with SG2-3 if they possess levels of blight resistance equal to or greater than that of F1s between Chinese and American. Such F1s typically are intermediate in blight resistance between the two parents. The results of the SG2-3 inoculations enable us to eliminate about 60-70% of the B3-F2s, depending on the size of the tested trees and the year.

We do not include controls such as Chinese chestnut in the B3-F2 seed orchards. The small SG2-3 cankers after the first season of canker expansion on the selections could not be any smaller on Chinese chestnut, so their inclusion as controls would not be informative. Chinese chestnut trees could be informative in later years if left in the orchard but would then start to produce undesired pollen. The B3-F2 orchards also are designed to produce seed with maximum genetic diversity over long periods, and the design appropriate for that goal cannot provide statistically and experimentally sound evidence of blight resistance in the B3-F2s.

We will make additional selections over the next few years following inoculation by examining cankers on the preliminary selections. However, as outlined in the Ten-Year Plan for 2004-2014 (Hebard, 2004), we have been intending to make the final selections among the B3-F2 trees by testing the blight resistance and performance of their B3-F3 progeny in orchard and forest settings.

Results of the First Season of Canker Expansion in an Orchard Test of Blight Resistance in B3-F3 Restoration Chestnut 1.0 Trees Planted Using a Formal Experimental Design

In 2008, we harvested our first crop of B3-F3s large enough to test formally in both orchard and forest settings using an experimental design and control plants. The orchard test was planted in 2009. We now plant these tests every year; they have become a major new effort. In June, 2011, we inoculated that first test planted in 2009 and measured canker lengths in December, 2011, using methods described by Hebard (2005).

Table 5 shows statistics for cankers incited by both Ep155 and SG2-3 on the different cross types in the experiment. (We inoculated these trees with both SG2-3 and Ep155 because they did not need to survive the experiment for further breeding and because the Ep155 inoculations enable us to detect high levels of blight resistance.) The controls for canker sizes, ranked from susceptible to resistant, were American, B2, F1 plus B1-F2, B1xC, and Chinese. (The backcross controls are imperfect resistance standards, as mistakes in selection can lessen their resistance). We expected the B3-F2 selections in the seed orchard that produced these progeny to have blight resistance equal to or greater than that of F1s and B1-F2s, since those B3-F2s had

been screened using only strain SG2-3. If this first expectation were met, one would then expect their B3-F3 progeny to have mean canker lengths intermediate between the F1/B1-F2s and the B1xCs. Instead, cankers on the B3-F3s were similar to or slightly longer than those on B1-F2s. Reasons for this include that pollen is still being produced by unselected B3-F2 parents in the seed orchards, as well as selection being incomplete, and/or that there was some degradation of blight resistance during backcrossing.

Out of 583 trees tested, there were 95 B3-F3s with small cankers for both strain Ep155 and SG2-3, where small cankers are those less than 5 cm in length. Normally, one would expect trees with such small cankers to have a high level of bight resistance. However, there was dominance toward small cankers in this test, leading to a higher frequency of trees with small cankers in the B1-F2 progenies than is observed in most tests of F2s; we observed 35 out of 171 B1-F2s with small cankers where usually we would expect to observe about 10. We expect many of these small cankers on the B1-F2s to start expanding in 2012. How much that occurs also in the 95 B3-F3s with small Ep155 cankers will be interesting to follow.

The dominance toward small cankers after the first season of canker expansion in this test also is reflected in the bimodal distribution of canker sizes. The bimodality is most evident for the Ep155 cankers in the B3-F3 and B1-F2 crosses in Table 5, where there is a peak in the 0-5 cm class and another in the 10-15 cm class. The peak at 0-5 occurred because cankers in the 0-5 cm class cannot get any smaller, so their numbers pile up when dominance is toward small cankers. There was even more clustering in the small canker class for the SG2-3 cankers in the B3-F3 and B1-F2 crosses, which is expected given SG2-3's lesser pathogenicity. However, the ranking of mean canker size for cross type was the same for both strains.

The predominance of small cankers led to a significant fungus strain by cross-type interaction, since the SG2-3 and Ep155 cankers on Chinese chestnut were similar in size while in the other cross types, SG2-3 cankers were about 6-8 cm shorter than Ep155 cankers. There was no interaction between strain and families nested within cross type. Another effect of very small cankers was that the variance of canker length was reduced in Chinese chestnut compared to the other crosses, especially for strain SG2-3. The unequal variances (heteroscedasticity) for strain SG2-3 increased the likelihood that differences between cross types and families would be declared statistically significant, making declarations of significance suspect for SG2-3.

TACF volunteer Terry Stamper helps perform controlled pollination of chestnut trees at Meadowview Research Farms

Table 6 shows canker length statistics for individual families within the various cross types. The Ep155 cankers yielded significant differences in canker size for the more resistant trees while the SG2-3 cankers yielded significant differences for the more susceptible trees (although, again, the significance of the SG2-3 differences is suspect). Twenty-one of 36 B3-F3 families had significantly ($p<0.05$) smaller SG2-3 cankers than the American chestnut family. The B3-F2 parents of the remaining 16 families are candidates for rogueing.

The decision as to whether or not to rogue a B3-F2 because of inadequate blight resistance cannot always be made based solely on statistical significance. For one thing, it depends in part on whether individuals with better resistance remain in a plot. Additionally, statistics do not always provide clear distinctions because of lack of precision or loss of family members (as a practical matter, it would be best if these tests were installed in blocked experiments, to increase precision). The state of other traits also guides the selection. This can be illustrated in plot D5-18. Eventually, we plan to have only one selection in that plot, and the others. Trees D5-18-95 and D5-18-50 clearly should be rejected based on their progenies' large mean canker sizes in comparison to tree D5-18-2. But only 7 progeny of D5-18-2 were tested, so perhaps D5-18-25 should be retained until more progeny of D5-18-2 can be tested. It also is unclear whether tree D5-18-101 should be retained. Ultimately, the decision is a subjective one, based on the best available evidence.

Discussion of B3-F3 canker results

This crop of B3-F3s was significantly more blight resistant than the American chestnut controls, roughly comparable in resistance to the Chinese x American F1 or backcross F2 control families, in the aggregate. None of the individual B3-F3 families had as high a level of blight resistance as the Chinese chestnut control families, but many contained highly blight-resistant individuals, as of the end of the first season of canker expansion. This is roughly in accord with expectation, given that selection is not finished in the B3-F2 orchards from which the nuts were harvested. The best B3-F3 families had resistance roughly comparable to that of families from crosses of selected straight backcrosses with Chinese chestnut; this is what we would expect in nuts from Chinese chestnut fathered by the pollen being produced in the orchards. However, we have not eliminated the possibility that some of the blight resistance of Chinese chestnut has been lost during backcrossing.

While not providing absolute proof that the TACF breeding program will be successful, the results of this experiment are encouraging and suggest we should continue to pursue the research direction set for us by Charles Burnham.

