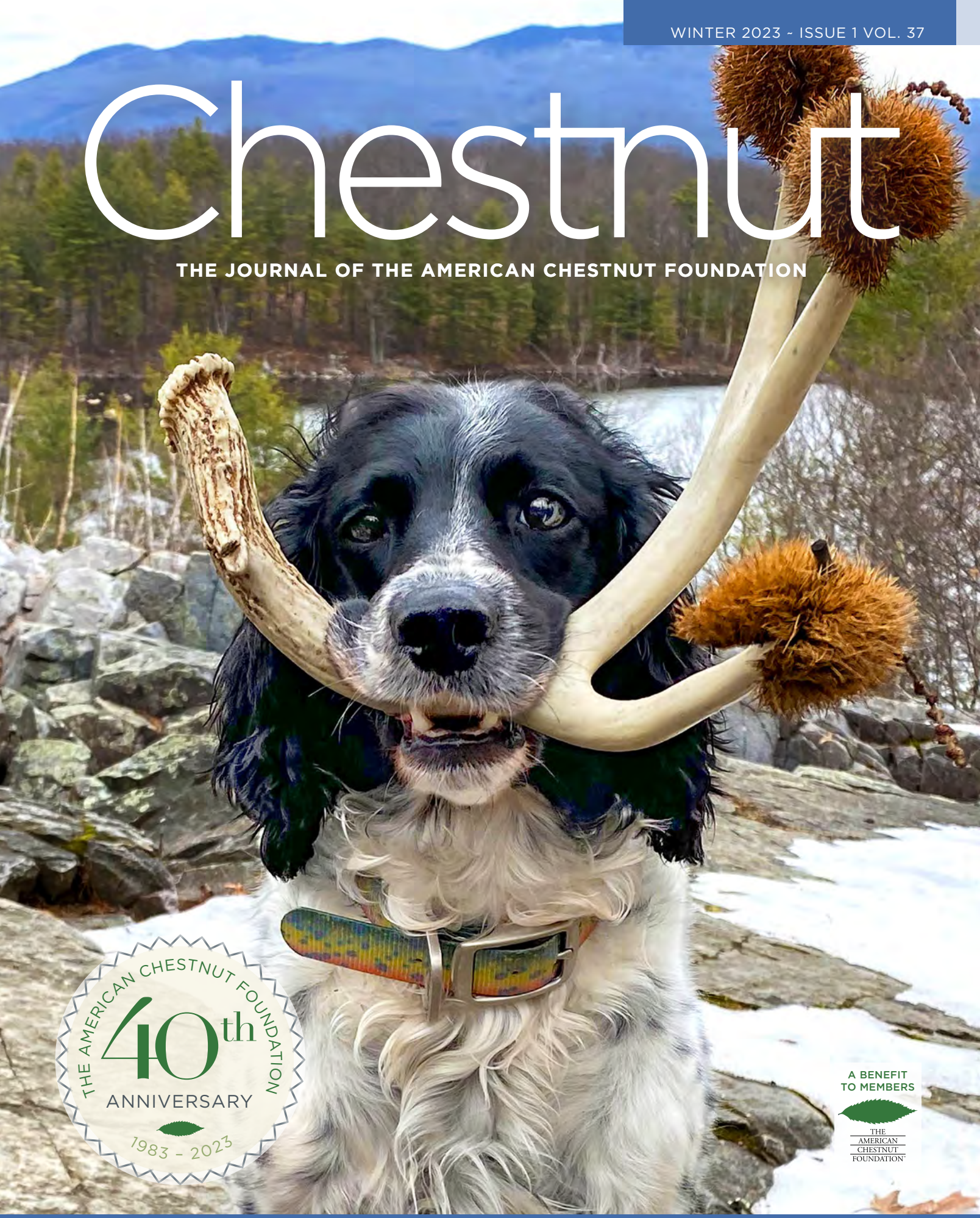
WINTER 2023 ~ ISSUE 1 VOL. 37

Chestnut

THE JOURNAL OF THE AMERICAN CHESTNUT FOUNDATION



THE AMERICAN CHESTNUT FOUNDATION 40th ANNIVERSARY 1983 – 2023

A BENEFIT TO MEMBERS

THE AMERICAN CHESTNUT FOUNDATION

Deregulation Status ~ Chestnut Symposium ~ USDA Multistate Project ~ *dentata*Base for Darling 58

WINTER 2023 ~ ISSUE 1 VOL. 37

Chestnut

THE JOURNAL OF THE AMERICAN CHESTNUT FOUNDATION

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IN HONOR AND IN MEMORY

Lisa Thomson

President and CEO

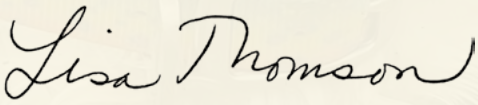
DEAR CHESTNUT ENTHUSIASTS,

The new year is a perfect time to reflect on past accomplishments and anticipate progress ahead in our decades-long, bold mission. 2023 will be a momentous time for TACF and our many partners. With the hopeful deregulation of SUNY-ESF's Darling 58 (D58) American chestnut and the release of our documentary film, *American Chestnut: Optimist of the Forest*, we will be even more prominently recognized on the national stage.

These milestones would likely surprise our early supporters during TACF's humble beginning in 1983. Many of our current and former board of director members have made a huge difference in the success of the organization. Four long-time impactful volunteer leaders, Hill Craddock, Michael Doochin, Kim Steiner, and Donald Willeke, Esq. were elected as Board Emeriti in December for their decades of service. We mourn the loss of Board Chair Emeritus Richard S. "Dick" Will, and former Finance and Audit Chair, Z. Cartter Patten, both of whom passed away in 2022. I was deeply honored to participate in their life celebrations in Frederick, MD and Chattanooga, TN respectively. We are grateful for their contributions and those of so many other dedicated volunteers. One such volunteer, forester K.O. Summerville, is profiled on page 9 and was recently honored by his alma mater, NC State University.

TACF remains incredibly resilient, thanks to members and donors steadily supporting us with their generosity, as indicated by another successful End of Year Appeal. D58 deregulation will allow increased blight-tolerant material into our traditional breeding program. Our 40th Anniversary will bring celebratory events and social media stories. The documentary film will debut in the spring at various regional premiere venues and later, film festivals. We are reviving the popular Chestnut Chat, our lively virtual learning and sharing forum. Diversity, equity, inclusion and justice training has been launched with Lacy Consultants to ensure we have as many communities and cultures at the table who are a part of the successful restoration of the American chestnut. The future is bright!

As many of you know, 2023 will mark my last year as TACF's President and CEO to embark on new adventures. It has been an honor of a lifetime to serve you these past eight years. I pledge to support and celebrate my successor, just as Bryan Burhans so generously did for me. Please know that you, and this inspiring mission, will be in my heart forever.



Lisa Thomson, President and CEO
The American Chestnut Foundation

Recognize the adorable dog photo on the cover?

It made an appearance in last year's winter issue as the 3rd place winner in TACF's annual Photo Contest. Lady Chaga Warrior Princess, as she is affectionately known, found American chestnut burs and an antler while hiking with her human companion, Chris Cartier, in Rutland, VT. Chaga found the goods but Chris gets credit for capturing this wonderful moment in time!

THE AMERICAN CHESTNUT FOUNDATION™

WHAT WE DO

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

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Update on the Deregulation Status

OF THE TRANSGENIC AMERICAN CHESTNUT

By Adriana Del Grosso and Andrew Newhouse, American Chestnut Research and Restoration Project, SUNY College of Environmental Science and Forestry

After more than three decades of research and development, SUNY College of Environmental Science and Forestry (ESF), in partnership with The American Chestnut Foundation (TACF), has developed transgenic, blight-tolerant American chestnut trees. These trees, with an oxalate oxidase (OxO) gene, have demonstrated effective tolerance to blight infections with less damage, making them a promising part of future restoration plans (bit.ly/esf_biotech). The first line of OxO-containing chestnuts being evaluated is called Darling 58: several generations of Darling 58 offspring have been produced and tested; all evidence suggests they are safe and functionally equivalent to non-transgenic chestnuts, with the added benefit of blight tolerance. However, these transgenic trees need to be reviewed by three federal agencies in the U.S. before they can be distributed for public plantings or restoration use.

This tree at TACF's Meadowview Research Farms was pollinated with transgenic pollen and sealed tightly in protective wire mesh cages.

The first of these agencies, U.S. Department of Agriculture (USDA), is conducting an intensive review of Darling 58 blight-tolerant American chestnuts generally focused on the safety of the trees for people and for the environment. The USDA did their due diligence by spending more time on this review than is currently typical for transgenic agricultural crops. They recently published drafts of two key documents for their review process. These documents, a Plant Pest Risk Assessment and an Environmental Impact Statement (EIS), are draft versions of their final regulatory decisions on the Darling 58 trees. These documents state that "Darling 58 American chestnut is unlikely to pose a plant pest risk" (draft EIS, p. 3-3) and acknowledge that environmental impacts associated with planting Darling 58 American chestnuts are likely to be either positive or similar to planting other types of chestnuts. This is exciting progress towards our goal of making these trees available for reintroduction to the historic native range of the American chestnut.

