

THE
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Journal
OF THE AMERICAN CHESTNUT FOUNDATION



Special Issue: Chestnut Growers Guide to Pests and Diseases
News From the State Chapters
Ambrosia Beetles: a New Challenge



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About Our Cover Image

Our cover this month illustrates some of the pests and diseases which backyard and small orchard growers may have to contend with. Clockwise from upper left: Orangestriped oakworm; photo courtesy of Steven Valley, Oregon Dept. of Agriculture/ForestryImages.org. Chestnut sapling showing leaf curl caused by aphids; photo by Sara Fitzsimmons. Periodical cicada; photo courtesy of Jon Yuschok/ ForestryImages.org. Galls on an American chestnut caused by Asian chestnut gall wasp; photo by Paul Franklin.

Correction: in our March/April 2013 issue, we neglected to credit Chuck Rudy of Mechanicsville, PA, for the lovely image of the seedling that appeared in Chestnut Moments. We apologize for the omission.

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Background photo: The East Coast of the US will see a large emergence of cicadas this year. Periodic cicadas emerge only every 13 or 17 years and in large numbers they can be damaging to chestnut trees. Photo courtesy of PA Dept. of Conservation and Natural Resources / ForestryArchive.org

How Long Will This Take?

By Bryan Burhans, TACF president and CEO

“Are we there yet?” Those all-too-familiar words haunt every parent. And it’s no different with The American Chestnut Foundation. “When will we be able to purchase trees for my property?” is a common question, especially from nonmembers who don’t understand the magnitude of our breeding program.

TACF has been on a long road trip. For thirty years we have steadfastly focused our limited resources and volunteer efforts to develop a disease-resistant chestnut through our traditional breeding program. And since 1990, our NY Chapter has kept its nose to the grindstone in the quest, working with the State University of New York, College of Environmental Science and Forestry (SUNY-ESF), to use molecular biology techniques to develop a disease-resistant tree. Both the traditional breeding program and the SUNY-ESF work have met with great success.

We are getting there! Both the backcross breeding program and the efforts by the SUNY-ESF researchers have resulted in first-generation trees that are currently under evaluation. However, we still have many years of work ahead of us before we can claim victoriously that “American” chestnuts with proven resistance can be made available to the general public.

Ah, but the once-distant future is rapidly coming closer. We have learned much about the genetics of the chestnut in the past decade or so, and new information and technology are continually moving us toward a goal that was once considered a practical impossibility by the experts.

Yet, there is still much we don’t know. To address this knowledge gap, TACF and our partners continue to look at new opportunities to support critical research that advances our mission. Although no individual research project can answer all of our questions, the organization and our partners are faced with the challenge to incrementally further our knowledge of chestnut and develop new techniques to help us succeed.

The breadth of knowledge we must acquire is daunting. We need to build our understanding of the tree’s ability to resist the blight, and also deal with the ever-present



The restoration of the American chestnut is a long-range project.
Photo by Paul Franklin

and ubiquitous ink disease that plagues many of our southern states. We continue to look for better and more efficient methods to screen our trees for disease resistance. Our current screening process requires 4 to 6 years before we have an indication of whether or not a tree possesses adequate resistance. Just think of the savings in time, land, and labor if those evaluations could be done within a year.

“We are not there yet,” is the answer to the opening question. But we are making every effort to develop the new and innovative technologies needed to increase the quality of the trees we develop and, hopefully, decrease the time it takes to get there.

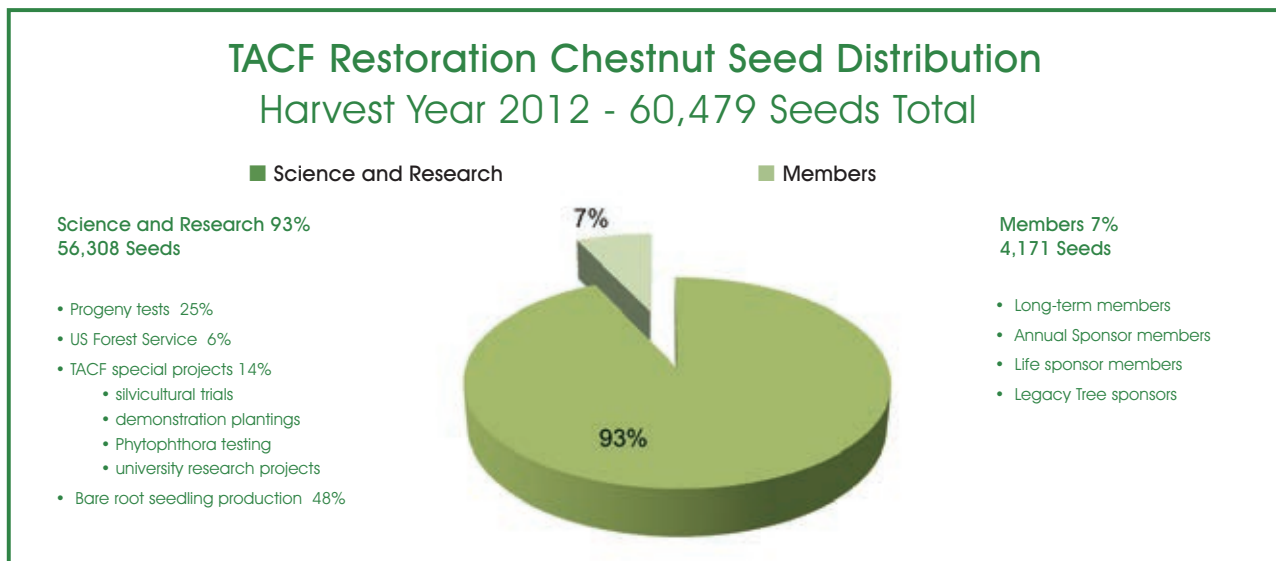
And no, we cannot take a break at the rest stop!

At a Glance: 2013 Seed Distribution

The 2012 seed crop was the largest to date at TACF’s Meadowview Research Farms, almost triple that of the previous year. Increased harvest translates to increased distribution, so we are pleased to announce 60,479 seeds were distributed this spring for various projects and programs throughout the country.

The majority of our Restoration Chestnuts 1.0 go toward building research projects across the range of the species. This spring, 56,308 seeds, or 93% of the harvest, were designated for science and research.

The remaining 4,171 seeds, or 7%, were distributed to our members. TACF members who have an opportunity to plant and test Restoration Chestnuts 1.0 on their property include long-term members, Annual Sponsor members, Life Sponsors, and participants in the Legacy Tree program. Members who don’t have the capacity to utilize the seeds can donate them to the chapter of their choice.



Garden Club of America’s Medal of Honor Bestowed on TACF

On May 2nd, the Garden Club of America (GCA) presented its Medal of Honor, the highest award given to an outside organization, to TACF for outstanding service to horticulture. The award was presented to TACF President and CEO Bryan Burhans by Jane O. Goedecke, National Chairman of GCA’s Awards Committee, at the GCA’s Awards Dinner in Philadelphia, PA.

“TACF is deeply honored to receive this award,” said Burhans. “Gardeners and garden clubs have been a very important part of TACF’s success story. Without the hearts and hands of dedicated, hardworking gardeners, we never could have achieved all that we have.”

TACF joins an impressive list of Medal of Honor recipients, such as Robert Moses, New York’s Park and Highway Commissioner

Bryan Burhans with Mary Lee Scalise of Allyn’s Creek Garden Club at the Garden Club of America’s Awards Dinner in Philadelphia, PA. Photo courtesy of Cynthia Buff/Garden Club of America

(1938); Henry Francis duPont, for the creation of Winterthur Gardens (1956); and Nobel Laureate Dr. Norman Borlaug, for his work on developing wheat strains that helped feed the developing world. Interestingly, Dr. Borlaug was also one of the founders of The American Chestnut Foundation in 1983.

“In awarding medals,” said Jane Goedecke, “the Garden Club of America looks to honor those individuals and organizations who share our values and further our mission: to stimulate the knowledge of gardening and to restore, improve and protect the quality of the environment. The American Chestnut Foundation meets all those criteria and we are proud to award it the Medal of Honor.”

Dr. William Powell addresses the TEDxDeExtinction audience on the topic of American chestnut restoration.

Photo credit: TEDxDeExtinction



TEDxDeExtinction Conference Explores Reviving Extinct Species

In March, National Geographic hosted the first-ever public exploration of the subject of reviving extinct species at TEDxDeExtinction, a day-long event at Grosvenor Auditorium in Washington, DC. The event brought together 25 of the world’s leading experts in the fields of conservation and biotechnology to explore the benefits and complexities of de-extinction science. Presenters discussed species-revival projects ranging from the passenger pigeon and Pyrenean ibex to the Tasmanian tiger and woolly mammoth.

Among the speakers was Dr. William Powell, Director of the Council on Biotechnology in Forestry at State University of New York (SUNY-ESF), who spoke about the ongoing work to restore the American chestnut to the eastern forests of the United States. Dr. Powell’s

work, in partnership with the New York Chapter of TACF, has focused on transgenic methods of creating viable lines of blight-resistant American chestnut. In 2006, Dr. Powell’s and Dr. Charles Maynard’s team at SUNY-ESF began planting transgenic, potentially blight-resistant chestnuts in controlled test environments. In 2012, some of these trees demonstrated an enhanced level of blight resistance.