Acknowledgements

We would like to thank Lou Silveri, Monica Appleby, and Joneen Sargent for helping with pollinations and inoculations. Sam Fisher of the Southwest Virginia 4H Center is immensely helpful leading an Elder Hostel Service project that does much of our inoculations. Special thanks to Dave Slack for volunteering one or two days a week all year round for the past six years! Also, we need to acknowledge the role of George Sykes, Danny Honaker, Darryl Caudell, Lori Hall, Louise Cottrell, Bobby Scarborough, and many others in keeping the farms running from day to day. Dr. Kim Steiner provided valuable guidance in analyzing the data. Thanks to all—this wouldn't get done without their help. If you are interested in helping to pollinate next year, plan on any time in June. Call (276) 944-4631. If you want to learn more about the Elder Hostel program, call (617) 426-8055 or write 75 Federal St., Boston MA 02110.

References

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We would like to remind all TACF members that you are welcome to visit the farms at any time. The lab is located at 29010 Hawthorne Dr., Meadowview, VA, 2.5 miles from Exit 24 on Interstate 81, the Meadowview Exit. We generally are there during normal work hours, but it might be good to call ahead (276) 944-4631.

A Quick Guide to Chestnut Breeding Terminology

Parents		Offspring
American x Chinese	=	F_1, F-one
F_1 x F_1	=	F_2, F-two
F_2 x F_2	=	F_3, F-three
F_1 x American	=	B_1, first backcross, or B-one
B_1 x American	=	B_2, second backcross, or B-two
B_2 x American	=	B_3, third backcross, or B-three
B_3 x American	=	B_4, fourth backcross, or B-four
B_1 x B_1	=	B_1-F_2, B-one F-two
B_1-F_2 x B_1-F_2	=	B_1-F_3, B-one F-three
B_2 x B_2	=	B_2-F_2, B-two F-two
B_2-F_2 x B_2-F_2	=	B_2-F_3, B-two F-three
B_3 x B_3	=	B_3-F_2, B-three F-two
B_3-F_2 x B_3-F_2	=	B_3-F_3, B-three F-three

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

Type of Tree	Number of		
	Nuts or Trees	Sources of Resistance	American Lines*
American	1575		223
Chinese	1014	30	
Chinese x American: F_1	417	18	57
American x (Chinese x American): B_1	646	11	24
American x [American x (Chinese x American)]: B_2	1316	13	43
American x {American x [American x (Chinese x American)]}: B_3	2158	10	92
Am x (Am x {Am x [Am x (Ch x Am)]}):B_4	888	4	14
(Ch x Am) x (Ch x Am): F_2	213	5	5
[Ch x Am) x (Ch x Am)] x [Ch x Am) x (Ch x Am)]:F_3	5	1	1
[Am x (Ch x Am)] x [Am x (Ch x Am)]: B_1-F_2	625	7	10
{Am x [Am x (Ch x Am)]} x {Am x [Am x (Ch x Am)]}:B_2-F_2	667	9	12
B_2-F_3	31	1	1
(Am x {Am x [Am x (Ch x Am)]}) x (Am x {Am x [Am x (Ch x Am)]}):B_3-F_2	35394	2	51
B_3-F_3	3826	2	22
Clapper B_3 x Graves B_3: B_3-I_1	110	2	9
Chinese x [American x (Chinese x American)]: Chinese x B_1	167	3	7
Ch x {Am x [Am x (Ch x Am)]}: Chinese x B_2	72	1	2
Ch x (Am x {Am x [Am x (Ch x Am)]}): Chinese Test Suite x B_3	286	5	16
Chinese Test Suite x Chinese	1471	67	67
Chinese Test Suite x Japanese	46	2	2
Chinese Test Suite x European	43	1	1
Chinese Test Suite x Large, Surviving American	149	7	7
European x American F_1	2	1	1
Japanese	3	1	1
Japanese x American F_1	8	1	1
[(Japanese x American) x American] B1	5	1	1
{[(Japanese x American) x American] x American} B_2	142	1	1
Japanese x European	80	1	1
Japanese x Large, Surviving American	27	5	5
Castanea ozarkensis	21	1	2
Castanea pumila	44	3	3
*Castanea seguin*ii	48	3	3
Seguin x American F_1	54	2	2
Large Surviving American F_1	486	12	37
Large Surviving American B_1	506	8	14
Large Surviving American B_2	72	3	4
Large Surviving American B_3	161	1	1
Large Surviving American F_2	266	13	11
Large Surviving American F_3	270	1	2
Large Surviving American I_1	1666	32	13
Large Surviving American I_2	303	11	1
Large Surviving American I_3	104	2	32
Large Surviving American advanced F_1	804	12	25
Other	3		
Total	**56194**		

* The number of lines varied depending on the source of resistance. We will have to make additional crosses in some lines to achieve the desired number of progeny per generation within a line. In keeping with past practice, the number of lines for each source of resistance are added separately; thus, progeny from two sources of resistance that share an American parent would be counted as two lines rather than one line (this only occurs rarely).

Table 2. Changes between 2009 and 2011 in the number of chestnut trees and planted nuts of different types at TACF Meadowview Research Farms, including changes in the number of sources of blight resistance and the number of American chestnut lines in the breeding stock.

Type of Tree	Number of		
	Nuts or Trees	Sources of Resistance	American Lines
American	-368		3
Chinese	509	-26	
Chinese x American: F_1	-36	-2	-25
American x (Chinese x American): B_1	-23	-3	-4
American x [American x (Chinese x American)]: B_2	-605	1	-24
American x {American x [American x (Chinese x American)]}: B_3	248	0	11
Am x (Am x {Am x [Am x (Ch x Am)]}):B_4	379	1	8
(Ch x Am) x (Ch x Am): F_2	-107	0	-5
[Ch x Am) x (Ch x Am)] x [Ch x Am) x (Ch x Am)]:F_3	0	0	0
[Am x (Ch x Am)] x [Am x (Ch x Am)]: B_1-F_2	-212	0	-2
{Am x [Am x (Ch x Am)]} x {Am x [Am x (Ch x Am)]}:B_2-F_2	422	3	0
B_2-F_3	31	1	1
(Am x {Am x [Am x (Ch x Am)]}) x (Am x {Am x [Am x (Ch x Am)]}):B_3-F_2	-2964	0	3
B_3-F_3	2559	1	12
Clapper B_3 x Graves B_3: B_3-I_1	110	2	9
Chinese x (Chinese x American): Chinese B_1	-183	-4	-4
Chinese x [American x (Chinese x American)]: Chinese x B_1	41	0	-1
Ch x {Am x [Am x (Ch x Am)]}: Chinese x B_2	-222	-4	-14
Ch x (Am x {Am x [Am x (Ch x Am)]}): Chinese Test Suite x B_3	286	5	16
Chinese Test Suite x Chinese	-543	0	
Chinese Test Suite x Japanese	-63	0	
Chinese Test Suite x European	-97	0	
Chinese Test Suite x Large, Surviving American	-4	0	
European	-1	-1	-1
European x American F_1	0	0	0
Japanese	-5	-2	-2
Japanese x American F_1	-1	-1	-1
(Japanese x American) x American B_1	-5	-1	-1
[(Japanese x American) x American] x American B_2	8	0	0
Japanese x European	-77	0	0
Japanese x Large, Surviving American	0	0	0
Castanea ozarkensis	-9	0	0
Castanea pumila	5	1	1
Castanea seguinii	0	0	0
Seguin x American F_1	54	2	2
Large Surviving American F_1	-623	-7	-13
Large Surviving American B_1	-35	1	1
Large Surviving American B_2	-97	0	0
Large Surviving American B_3	161	1	1
Large Surviving American F_2	123	6	0
Large Surviving American F_3	-50	0	1
Large Surviving American I_1	-227	1	-19
Large Surviving American I_2	-35	4	-7
Large Surviving American I_3	16	1	31
Large Surviving American advanced F_1	804	12	25
Other	-58		
Total	**-958**		

Table 3. The American Chestnut Foundation Meadowview Farms 2009 nut harvest from controlled pollinations and selected open pollinations.