Transgenic American chestnuts flowering in a high-light growth chamber. Photo by Vernon Coffey.

The second agency is the Environmental Protection Agency (EPA). This agency is examining the safety of Darling 58 trees. Because the gene that gives Darling 58 blight tolerance is associated with a pathogen (the *Cryphonectria parasitica* fungus), these trees are evaluated under EPA pesticide rules. We are in the process of seeking an exemption from the pesticide registration process, since Darling 58 does not kill the fungus and does not fit into the conventional definition of a pesticide. Until such an exemption is approved, though, it is likely that the EPA will issue a set of conditions surrounding distribution and labeling of Darling 58 trees. If an exemption is granted, these conditions would be lifted.

We are also electing to go through an optional review by the FDA to confirm that nuts from Darling 58 trees are safe for consumption by humans and animals. For this process, we have submitted nutritional analyses showing that Darling 58 nuts do not differ in nutritional value than American chestnuts, and are absent of wheat allergens and gluten. For more details about these analyses, visit this webpage: bit.ly/tgsafetytests-pt1.

We expect all three agencies to wrap up their reviews by August of 2023 at the latest. In the meantime, ESF and TACF are planning for the first stages of distribution of Darling 58, and are laying the groundwork for scaling up production of these ecologically and culturally important trees.

Once Darling 58 trees are approved for distribution, availability will be limited at first. Initially, we will focus on distributing pollen, seeds, and trees to our research and breeding collaborators, establishing educational plantings, and small-scale distribution to the public. Early distribution efforts will directly support our collective goals to continue research, build a genetically diverse population of Darling 58 trees, educate the public on the history of the American chestnut and on bioengineering as a tool for conservation, and to acknowledge those who have generously supported our efforts to date.

How can you receive a tree? ESF and TACF would like to honor those that have made a commitment to conserving and restoring the American chestnut by prioritizing distribution to members of TACF. The NY Chapter of TACF has supported ESF's research project since its inception in 1990, so a small portion of Darling 58 seedlings have been designated for long-time members of this Chapter (those who joined prior to January 2017). These members have already been contacted. Individual seedlings will be available to members of TACF for purchase to support the research and offset costs that went into producing these trees. However, plant material will still be scarce until we significantly scale up production. After Darling 58 is granted non-regulated status, we will update TACF members on our longer-term plans to distribute these trees.

Pollen distribution will be handled differently than seed and seedling distribution. Pollen, like other Darling 58 plant material, will be limited during the first few years, and additional EPA oversight may apply for a period of time. Because the distribution of pollen is essential for furthering long-term restoration goals for outcrossing and genetic conservation, we will be working with TACF chapters and trained citizen scientists to pollinate surviving American chestnuts. To learn how you can participate in this effort, please contact Hannah Pilkey at hcpilkey@esf.edu.

Thank you for your patience in waiting for the availability of these blight-tolerant American chestnuts. We appreciate your commitment to American chestnut restoration and we look forward to working with TACF members and others to restore this foundation tree species to our forests.

2022

NE-1833 Meeting

By Brianna Heath
Mid-Atlantic Regional Science Coordinator

In late August 2022 American chestnut enthusiasts and scientists met in Charlottesville, VA for another NE-1833 conference to discuss research, ideas, and the future of this magnificent tree. While the blight has been a major roadblock for American chestnut, there are other pests and pathogens plotting against its survival. This was a significant discussion topic during the conference.

The American Chestnut Foundation (TACF) staff, partners, and members have been participating in progressive research and technology for years in an effort to combat these hurdles. For instance, Steve Jeffers with Clemson University is testing various fungicides to fight Phytophthora and researchers at SUNY's College of Environmental Science and Forestry has developed a transgenic American chestnut using a gene from wheat that breaks down oxalic acid in the blight, weakening its ability to infect the tree.

The first two days of the conference brought about insightful talks as colleagues were able to reunite for the first time since the pandemic. Another first was the option to have a hybrid meeting, so that those who could not attend in person could participate in all of the discussions via Zoom video conferencing. It was a pleasure to see everyone enjoy the conference, whether physically or virtually.

In-person attendees were treated to a field trip to nearby Lesesne State Forest in Roseland, VA near Wintergreen. The Virginia Department of Forestry maintains the 422 acres which, in large part, is dedicated to American chestnut research. VA Chapter President John Scrivani led a tour of the many generations of research trees, including numerous backcross orchards and some large surviving American chestnuts. One of the more interesting stories was the recollection of an experiment involving chestnut seeds and radiation. While the experiment

Attendees who participated in the tour at Lesesne State Forest gather for a group photo.

did not yield the results expected, the hope was that the radiation would cause mutations in the chestnut DNA that may lead to increased blight resistance.

The field trip, like the overall conference, was vastly informational and a huge success. Even though this gathering has concluded, the conversations certainly have not. There is rigorous discussion, thoughtful strategies, and continued research toward the eventual restoration of the American chestnut. The excitement surrounding the chestnut community and TACF's mission is palpable. We look forward to the next NE-1833 conference and the progress that will take place between now and then.

VA Chapter President John Scrivani (pointing) leads conference attendees on a tour of the various research stages of chestnut trees at Lesesne State Forest.

NE-1833 attendees listen to TN Chapter President Hill Craddock give a presentation during the conference.

A view of sunlit leaves on several chestnut trees in one of the orchards at Lesesne State Forest.

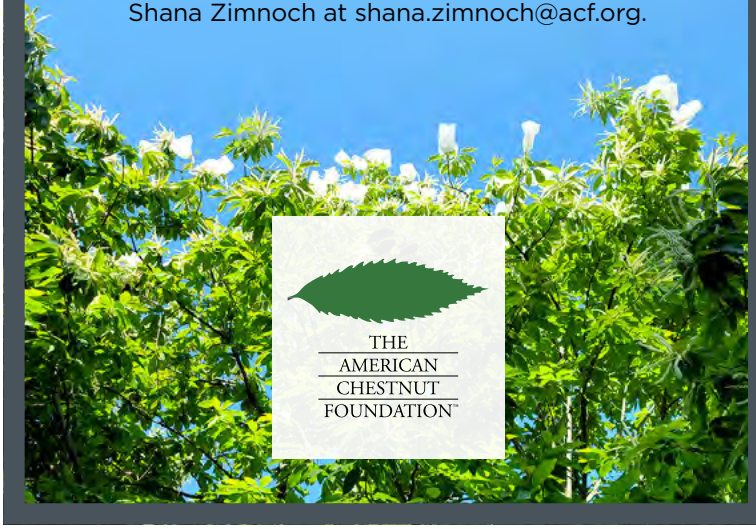
The POWER of Planned Giving

Gifts through your will, living trust, retirement plan, or life insurance policy can have a big impact on our ambitious goal to restore the American chestnut, an effort that may take decades to fully achieve. What better way to leave a personal legacy after your lifetime than to ensure our work will continue for future generations?

When you make any of these gift commitments, your assets remain in your control. Your gift comes to TACF only after your lifetime and changes can be made, if necessary. You can also designate what you choose to gift TACF while still ensuring you and your loved ones are cared for.

Unlike wills and living trusts, gifts through retirement plans and insurance policies pass to recipients, such as TACF, through beneficiary forms. Simply contact your plan administrator and request a beneficiary change form, complete the form, and return it to the administrator or agent who holds the plan.

There may be favorable tax consequences by including philanthropy in your estate plans. TACF encourages you to contact a qualified estate planning attorney or financial advisor before making your commitment. If you decide to include TACF in your plans, please notify us so we can welcome you into the Chestnut Society and record your wishes in our confidential files. For more information, contact Director of Donor Engagement Shana Zimnoch at shana.zimnoch@acf.org.



Day of the Living Dead

TACF'S FIRST PUBLIC EVENT IN A CEMETERY

By Lisa Thomson, President and CEO, and Anna Sproul-Latimer, TACF Board of Directors

Not everything in DC's historic Congressional Cemetery is as dead as you might think. It is home to six thriving backcross American chestnut trees planted a number of years ago by Mid-Atlantic Regional Science Coordinator at the time, Matt Brinckman.

Festival visitors gather around one of the American chestnut trees in the cemetery, listening to VA Chapter President John Scrivani share information about the tree's significance and benefits.

The festival was a brainchild of TACF's newest board member, Anna Sproul-Latimer of the VA Chapter. She nearly single-handedly organized the event which included food and beer trucks, vendors, commemorative t-shirts, and raffles for seedlings and chestnut honey. Conceived to raise awareness in the great DC-VA-MD corridor, home to many members, orchards, and activities, the event attracted young families and professionals who live on Capitol Hill, where the cemetery is located. We hope this American Chestnut Festival will mark the first of many homecoming celebrations.

The event was co-hosted by TACF and the Congressional Cemetery itself. Held on October 23, 2022, this free festival also included talks from TACF scientists and Congressional Cemetery historians; live music; kids' crafts and face painting; and a chestnut roasting demonstration. Volunteers from TACF's VA and Carolinas Chapters staffed booths to answer questions about chestnuts and sell merchandise. A representative from TACF's partners at SUNY's Environmental College of Science and Forestry also attended to share information and updates about the Darling 58 transgenic American chestnut tree. Though rain was predicted, it stayed away for this special day and a wonderful time was had by all!