While many speakers at the event focused on projects that are planned for the future, Dr. Powell addressed current efforts to restore a species: “Although the American chestnut isn’t extinct, I hope that the practical experiences that we have gained at SUNY-ESF will help add to the body of knowledge in this fascinating field.”

TACF Invites Student Researchers with Poster and Research Presentations to the 30th Annual Meeting

By Kendra Gurney, TACF New England Regional Science Coordinator

One of the most successful events at last year's American Chestnut Summit was the poster session. A new addition to TACF's conference activities, the poster session gave nearly 30 scientists the opportunity to present their chestnut-related research to our members and partners, who crowded the presentation room during the weekend. TACF will again be hosting a poster session at our 2013 Annual Meeting, which will be held October 19-20, 2013, in Herndon, VA, near Washington, DC. Building on our successes from 2012, we will have a more centralized and open space for display and hope to again showcase a wide range of topics related to American chestnut restoration.

In addition to the poster session, we will hold student research presentations, offering students the opportunity to showcase their work before an audience. These sessions are designed to help students improve their

professional skills, while offering attendees an opportunity to learn more about the wide range of chestnut-related research being conducted at colleges and universities.

For more information on how to submit research posters and presentations to TACF's 30th Annual Meeting visit www.acf.org/30th_Annual_Meeting.php or contact Kendra at kendra@acf.org.



Student researcher and poster presenter Kathryn Vescio of Penn State University explains her research to John Murray of the TN Chapter at the 2012 American Chestnut Summit. Photo by Paul Franklin

In Memory of and In Honor of Our TACF Members March/April 2013

In Memory of

Wayne Carpenter

*Wayne and Louise Biby
Melvin and Anne Carpenter
Ralph Carpenter
Thomas and Loni Dapp
Tempe Thomas
Jessica Wilkins*

David Jeffries

Marjorie Jeffries

Rebecca Pernice

Ralph Pernice

In Honor of

**Denis Melican and
Lois Breault-Melican**

*Peter and Kendra Wilde, The
Chestnut Hill Garden Club*

ALABAMA



Taking part in the May 2 planting. Left to right: McKee and Edie Paterson; Libby, Porter and Caroline Neubauer. Photo by Pratt Paterson

Alabama Grows New Branches

In April, Alabama hosted an exciting meeting in Huntsville at which members of the Alabama and Tennessee Chapters met to form two branches: The Sewanee branch and the Huntsville branch. Similar to recent branch formations in Nashville, TN, and Louisville, KY, these Restoration Branches are significant because they provide members and volunteers the opportunity to get involved in the TACF activities on a local level. These branches have already set solid goals that include establishing science and outreach committees, planting a regional breeding orchard, and planting a progeny test on the Domain of The University of the South, in Sewanee, TN.

TACF regional science coordinator Tom Saielli was quick to praise the effort: "The formation of Restoration Branches creates powerful tools for engaging local members and volunteers to get involved in TACF activities. From planning and planting orchards, searching the woods for surviving American chestnuts, educating the community, to hosting a fund-raising event, the Restoration Branch brings communities together in a grass-roots style of self-empowerment."

As a big first step, on March 2, Alex Neubauer and Pratt Paterson, members of the South Cumberland Restoration Branch, got their families together to pot Restoration Chestnut 1.0 seeds in preparation for planting the seedlings in the wild. Participating in the project were the five Neubauer and Paterson children, who learned that these seeds will mature into seedlings that, in a few months, will be ready to be transplanted into the forests of southern Tennessee and northwest Alabama. - Submitted by Jack Agricola and Tom Saielli

CAROLINAS



North Carolina Forest Service Ranger Jon Albertson watches as Caroline Clodfelter plants a Restoration Chestnut 1.0 as part of a test planting in the Uwharrie Mountains of central North Carolina. Photo by Fred Clodfelter


Chestnut Planting in the Uwharrie Mountains

On April 10, a group of Carolinas Chapter volunteers gathered to create an interesting experimental planting on Fred Clodfelter's property in the ancient Uwharrie Mountains in central North Carolina. The purpose of the test was to measure the relative growth and survival rates of Restoration Chestnuts 1.0 in forest clearings versus open field environments. Regional Science Coordinator Tom Saielli developed the plan and directed the planting of the seeds. With the help of friends and family, the Clodfelters had earlier prepared the orchard site, which was protected by a fence to keep out wild boar and deer. The volunteers planted ninety-six seeds; sixteen chestnut seeds in each of 6 rows.

On the same property, six separate, narrow forest plots had been cleared to allow sunlight to penetrate. Sixteen nuts were planted in each row in each plot to replicate the rows planted in the orchard. Cages of fencing wire were secured around each of the nuts planted in the forest plots.

Records will be kept of each seedling's growth, and the results will help define the benefit of planting hybrid chestnuts in orchards open to the sun and elements with little competition from other trees, versus planting nuts in forest clearings where sunlight is more limited and competition from other trees is greater. - Submitted by Doug Gillis

Please Give Generously to TACF's Spring Appeal!



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chestnuts
in our lifetimes.

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Restoring the American chestnut is a huge undertaking.



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CONNECTICUT



The Connecticut Chapter honored outgoing Chapter President Bill Adamsen for his years of service to TACF. Bill is pictured here with his daughters Sydney and Elizabeth, at a Salem, CT, orchard planting in 2007.

Photo by Leila Pinchot

Bill Adamsen Honored at Connecticut Annual Meeting

The CT Chapter held its annual meeting on April 6 at the Rockfall Foundation's de Koven House in downtown Middletown, CT. Attendees were treated to engaging presentations by forester Starling Childs, who shared the long history of chestnut research at Great Mountain Forest (located in the northwest corner of the state), and Dr. Leila Pinchot, who discussed chestnut restoration efforts as they relate to working with private landowners.

In addition, outgoing Chapter President Bill Adamsen was honored with kind words, sincere thanks, and a chestnut plaque commemorating his eight years of service in that role. The presentation was made by incoming Chapter President John Anderson. After lunch, meeting participants were invited to the Chapter's Middletown orchard for a tour. It was a beautiful afternoon to be out with the young chestnut trees; for many it was the first time they had seen the orchard, which was established in 2008. - Submitted by Kendra Gurney

GEORGIA



A tired but happy team of TACF volunteers after planting GA-TACF Chapter's first restoration site near Lake Allatoona. From the left: Dale Higdon, Jeff Harding, Shea Sennett, Kaitlin Sennett, Mark Stoakes, Vickie Stoakes, Nathan Barth, David Keehn, Irv Barth, Steve Wallin, Ralph Tanner, and Tom Saeilli. Photo by Martin Cipollini

New Partnerships and Plantings in Georgia

The Georgia Chapter of TACF has created a new partnership with the Coastal America (EPA) group involving an initial test/demo chestnut planting with the Southfork Conservancy at Confluence Park in Atlanta. Another partnership has been established with the Georgia Piedmont Land Trust, starting with an initial test planting of Restoration Chestnuts 1.0 on one of their properties in Snellville.

This spring, GA-TACF volunteers finished planting the Henry Family/Berry College backcross orchard near Armuchee, and Georgia's first Restoration Chestnut 1.0 orchard at Lake Allatoona. Hundreds of seeds were planted at these sites with the help of members and volunteers, including a number of Berry College students. Georgia currently has chestnuts planted in about 125 sites, including 9 full and 7 partial BC lines in backcross orchards, which puts the chapter over halfway to its goal of 20 full lines. GA-TACF will also inoculate its first orchards this summer.

Berry College has awarded Dr. Martin Cipollini and GA-TACF interns Sam Watkins and Theron Kantelis a Laura Maddox Smith grant (\$5,500) to help fund the inoculation work. Data from these inoculations, and hopefully offspring from the selected trees, will be another step toward the goal of adding Georgia genetic diversity to TACF's American restoration program.

- Submitted by Theron Kantelis and Martin Cipollini

INDIANA



Salem school students, advisors, and teachers prepare to plant American chestnut trees as part of an Outdoor Learning Lab.

Photo courtesy of Sycamore Land Trust

Salem Schools Help with American Chestnut Restoration

Salem Schools, in conjunction with the Indiana Chapter of the American Chestnut Foundation, planted approximately 100 chestnut trees in their outdoor learning lab over the weekend of April 13, 2013. This is the first planting of American chestnuts, which were once native to Washington County, at an Indiana public school, and is important because such events encourage students to play an active role in preserving and restoring the environment.

Carroll Ritter, the Environmental Education Coordinator of the Sycamore Land Trust, is leading the project. "The outstanding cooperation of teachers, administration, and students at Salem has enabled us to begin creating one of the most outstanding outdoor laboratories in the state," he said. "The ongoing development of a 16-acre prairie, wetland enhancement, riparian corridor improvement, invasive species removal, and six-acre tree planting are almost unheard of for a school system. With the inclusion of planting a research plot reintroducing the American chestnut, we truly have a gem of a project." The outdoor lab is an example of "citizen science," as results of the planting will be fed into the national effort to restore the American chestnut. - Submitted by Ben Finegan

KENTUCKY



Kentucky's Green River Lake staff members with a newly planted Restoration Chestnut 1.0 tree; from the left, Tyler Royce, Lori Brewster, Larry Lemmon, David Wethington, Andrea O'Bryan, and Jim Goode.