Nut Type*	Female Parent	Pollen Parent	Pollinated			Unpollinated Checks			No. of Crosses
			nuts	bags	burs	nuts	bags	burs	
B_1	mollissima11 F_1	American	65	112	170	0	11	17	3
B_1-F_2	Nanking B_1	Nanking B_1	11	96	311	0	10	31	2
B_1-F_3	Clapper;Graves B_1-I_1	open pollinated	3121		1891				12
B_1xC	Meiling B_1	Nanking Chinese	4	34	80	0	4	9	1
B_1xC	Nanking B_1	Nanking Chinese	107	132	354	0	9	62	2
B_2	72-211 B_1	opWeekly;Ort LSA I_1	22	33	92	0	5	12	1
B_2	mollissima7 B_1	American	30	82	139	0	8	14	1
B_2	Nanking B_1	American	14	37	254	0	4	23	1
B_2-F_2	MusickChinese B_2	MusickChinese B_2	5	64	147	0	7	15	1
B_2-F_2 & B_3-F_2	Chapter Phytophthora		311	204	596	3	22	54	2
B_2-F_3	Clapper B_2-F_2	open pollinated	3737		2249				4
B_2-F_3	Clapper B_3-F_2	Clapper B_3-F_2	50	28	63	0	4	12	1
$B_{2/3}$-F_2	R11T14 B_2	R11T14 B_3	9						1
B_2xC	Nanking Chinese	Nanking B_2	3	49	131	0	5	25	1
B_3	American	Nanking B_2	195	154	333	3	15	32	9
B_3	Meiling B_2	American	1	14	27	0	2	3	2
B_3	MusickChinese B_2	American	220	205	565	0	22	50	4
B_3	Nanking B_2	American	151	212	517	3	15	51	6
B_3 & B_4	Chapter		1825	1428	5196	13	168	534	39
B_3-F_2	Clapper B_3	open pollinated	17770	82	14067				49
B_3-F_2	Graves B_3	Graves B_3	46	247	1062	0	29	101	2
B_3-F_2	Graves B_3	open pollinated	16190		14627				50
B_3-F_3	Clapper B_3-F_2	open pollinated	12659		8107				121
B_3-F_3	Graves B_3-F_2	open pollinated	712		380				13
B_3xC	Nanking Chinese	Nanking B_3	69	45	109	0	5	14	1
B_4	American	Nanking B_3	383	213	427	0	35	39	22
B_4	American	R1T7 B_3	38	81	193	0	9	26	1
B_4	Douglas B_3	American	2	5	6	0	1	1	1
B_4	Nanking B_3	American	72	102	115	0	12	21	6
B_4	R1T4 B_3	American	0	23	64	0	2	7	2
B_4	R1T7 B_3	American	18	69	216	0	7	19	2
CxC	Nanking Chinese	Vanuxem Chinese	175	693	2020	0	14	52	1
F_1	Nanking Chinese	American	84	99	253	0	8	29	3
F_1	Richwood Chinese	American	20	44	87	0	4	6	1
F_1	Vanuxem Chinese	American	133	101	194	0	7	13	2
Japanese B_2	PI#104016 Japanese B_1	American	11	18	27	0	2	2	1
LSA B_1	Corrigan LSA F_1	American	0	.	18	0	2	2	1
LSA B_1	Hill4565 LSA F_1	American	45	49	132	0	4	10	1
LSA B_3	ScientistsCliffs LSA B_2	American	132	41	88	0	5	18	1
LSA F_1	American	Nanking B_2	10	35	62	0	3	5	2
LSA F_1	opSugarLoafMountain830 LSA op	American	49	87	112	0	7	17	2
LSA F_2	NCChamp LSA F_1	NCChamp LSA F_1	25	137	262	0	14	32	2
LSA I_1	NCChamp LSA F_1	DaresBeach LSA B_1	19	67	119	0	10	14	1
LSA I_1	NCChamp LSA F_1	Gault;Gault LSA F_2	9	80	152	0	9	13	1
LSA I_1-F_1	opDaresBeach;Gault;Gault LSA I_1	American	11	24	42	0	3	3	3
LSA I_2	GaultScientistsCliffs LSA I_1	WayahBig LSA op	5	24	57	0	4	12	1
LSA I_2	NCChamp LSA F_1	opWeekly;Ort LSA I_1	19	53	111	0	3	9	1
LSA I_2	opDaresBeach I1-F_1	WayahBig LSA op	1	44	56	0	5	7	1
Total Controlled Pollinations, w/o Chapter			**2263**	**3633**	**9167**	**6**	**325**	**828**	

Table 4. The American Chestnut Foundation Meadowview Farms 2010 nut harvest from controlled pollinations and selected open pollinations.