Adriana Del Grosso (rt.), tree distribution manager at SUNY-ESF, shares information about the transgenic American chestnut.

These American chestnut trees add beauty and nostalgia to the cemetery grounds.

Kids use American chestnut leaves to create works of art.

Folks line up to grab a beer as they enjoy the festivities of the day.

K.O. SUMMERVILLE RECOGNIZED AS

2022 Distinguished Alumnus of the Year

AT

NC STATE UNIVERSITY

By Lisa Thomson, President and CEO

At a festive event November 3, 2022, the NC State College of Natural Resources awarded Kenneth "K.O." Summerville its 2022 Distinguished Alumnus of the Year for his esteemed career and dedication to forestry research.

K.O. Summerville (red tie) poses with family and friends before the evening's special event begins.

Lisa Thomson and Jules Smith, director of communications, were honored to join K.O., his family, and friends at NC State's "Evening of Stars Gala," an event presented by the NC State Alumni Association to celebrate alumni and friends of the University who have given back to their professions, communities, or alma mater. Summerville and his late wife, Pat, established the Summerville Family Forest Research Fund Endowment in 2013.

"K.O. Summerville's contributions to the forestry profession and the College of Natural Resources represent an extraordinary dedication to public service. His 34-year career with the North Carolina Forest Service was crucial to the establishment of new forests that now provide valuable wildlife habitat, timber crops and even outdoor recreation spaces," said Dean Myron Floyd.

A native of Mecklenburg County, Summerville enrolled at NC State in 1954 to pursue a bachelor's degree in forest management. Following graduation and two years of service in the U.S. Army, Summerville returned to NC State as a research technician with the intent to earn a master's degree in tree improvement.

However, after four years of employment and study, Summerville decided to join the North Carolina Forest Service's Nursery and Tree Improvement Program. He was stationed in Goldsboro to assist with the program's efforts to establish seed orchards for loblolly pine, longleaf pine, and various other native tree species.

During his time with the Nursery and Tree Improvement Program, Summerville traveled extensively across the state to identify suitable trees for planting and led numerous studies to improve the production of tree seedlings in four nurseries across the state. He also authored or co-authored 10 research papers on Atlantic white cedar.

Summerville retired from the Tree Improvement Program in 1998 and was elected a Society of American Foresters Fellow in 2002 for his career contributions. He has shared his expertise and talents as a volunteer for TACF for more than a decade. In 2015, Summerville received the Foundation's Southern Region Volunteer Service Award for his contributions to our breeding program. He also donates handmade woodworking pieces, most recently several beautiful wormy chestnut frames created for TACF's award winners at our fall Symposium.

Please join us in congratulating K.O. for this prestigious award!

K.O. accepts his Distinguished Alumnus award from Myron Floyd, Dean of NC State's College of Natural Resources. Photo courtesy of NC State Alumni Association.

(Left to right) Jules Smith, K.O., and Lisa Thomson enjoy a moment together prior to the dinner and presentations.

The "Evening of Stars Gala" was a packed event, honoring a number of alumni from NC State University.

2022 Photo Contest Winner

CHASE WITMER

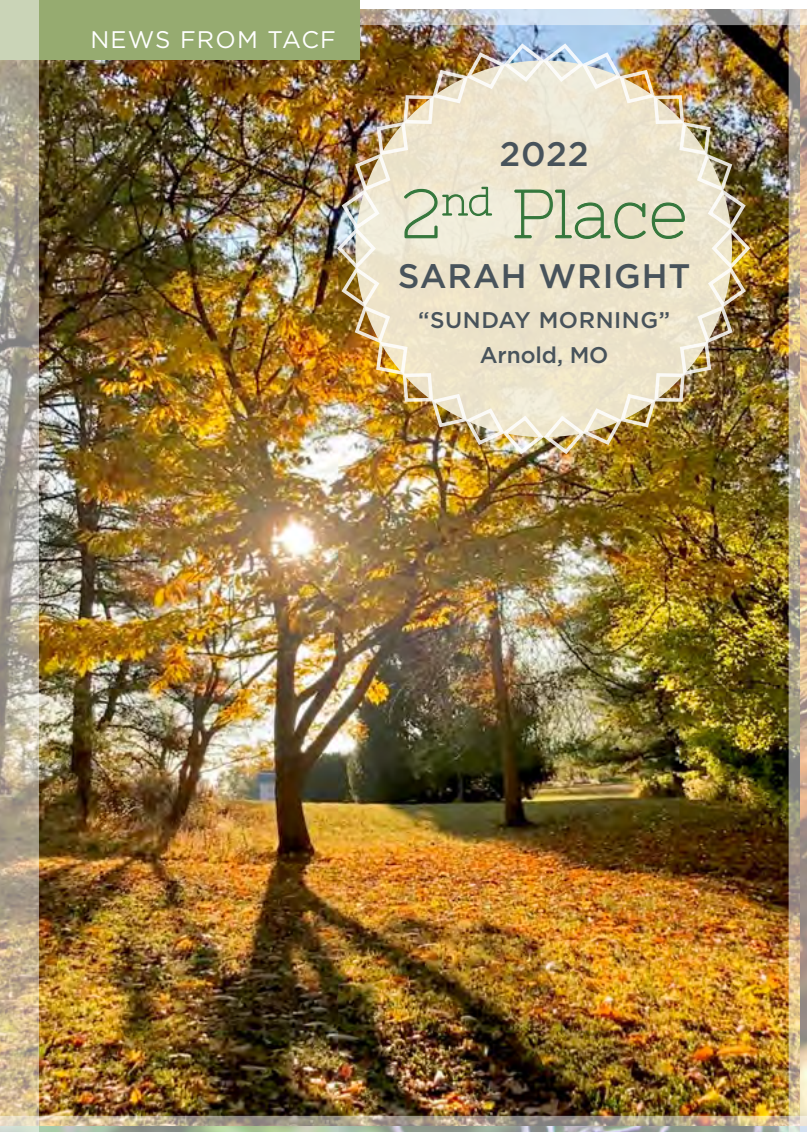
"CHESTNUT LEAVES"
Centre County, PA

We are grateful to all those who participated in TACF's 2022 Chestnut Photo Contest! This year's submissions showcased each photographer's unique eye and ability to capture the moment. Congratulations to our finalists whose photos focused on the tree's beauty during the seasons of summer and autumn.

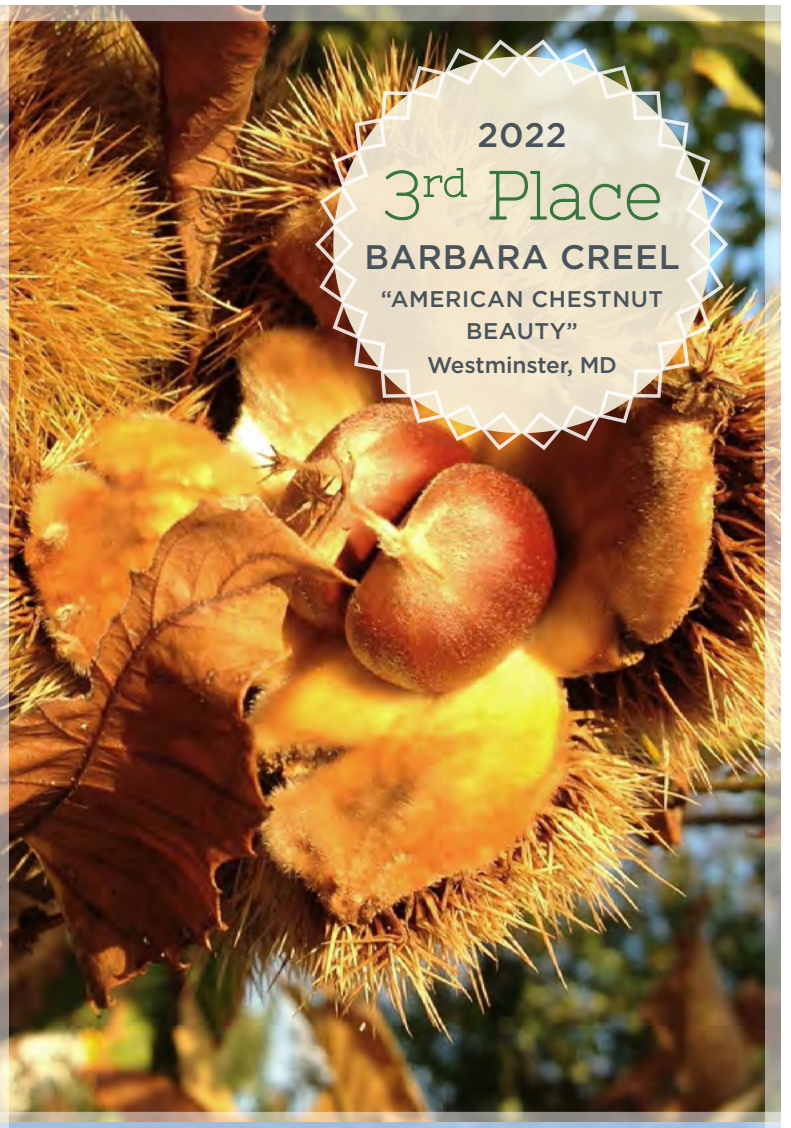
The winning photo, simply titled "Chestnut Leaves," was taken by Chase Witmer in Centre County, PA on land that has been in his family for 100+ years. It wasn't until after the photos were judged that an interesting fact was learned about Chase; he is only 15 years old! From a very early age, Chase's dad began telling him stories about the American chestnut that he heard from his father. Since that time, Chase has been studying the trees on the property and visits them often. He is looking forward to a career in forestry.