Photo by Keith Chasteen.

Corps of Engineers Partners in New Kentucky Plantings

The Kentucky Chapter has recently partnered with a number of local, state, and federal organizations and agencies. In November 2012, TACF-KY collaborated with the U.S. Army Corps of Engineers to establish plantings at Carr Creek Lake in Sassafras, KY, and Green River Lake in Campbellsville, KY. American chestnut originally grew abundantly in both areas, and at both sites, four Restoration Chestnut 1.0 seedlings and four B4F1 seedlings were planted. KY-TACF member Ann Bobigian, who raised some of the hybrid seedlings that were planted, said: "To see this tree is to admire it, and for some it will be like recapturing a memory from the past."

Both Carr Creek Lake and Green River Lake have visitor information areas and both will include informational displays about the American chestnut and TACF. Keith Chasteen, Natural Resources Specialist with the Corps and TACF member, indicated, "This is a great start for the Corps and TACF within Kentucky to work cooperatively in restoring the American chestnut. Enthusiasm and support are building within the agency, as well as in our visitors, who are learning of our efforts. Future opportunities are endless!" - Submitted by Bethany Baxter

MAINE



Ann Seikman (left) and Roger Crocket (center) are presented with a box hand-crafted of Maine chestnut. The presentation was made by Chapter President Glen Rea
Photo by Ann Rea

Maine Honors Owners of 95' Tall Chestnut

In March, Ann Seikman and Roger Crocket were honored with an award from the Oxford County Soil and Water District having for the tallest native American chestnut tree in Maine - a 95 ft. tree growing on their 170 acre farm near Hebron. Also at this meeting, Glen Rea, president of the Maine Chapter, presented Ann and Roger with a box made from Maine chestnut in recognition of the discovery of this remarkable tree.

The tree has been widely publicized, and Ann and Roger are encouraging people to come to their farm, especially school children, to see what a beautiful chestnut tree looks like. To date there seems to be no sign of blight on the tree and the ME chapter hopes to incorporate it into its breeding program in the near future.
- Submitted by Glen Rea

MARYLAND



An inmate at the Patuxent Institution in Jessup, Maryland, carries American chestnut seedlings grown in the institution's greenhouse to Correctional Sergeant Bud Tarleton. The seedlings will be planted by volunteers working with TACF.

Photo courtesy of the Maryland Department of Public Safety and Correctional Services

Maryland Inmates Grow Chestnut Seedlings in Innovative Program

In January, the Maryland Chapter delivered seeds of American chestnut trees to the Patuxent Institution, Maryland's correctional mental health center in Jessup. The inmates grew the seeds into seedlings in their greenhouse under the "restorative initiative program" of the Maryland Department of Public Safety and Correctional Services. For their efforts, the inmates earned Master Gardener certification through the University of Maryland Extension Service.

"We have a symbiotic relationship with these trees," said one inmate in the program. "The trees benefit from us and we benefit from them. It makes me very proud. It's just a joy to be out here and to be able to give something back."

Last month the program paid off when Gary Carver, president of the Maryland Chapter, and Matt Brinckman, Mid-Atlantic regional science coordinator, received more than 600 seedlings that the inmates had grown. Director Randall Nero explained, "The program really contributes to providing inmates with skills they can use when they return to the community and the workforce." - Submitted by Gary Carver

MASSACHUSETTS



University of Rhode Island Master Gardeners helped plant chestnuts at the MA/RI-TACF South Kingstown, RI, orchard. Photo by Yvonne Federowicz

Plantings and Presentations in Massachusetts

The Massachusetts/Rhode Island Chapter has had a busy and productive start to 2013. After giving presentations and hosting displays at several regional events, the growing season began early with roguing of several BC3 orchards.

The chapter will have three seed orchards planted by late spring. The South Kingstown, RI, orchard now has five plots mostly planted in its second year, and the new Smith College seed orchard at the lovely new

continued

Massachusetts *continued*

MacLeish Field Station, has its first plot begun. The Granville, MA, seed orchard, MA's first Graves seed orchard, is ready to go, with seeds for a plot awaiting completion of the deer fence.

A busy summer lies ahead. The completed selections and roguing at several BC3 orchards means that usable BC3F2

seed can be created. Volunteers are always welcome; in particular, additional seed orchard sites with local volunteer support are needed. Anyone interested in participating should attend a chapter meeting and sign up to get involved with this work on chestnut restoration. - *Submitted by Yvonne Federowicz*

NEW YORK



Cal DeGolyer, a 90-year-old founding member of the New York State Chapter of The American Chestnut Foundation (center) takes a break from planting chestnuts with NY-TACF President Herb Darling (left) and The Friends of Letchworth State Park Project Manager Allen Gregg (right). Photo Courtesy of Rocco Laurienzo/Daily News Online.com

Nonagenarian Spearheads Re-introduction of American Chestnut at Letchworth State Park

On April 27, 2013, the first of twenty-four American chestnut seedlings were planted at Letchworth State Park in western New York state. The trees were selected from the William W. White Chestnut Plantation near Gowanda, NY, which was started twenty years ago to maintain the gene pool from areas all over the state. Participating in the planting was 90 year-old Cal DeGolyer, who was a founding member of both the New York State Chapter of The American Chestnut Foundation and The Friends of Letchworth State Park; Allen Gregg, a project manager of the Friends of Letchworth Park; and Herb Darling, president of the New York Chapter of The American Chestnut Foundation.

Renowned for its steep river gorges and beautiful waterfalls, Letchworth State Park was chosen for the ceremonial planting by DeGolyer. One seedling was planted and the rest were taken to Hemlock Nursery in Gainesville, NY, to be grown to a larger size before returning them to the park. Interestingly, one of the original trees planted at the White orchard twenty years ago was named DeGolyer-1 in honor of DeGolyer's work with the Foundation. Twenty years later, seedlings produced from the progeny of DeGolyer-1 were returned to Letchworth State Park to start the reintroduction program.

DeGolyer has been the driving force behind this effort, and he is an avid park supporter," said Allen Gregg; "the new trees will help bring the species back to this region." - *Submitted by Herb Darling*

OHIO



USFS partners (from left) Nick Galletin, Gala Goldsmith, Gary Willison, and Kwei Perry standing next to the largest of four American chestnuts discovered on the Marietta Unit of the Wayne National Forest, near the Ohio River.

Photo by Anne Carey

USFS Finds Large American Chestnuts in Ohio

On March 18, Ohio Chapter President Brian McCarthy, TACF President and CEO Bryan Burhans, and a team from the Wayne National Forest in southeastern Ohio met with the goal of enhancing their partnership and planning upcoming restoration activities on national forest lands. TACF's partnerships with state and federal agencies is critical to the long-term mission of restoring American chestnut to the region.

Coincidentally, in the week prior to the meeting, a USFS field crew discovered a mature, fruiting, 11-inch diameter American chestnut surrounded by several other chestnuts, with diameters from 4 to 8 inches. These trees were found in a bottomland area within several hundred yards of the Ohio River on the Marietta Unit of the Athens Ranger District.

continued

Ohio *continued*

OH-TACF hopes to work with the USFS to get the trees released and perhaps gather nuts in the fall for local germplasm collection. Anne Carey, Forest Supervisor for the Wayne National Forest said, "We are so excited to

discover these chestnuts on our forest! We view this as the beginning of a great partnership to re-establish American chestnut on the Wayne." - Submitted by Dr. Brian McCarthy

PENNSYLVANIA



Jeff Krause and Robert Lingenfelter chat during the Pennsylvania/New Jersey Chapter's annual growers meeting in Hershey, PA. Photo by Stephanie Bailey

More Plantings in Pennsylvania

The Pennsylvania/New Jersey Chapter keeps momentum going in winter by staying busy with board meetings, education and outreach events, data analysis, and strategic planning. Even before the final snow of the year, preparations are made for the season to come. In April, the chapter had its annual spring growers meeting in Hershey, PA, at the Milton Hershey School Environmental Center. Members came together to share stories from the previous year, ask advice of one another, and learn from speakers who joined in for the day to share knowledge related to the chapter's efforts.

A week after the spring meeting Tim Eck and a group of PA volunteers began the season's plantings at the House Rock orchard in Lancaster County. Over a period of three days, volunteers dug up over 200 trees for transplanting at a new nearby orchard location and planted nearly 350 seeds between the two orchards. - Submitted by Stephanie Bailey

TENNESSEE



A meeting in Tennessee included a nut grafting demonstration. Photo by Larry Taylor

Nut Grafting Workshop and a Miniature Train Ride in East Tennessee

On April 14, 2013, Jack Torkelson and Joe Schibig showed Vicki Turner, Larry Taylor, and Larry's "train friends" how to reproduce American chestnut trees by nut grafting. Basically, nut grafting involves inserting a chestnut twig with one dormant bud into a chestnut seed that has developed a short root. After the tissues of the twig and seed fuse, the bud will develop into a growing shoot that will be a genetic twin of the tree the twig was taken from. The procedure is nicely illustrated on these websites: <http://www.accf-online.org/chestnut/nutgrafting.htm> and <http://www2.volstate.edu/tncchestnut/nutgraftingbasics2.pdf>

Following the nut grafting, Larry Taylor treated several members to an enjoyable miniature train ride through the rugged but beautiful Cumberland Mountains. Along the way, they stopped and observed several American chestnut stump sprouts that were just starting to leaf out. Since the outing, Tom has provided Larry with some American chestnut seed to plant in the forest gaps caused by a tornado and pine death from insects. - Submitted by Joe Schibig

VERMONT



Finding sprouted seeds in a bur were one of the highlights of a field trip during the Vermont/New Hampshire annual meeting. Photo by Sara Fitzsimmons

Wintry Vermont Outing Leads to Mature American Chestnuts

On April 13, forty members of the VT/NH Chapter braved snowy conditions to gather for their annual meeting at the Billings Farm in Woodstock, VT. TACF Northern Appalachian Regional Science Coordinator, Sara Fitzsimmons, delivered a fun and lively keynote address on her travels

continued

Vermont *continued*

in China. Her slides ranged from hillsides forested with chestnuts, to laboratories, to a dish of sautéed chicken heads.