Cross Type*	Female Parent	Pollen Parent	Pollinated			Unpollinated Checks			No. of Crosses
			nuts	bags	burs	nuts	bags	burs	
B_1	Mahogany F_1	American	165	125	232	0	14	27	2
B_1	Mahogany F_1	American	165	125	232	0	14	27	2
B_1-F_2	Clapper;Graves B_1-I_1	open pollinated	4745		2563				12
B_2	72-211 B_1	American	41	33	51	0	4	6	1
B_2	mollissima10 B_1	American	0	2	3	0	1	1	1
B_2	mollissima7 B_1	American	35	31	39	0	3	7	1
B_2	PI#104016 Japanese B_1	American	31	16	24	0	2	3	2
B_2-F_3	Clapper B_2-F_2	open pollinated	9898		5323				7
B_2-F_3	Graves B_2-F_2	open pollinated	412		542				2
B_3	American	Nanking B_2	226	514	992	0	48	58	13
B_3	American	R11T14 B_2		37	59	0	3	3	1
B_3	Meiling B_2	American	0	2	2	0	1	2	1
B_3	Nanking B_2	American	206	195	309	0	16	21	6
B_3 & B_4	chapter		3076	1848	4178	22	188	437	54
B_3-F_2	Chapter Phytophthora		133	46	100	0	4	14	1
B_3-F_2	Clapper B_3	open pollinated	20236		10122				49
B_3-F_2	Graves B_3	Graves B_3	23	96	269	0	10	18	2
B_3-F_2	Graves B_3	open pollinated	5767		3245				34
B_3-F_3	Clapper B_3-F_2	open pollinated	12213		7536				141
B_3-F_3	Graves B_3-F_2	open pollinated	5099		2837				65
B_4	Nanking B_3	American	15	30	29	0	3	1	2
B_x-F_2	Douglas B_2	Douglas B_3	51	37	24	0	4	4	1
B_x-F_2	Douglas B_3	Douglas B_2	44	27	45	0	3	3	1
B_x-F_2	MusickChinese B_2	MusickChinese B_2	193	101	266	0	11	24	3
B_x-F_2	R11T14 B_2	R11T14 B_3	126	237	863	0	21	59	2
B_x-F_2	R11T14 B_3	R11T14 B_2	8	66	105	0	7	8	2
CxC	Nanking Chinese	Vanuxem Chinese	23	39	70	0	4	8	1
F_1	American	Chinese VICT	22	44	54	1	6	3	3
F_1	Kuling Chinese	American	47	54	83	0	9	15	2
F_1	Meiling Chinese	American	150	151	321	0	16	23	2
F_1	Nanking Chinese	American	28	53	120	0	9	23	2
F_1	Vanuxem Chines	American	34	46	63	5	6	12	2
LSA B_3	ScientistsCliffs LSA B_2	American	29	21	36	0	4	8	1
LSA $F_{2\text{-}3}$	DaresBeach;DaresBeach LSA F_2	DaresBeach LSA F_1	80	85	169	0	10	8	1
LSA I_1	DaresBeach LSA F_1	DaresBeach;DaresBeach LSA F_2	15	69	139	0	5	12	1
LSA I_1-F_1	American	DaresBeach;ScientistsCliffs LSA I_1	153	85	200	0	12	15	6
LSA I_1-F_1	American	Ort;ScientistsCliffs LSA I_1	42	81	176	0	8	16	2
LSA I_1-F_1	American	opDaresBeach;Gault;Gault LSA I_1	80	60	142	0	12	4	2
LSA I_1-F_1	opDaresBeach;Gault;Gault LSA I_1	American	0	7	9	0	1	0	1
Seguin F_1	American	Seguin	123	80	155	0	5	12	5
Total Controlled Pollinations, w/o Chapter			**1990**	**2424**	**5049**	**6**	**258**	**404**	

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

Table 5. Mean, standard deviation and distribution of canker size classes (length in cm) for cankers incited by two strains of the blight fungus on cross types of American and Chinese chestnut in 2011.

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

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

Table 6. Means for length (in cm) of cankers incited by two strains of the blight fungus on individual families of American and Chinese chestnut in 2011.

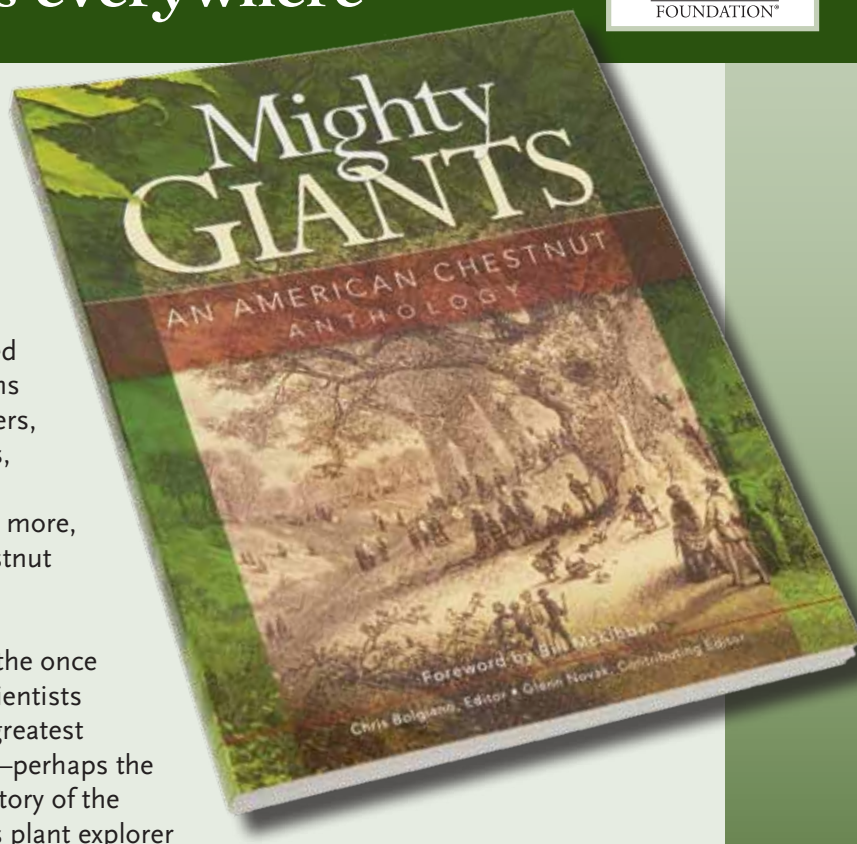
Cross Type*	Mother*	Father	Source of Resistance	N	Grand Mean	Least Square Means**			
						Strain Ep155		Strain SG2-3	
American	PL1-08	op	none	16	14.4	17.4	A	11.4	A
B3-F3	D5-26-54	op	Clapper	14	12.5	17.0	AB	8.0	ABC
B2	B2208	AN17	Nanking;none	5	11.7	16.4	ABCD	7.0	ABCD
B3-F3	D5-29-124	op	Clapper	1	11.2	12.1	ABCDE	10.4	ABCD
B3-F3	D3-28-10	op	Clapper	11	11.0	16.2	ABC	5.8	ABCD
B2	TM474	A1530	Nanking;none	8	10.8	15.0	ABC	6.6	ABCD
B3-F3	D5-17-89	op	Clapper	20	10.6	13.8	ABC	7.5	AB
B3-F3	D5-19-72	op	Clapper	22	10.2	14.2	ABC	6.1	ABCD
B3-F3	D5-18-95	op	Clapper	7	10.0	11.4	ABCDE	8.6	ABCD
B3-F3	D5-18-50	op	Clapper	10	9.8	14.1	ABCD	5.4	ABCD
B3-F3	D5-27-108	op	Clapper	17	9.3	13.8	ABC	4.7	BCD
B3-F3	D5-27-101	op	Clapper	29	9.3	14.1	ABC	4.5	BCD
B3-F3	D5-26-131	op	Clapper	32	9.3	13.1	ABC	5.4	BCD
B3-F3	D5-29-50	op	Clapper	10	9.1	11.9	ABCDE	6.3	ABCD
B2	B210	A1117	Nanking;none	15	9.1	13.4	ABC	4.9	BCD
B3-F3	D5-25-49	op	Clapper	18	9.1	12.2	ABCD	6.1	ABCD
B3-F3	D5-18-101	op	Clapper	12	8.9	14.1	ABC	3.8	BCD
B3-F3	D5-29-3	op	Clapper	23	8.9	13.5	ABC	4.2	BCD
B1-F2	TM538	TM158	Nanking;Nanking	7	8.8	14.8	ABCD	2.7	BCD
B3-F3	D5-22-17	op	Clapper	15	8.8	13.1	ABCD	4.5	BCD
B3-F3	D5-27-36	op	Clapper	24	8.8	13.0	ABC	4.6	BCD
B3-F3	D5-26-94	op	Clapper	28	8.6	13.0	ABC	4.2	BCD
B3-F3	D6-26-27	op	Clapper	37	8.6	12.9	ABC	4.3	BCD
B3-F3	D5-18-25	op	Clapper	26	8.4	13.0	ABC	3.7	BCD
B3-F3	D5-17-122	op	Clapper	1	8.2	10.4	ABCDE	6.0	ABCD
B2	CY554	MB190	Nanking;none	16	8.0	13.1	ABC	2.8	BCD
B3-F3	D2-29-44	op	Clapper	24	8.0	11.6	ABCD	4.3	BCD
B1-F2	B2354	TM672	Nanking;Nanking	117	7.9	11.7	ABC	4.2	BCD
B3-F3	D5-30-24	op	Clapper	20	7.7	11.7	ABCD	3.6	BCD
B3-F3	D5-27-95	op	Clapper	32	7.4	11.7	ABCD	3.1	BCD
B3-F3	D4-28-31	op	Clapper	4	7.2	12.0	ABCDE	2.4	ABCD
B1xC	JB478	MuChin1	MuChinX;MuChin1	1	7.1	13.3	ABCDE	0.8	ABCD
B1-F2	TM158	TM538	Nanking;Nanking	21	7.1	10.5	ABCDE	3.6	BCD
B3-F3	D2-26-72	op	Clapper	23	6.9	10.3	ABCDE	3.6	BCD
B3-F3	D1-27-25	op	Clapper	12	6.8	11.7	ABCDE	2.0	BCD
F1	TA3	MB190	Kuling;none	1	6.7	9.5	ABCDE	3.8	ABCD
F1	KY106	MB190	Meiling;none	6	6.7	10.5	ABCDE	2.9	BCD
B3-F3	D5-22-86	op	Clapper	17	6.7	11.2	ABCDE	2.2	BCD
B3-F3	D5-25-147	op	Clapper	11	6.6	9.9	ABCDE	3.4	BCD
B3-F3	D5-18-2	op	Clapper	7	6.5	9.1	ABCDE	3.8	ABCD
B3-F3	D5-30-11	op	Clapper	22	6.4	10.5	ABCDE	2.3	CD
B3-F3	D9-26-36	op	Clapper	3	5.9	7.4	ABCDE	4.4	ABCD
B1xC	TM672	GR119	Nanking;Nanking	18	5.7	9.1	ABCDE	2.4	BCD
B1-F2	B2275	B293	72-211;72-211	10	5.5	9.3	ABCDE	1.7	BCD
B1-F2	B2430	B2275	72-211;72-211	13	5.5	8.4	ABCDE	2.6	BCD
B3-F3	D2-28-76	op	Clapper	14	5.3	7.9	BCDE	2.8	BCD
B3-F3	D5-17-130	op	Clapper	9	5.2	7.9	ABCDE	2.5	BCD
B3-F3	D8-26-69	op	Clapper	16	5.2	8.0	CDE	2.4	BCD
B3-F3	D2-26-66	op	Clapper	3	5.0	8.2	ABCDE	1.7	ABCD
B3-F3	D2-28-52	op	Clapper	3	4.3	5.9	ABCDE	2.7	ABCD
B1xC	B2239	GR119	Nanking;Nanking	6	4.2	6.4	ABCDE	1.9	BCD
B1xC	JB5	MuChin1	MuChinX;MuChin1	3	4.1	5.9	ABCDE	2.3	ABCD
B1xC	B2426	GR119	Nanking;Nanking	10	4.1	6.8	CDE	1.4	BCD
CxC	GR119	SLR1T15	Nanking;Mahogany	20	2.6	3.7	E	1.5	D
CxC	KY106	op	Meiling;unknown	5	2.4	3.3	CDE	1.4	BCD
CxC	KY75	SLR1T15	Meiling;Mahogany	10	2.4	3.2	DE	1.6	BCD
CxC	TA3	op	Kuling;unknown	3	2.2	2.8	ABCDE	1.7	ABCD