JUDGES: SOUTHERN APPALACHIAN HIGHLANDS CONSERVANCY

The Southern Appalachian Highlands Conservancy (SAHC) is a nonprofit land trust conserving land and water resources in the mountains of Tennessee and North Carolina. Since 1974, SAHC has protected more than 80,000 acres of unique plant and animal habitat, clean water, farmland, scenic views, and places for all people to enjoy. SAHC endeavors to protect land with ecological and cultural value, responsibly steward conserved land and water resources, and connect people with nature. More info at Appalachian.org.



2022
2nd Place
SARAH WRIGHT
"SUNDAY MORNING"
Arnold, MO



2022
3rd Place
BARBARA CREEL
"AMERICAN CHESTNUT BEAUTY"
Westminster, MD

HONORABLE MENTION: JACK SWATT
"CEDAR WAXWING IN AMERICAN CHESTNUT"

HONORABLE MENTION: KATHERYN TELLES
"*CASTANEA ALABAMENSIS* AND MORNING GLORY"

HIGHLIGHTS FROM TACF'S 2022 CHESTNUT SYMPOSIUM: ASHEVILLE, NC

IN THE EARLY FALL OF 2022, nearly 175 chestnut enthusiasts gathered in Asheville, NC, and were treated to presentations, talks, and a panel discussion of experts to learn the latest efforts as we steadily come closer to full-scale reintroduction. The first such meeting in three years, it was energetic, enlightening, and wonderful to finally get together as a chestnut team united in hope and determination.

Keynote speakers, Victor Harris and Michael Webster, gave well-prepared and thought-provoking presentations on our changing world. Students and researchers submitted 17 detailed posters on their work culminating in Chris Johnston, Morgan DuPree, and Kaitlyn Harden winning the first, second, and third place prizes respectively.

Despite Hurricane Ian making a brief appearance and the ever present Covid concerns, the meeting went off without a hitch. It would not have been possible without the hard-working administrative team at the Asheville office. Keep an eye out for information about future meetings, including those held by your local chapters.

2022 Annual Meeting Sponsors

The American Chestnut Foundation would like to

THANK

these organizations who helped make this event possible:

Dollywood PARKS & RESORTS

BARTLETT TREE EXPERTS
SCIENTIFIC TREE CARE SINCE 1907

Fonta Flora BREWERY

TRUIST

KEYNOTE SPEAKERS

VICTOR HARRIS

What do dinosaurs, minority landowners, and the American chestnut have in common? Friday night's keynote speaker, Victor Harris, presented "Finding Your Jurassic Park Moment." Harris, with more than 35 years of experience in forest management and urban natural resource management, expanded on just how important the moments in our life are. Venturing through an audacious mission can bring trepidation, but with a large community of supporters, it becomes a collaborative journey toward success.

MICHAEL MEHTA WEBSTER

Saturday evening, during the Chestnut Celebration Dinner, Michael Mehta Webster presented on "The Rescue Effect: How Nature Can Rescue Species from Extinction and How We Can Help." Throughout nature, many rescue effects can be seen and often automatically kick in when organisms are stressed or declining. Webster brought to life the possibilities of how some species are being brought back from extinction. His recently published book, *The Rescue Effect: The Key to Saving Life on Earth*, explains this hopeful trend. It includes an entire chapter on American chestnut.

OUR BOARD OF DIRECTORS

dedicates energy and countless hours to fulfilling the mission and vision of TACF. Two members rolled off the board in 2022 and were honored at the Symposium for their stalwart service.

2022 Awards and Certificates

VOLUNTEER SERVICE AWARDS

American chestnut restoration would not be possible without the dedication and hard work of these invaluable volunteers.

The Volunteer Service Award is presented each year to four outstanding individuals who have gone above and beyond in their efforts to restore this foundation tree species.

2022 recipients were Glenn Kotnik, Ken Darnell, Jack Swatt, and Paola Zannini.

BRAD STANBACK
(Right)

JEANNE ROMERO-SEVERSON
(Left)

TACF would like to extend deep gratitude to all the volunteers who bring this mission to life.

Glenn Kotnik (right), IN Chapter, presented by Sara Fitzsimmons

Ken Darnell (right), KY Chapter, presented by Rex Mann

Jack Swatt (right), CT Chapter, presented by Jack Ostroff

Paola Zannini (center), TN Chapter, presented by Hill Craddock

STUDENT POSTER SESSION WINNERS

AFTER A TWO-YEAR HIATUS,

TACF was excited to once again invite researchers to share their American chestnut posters at the Symposium. The poster session aims to recognize a breadth of topics under investigation in the name of species restoration. This year, a total of 17 posters were presented and judged. Congratulations to those who won awards for their outstanding submissions: Chris Johnston, Morgan DuPree, and Kaitlyn Harden, with thanks to Hill Craddock for bestowing the awards.

Chris Johnston, SUNY College of Environmental Science and Forestry: "Updated North American range of the Asian chestnut gall wasp with the use of the citizen science database iNaturalist"

Morgan DuPree Wingo, Berry College: "Evaluation of an alternative small stem assay in backcross chestnut seedlings in Georgia"

Kaitlyn Harden, The University of Tennessee at Chattanooga: "Oxalic acid leaf disk assays may be another method of screening phenotypic variability in "American" looking *Castanea* hybrid trees"

TACF's 2022 Raffle Winner

Carolinas Chapter member Jon Taylor crafted and donated this stunning, wormy American chestnut entryway table specifically for TACF's 2022 raffle. Rescued from the exterior of a barn in Western North Carolina, Jon fashioned this storied wood into a coveted heirloom.

The raffle drawing took place during Saturday evening's Chestnut Celebration Dinner and MD Chapter member

MARC WALTON

was the lucky winner. TACF raised nearly $30,000 from raffle sales for this one-of-a-kind table!

Mark Walton proudly poses by the entryway table shortly after its delivery.

2022 Chestnut Symposium at a Glance

Symposium participants listen to Michael Mehta Webster speak during Saturday's Chestnut Celebration Dinner.

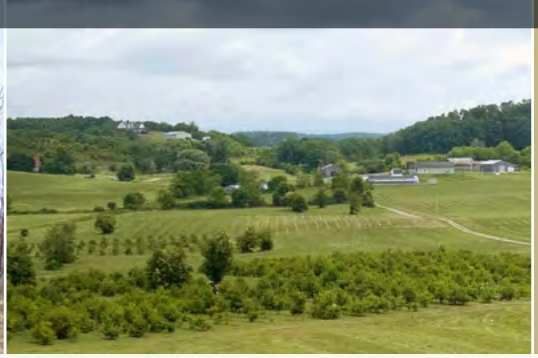
Board of Directors Chair Jay Cude, and Promotion and Outreach Committee Chair Betty Allison.

Jason Holliday, professor of forest genetics and biotechnology at Virginia Tech, takes questions after his presentation.

Symposium attendees visit the poster session and ask questions to those who submitted abstracts.

1983

TACF was founded by a group of plant researchers and citizen scientists. Philip Rutter (pictured) was the first president and CEO.



1989

TACF's first breeding farm was established in VA, now part of multiple properties that make up the Foundation's Meadowview Research Farms.

ESF

1990

Researchers at SUNY's College of Environmental Science and Forestry begin work toward the development of a transgenic American chestnut tree.

1991

Researchers began a biocontrol study with hypovirulence to treat individual blight cankers.

A GLIMPSE OF TACF'S GROWTH OVER THE LAST FOUR DECADES

THE AMERICAN CHESTNUT FOUNDATION™

2004

Chestnut Returns Farm in SC established chestnut orchards to research Phytophthora root rot.

2009

The first American chestnut hybrids were planted in forests.

2010

TACF finalizes all 16 state chapters from Maine to Alabama.

2016

The 3BUR approach, using multiple pathways to create a disease-tolerant and genetically diverse population of American chestnut, was approved by TACF's Science and Oversight Committee.

2020

Chestnut Chat live virtual webinars were created as a way to engage chestnut enthusiasts during the pandemic lockdown and continues due to popularity.

2022

Final USDA public comment period opened toward the deregulation of the transgenic American chestnut.

TACF is entering 40 years of progress and growth toward accomplishing its mission to return the iconic American chestnut to its native range. We celebrate the people and scientific advancements that continue to move us closer to restoring healthier forests in the eastern U.S. Whether you have been part of this organization for months or decades, you are an essential asset in this bold and unified effort. Thank you for all you have done that has carried us this far and will ensure chestnut restoration to mission success!