The field trip was a tour of the Marsh-Billings-Rockefeller National Historic Park forest led by Dr. Bill Keeton, professor of forestry and forest ecology at University of Vermont and TACF member. This is the oldest continuously managed forest in the United States, a legacy of forest stewardship begun by George Perkins Marsh, and continued

by Fredrick Billings and Laurence and Mary Rockefeller. Bill led the group to a mature and stately American chestnut growing in the forest. The tree had produced fertile nuts, and in a rare find, some burs were discovered to contain sprouting seeds. Neither Sara Fitzsimmons, Bill Keeton, nor TACF Chief Scientist Fred Hebard (who did not attend the meeting, but saw a photo of the chestnuts the next day) had ever before seen wild chestnuts sprouting in a bur. - *Submitted by Grace Knight*

VIRGINIA



Mid-Atlantic Region Science Coordinator Matt Brinckman, with orchard owners Penny and Marie Firth at "The Ranch" in Rappahannock County. Photo by Jack Lamonica

Virginia Improves Orchards, Plans for Pollinations

On April 20 a new orchard was planted in The Plains, VA, in partnership with the Rockley Foundation. Many existing orchards were measured, mowed, mulched and maintained. All are looking good, thanks to the owners, stewards and volunteers. Two science planning meetings have already been held to prepare for pollinations, with no shortage of available trees. A remarkable group of 10 trees from 6-13" DBH were spotted near Cobbler Mountain Winery in Fauquier County and Brian Smith continues his tireless searches and discoveries in the Fairfax area.

Despite success in establishing well over 20 lines since 2007, the challenges of weather, insect invasions, and tree loss continue. At least three mother trees have succumbed to the blight, but their progeny live on in the breeding orchards and a "mother" tree orchard at the Smithsonian's SCBI campus in Front Royal. The membership is already looking forward to fall, and hosting the Annual Meeting in Herndon, VA. - *Submitted by Jack LaMonica*

WEST VIRGINIA



From the left: Christina Hensley, Jason Spinks, and Andrew Andersen participated in a planting of 625 American chestnut trees on reclaimed minelands in Webster County, WV. Photo by Brian Perkins

Students Plant Chestnut Trees on Reclaimed Surface Mine in West Virginia

On Saturday, March 9, twenty student volunteers from Glenville State College (GSC) joined forces with the West Virginia Chapter of TACF to plant 625 chestnut trees, including 475 Restoration Chestnut 1.0 seedlings, on a reclaimed surface mine in Nicholas County, WV.

Brian Perkins, GSC assistant professor of Forestry, commended the students for volunteering for the planting event even though it took place during their spring break. "This type of hands-on service learning is an important component in our GSC curriculum," said Perkins. "The students learned about the Forestry Reclamation Approach and American chestnut restoration, and were given a tour of a surface coal mine."

The planting in Nicholas County is part of a large-scale, multi-year project by TACF to reforest 12 reclaimed mine sites throughout five states (Kentucky, Ohio, Pennsylvania, Virginia, and West Virginia) funded in part by a Conservation Innovation Grant from the USDA Natural Resources Conservation Services (NRCS). Over three years, approximately 250,000 seedlings, including more than 14,000 blight-resistant American chestnuts, will be planted by TACF and project cooperators on a total of 360 acres. This project is the largest planting of potentially blight-resistant American chestnut trees in the Foundation's history and marks a milestone in the restoration of this once dominant native tree. - *Submitted by Brian Perkins*



Tom Saielli (left) and Vicki Turner (right) with Sheree and Alton Kelley, of Belle Meade Plantation after a planting of Restoration Chestnuts at the Belle Meade arboretum. Photo by Greg Weaver

TACF Honors Its Volunteers

Vicki Turner

By Mila Kirkland, TACF staff

Vicki Turner was 9 when her family moved to Nashville, Tennessee. There, she graduated from Harpeth Hall School, raised a family and founded her own wine marketing company, called Victoria Pierce Turner Ventures.

A self-described “plant lover and all-purpose gardener,” Vicki stepped it up a notch in 2008 when her mom, Vadis Pierce, put a conservation easement on her property in Sumner County, TN. Vicki took this opportunity to plant rare and threatened trees on the land and attain arboretum certification. Along the way, she became fascinated with the story of the American chestnut and after joining the TN Chapter of TACF, she began to experiment with growing chestnuts on her own.

Empowered by her new tree knowledge, Vicki organized an arboretum in her neighborhood in Nashville and soon became a mover and shaker in a movement started by Nashville Tree Foundation arboreta to plant American chestnut trees on their land. Now a member of the Nashville Tree Foundation Board of Directors, she works to spreading the word about American chestnut restoration.

Vicki has played a pivotal role in the formation of the Nashville Branch of the TN Chapter. “As the chair of the branch, Vicki is helping to coordinate orchard maintenance, ceremonial plantings, an upcoming fundraising event, even a nut grafting workshop,” said Tom Saielli, TACF Southern Regional Science Coordinator. “Whether Vicki is organizing a ceremonial planting, recruiting volunteers for orchard work, or just managing the on-the-ground logistics, her leadership is invaluable!”

Craig Hibben

By Frank Munzer, Vice President of the NY Chapter and Mila Kirkland, TACF staff

Craig Hibben is a familiar presence at the Lasdon orchard at Lasdon Park and Arboretum in Somers, New York. Since 1994, he has overseen the planting, maintenance, and seed collection at the NY Chapter research orchard located there. The Lasdon orchard represents one of the largest and best maintained NY Chapter orchards and contains some of the earliest material planted by the chapter as well as transgenic trees developed by researchers at SUNY-ESF.

Craig earned a PhD in Plant Pathology from Cornell University. Before getting involved in American chestnut research, he worked as a research plant pathologist and chairman of Brooklyn Botanic Garden’s Research Center in Ossining, NY, conducting research on dogwood anthracnose and ash dieback in the Northeast.

During his nearly 20 years as orchard manager, Craig developed several novel approaches to common problems in orchard establishment. One was a mudpacking procedure of cutting away the blight canker to reveal the outermost edge of fungal advancement. A mudpack is a soil compress placed over a canker to “cure” it and extend the life of the tree. Typically, the most common error made with mudpacking is not covering the entire affected area, and Craig’s method keeps this from occurring.

A cancer diagnosis 2 years ago forced Craig to put his orchard work in the hands of others. Now on the mend, he looks forward to continuing his work. “Craig has been a strong asset to the NY Chapter,” said Frank Munzer, Vice President and Director District 3 of the NY Chapter. “I am excited to see his health progressing and know that we can expect him back shortly.”



Craig Hibben at the Lasdon Orchard in Somers, NY. As a result of Craig’s innovation and regular maintenance at Lasdon, the trees have lived beyond what many consider an average age for pure American chestnuts.

Photo by Sara Fitzsimmons

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A gift of TACF membership for your friends or family members is a gift that comes from the heart. It's an opportunity to share with them one of the greatest environmental success stories of our time. And it's a chance to help TACF reach our goal of restoring the American chestnut to our eastern forests.

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- Access to expert advice on growing and caring for American chestnut trees
- Opportunities to participate in local breeding and research activities

The American Chestnut Foundation depends upon its members to support research to develop a blight-resistant American chestnut tree. Today, almost 6,000 members are helping to bring this important tree back from the brink of extinction.



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Chestnut Growers Guide to Pests and Diseases

By Elsa Youngsteadt and Kendra Gurney

Growing American chestnuts is an adventure with many rewards: stately trees, delicious nuts, and conservation of an important species. But today's chestnuts have to fend off much more than the notorious blight fungus. Other exotic pathogens and pests have arrived on the scene, and a whole host of hungry insects and mammals—both native and introduced—probably want a bite of your trees. This guide, intended for backyard and small orchard growers, will help you recognize some of the common problems and offer suggestions for how to deal with them.

Give your trees a good start

Although many pests and pathogens bother American chestnuts, often the biggest problems are caused by poor site selection. A good tenet of gardening is “right plant, right place,” and this certainly applies to American chestnuts. Planting your trees on well-drained, slightly acidic soil in a sunny location will give you the best chance of growing success. Other common problems with chestnut result from poor or non-existent vegetation management around the base of young trees, over-watering, and under-watering.