* The first letter of the code for the B3-F3 crosses identifies the farm containing its B3-F2 parent. The first number identifies the block of trees containing the B3-F2 parent. The middle number identifies the plot within a block, and corresponds to the American great-great grandparent of the B3-F2. The last number is the tree number within a plot, within a block. In this set of crosses, there is only one open-pollinated B3 grandparent of the B3-F3s in a plot, except that the B3 grandparent of D5-18-95 and D5-18-101 differs from the B3 grandparent of the other trees in plot 18.

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

Chestnut anthology makes a great gift for nature enthusiasts everywhere

THE AMERICAN CHESTNUT FOUNDATION®



The perfect gift for the nature enthusiast in your life. *Mighty Giants: An American Chestnut Anthology* is the inspiring story of an American symbol and the struggle to save it from the brink of extinction, the saga of a unique and exceptional tree that supported a way of life, that fed and sheltered our ancestors, and "touched almost every phase of our existence." From Indians and early explorers, to colonists, naturalists, loggers, industrialists, and beyond; from presidents, poets, and artists, including Jefferson, Lincoln, Carter, Thoreau, Frost, Homer, Andrew Wyeth, and many more, the story of our once mighty, towering native chestnut tree is a lesson for our times.

The book tells, in images and words, the story of the once mighty monarch of the eastern forests and the scientists who engaged in the struggle against "one of the greatest natural disasters in the history of forest biology"—perhaps the deadliest plant blight ever encountered. It is the story of the dedicated few who refused to give up: the fearless plant explorer who tracked down the blight in war-torn China, the plant pathologists and geneticists who labored long and valiantly to understand the blight and find a way to thwart it. It is also a story of hope, of small but vital triumphs, as the secrets of the American chestnut and its deadly nemesis are gradually revealed.

Notable contributors to the book include former President Jimmy Carter, author Barbara Kingsolver, Nobel Peace Prize laureate Norman Borlaug and Bill McKibben, author of *The End of Nature*. The 296-page full color book is available in hardback for $50 and paperback for $25.