2010 NE-1833 Meeting in Maggie Valley, NC.

An Award-Winning Group:

THE USDA MULTISTATE PROJECT ON CHESTNUT

By William MacDonald and Mark Double, WV Chapter

In the mid-1970s, West Virginia University Provost William Vehse was besieged by calls from numerous people around the state asking about the American chestnut and what research was occurring at the institution to help restore the species. In September 1975, a feature article in *Science* magazine by researchers at the Connecticut Agricultural Experiment Station detailed findings that fueled the idea of restoration of the American chestnut. The article, titled "New Hope For a Fallen Giant," renewed interest in this significant tree species to the extent that the Forest Management Review Commission of the West Virginia Legislature scheduled a discussion of the topic at a pre-legislative hearing. At the Provost's request, West Virginia University faculty members, William MacDonald, forest pathologist and Franklin Cech, forest geneticist, attended the hearing. They were asked by Commission members why the University was not working on the topic. The *Science* article unleashed great enthusiasm for the tree, particularly in West Virginia. The state's central location in the chestnut range and former importance of chestnut as a forest resource were well appreciated by members of the Commission. At the time, no research at West Virginia University was directed toward chestnut, as the species had long been reduced by the blight fungus to that of an understory shrub. Fortunately, the species has survived, as it continuously sprouts only to be re-infected and killed by the blight, a scenario that continues to this day. The Provost suggested that a symposium be held in West Virginia to see what interest there was in chestnut. At the urging of West Virginia Senator, Robert C. Byrd, the provost contributed $10,000 to hold a symposium. That figure was matched by the USDA-Forest Service's Timber and Watershed Laboratory in Parsons, WV. The result was the first international chestnut symposium, held in January 1978 in Morgantown. More than 200 people attended, including three key researchers from Europe.

One obvious outcome of the symposium was that the interest in chestnut was overwhelming. The concern among those attending the symposium was whether a baseline source of funding could be established for research. As a result, a core group

Hill Craddock, TN Chapter (left) and Paul Sisco, Carolinas Chapter at the 2003 gathering in Columbia, MO.

2008 NE-1833 Meeting in Chimney Corners, MI.

2019 NE-1833 Meeting in Alpine Lake, WV.

of researchers held a meeting at Pipestem Resort State Park in West Virginia in 1981 to discuss whether a USDA Regional Project should be established to coordinate, perpetuate, and enhance the chestnut research effort that was in its infancy at few institutions. At our request, Dale Zinn, then Dean and Director of the West Virginia Agriculture and Forestry Experiment Station, attended the Pipestem meeting and encouraged us to move forward by establishing a multistate project. Dale Hindal, William MacDonald, and Mark Double agreed to coordinate the first writing of the project by gathering information from the various individuals/institutions who wished to join a newly formed USDA Multistate Research Project. Researchers from several land-grant institutions in the eastern and north-central states chose to contribute to the new project and were very enthusiastic about cooperative research. Some researchers already had worked together, and others had complimentary research interests. The collaborative effort made sense to everyone. At the time of the Pipestem meeting, Dean Zinn was chairman of the Northeast Regional Association of Experiment Station Directors and fostered our case for establishing a new Regional Research Project that focused on chestnut. The project was overwhelmingly approved by the Northeastern Experiment Station Directors and the first multistate project meeting was held in Frankfort, MI in 1982. The purpose of a multistate project is to enable research on high-priority topics among the State Agricultural Experiment Stations (SAES). In this way, technological opportunities and complex problem-solving activities that are beyond the scope of one Experiment Station, can be approached in a more efficient and comprehensive way. The project members are experts in many disciplines such as: molecular biology, mycology, genetics, horticulture, agroforestry, and silviculture. This cooperation has been productive as the project members collectively averaged 30-50 publications per year since the mid-1990s. The project remains active today. Over the years, project members at each of the 15-20 institutions have shared the responsibility of hosting the meeting at their institutions. This has provided project members the opportunity to visit other institutions, witness ongoing research conducted by various committee members and often the chance to visit both natural and artificially established chestnut field sites. The chestnut multistate project is one of the longest running in the USDA, and the group has been the recipient of three national awards of excellence in 1997, 2008 and 2010. Senator Robert C. Byrd, an individual who witnessed first-hand the devastation caused by the chestnut blight fungus, continued lobbying for funding for the multistate project. Byrd appropriated money to several eastern land-grant universities to support their chestnut initiatives.

Two additional international chestnut meetings were held in West Virginia in 1992 and 2012. Several European countries also have hosted chestnut symposia as chestnut is appreciated in both Europe and Asia.

Most of the founding members of the project have retired, but the next generation of scientists are moving forward with the goal of restoring American chestnut back into the forests of eastern North America.

A View

FROM MEADOWVIEW

The Darling 58 and DarWin transgenic chestnut seeds produced this year at Meadowview Research Farms are hemizygous, meaning only one of their parents has the transgene responsible for producing oxalate oxidase (OxO) to disarm the blight fungus. While all of these seeds have transgenic fathers, all of their mothers are non-transgenic and therefore do not have a copy of the OxO transgene to pass on. On average, a bit less than half of the seeds in these crosses inherit the wheat-sourced transgene, while the other half inherit only chestnut genetic material. To find out whether a seed from such a cross has inherited the transgene, a chemical test is performed on a tiny piece of the seed material. Meadowview Laboratory Manager Cassie Stark is seen here testing a batch of seed sent from Bill Powell's lab at SUNY-ESF, where the Darling 58 chestnut was developed. The seed core is submerged in a specially prepared solution containing oxalic acid to see if the core contains the OxO that reacts with it. When the reaction takes place, the core and the solution turn a deep blue color. How many blue vials indicating OxO gene inheritance can you spot in this image?

PREPARING FOR DEREGULATION:

*dentata*Base for Darling 58

By Kendra Collins, New England Regional Science Coordinator and RSC Manager

Intern Dan Hale pollinates a wild American chestnut tree in 2011. Recording these types of trees in *dentata*Base is an important step towards eventually pollinating them with D58 transgenic chestnut pollen.

The science program of The American Chestnut Foundation (TACF) is expansive. Between our Meadowview Research Farms, state chapter programs, partners, collaborators, and members there is a LOT of data generated that we need to track. TACF's *dentata*Base is an online relational database that houses the majority of these data and is used by scientists, volunteers, and landowners alike to track the chestnuts they care about.

With deregulation of SUNY College of Environmental Science and Forestry's (ESF) Darling 58 transgenic American chestnut (D58) on the hopeful horizon, tracking the expansion of this aspect of our science program will be crucial. Further, with ESF and TACF working as a team, centralized data storage and management is critical. It is expected that D58 would remain under an Environmental Protection Agency registration for at least a few years post-deregulation, which may require careful tracking of all uses of D58-derived material. Luckily, with our *dentata*Base we are ready to handle this data tracking and we can start now to prepare to hit the ground running whenever that (hopefully!) positive decision is announced.

Another benefit of tracking everything D58 in *dentata*Base is that we can better respond to critics of the program who are concerned about following the trees and documenting any ecological impacts. Recording all D58 plantings and any associated observations would go a long way towards addressing those concerns and also allow us to better follow-up on these trees and their performance well into the future.

Intern Liana Vitousek pollinates an orchard tree in 2016. Pollinating these trees will require that the orchard is entered into *dentata*Base, along with the cross and eventual harvest details.

Tracking and Recording Wild Trees

One of the biggest needs of the D58 program will be increasing and expanding the genetic diversity of the population. TACF's state chapters are well-positioned to make a big impact by crossing D58 with flowering wild trees in their chapters. These trees need to be properly tracked in *dentata*Base such that they may be used to make D58 crosses. For wild trees not yet recorded, next spring would be a great time to collect and press a leaf and twig sample, and submit it to your regional science coordinator with a Tree Locator Form, available on TACF's website.

Tracking Orchards

Many chapters have been developing germplasm conservation orchards as part of their preparations for D58 deregulation. In addition, many of the existing backcross orchards contain trees that could be used in D58 crosses because they are either highly American, or some of the best our breeding program has produced, allowing us to stack resistance sources. In any of these cases, if there are flowering orchard trees to pollinate, like wild trees, orchard trees must be entered in *dentata*Base. Post-deregulation, large D58 plantings can be tracked in the same manner.

Tracking Backyard Plantings

A new feature of *dentata*Base allows users with small plantings to easily plant and track their trees. A mapping interface allows users to drop a pin on a map, plant a tree, give it a name, and follow its growth and health into the future. This feature could be used to track backyard plantings intended to help produce D58 nuts, or, when available, small plantings of D58 trees. Educational, demonstration, and ceremonial plantings can also be tracked using this feature.

This wild tree in New Hampshire was reported, a sample verified as American chestnut, recorded in *dentata*Base, and then pollinated by NH Chapter member Todd Ross in 2010.

Distribution of D58 pollen will be tracked in *dentata*Base. Photo by Tom Klak.

Distributions – Pollen, Nuts, Seedlings

Spring or early summer deregulation would allow for wide use of D58 pollen during the upcoming breeding season. That said, not only do the trees to be pollinated need to be in *dentata*Base, so too do the pollen distributions. In addition, any nuts or seedlings sent out will also be tracked and distributed using *dentata*Base.