Asian Chestnut Gall Wasp

Dryocosmus kuriphilus

Asian chestnut gall wasp, *Dryocosmus kuriphilus*, is known to attack all species of chestnut throughout its natural range. Photo courtesy of Gyorgy Csoka/Hungary Forest Research Institute/ForestryImages.org

This tiny insect, about the size of two poppy seeds, was accidentally introduced into North America from China nearly 40 years ago. It now attacks all chestnut species in 13 states and Ontario, Canada, including almost the entire historical range of American chestnut. Its damage can be severe, but the good news is that its natural enemies are spreading along with it.

Gall wasps lay their eggs in leaf and flower buds in early summer. The eggs hatch quickly, but cause no sign of trouble until the next spring. At budburst, the larvae cause distorted growth and globular galls on leaves, stems and petioles. These green swellings often have a reddish blush and reach about one-quarter to one inch in diameter. Inside the galls, the larvae feed for a few weeks, then pupate and emerge as female wasps in early summer. (All chestnut gall wasps are females that reproduce without mating!) Once the wasps emerge, the galls shrivel up. Dry leaves stay attached to the old galls, making infestations especially easy to spot in the winter.



Galls on an American chestnut caused by Asian chestnut gall wasp. Photo by Paul Franklin

Although the wasps rarely kill established trees, galled twigs die back, nut production declines, and small trees may die. No pesticide is labeled for this species; instead, a grower's best allies are other wasps. Parasitic species, both native and introduced, infiltrate the galls and devour the gall wasp larvae. It may take time for these species to catch up to a new infestation,

Asian Chestnut Gall Wasp *continued*

but they have a good track record of eventually reducing damage to acceptable levels. These beneficial species spend the winter in shriveled galls, so it's important to leave the previous season's galls on the tree rather than prune them out. Cutting out galls is only helpful if you're dealing with one or two fresh galls on an isolated tree.



Japanese Beetle

Popillia japonica

Japanese beetles will gladly feed on more than 300 plant species, including chestnuts. Adults are bulky insects about three-eighths of an inch long, with metallic green bodies, coppery wing covers, and a row of five white tufts just below each wing cover. They first appear in late spring or summer and continue to feed and mate—and feed some more—for the rest of the season. They eat leaves but not the veins, producing a characteristic, lacy-looking damage. Established trees can generally withstand the defoliation, but young trees may need special treatment. On cool mornings (below about 73°F), beetles can be easily knocked off the plant into a bucket of soapy water, and several pesticides are labeled for Japanese beetles. Although traps are available, they're usually counterproductive because they attract more beetles than they catch.

Japanese beetle, *Popillia japonica*. Photo courtesy of Steven Valley, Oregon Dept. of Agriculture/ForestryImages.org



Lacy leaves are typical damage caused by Japanese beetles. Photo by Sara Fitzsimmons



Periodical Cicadas

Magicicada species

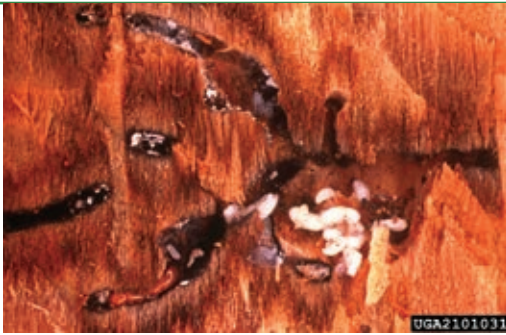
Periodical cicadas kill branch tips and reduce or eliminate nut production for three years; at least they don't do it very often. These insects spend most of their lives underground, emerging as noisy, red-eyed adults only once every 13 or 17 years. Adult females do the most serious damage by carving slits in the undersides of small branches and laying eggs there. The tips of these branches turn brown and droop, called "flagging." To find out whether and when to expect periodical cicadas in your area, consult with your extension agent or use maps, such as those at magicicada.org.

Minimize damage by waiting until after an emergence year to plant saplings, which cicadas can kill. Protect other trees by draping them with bird netting (one-quarter to one-half-inch mesh). If you install netting before cicadas emerge, gather and fasten it around the trunk. Otherwise, wait until cicadas have been active for a few days and drape it loosely over the tree.



Typical of cicada damage, many branch tips on this tree have turned brown and died. Photo by Sara Fitzsimmons

Red-eyed and noisy, periodical cicadas emerge just once every 13 or 17 years. Photo courtesy of Jon Yuschock/ForestryImages.org



Ambrosia Beetles

Ambrosia beetles damage trees by carrying pathogens deep into the wood. Photo courtesy of Daniel Adam/Office National des Forêts/ForestryImages.org

(See page 28 for special report on ambrosia beetles.) Small trees less than three inches in diameter are the most likely to be attacked, and damage from the beetles and fungi often kills them; at best, it stunts their growth or sets you back to a resprout.

Once beetles make it inside the trunk, there's no remedy, so the key is to catch them early. Start monitoring in early spring, before budbreak, using purchased or homemade traps baited with ethanol. (See page 29 for instructions on building ethanol traps.) As soon as ambrosia beetles show up in the traps, you know it's time to spray. Coat trunks of small trees with an approved pyrethroid insecticide and repeat the spray every two to three weeks. Once chestnuts are fully leafed-out, they seem to be safe for the season.

Although dozens of ambrosia beetle species live in the eastern United States, just a handful of introduced species are really pestiferous. Among the most severe are granulate ambrosia beetle (*Xylosandrus crassiusculus*), black stem borer (*X. germanus*), and fruit-tree pinhole borer (*Xyleborinus saxeseni*). Like most ambrosia beetles, they are a few sixteenths of an inch long, bullet shaped, and black or brown. Get familiar with online identification resources or consult your extension agent. If in doubt, any ambrosia beetle in your trap probably means it's time to treat.

Weevils



Small chestnut weevil *Curculio sayi*. The weevil uses its long snout to drill holes in chestnuts into which it lays its eggs. Photo courtesy of Jennifer C. Giron Duque/University of Puerto Rico/ForestryImages.com

Little beige “worms” inside your chestnuts are likely the larvae of long-snouted beetles called weevils. The lesser chestnut weevil (*Curculio sayi*) is a common problem, but a handful of fairly similar species can also infest your crop, damaging the nuts but not the tree. (See special weevil report on page 24.) Adults range in color from gray to brown and are about one-sixth to one-half an inch long. Females use their long proboscis to drill holes in developing chestnuts, where they lay their eggs. The larvae tunnel through the nuts as they feed.

By the time chestnuts fall to the ground in the autumn, the larvae are nearly developed and ready to chew their way out, leaving a visible pinhole. They burrow a few inches into the ground and spend the winter (or sometimes a year or more) inactive under ground. Finally, adult weevils make their way back into your trees in search of nuts.

If left unmanaged, these beetles can ruin an entire nut crop. Even the tiniest amount of weevil damage drastically reduces germination, and nobody wants to eat a wormy chestnut. Commercial nut producers with heavy infestations may need to spray in late summer or early fall when adult weevils are active.

Weevils *continued*

In other cases, good sanitation alone should do the trick. That means harvesting directly off the tree and collecting fallen nuts daily, before larvae escape into the ground. Depending on your goals, simply burn the nuts, or store them in a thick, plastic bucket to capture emerging larvae. Destroy the larvae and use the good nuts that don't have holes in them. If you plan to eat the nuts, dunk freshly harvested chestnuts in 120°F water for 20 minutes. The heat kills eggs and larvae inside the nuts—usually when they're still too small to notice. Bon appétit!



Chestnut saplings show leaf curl caused by aphids. Photo by Sara Fitzsimmons

Sucking Insects

Many small, soft-bodied insects drink plant sap using flexible, straw-like mouth parts. They can deplete a tree's resources and inject toxic saliva that causes leaves and shoots to become distorted and yellow. Aphids, whiteflies, phylloxerans, and leafhoppers can all damage chestnuts, although they're rarely bad enough to warrant treatment. Aphids are small, soft, grenade-shaped insects with or without wings; whiteflies are minute, white bugs that often flutter off leaves when disturbed. Both groups make sweet, sticky excrement that can be messy and promote mold growth, but their natural enemies usually keep them in check. Phylloxerans can cause more severe yellowing and crinkling of leaves; look for yellow or orange slow-moving, soft-bodied insects clustered along leaf veins. Similar damage can also result from potato leafhoppers—bright green, wedge-shaped insects that scamper quickly across the leaves. If any of these groups reach damaging levels, check with your extension agent for a positive ID and treatment recommendations.



Gypsy moth caterpillars are voracious and can defoliate entire orchards. Photo courtesy Haruta Ovidiu/University of Oradea/ForestryImages.org

Gypsy Moth

Lymantria dispar

Gypsy moths have defoliated millions of acres of forest and may be the most notorious caterpillars on the continent. When they hatch in the spring, they cause shot-hole damage in foliage. As they grow, older caterpillars develop two recognizable rows of blue and red spots on their backs; they can devour entire leaves. After feeding for several weeks, they spin cocoons and remain inactive until adults emerge in midsummer, mate, and lay clusters of several hundred eggs. Gypsy moth abundance varies wildly from year to year, so keep in touch with your extension agent to find out when to expect an outbreak. Chestnuts can usually

withstand up to 50% defoliation before they require treatment. For small-scale control, wrap an apron of burlap around the tree trunk. Large caterpillars will rest there and can be easily found and destroyed. On a larger scale, spraying a pesticide such as Bt protects trees during outbreak years. Spraying also a good choice for smaller saplings, where wrapping is not a viable solution.