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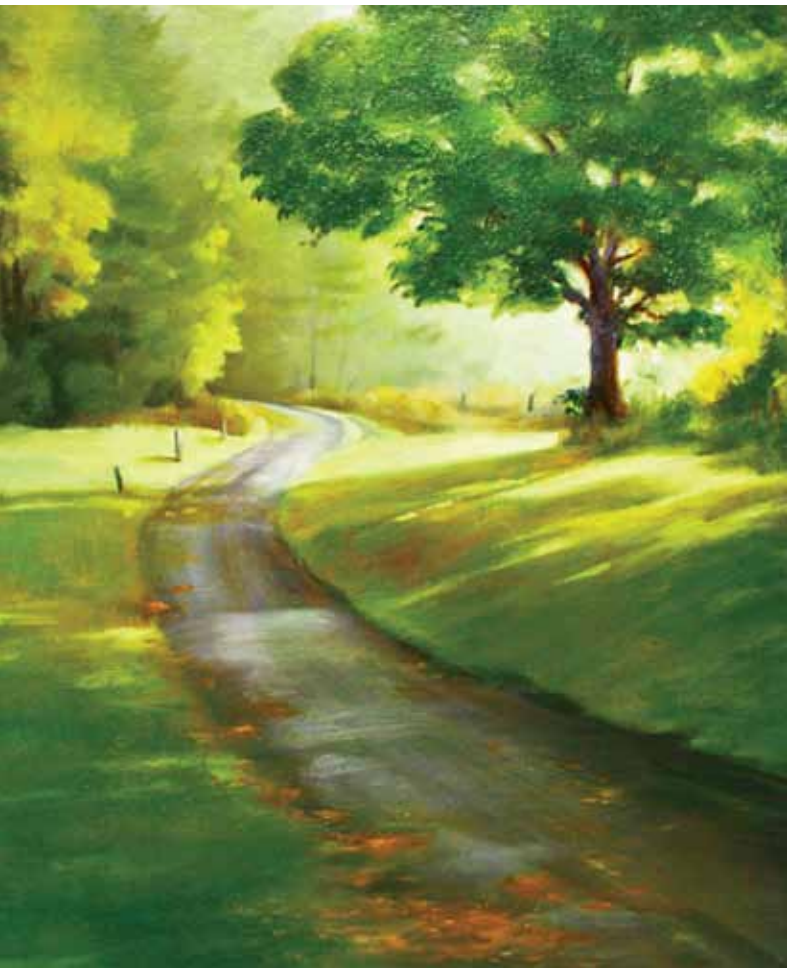
Artist Susan Bull Riley: A Passion for Trees

by Lisa Densmore



A sun dappled lane leads to the *Fairlee Chestnut Tree in Autumn*

Susan Bull Riley at work in her Burlington, Vermont studio

by Richard Riley

A little girl stood on a tree-lined street waiting for the school bus near her home in Burlington, Vermont. The Dutch elms arched over the lane, dying before her eyes. The long lifespan of these majestic trees were hard for the child to grasp, yet she felt the loss of them acutely. They were saplings when her grandparents were her age. The elms had taken decades to grow tall and graceful, but soon and so quickly, they would be gone.

Eventually the little girl grew into a woman, went to college, married and raised a family. She left a career as a flutist to become a teacher and then a painter, but she never stopped mourning the elms of her childhood. Some people are born with a passion for trees. Susan Bull Riley, that little girl who loved Dutch elms, is one of those people. Riley also loves American chestnuts and almost all other aspects of our natural world. But American chestnuts have grown particularly close to her heart, and have become an inspiration for many of her expressive, light-dappled paintings that adorn The American Chestnut Foundation's notecards, commemorative posters, and pages of this magazine.

Riley's aunt, Barbara Knapp, a founding member and secretary of the Maryland Chapter of TACF, introduced the artist to the tree in 1998 when she asked her niece to paint a watercolor depicting a branch of an American chestnut in full leaf with both male and female flowers. "My Aunt Barbara had American chestnuts growing on her property," remembers Riley. "She told me they were special. She would say, 'if you understand it, you'll protect it.' Her passion was contagious. I remembered watching the elms die. I couldn't do anything about the elms, but maybe I could help the chestnuts."

The challenge was finding a chestnut branch to paint. Riley learned of a man near Ithaca, New York, who had a chestnut orchard. He gave her a branch with flowers on it. It took her a week to draw and paint it—about the time it took for the branch to wilt. As she studied the branch, the familiar acute tree-grief of her youth

Phoenix Rising is Susan's ode to the possible return of the American chestnut

resurfaced. The American chestnut tree that had borne the branch would likely die from chestnut blight before it grew much more than 20-feet tall. Her aunt's cause became her own.

In 1999, that singular watercolor became a TACF notecard, which led to a series of botanical notecards painted by Riley for the foundation, one for each season of the year, as well as a number of other paintings of American chestnuts. Each subsequent painting has introduced her to people who share her love of chestnut trees.

Grace Knight, president of the Vermont/New Hampshire Chapter, told Riley about meeting a logger at a 2009 planting and supper who was moved to tears upon learning that there was a chance that the chestnuts could come back. The artist explains, "It spoke to me of how intensely everyone is involved with this project and the passion they have for trees. It touched a deep chord in me."

Riley's paintings of American chestnuts include *Phoenix Rising*, a watercolor of a seedling growing from an old stump, which represents new life for the chestnut. According to Riley, the stump was largely imagined because stumps of that size are now mostly rotted away; but the seedling was real, located on the Knight's property.

Through TACF, Riley has further expanded her network and knowledge, which led to more chances to portray American chestnuts in her artwork. She credits Nancy Kyle of the Pennsylvania Chapter for one of the more memorable opportunities.

In 2007, Kyle commissioned the artist to paint a mature American chestnut. Through the Bennington office of TACF, Riley garnered an invitation to visit an 85-foot American chestnut which resulted in the two similar oils called *American Chestnut Survivor* and *American Chestnut Spring* (see Chestnut Moments, page 25).

"I didn't know of any mature chestnuts to paint," explains Riley. "Eventually I was allowed to go to Fairlee, Vermont, to see a tree. It was a real privilege to paint

Riley's paintings of American chestnuts include *Phoenix Rising*, a watercolor of a seedling growing from an old stump, which represents new life for the chestnut.

In addition to chestnut themes, Susan paints a wide array of detailed and evocative wildlife subjects such as this one, titled *Owl Bark and Birch Feathers*

it. Few people had been permitted to visit it to protect it from blight, and out of respect for the owner's privacy. As I sat and sketched, I felt a reverence, an awe to be in the presence of a tree that old."

In a common story repeated among chestnut tree owners, the Fairlee tree was discovered by accident and saved by chance. In this case, the owner of the property was clearing trees from a stone wall. When he paused for lunch, a friend stopped by and looked at the very next tree he was going to cut.

"Do you know what kind of tree that is?" asked the friend.

"No," answered the property owner.

"My Aunt Barbara had American chestnuts growing on her property," remembers Riley. "She told me they were special. She would say, 'if you understand it, you'll protect it.' "

"It's an American chestnut, and it's a big one!" replied the friend, so the owner contacted TACF.

The painting, *American Chestnut Spring*, became the TACF poster commemorating its 25th Anniversary in 2008, and *American Chestnut Survivor* now resides in Grace Knight's home.

Through paintings such as *American Chestnut Spring*, Riley hopes people will recognize her affection for the tree and feel it too — like her aunt's passion was contagious to her.

"Making art is life-affirming to me." says Riley, "We need to keep the torch lit…. Working with a tree's lifespan highlights the relative brevity of our lives. It's not an arena that rewards impulsivity and short-term gain. People who are patient enough to work with the long spans of time that are a tree's life, leave me breathless with admiration."

To see more of Susan Bull Riley's paintings or to contact the artist, visit her web site: http://www.susanbullriley.com.

American Chestnut Leaves, Bur and Nut

Wilderness Hunt: Searching the Appalachian Trail for Surviving American Chestnut Trees

by Mike and Kieu Manes

It was hot—too hot to be long-distance hiking with a heavy pack on the Appalachian Trail. The two southbound hikers had been out for eleven days, and the temperature and humidity seemed to be getting more uncomfortable with each new day. Lunch time was coming up, and nearby Sunfish Pond promised to be a great place to stop and eat by the water. Crossing the next rise they paused to view the curious scene before them. In the distance, two senior citizens stood stock still, gazing up into the branches of a large tree. Were they lost? …looking for something? …terminally confused?