Tracking Crosses

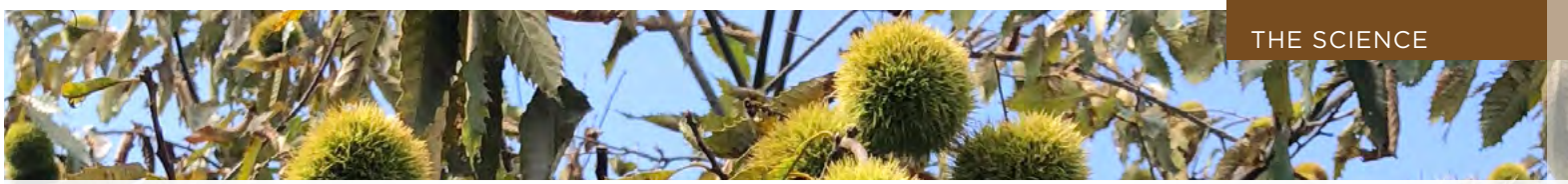
Any crosses made with D58 pollen will be recorded in *dentata*Base and the harvested nut totals updated in the fall. Unlike the chestnut pollinations most of our members have done in the past, a post-harvest step is testing every individual nut for the presence of the oxalic oxidase (OxO) gene. This will require sending all harvested nuts to testing centers before any further plans are made. While further distribution plans are still under development, one thing that is certain is that we'll need this centralized record to keep track of all the nuts our staff, citizen scientist volunteers, and partners produce.

*dentata*Base Training and User Accounts

Our members and partners interested in using *dentata*Base to track any of these aspects of the D58 program, or similar aspects of our broader science program, may receive training and an account. Your local RSC is the best point of contact for learning more about how you or your chapter may better interact with this system. We expect to host and advertise training opportunities at the organizational and regional levels. Chapters may also wish to plan training sessions and RSCs are available to assist as needed.

With D58 deregulation a possibility for spring of 2023, the best we can do is be hopeful, and ready!

Development team lead Sara Fitzsimmons and team member Kendra Collins have been working on this project for more than a decade and are happy to provide more information about this important system. Staff contact information may be found at acf.org/about-us/staff/.



Dual Resistance:

COMBINING RESISTANCE TO CHESTNUT BLIGHT AND PHYTOPHTHORA ROOT ROT

By Jared Westbrook, Director of Science

While resistance to chestnut blight is critical for American chestnut restoration, it is important that some of our restoration trees are also resistant to Phytophthora root rot (PRR). This disease, caused by a soil borne pathogen *Phytophthora cinnamomi*, was first introduced into the U.S. from Asia in the 1800s. *Phytophthora cinnamomi* belongs to a class of microorganisms called oomycetes, which are more closely related to algae than they are to fungi. Spores of this species swim through moist soils and are capable of infecting the roots of more than 5,000 plant species.

First-generation selections to intercross via open pollination.

Figure 1

Steps to generate American chestnut trees with dual resistance to chestnut blight and Phytophthora root rot (clockwise from top left).

STEP ❶: Identify PRR-resistant backcross parents by inoculating progeny with *Phytophthora cinnamomi*. Photo by Steve Jeffers.

STEP ❷: Apply pollen containing a blight resistance gene (OxO) to PRR-resistant parents. Pictured: TACF intern Israel Golden and John French from the GA Chapter.

STEP ❸: Identify nuts that inherited OxO via a chemical detection method.

STEP ❹: Select PRR-resistant progeny in the greenhouse. Pictured: Jamie Van Clief, Southern Regional Science Coordinator.

STEP ❺: Plant progeny in an orchard site infested with *P. cinnamomi*. Pictured: Austin Flint (standing) and Johnny Paolozzi from the GA Chapter.

STEP ❻: Allow the first-generation selections to intercross via open pollination.

On chestnuts, PRR is sometimes referred to as "ink disease" after the characteristic blackened lesions on roots, which cause the above ground plant to wilt. In 2005, after whole orchards of American chestnut backcross trees in South Carolina and Tennessee succumbed to PRR, TACF volunteers and scientists from Clemson University began intentionally inoculating seedling progeny of backcross trees with *P. cinnamomi* to find out if any of these trees inherited PRR resistance from their Chinese chestnut ancestors. We have since identified hundreds of backcross hybrid trees that inherited partial resistance to PRR. With potential federal approval to release blight-tolerant transgenic American chestnuts on the horizon, breeding these blight-tolerant trees with backcross hybrids that inherited PRR resistance is a promising strategy to generate 'dual resistance' trees.

The dual resistance strategy

Resistance to PRR is likely to be controlled by a few large effect genes (Zhebentyayeva et al. 2019). Similarly, the insertion of the wheat oxalate oxidase (OxO) gene, which detoxifies oxalic acid produced by the chestnut blight fungus (*Cryphonectria parasitica*), is expected to confer high levels of blight tolerance to American chestnut (Powell et al. 2019). When transgenic pollen containing the OxO gene is applied to mother trees without this gene, 50% of the progeny are expected to inherit the gene. It should be possible to select dual resistance trees that inherited OxO, PRR resistance genes, and a large majority of their genome from American chestnut. Intercrossing first generation dual resistance selections may be required to further enhance PRR resistance to levels adequate for trees to be competitive in the forest (**Figure 1**).

STEP ❶: Identify PRR-resistant backcross parents

The first step in creating dual resistance trees is to identify PRR-resistant backcross parents. Our criteria for selecting PRR-resistant parents are 1. seedling progeny should have at least 25% survival rates when inoculated with *P. cinnamomi* in greenhouse conditions, 2. surviving progeny must have intact root systems with minimal PRR lesions, and 3. backcross parents must inherit at least 60% of their genome from American chestnut. To select resistant parents, TACF collaborators have inoculated 32,000 seedling progeny of 918 American chestnut backcross parents with *P. cinnamomi* (Westbrook et al. 2019). This extensive screening effort took 17 years, spanning 2005 to 2021. There are thousands of additional backcross selection candidates for PRR resistance and inoculating progeny from all of them is not feasible. Therefore, we used genomic prediction to accelerate the identification of PRR-resistant parents. With genomic prediction, the PRR resistance of backcross trees whose progeny have not yet been inoculated with *P. cinnamomi* is predicted from genetic relatedness with parents whose progeny have been screened. Through progeny testing and genomic prediction, PRR resistance was estimated for a total of 2,716 selection candidates. We identified 70 top tier selections where progeny survival rates after *P. cinnamomi* inoculation are expected to exceed 40%. We also identified 159 second tier PRR selections whose progeny survival rates are expected to vary between 25% and 40%. Estimates of American chestnut ancestry of the PRR selections, which were obtained from DNA sequence data, varied from 99% to 60% and averaged 81% (**Figure 2**).

STEP ❷: Apply pollen containing a blight tolerance gene (OxO) to PRR-resistant parents

The next step is to pollinate the PRR-resistant backcross parents with pollen containing the OxO gene. Progeny that inherit OxO are currently federally regulated as genetically modified organisms so we obtained permits from the U.S. Department of Agriculture (USDA) to conduct these pollinations at two sites with restricted access. In 2020 and 2021, TACF staff pollinated and harvested seed from OxO pollinations on ten PRR-resistant backcross selections.

STEP ❸: Select for the inheritance of OxO gene

We expect approximately 50% of the progeny to inherit the OxO gene. To identify these progeny, we extract a small sample of nut tissue and place it in a chemical solution that turns color in the presence of OxO activity, but remains clear in its absence (**Figure 1**).

STEP ❹: Select for PRR resistance via greenhouse inoculations

After OxO testing, we send the seed to a contained greenhouse facility where seedlings are inoculated with *P. cinnamomi*. In 2021 and 2022, we inoculated a total of 483 progeny from dual resistance crosses with *P. cinnamomi*. A total of 244 of these progeny inherited OxO and are therefore expected to be blight-tolerant. Among the OxO positive trees, 65 (26%) survived the greenhouse inoculation with *P. cinnamomi* with minimal to moderate root lesions.