Other Caterpillars

Although gypsy moths are the most severe, many moth caterpillars find their way to chestnut leaves, and some may cause obvious damage. Orangestriped oakworm (*Anisota senatoria*) and yellownecked caterpillar (*Datana ministra*) are two conspicuous species that appear in late summer. Both are boldly striped with black and orange or yellow, and often feed in clusters when small. Leaf rollers, leaf skeletonizers, bagworms, and armyworms are all groups of caterpillars that you may find on chestnut. They can make a tree look bad, but birds, diseases, and parasites usually do a good job of controlling them. If you reach 50% defoliation, or if you have two bad caterpillar years in a row, you may need to treat. Several pesticides are effective, and your extension agent can recommend one for your particular caterpillar.

Orangestriped oakworm is one of several types of caterpillar that can do damage to foliage, but seldom pose a serious threat to the tree.

Photo courtesy of Clemson University/ForestryImages.org



Chestnut Blight

With all the work that TACF has done to produce blight-resistant chestnuts, it is hard sometimes to remember that they are only blight *resistant* – not blight proof. Even with Restoration Chestnut 1.0 trees, a certain percentage will succumb to the blight, and many chestnuts planted today in backyards or small orchards are from earlier stages in the breeding process and are less resistant. This means that chestnut blight will still claim a significant number of trees.

Chestnut blight starts when the pathogen, *Cryphonectria parasitica*, enters the chestnut through a crack or wound in the bark. Once established it sends out threads of fungus that eventually encircle the stem, creating raised or sunken cankers. On young trees with smooth bark the canker often appears orange in color. As it expands, the infection cuts off the flow of water and nutrients beyond the canker. When the fungus encircles the trunk, every part of the tree beyond the canker dies. When the fungus is reproducing, the surface of the blister can be covered in orange pimple-like structures called stromata. The fungus is very good at spreading, as it can travel both in water and through the air, and it is very effective at hitching a ride on insects, birds, or mammals.

This blight canker shows both raised and sunken attributes. The canker has completely encircled the stem and the reproductive orange stromata are clearly visible.

Photo by Paul Franklin

Although in the wild there is little one can do to stop the blight, in the home orchard there is one simple treatment that can be applied to individual trees that may slow the progression of the disease. The soil around the tree contains

Chestnut Blight *continued*

millions of microorganisms, some of which may attack or slow the spread of *Cryphonectria parasitica*. Gather soil from around the tree, add water until it makes a thick paste and pack it around the canker, holding it in place with 4-inch-wide shrink wrap purchased from a building supply store. Extend the mudpack about a foot above and below the canker so the canker cannot expand beyond the treatment area. You must treat all the cankers on a tree and inspect the tree monthly, treating new cankers and replacing the mudpacks on old cankers annually. As the tree grows larger it becomes more difficult to reach and treat all the cankers, but this method can extend the life of the tree.



Phytophthora attacks the root system, denying the tree nutrients and water. Photo by Joe James

is resistant to both blight and *Phytophthora*. In the meantime, there is no cure for *Phytophthora*, but it is possible to minimize the effects of the pathogen by treating soils and plants with anti-fungal agents like Ridomil®, as well as urea or potassium phosphite. All of these are potent treatments, so it's a good idea to consult your regional extension agent before using them. Follow all label instructions carefully.

Phytophthora (Ink Disease or Root Rot)

Chances are if you live south of Pennsylvania and your chestnut seedlings or trees suddenly wilt and die, the culprit is *Phytophthora*, a deadly pathogen that lives in soil and kills plants by destroying the roots. Also known as ink disease and root rot, *Phytophthora* was accidentally imported to North America from Asia in the late 1700s through human commerce. The pathogen moves slowly, transported in soil or by water mostly through agricultural activity. There are many species of *Phytophthora*, and one of the most lethal to American chestnut is *Phytophthora cinnamomi*. This pathogen tends to exist in the soil in patches, and the roots of a tree must make contact with it in the soil to be infected. One tree in a location can die of *Phytophthora* while others nearby remain healthy. Once a tree is infected, the roots quickly turn black and shrivel. Above ground, the leaves wilt and turn brown and within a remarkably short time the tree is dead.

The good news is that some of TACF's blight-resistant chestnut trees also show resistance to *Phytophthora*. A TACF breeding program underway in Seneca, SC, is working to develop a tree that



Deer Browse

Deer love American chestnut trees, and in areas with a large deer population, they can be devastating to a chestnut planting. Even in places where deer pressure is low, deer often discover that chestnuts are one of the tastiest trees to munch on.

The best way to keep deer from eating your chestnut trees is to keep them physically protected. For a small number of trees, many growers use individual cages made of garden wire. Tall

The effects of deer browse on a chestnut seedling. Photo by Sara Fitzsimmons

tree shelters are another option that could be considered, however we don't recommend them for chestnut because the trees often end up weak and spindly, creating a new set of problems. For a larger planting, an 8' deer fence is often the best option. TACF growers have used a variety of materials to fence orchards; galvanized steel woven wire seems to hold up the best over time, though it is not always the most cost effective. Plastic mesh or multi-strand electric fencing are also options and can be a good fit, depending on the situation.

If deer pressure is relatively low, repellents might be all that are needed to keep the deer from snacking on your chestnut trees the next time they stroll by. Several commercial repellents are available, some of which work with scent and some with taste. In either case, they work best when instructions are followed and applications are made on a regular basis.



Rodent Damage

There are many small mammals that will chew on chestnut stems, but often the most devastating to a chestnut planting are voles. Voles are particularly fond of eating plants, especially tender roots, and will often burrow under chestnut trees and eat the roots. (See the February/March 2013 Journal wildlife issue for more on voles.)

Rodents seek areas that can give them cover, so keeping the vegetation in the orchard short and well maintained is a good first step in controlling rodent damage. Both mulch and landscape fabrics can offer shelter to rodents as they burrow, so keeping the area around each tree vegetation-free with herbicide is often your best bet.

Typical of vole damage, this chestnut has been completely girdled at ground level. Photo by Sara Fitzsimmons

Another good preventative measure is to protect the base of each tree with a short shelter that is 18-24" tall. This can do double duty to protect the base of your tree – it provides a physical barrier above ground and can also be sunk 2-4" into the ground to halt most tunneling voles in their tracks. A variety of commercially available or homemade shelter types could be used; just remember that you will want to be able to remove the shelter before the tree outgrows it. Other rodent solutions include using vole and mole repellents, poisons, or traps. Any commercial products should be used according to the manufacturer's instructions.





Large chestnut weevil, *Curculio caryatrypes*, walking across a chestnut bur. Photo courtesy of Jerry A. Payne/USDA/ForestryImages.org

Weevil Diversity on Chinese, American, and BC3 Chestnut in Central Indiana

Dr. Harmony J. Dagleish, John T. Shukle, and Dr. Robert K. Swihart

A better understanding of the ecology of chestnut seed dynamics can inform management and restoration. Seed predation by weevils has been implicated as a factor contributing to limited oak recruitment throughout eastern US forests. As a first step toward understanding the potential weevil species that may infest BC₃ chestnuts, we trapped adult weevils on individual Chinese, American and BC₃ trees in central Indiana. *Curculio sayi*, the lesser chestnut weevil, was the most frequently encountered species. The second most commonly encountered species was *Cyrtopistomus castaneus*, the Asiatic oak weevil. Our results indicate that in Indiana, *C. sayi* and several other weevil species remain potential seed predators of BC₃ chestnut. While seed predators may not influence the initial establishment of BC₃ populations, they may inhibit their spread.

Introduction

Both reforestation and afforestation approaches to restoration will require natural regeneration via seed production and dispersal in order for successful population growth that will restore American chestnut as a functioning component of eastern forests. Achieving restoration goals necessitates a better understanding of the ecology of chestnut seed dynamics. Such knowledge can inform management to promote seed production, dispersal and seedling establishment, and enable the setting of realistic goals for restoration.

Seed predators have the potential to limit reproductive output and seedling recruitment (Bonal *et al.*, 2007; Espelta *et al.*, 2009). In temperate deciduous forests worldwide, weevils (Coleoptera: Curculionidae) are major seed predators. In eastern US forests, members of the genus *Curculio* are the most abundant weevil species on oaks (*Quercus*) and hickories (*Carya*) (Gibson, 1969; Lombardo & McCarthy, 2008). Adult females use their long rostrum to bore a hole in the pericarp of a seed through which they oviposit their eggs. After oviposition in the late summer, the eggs

hatch and the larvae feed in the seed for 2-6 weeks (Gibson, 1969). Weevil larvae consume the cotyledons and/or embryo before exiting the seed, burrowing into the soil beneath the tree, and undergoing diapause (Gibson, 1969). Weevil seed predation rates can be high in natural forest stands (seed losses of up to 100% have been reported in oaks), though the number of seeds affected often varies among years, locations, species, and even individual trees (e.g., Gibson, 1972; Crawley & Long, 1995; Fukumoto & Kajimura, 2000; Branco *et al.*, 2002; Maeto & Ozaki, 2003; Yu *et al.*, 2003; Xiao *et al.*, 2007; Lombardo & McCarthy, 2009).