The two lost souls found by the hikers were me and my wife. We had just encountered what we had been seeking for some time: a magnificent, large (and flowering) American chestnut tree! The two hikers stopped to chat, take pictures of us and the tree, and share lunch in its much-appreciated shade. A discussion of our work/hobby followed.

Crossing the next rise they paused to view the curious scene before them. In the distance, two senior citizens stood stock still, gazing up into the branches of a large tree.

Looking for surviving American chestnut trees may seem like an odd hobby to most people, but it didn't take long for us to get completely hooked. A retired couple, my wife Kieu and I are long-time members of the Appalachian Mountain Club. Our club activities include trail maintenance on a 15.4-mile section of the Appalachian Trail (AT) in Pennsylvania.

In June of 2011 we attended a MEGA-Transect chestnut training class led by Sara Fitzsimmons of The American Chestnut Foundation (TACF), that was the result of a partnership between the Appalachian Trail Conservancy (ATC) and TACF. The AT MEGA-Transect project is designed to promote studies of various environmental issues and conservation opportunities along the AT. We attended this class on June 12, and the very next day headed out to start searching "our" section of the trail for surviving chestnut trees. That day was the beginning of many days spent happily looking for chestnuts.

A large surviving American chestnut is defined in the AT MEGA-Transect project as a tree with a circumference of 13 inches or greater

Photo by Mike Manes

After searching "our" fifteen miles of the AT, we decided to check out some large chestnut trees that had been found by others along this 2,000-mile trail. The MEGA-Transect program defines a "large" tree as one with a circumference of 13 inches or more at a height of 4 1/2 feet above the ground. Our first search for a previously discovered 50-inch tree was unfruitful, but we were not discouraged and went looking for a 31-inch tree in the Delaware Water Gap area. The second tree proved easy to find, and it was there that we met the two long-distance hikers to whom we told the story of the American chestnut.

Authors Mike and Kieu Manes led a group hike to share their knowledge of the American chestnut.
Photo by Mike Manes

That day and the next were spent slowly walking the AT (and an access trail named the Garvey Spring Trail) looking in all directions with our binoculars. We were able to find a dozen additional trees that could be classified as large American chestnuts. Three of these trees were flowering. We lightheartedly referred to these older trees as "senior citizens" and joked about how they may or may not need Medicare, after examining them for blight, insect, or other damage.

During our searches for "senior citizens" we have explored several areas in eastern Pennsylvania and nearby New Jersey and found over 40 large surviving American chestnut trees. Along the way we met many hikers. Some, seeing us measuring and taking notes, were curious and stopped to ask what we were doing. They would listen to our explanations, examine the leaves, and bark, and take photographs. Several have become friends, and we now keep in touch by email.

It is not surprising to find that many individuals who wander the woods in Appalachia love trees, and are anxious to learn more about them. One of the greatest bonuses of looking for surviving chestnut trees is meeting people who share our love of the outdoors. With this in mind we decided to lead a hike, to share with others the wonders that we had found. I advertised this hike with the Appalachian Mountain Club, as well as with TACF. The weather looked stormy that day and only twelve tree-loving hikers showed up. Under a sky continuously threatening rain we started the hike with a thousand-foot ascent to a ridge line, which we then followed for two miles before returning the same way. Fortunately, the rain held off until we were about three hundred yards from the parking area. The highlight of the hike occurred when a participant found a previously unknown large American chestnut near the Garvey Spring Trail.

Has the MEGA-Transect project benefited TACF and the ATC? From a chestnut-lover's viewpoint I will say yes. My wife and I are two long-time hikers who were converted to American-chestnut lovers in 2011—and we are slowly converting more hikers.

Most hikers are eager to learn more about this native species, but we currently know of only one hiking club that is directly working in the chestnut survey. This begs the question of how we could promote the MEGA-Transect program among hikers and others with similar interests. Could bird watchers, hunters, geocachers, and horseback riders be enlisted? I believe the answer is yes to all of these.

In 2012, my wife Kieu and I plan to do all we can to increase hiker awareness of the American chestnut. We will lead more hikes, teach others how to search, continue to look for more large chestnuts, and re-visit known trees to assess their current condition. We also welcome ideas about what more can be done to excite others about hunting for large surviving American chestnuts in the Appalachian wilderness.

This fifth grade class is ready to grow chestnuts to win Disney's Planet Challenge.
Photo by Jillian Young

Our Chestnut Challenge

by the Fifth Grade Class of Elwood Kindle Elementary School

This story was written by Mrs. Young's fifth grade class in Pitman, New Jersey. It describes the impressive American chestnut project they undertook as part of Disney's Planet Challenge. A part of the challenge required them to write and publish a description of their project. TACF is pleased to be a part of this fascinating project and we wish these hardworking kids every success.-Ed.

We are fifth graders from Pitman, a small town in southern New Jersey. Our science teacher, Mrs. Young, and our principal, Ms. Yearwood, heard about a competition called Disney's Planet Challenge. We jumped at the chance to participate. Disney's Planet Challenge is a competition between schools across the country. Students come up with ideas to make our planet and community healthier and greener. Our class decided to enter, not just because we could win awesome prizes, but also because we wanted to help our planet. We brainstormed all kinds of ideas. We really wanted to choose a project that would have special meaning to our town. Instead of picking up trash or cleaning a lake (which would only have an effect on the environment for a little while), we decided to focus on the American chestnut, which used to be the official town tree of Pitman.

American chestnut trees were once a huge source of food for people and animals, and many of the older homes in our town are made from their wood. The blight which killed most of these trees during the early 1900s was devastating to our town. Sadly, most people (especially kids) don't know much about the American chestnut tree. As part of our project, we are trying to revive the chestnut population and educate our school and town about the American chestnut tree.

For Disney's Planet Challenge, our class has created seven committees, which we call "commit*trees*." Each committree is in charge of a different part of the project. One committree is working on a digital portfolio. Other committrees are doing research or working on contacting guest speakers. We have had two guest speakers so far: a geneticist from Wistar Institute in Philadelphia who taught us how backcrossing works, and a local man who is very passionate about the history of the American chestnut tree.

Disney's Planet Challenge is a competition between schools across the country. Students come up with ideas to make our planet and community healthier and greener.

Our project would not be possible without help from the Pennsylvania Chapter of The American Chestnut Foundation (TACF). Ms. Fitzsimmons has sent us lots of chestnut seeds, which we are trying to grow into seedlings in our classroom. She will also come to help us plant 5-10 backcross seedlings in the spring.

It seems like everyone who hears about our project wants to be a part of it. In February, three of our classmates presented at the Pitman Garden Club meeting. The Garden Club offered to help us with our school chestnut garden by giving us plants, flowers, fencing, and an irrigation system. Pitman's mayor, Russ Johnson, attended the meeting and is hoping we can plant some of our chestnut trees in the town's parks!