STEP ❺: Plant the greenhouse survivors at field sites infested with *P. cinnamomi*

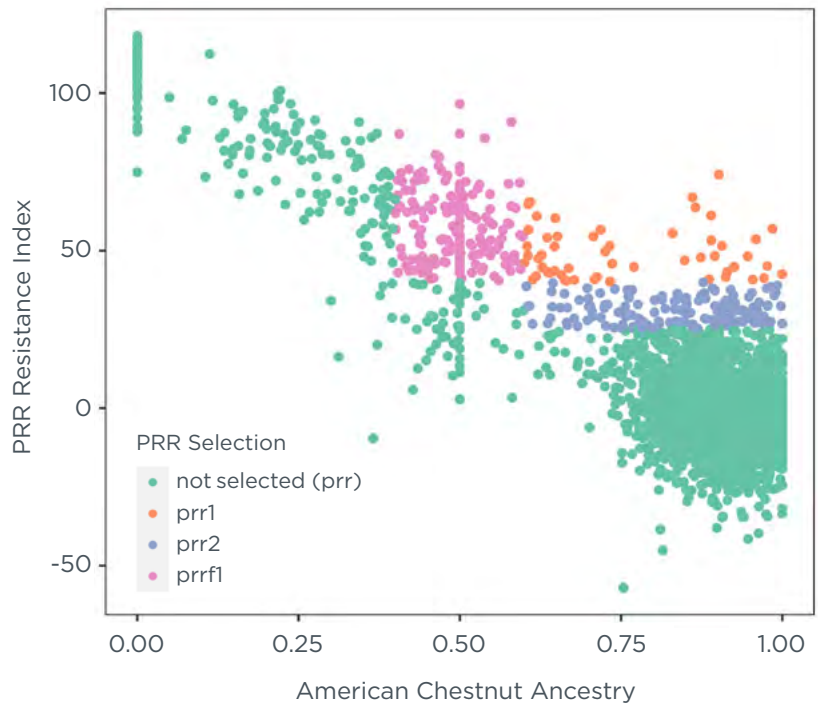
In 2021 and 2022, we planted a total of 65 OxO positive seedlings that survived greenhouse inoculation with *P. cinnamomi* at a USDA permitted field site in GA where the soil is infested with *P. cinnamomi*. Prolonged exposure to *P. cinnamomi* in the field ensures that we have stringently selected for PRR resistance. From previous experience, we conservatively estimate that 25% of the seedlings will survive to flower and produce seed, which typically begins at age seven years in open growth conditions.

STEP ❻: Allow the dual resistance trees to intercross via open pollination

Overall, our selection rate in the first generation is expected to be approximately 3%, assuming 50% of seed inherit OxO, 25% of the OxO positive seedlings survive the *P. cinnamomi* greenhouse inoculation, and 25% of the greenhouse survivors live to reproduce in the field. Even with this stringent selection, the first-generation trees are expected to inherit only partial resistance to *P. cinnamomi*. There are multiple genes involved in PRR resistance and each first-generation selection is expected to inherit different subsets of resistance genes from only one parent. With federal deregulation of blight-tolerant OxO trees, we would eventually like the first-generation dual resistance selections to intercross via open pollination. Open pollination generates many more seeds than we can generate with controlled pollinations. A subset of the intercross progeny are expected to inherit major PRR resistance genes from both parents and are therefore expected to have enhanced resistance relative to their parents.

The future of this work depends on whether or not blight-tolerant trees containing the OxO gene are federally approved. Without approval, we are restricted in what sites we can conduct controlled pollinations and we cannot allow open pollination of the dual resistance trees. With approval, producing large quantities of dual resistance seed through open pollination will require at least a decade. Much of the time required for large-scale seed production is waiting for the trees to grow as American chestnuts do not typically start producing nuts in orchard conditions until age seven years. However, we should be able to assess how successful the dual resistance breeding program is in the next few years as we continue to monitor survival, growth, and reproduction in orchards when trees are challenged by the two major diseases that decimated American chestnut. It takes hope and a village to raise dual resistance trees.

Figure 2



Resistance to Phytophthora root rot versus American chestnut ancestry proportion in TACF's hybrids. A PRR resistance index was estimated for 2,176 backcross parents from progeny testing and genomic prediction of average progeny survival and root lesion severity ratings. Seventy backcross parents with PRR resistance index values greater than 40 and greater than 60% American chestnut ancestry were classified as top tier selections (PRR1) and 159 second tier selections (PRR2) with PRR resistance greater than 25 and less than 40 were identified.

ACKNOWLEDGEMENTS

Many TACF volunteers and scientific collaborators contributed to this work. Steve Jeffers (Clemson University) and Joe James (Chestnut Return Farms) initiated the PRR resistance screening for TACF's backcross program in 2005 and have continued this work to present day. Katie McKeever (U.S. Forest Service) has been instrumental in scaling up the *P. cinnamomi* greenhouse inoculations. Tom Klak from the University of New England and Hannah Pilkey from SUNY-ESF provided the blight-resistant pollen. Qian Zhang and Jason Holliday at Virginia Tech accelerated selection of resistant backcross parents with genomic prediction. Eric Jenkins, Dan Mckinnon, and Jamie Van Clief from TACF performed the controlled pollinations to generate the dual-resistant progeny. John French, Zach Felix, Caitlin Conn, and Austin Flint from the Georgia Chapter of TACF installed the first dual resistance planting. We are grateful to Ben May Charitable Trust for financially supporting the PRR resistance screening effort.

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Improving Mudpack Efficiency

WITH CHAGA MYCELIUM

By Claire Roberts, Environmental Research Coordinator, Friends' Central School

Mudpacks are a well-established technique used to slow the progression of canker development of blight-infected chestnuts. Anecdotal evidence from Canada has suggested that the inclusion of *Inonotus obliquus*, commonly known as chaga, into mudpack mixtures resulted in full recovery from blight infections. This article highlights a 2021 study aimed at evaluating potential advantages of including chaga in mudpack mixtures.

***Inonotus obliquus*, commonly known as chaga.**

Introduction

Mudpacking

Chestnut blight is caused by the fungus *Cryphonectria parasitica* and characterized by bark lesions 'cankers,' typically appearing sunken and orange in color. Mudpacking has historically been established as a simple, accessible technique used to slow canker development on blight infected American chestnuts.

Mudpacks are poultice mixtures of sediment and water mixed to a clay-like consistency. The poultice is applied directly over infections, ensuring that both the canker and adjacent healthy tissue are covered. Often mudpacks are left undisturbed for multiple growing seasons.

This technique is effective at reducing canker development, thereby affording blighted chestnuts additional seasons of growth before succumbing to canker infections. While mudpacks may extend a chestnuts' lifespan, their capacity to cure blight infections remains severely limited.

The significance of Chaga

Anecdotal evidence presented in Paul Stamets 2017 publication *Mycelium Running: How Mushrooms Can Help Save the World* featured claims about highly effective mudpack techniques deployed in Canada. The manager of an American chestnut orchard stationed in Quebec, observed that incorporation of the fungus *Inonotus obliquus* (chaga) into mudpack poultice resulted in full canker arrest and promoted chestnut recovery (Stamets, 2017).

Hailed for its medicinal capacities, chaga also has unique chemical properties that may underpin its supposed ability to subdue blight infections in American chestnuts. Studies on chaga have documented antifungal properties against competing fungi and have recorded extremely high quantities of compounds known as oxalate salts within chaga tissue (Glamočlijaa et al., 2015, Beug, 2019). These oxalate salts form when oxalic acid (oxalate) comes into contact with free ions, most frequently calcium and potassium ions.

The chestnut blight fungus, *C. parasitica*, relies heavily on its ability to excrete oxalate to successfully degrade chestnut tissue. It is possible that the high concentration of oxalate salts observed in chaga disrupt oxalate production by the chestnut blight fungus. It is possible that the phenomena observed in Quebec were the result of chaga acting antagonistically towards chestnut blight, resulting in reduced physical growth and/or decreasing the toxicity of blight infections by disrupting oxalate production in *C. parasitica*.

Over the summer of 2021, we carried out an experiment to quantify and compare the efficacy of traditional mudpacks and chaga-enhanced mudpacks 'chagapacks' to slow or arrest canker development in American chestnut saplings infected with blight.

Figure 1

An example of a mudpack and chagapack randomly assigned to cankers on an inoculated American chestnut sapling. Here, the bottom and top canker locations received treatments and the middle canker site was left as the control. Photo by Claire Roberts.

Materials and Methods

Experimental Design

To compare the efficacy of traditional mudpacks against chagapacks, we infected 30 American chestnut saplings aged 1-2 years with *C. parasitica* at three sites along the stem length. These sites are referred to by their relative position to the root system as 'bottom, middle, top.' For every sapling, each inoculation site was randomly assigned to one of three treatment categories: control (no treatment), traditional mudpacks, and chaga-enhanced mudpacks (chagapacks) (**Figure 1**). Therefore, for every sapling, there were three inoculation sites, with each site corresponding to one of the three treatment groups, resulting in a total of 90 blight cankers. The cankers were monitored over an eight-week period, consisting of four weeks of uninhibited canker growth followed by a four-week mudpack/chagapack treatment period (**Figure 2**).

Figure 2

Chestnut sapling before (left) and after (right) four-week treatment period. Sapling photographed was assigned mudpack (bottom canker), chagapack (middle canker), and control (top canker). Note the callousing of tissue on the bottom canker, the decrease in sporing on middle canker, and buckling on top canker. Photos by Claire Roberts.

Infection Parameters

Three parameters of interest were established to quantify and assess canker development during treatment: Vertical Canker Expansion (VCE) (mm), Stem Desiccation (% loss), and Oxalic Acid Concentration (umole/g). For clarity and concision, this article reports only VCE and oxalate concentration observations. VCE was defined as the change in the longest vertical extent of the canker (mm) along the stem before and after the four-week treatment period. Oxalic acid concentration was determined at the end of the treatment period and defined as umole of oxalate per gram of chestnut tissue.