Seed predation by weevils has been implicated as a factor contributing to limited oak recruitment throughout eastern US forests. For example, Lombardo and McCarthy (2009) found that weevil damage reduced germination in red oak (*Quercus rubra* L.) from 86% to 26% and that seedlings grown from weevil-damaged acorns exhibited reduced vigor. Historical records show that weevil predation rates in unmanaged American chestnut orchards could range from 50-100% of a nut crop (Brooks & Cotton, 1929). Our recent research demonstrates that BC₃ chestnut has low tolerance for weevil damage (Dalgleish *et al.*, 2012). We non-destructively assessed the amount of weevil damage to seeds using X-ray imagery and found that damage that was barely visible on the x-ray reduced germination from 94% to 32%. No seeds with >50% damage to the seed germinated, and weevil damage reduced seedling growth by 50% compared to undamaged seeds.

The potential for high levels of infestation combined with the strongly negative effects of weevil damage indicate that weevils could be an important barrier to regeneration and spread of BC₃ chestnut. However, chestnut blight presumably reduced populations of the lesser and greater chestnut weevils (*C. sayi* Gyllenhal and *C. caryatrypes* Boheman) by preventing seed production of their main host plants (Brooks & Cotton, 1929; Gibson, 1969). Despite the loss of their primary host plants, both weevil species may have been maintained in Chinese chestnut orchards. As a first step toward understanding the potential weevil species that may infest BC₃ chestnuts, we trapped adult weevils on individual Chinese, American and BC₃ trees.

Methods

We placed traps on nine Chinese chestnut at two locations, seven American chestnut trees at four locations and five BC₃ chestnut trees at a single breeding orchard, all located in Tippecanoe County, Indiana.

We deployed circle trunk traps (Great Lakes IPM INC., Vestaburg, MI) to capture adult weevils emerging from the soil under each tree sampled. Two to three circle traps were attached to tree trunks at breast height and acted as a funnel that captured insects climbing the tree. For the Chinese and BC₃ trees we used 1.4 cm staples to attach the traps and for the American trees we used 14-gauge galvanized electric fence wire to prevent bark damage, which may increase susceptibility to blight. All traps and attachment materials were sanitized using a 10% bleach solution prior to use with American chestnuts to avoid contamination with the blight. Between 26 August and 18 November 2009, we collected adult weevils from each trap every 3 weeks, labeled the collections with tree ID and sampling date and preserved them in 95% ethanol in vials kept at -20°C. We identified all weevils to species based on external morphological characters and genital dissection, as needed (Gibson, 1969; Downie & Arnett, 1996).

Results

We trapped a total of 278 weevils, of which 58% were on Chinese chestnut (162 weevils), 31% on American chestnut (85 weevils), and 11% on BC₃ chestnut (31 weevils) (Fig. 1).

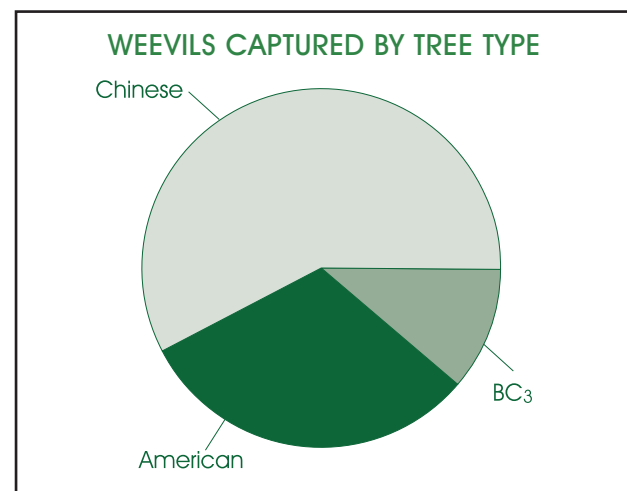


Figure 1. Percentage of weevils caught on Chinese, American, and BC₃ chestnut.

On both Chinese and American chestnut trees, we trapped adult individuals of six species of weevil (*C. sayi*, *Curculio sulcatulus* Casey, *Curculio proboscideus* Fabricius, *Cyrtopistomus castaneus* Roelofs, *Conotrachelus naso* LeConte and *Eubulus parochus* Herbst). On BC₃ chestnut trees, we trapped adult individuals of three species of weevil (*C. sayi*, *C.*

castaneus, and *C. naso*). In Chinese, American, and BC₃ chestnut, *C. sayi* was the most frequently encountered species, representing 54% of all weevils trapped, followed by *C. castaneus* at 31% of the catch (Fig. 2).

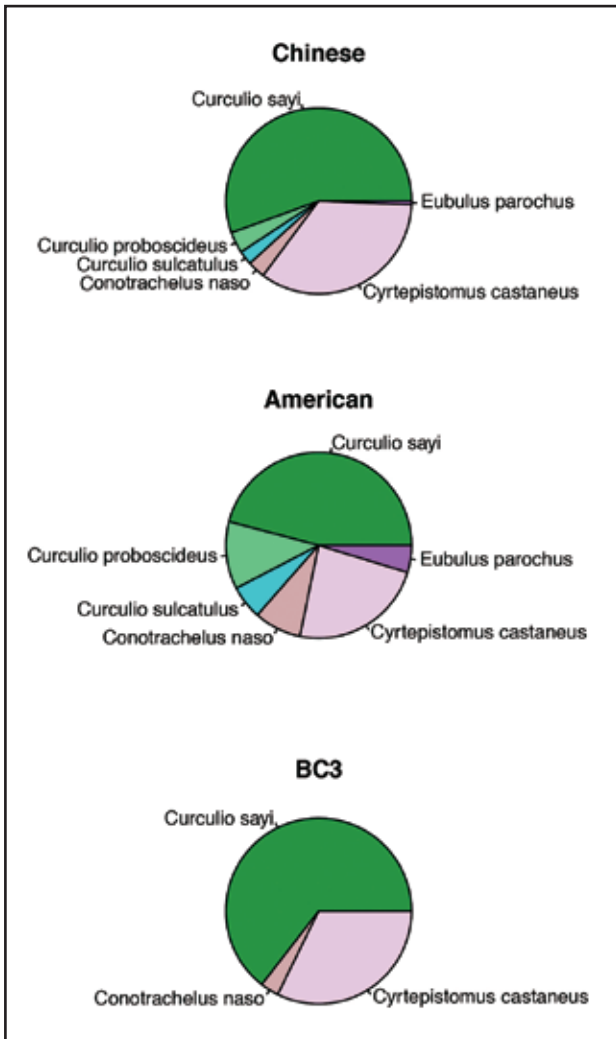


Figure 2. Weevil species caught on Chinese, American, and BC₃ chestnut.

Discussion

Curculio sayi was the most frequently encountered species on Chinese, American, and BC₃ chestnut in our study. The second most commonly encountered species was *C. castaneus*, the Asiatic oak weevil, an exotic species which was first encountered in New Jersey in 1933 and has since spread throughout the eastern United States (Frederick & Gering, 2006).

It is thought that populations of both *C. sayi* and *C. caryatrypes* were drastically reduced due to blight

(Brooks & Cotton, 1929). However, little is known about the ability of either *C. sayi* or *C. caryatrypes* to reproduce and sustain populations on non-*Castanea* plant hosts. Both *C. castaneus* and the European chestnut weevil, *Curculio elephas* Gyllenhal, are documented to use both chestnuts and acorns as hosts (Debouzie *et al.*, 1996; Frederick & Gering, 2006). Similarly, *C. sayi* and *C. caryatrypes* may be able to reproduce (though perhaps not optimally) on oaks and hickories, which are known to be used by other North American *Curculio* species (Gibson, 1969; Gibson, 1971; Gibson, 1972; Gibson, 1982; Lombardo & McCarthy, 2008). In addition, chestnut weevil species may have sustained populations in Chinese chestnut orchards. However, sampling of 254 trees of white oak (*Q. alba*), red oak (*Q. rubra*), and shagbark hickory (*Carya ovata*) from 2006-08 in woodlands of west-central Indiana yielded 3,393 individuals and 9 species of *Curculio*, none of which were *C. sayi* or *C. caryatrypes* (Govindan and Swihart, unpublished data). Thus, chestnut weevil species more likely have sustained populations in Chinese chestnut orchards, at least in Indiana.

Adult weevils are generally thought to be poor dispersers. Lab studies indicate that while individuals of *C. sayi* can fly 2-3 km in one flight, the average flight distance was only 220 m (Keeseey, 2007). Limited dispersal ability of adults indicates that weevil infestations may be locally restricted and patchy across the landscape. However, successful restoration of chestnut may result in larger and more consistent weevil populations than we see in current forests because chestnut produces a more consistent seed crop than do oaks (Dalglish & Swihart, 2012). Consistent seed crops may enable weevil populations to spread more quickly as well.

In a restoration context, our results indicate that in Indiana, *C. sayi* and several other weevil species remain potential seed predators of BC₃ chestnut. More detailed study is required to understand host preferences and reproductive success of different weevil species on different host plants. While seed predators may not influence the establishment of BC₃ populations, they may inhibit their spread.