Later this spring we are going to donate some backcross and pure American seedlings to a local family, the Slacks, who are reforesting their 25 acres of land with indigenous trees. We are very excited that everyone in our town wants to be a part of this project. With so much community support, hopefully within the next ten years we will have American chestnut trees in Pitman once again!

If anyone wants to help us with this competition, or has any suggestions or ideas to make our project better, please email our teacher at jyoung@pitman.k12.nj.us.

In Memoriam: Essie Stripling Burnworth

September 25, 1939 - February 4, 2012

Essie received a gift of a Memory Book presented by Kathy Marmet at the 2011 Annual Meeting. The Memory Book was filled with pictures and mementos of Essie's years with TACF.

"*Essie was an exceptional woman who touched all of us. I will never forget how much she compassionately gave of herself to others. She has been an incredible role model and inspiration and will be dearly missed.*"
– Gregory Burnworth, Essie's son

"I am so grateful to Essie for her contribution to further TACF's efforts. I was the "new guy," and Essie became a valued mentor as I began to settle in. I will miss her very much, but feel truly blessed to have worked with her."
– Bryan Burhans, TACF President and CEO

On February 4, 2012, Essie Burnworth passed away. TACF has lost a passionate leader, a tireless volunteer and a good friend. She will be deeply missed.

Essie's long relationship with American chestnuts and TACF began when she and her husband, Burnie, were looking for a way to stay busy in retirement. They came across the long-neglected American chestnut orchard on Sugarloaf Mountain in Maryland and "adopted" it, discovering almost at once that they had a passionate desire to help in the effort to create a blight-resistant chestnut.

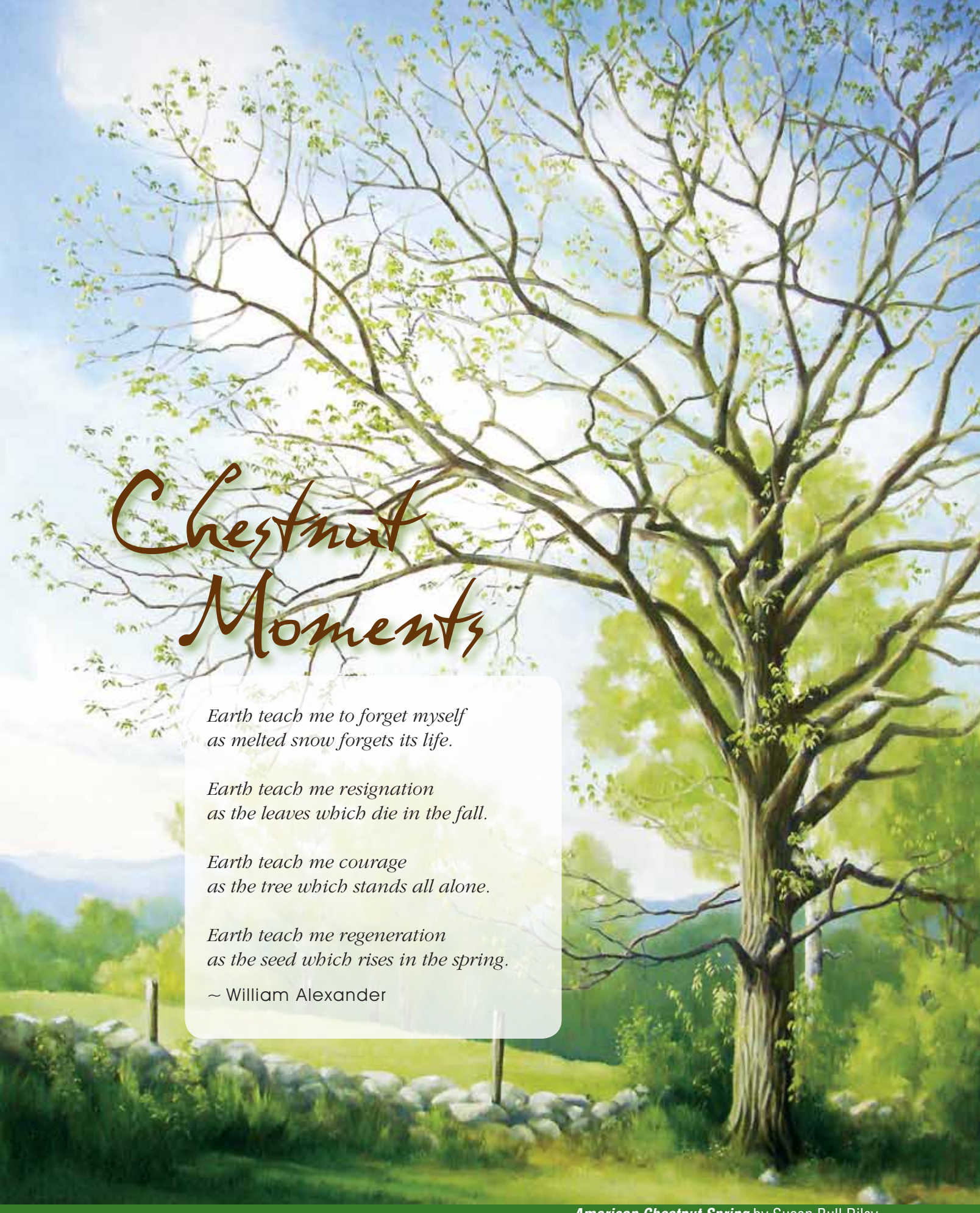
Although the Maryland Chapter did not exist at that time, they connected with other TACF members, and soon Essie and longtime member Barbara Knapp joined forces to establish a TACF state chapter. They traveled to county fairs, forestry conferences and garden clubs, signing up new members and documenting their work in a photo scrapbook.

In 2003, the Maryland Chapter was established and Essie was elected president. Under her leadership, the chapter made remarkable progress toward its goal of establishing 20 Clapper lines in backcross orchards. It also played a leadership role in promoting chestnut education and established important partnerships with public and private agencies.

Essie had a key role in bringing together the partners who created the University of Maryland Biotechnology Institute's American Chestnut Loaner Lab, and she and Burnie donated funds to equip and supply the lab, giving thousands of students hands-on experience and an introduction to the American chestnut story. She also served as chair of the TACF Development Cabinet Education Committee, never missing an opportunity to support educators and students in carrying out research.

Essie was elected to TACF's National Board of Directors in 2005 and served as Secretary until retiring in 2011. During that time, Essie served on the TACF committee that interviewed candidates and recommended Bryan Burhans as the new President and CEO in early 2009. She also helped plan the retreat that same winter in Aldie, Virginia, that led to the TACF Restoration Planning process.

Essie and Burnie moved to Seattle in August of 2011 so that they could spend more time with their two young grandsons. She is survived by her husband, Harold (Burnie) Burnworth, and their two sons, Jonathan and Gregory.



Chestnut Moments

Earth teach me to forget myself
as melted snow forgets its life.

Earth teach me resignation
as the leaves which die in the fall.

Earth teach me courage
as the tree which stands all alone.

Earth teach me regeneration
as the seed which rises in the spring.

~ William Alexander

American Chestnut Spring by Susan Bull Riley

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