Results

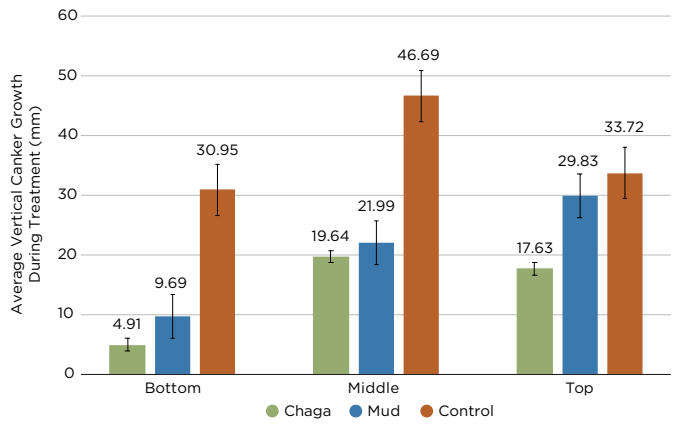
We found that both traditional mudpacks and enhanced chagapacks significantly reduced Vertical Canker Expansion (mm) (**Figure 3**) and Oxalic Acid Concentration (umole/g) (**Figure 4**) when compared to control cankers. On average, cankers treated with chagapacks experienced the least VCE, while cankers treated with traditional mudpacks experienced the lowest average oxalate concentration. Variations among VCE and oxalate concentration between mudpacks and chagapacks were not statistically significant, however. Across all treatment groups there is a positive, although weak, correlation between VCE and oxalate concentration observed in individual cankers (**Figure 5**).

Discussion

This study demonstrates the efficacy of mudpacks in reducing severity of blight infections while outlining their limitations in fully arresting canker development. Despite variability in VCE and oxalate concentration between mudpack and chagapack treatments, chagapacks were not found to significantly reduce canker development in comparison to mudpacks. Therefore, this study did not produce quantitative evidence favoring chagapacks over traditional mudpacks.

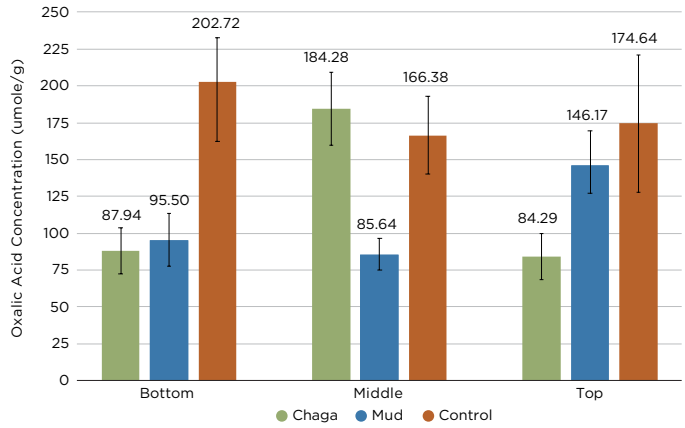
This is not to say that anecdotal evidence presented by Stamets is insignificant. This study was short-term, focused on young saplings, and utilized lab-grown chaga mycelium. It is possible that potential physiological or chemical differences in wild-foraged, mature chaga compared to younger, lab-grown chaga would have meaningful implications on the fungus's ability to enhance mudpack efficacy. The duration of this study (eight weeks total) may have also been insufficient to elucidate differences in mudpack versus chagapack efficacy.

Figure 3



Average VCE (mm) during treatment period organized by canker position (bottom, middle, top) and treatment group (control, mud, chaga). Error bars represent standard error.

Figure 4

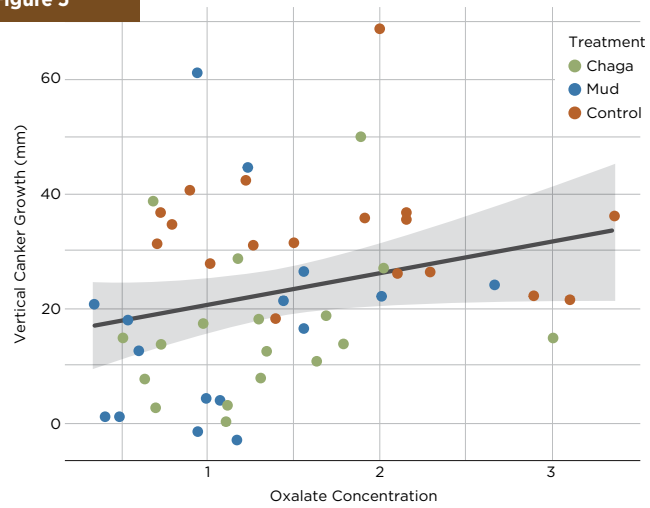


Average oxalic acid (oxalate) concentration by canker position on sapling (bottom, middle, top) and treatment group (chaga, mud, control). Values above bars represent average group concentration and error bars display standard error.

Positive correlations between VCE and oxalate concentration were observed consistently across treatment groups; however, this association is weak, likely due to different environmental conditions that drive canker expansion versus oxalate production in the chestnut blight fungus. While VCE tends to be driven by temperature and humidity, oxalate production appears to be more heavily influenced by access to nutrients and substrate pH (Rigling and Prospero, 2017, A. R. Bennett and D. F. Hindal, 1989). Though increases among infection parameters may occur together, neither parameter alone fully depicts infection severity. Therefore, any additional studies on this front should seek to include both physical parameters of infection (VCE, stem desiccation) and chemical indicators (such as oxalate concentration).

This study did not produce results that corroborate the anecdotes presented by Stamets 2017 work. The possibility of fungal – anti-fungal relations as a biological control for blight infections on American chestnuts remains an open and interesting line of inquiry for species stewardship.

Figure 5



Scatterplot between VCE (mm) on x axis with oxalate concentration (umole/g) on y axis. Trendline with 95% confidence band are shown.

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Tagliatelle with Chestnuts, Pancetta, and Sage

Recipe shared by Kendra Collins, TACF New England Regional Science Coordinator, from Epicurious.com*

My family and I look forward to making this recipe every fall, when fresh chestnuts are easier to come by. I'm always ready for heartier dishes as the cooler weather sets in! The dish comes together quickly and is great for a weekend dinner or busy weeknight. For this recipe, I cut the chestnuts in half and boil them briefly to make peeling easier, then coarsely chop them. We often substitute bacon for pancetta, as there are some great local options for bacon here in Vermont and pancetta can be harder to come by.

Ingredients

3 ounces pancetta (Italian unsmoked cured bacon), chopped (scant 1 cup)
1 tablespoon extra-virgin olive oil
1 small onion, finely chopped
4 garlic cloves, minced
2 tablespoons finely chopped fresh sage
8 ounces bottled peeled roasted whole chestnuts, coarsely crumbled (1 1/2 cups)
8 ounces dried flat egg pasta such as tagliatelle or fettuccine
2 ounces finely grated Parmigiano-Reggiano (1 cup)
2 tablespoons unsalted butter
1 tablespoon finely chopped fresh flat-leaf parsley

Method

Step 1: Cook pancetta in oil in a 12-inch heavy skillet over moderate heat, stirring frequently, until beginning to brown, three to four minutes. Add onion and cook, stirring frequently, until beginning to brown, two to three minutes. Add garlic and 1 tablespoon sage and cook, stirring one minute. Stir in chestnuts and remove from heat.

Step 2: Cook pasta in a 6- to 8-quart pot of boiling salted water according to package directions. Reserve 1 1/2 cups cooking water, then drain pasta in a colander and add to pancetta mixture in skillet. Add 1 cup reserved cooking water along with cheese and butter. Cook, tossing constantly over high heat until pasta is well coated (add more reserved water if necessary), about one minute. Add salt and pepper to taste and serve, sprinkled with parsley and remaining sage.

Makes six to eight side-dish or four main-course servings. Total Time: 30 minutes.

*Find the original recipe at epicurious.com/recipes/food/views/tagliatelle-with-chestnuts-pancetta-and-sage-231504

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

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WILD-TYPE AMERICAN CHESTNUT SEEDLING SALE

Tuesday, March 21, 2023

Ready to get your hands dirty this spring?

TACF will be running its annual Wild-Type American Chestnut Seedling Sale on Tuesday, March 21. This is a very popular member-exclusive opportunity and seedlings sell out quickly. Due to unforeseen issues in nursery stock, there is limited seedling availability this year. In order to accommodate demand and meet nursery bundle requirements, TACF is offering one bundle of 10 seedlings ranging in size from 12 to 18 inches for $80.00 while supplies last (shipping included). In order to prevent the spread of contagions from the native range, no orders will be shipped to states west of the Mississippi River.

Unlike prior years, there is no need to set your alarm clock for midnight. Online sales will open at 7:00AM and national phone lines will open at 9:00AM on Tuesday, March 21. A private link will be emailed to active members on Sunday, March 19 and again when the sale goes live on Tuesday. Orders will be mailed early- to mid-April.

So, mark your calendars and set your reminders! Growing wild-type American seedlings is a wonderful learning experience and helps preserve genetic diversity for future breeding. While wild-type American chestnuts are not resistant to the blight, they can thrive for many years and produce seed for harvest and consumption.

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