Acknowledgements

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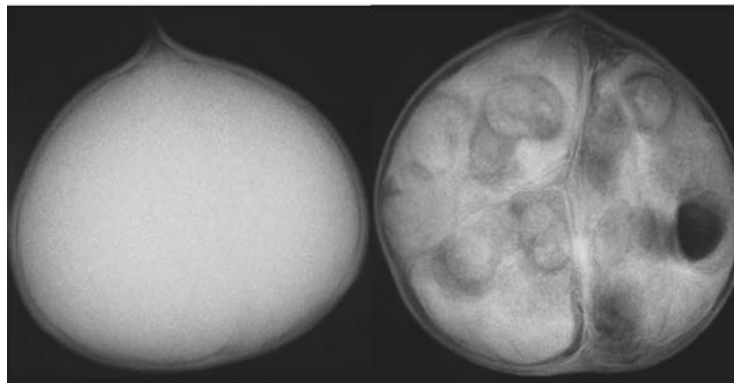
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Left: x-ray image of a sound BC3F3 chestnut seed. Right: x-ray image of a BC3F3 chestnut seed with extensive tunneling due to one or more weevil larvae

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Chestnut's Newest Enemy: Ambrosia beetles

By Erin Coughlin, Dr. Martin Cipollini, Sam Watkins

Although ambrosia beetles have troubled fruit and nut tree growers for the past several decades, they have only recently become a problem in TACF chestnut orchards. In 2011, ambrosia beetles came to the attention of the Georgia Chapter when significant infestations occurred in two major backcross orchards—the UGA Mountain Research Station orchard in Blairsville, and the Berry College orchard in Rome. In 2012, a major infestation also occurred in the backcross orchard at the UGA Horticultural Farm in Watkinsville (following a small infestation in 2011). In both 2011 and 2012, attacked trees were removed and burned to destroy all insect larvae.

Ambrosia beetle infestations are harmful to the host tree not only because they cut off water and nutrient transport, but also because they have the potential to introduce other pathogens. Ambrosia beetles are distinguished by their unique symbiotic relationship with fungal species, which, once established can serve as food for the beetle's growing larva. The beetle carries fungal spores in deep pits of its prothorax called mycangia (Kovach & Gorsuch 1985). As it bores into host trees, creating galleries for larval development and mating, the tree becomes inoculated with one or more of these fungal species. In some cases, these fungi can spread throughout the entire tree, destroying all vascular tissue. For example, *Xylosandrus germanus*, an introduced species of ambrosia beetle from Asia, has been found to transmit Dutch elm disease, a fungal disease that affects elm species of North America and Europe (Oliver & Mannion 2001). Another non-native species from Asia, *Xyleborus glabratus*, has been found to carry the fungus that causes laurel wilt, a disease that is lethal to a number of species in the Lauraceae family.

Ambrosia beetles typically attack trees in springtime, just before leaves emerge. In Georgia, ambrosia beetle attacks usually begin in early to mid-March and continue into April. Signs of an ambrosia beetle infestation can include fine strands of boring sawdust and frass (bug poop!) on stems (Figure 1), small boring holes (2-3 mm diam) on stems (Figure 2), and failure of trees to fully



Figure 1. Ambrosia beetle frass strands. Photo by Dr. Martin Cipollini

leaf out. Although some ambrosia beetles are specialists, meaning they parasitize only one or a few species of tree, many species are generalists and attack a wide range of hosts. Most ambrosia beetles attack thin-barked hardwoods, however, the host range of some species includes multiple types of pines.

There are many species of ambrosia beetle native to North America (Rabaglia 2006); however, it is the non-native species, primarily those from Asia, which are of greatest concern to chestnut orchard stewards. Although attacks by native ambrosia beetles can be deadly to a host tree, introduced species are responsible for the majority of the widespread, highly damaging infestations. Ambrosia beetle infestations are particularly problematic in TACF backcross orchards because they complicate blight testing. Although an infestation may top-kill a large number of chestnuts in an orchard, the majority of these trees will likely resprout from the roots if dead or dying material is removed soon enough. While this preserves the trees, it reduces the uniformity of tree size, growth rate, and physiological condition throughout an orchard. Resprouts may potentially be less able than the original stem to withstand chestnut blight inoculation and are likely to be smaller at the time of inoculation than unaffected trees.

Work at Berry College

Immediately following the 2011 and 2012 attacks in the Berry College backcross orchard, we removed all infested trees, began an insecticidal treatment program (a permethrin product in 2011 and a bifenthrin product in 2012), and conducted beetle monitoring studies. This orchard contained approximately 250 trees in 2011, the majority of which had completed their fourth or fifth



Figure 2. Ambrosia beetle boring holes. Photo by Erin Coughlin.

growing season. The purpose of the monitoring program was to describe ambrosia beetle diversity in the orchard, to gain a more precise understanding of attack patterns, and to work toward developing a successful prevention strategy for use by orchard stewards. The monitoring program was continued through the 2012 growing season.

Ethanol-baited traps (see Figure 3, sidebar) were set and collected on a weekly basis from May to September in 2011, and from February to September in 2012. In addition to the trap collections, we conducted weekly surveys to count tree attacks and, when possible, to collect beetle specimens as they emerged from boring holes. Several infested trunk sections collected from the first round of attacks in 2011 were kept in cloth bags, and examined in the laboratory after one generation time.

To date, 15 species have been found in traps in our orchard, and of those species, seven have been observed attacking trees (Table 1). The species responsible for the majority of attacks were *Xylosandrus crassiusculus* (Figure 4) and *Xyleborinus saxesenii* (Figure 5) (Table 2). These two non-natives are very common and well known as highly destructive species that are often responsible for large-scale orchard attacks. We observed four species attacking orchard trees that have not yet been documented to parasitize chestnuts (Table 1). In addition, we observed three species in traps that have not previously been recorded as occurring in orchard sites in the Southeast (Table 1).

The presence of a given beetle species in traps did not necessarily reflect their tree attack behaviors.



Figure 3. Ethanol-baited trap. Photo by Erin Coughlin

Monitoring Ambrosia Beetles in Chestnut Orchards is Easy!

Ambrosia beetles are here to stay, so monitoring for them is likely going to become a critical component of chestnut orchard maintenance and can even be helpful for small plantings. For example, Carolyn and Jim Hill of the GA-TACF used a trap to monitor for beetles in their small home orchard, and used the appearance of beetles to determine when it was time to spray. Building an ethanol-baited trap is inexpensive and simple to do. The instructions for this are as follows:

1. Cut a 3 X 4 in window in an old plastic bottle to create the body of the trap. We recommend making a detachable screen to cover the entire window using a 4 X 4 mm wire mesh (hardware cloth).
2. To create an ethanol lure, use a small plastic vial or bottle with a lid, punch a hole in the cap, and feed a cotton wick through the hole until it touches the bottom of the lure. Fill with 90% rubbing alcohol (non-wintergreen).
3. Glue or wire the lure to the back of the inside of the trap, across from the window.
4. Fill the bottom of the trap with propylene glycol* or soapy water.
5. Empty and strain trap contents once a week (a frying pan “splatter screen” is good for this), and refill ethanol lure and collection liquid. Propylene glycol can be reused if strained through a coffee filter.

*Although propylene glycol is marketed as a low-toxicity antifreeze, please take extreme caution if using this chemical. Always wash hands after use and do not work with traps where food is prepared. If you are concerned about using this chemical, soapy water is a fine alternative.

Place traps on free-standing posts that allow them to be suspended about 4 feet from the ground. Place traps around the perimeter of the orchard, and set about 1 trap per 50 trees. Traps should be first set in January, and weekly collections should be made through at least the end of May. As soon as ambrosia beetles are observed in traps, we recommend that insecticide treatment with bifentherin be applied, although other insecticides, such as pyrethroids and higher-concentration chlorpyrifos, have been found to be effective (Hudson 2009). Stems within the size range typically targeted by ambrosia beetles should be wet on all sides. To minimize spread within the orchard, we recommend cutting infested trees at the base as soon as the infestation is noticed. Remove them from the site and burn or chip to destroy larvae.

Xylosandrus crassiusculus, for example, did not have a significant presence in traps until May (Figure 6), yet they were primarily responsible for initial attacks according our records of emergences from stems collected at that time (Table 2). We did find that trapping is important in helping to determine the timing for orchard treatments. Results from 2012 suggest that there is +/- two-week period between beetle appearance in traps (presumably coming from infested trees in the vicinity of the orchard) and initial tree attacks (Figure 7). This period is a critical time for orchard treatment, and can allow for effective beetle attack prevention, given that the treatment is applied properly. The initial attacks in 2012 occurred on March 1; initial attacks in 2011 were unobserved, but likely to have occurred in mid-March. Annual variation in attack timing suggests that trap monitoring is important for determining the timing of insecticide application. Also, the range in diameter of attacked trees in 2011 and 2012 in comparison to the orchard range may indicate that trees are



Figure 4. *Xylosandrus crassiusculus*.
Photo Courtesy of Forestry Images/University of Georgia



Figure 5. *Xyleborinus saxesenii*.
Photo Courtesy of Forestry Images/University of Georgia

| Species | Relative Frequency |
|--------------------------------------|--------------------|
| <i>Xyleborinus saxesenii</i> | 24% |
| <i>Xylosandrus crassiusculus</i> | 23% |
| <i>Dryoxylon onobarensis</i> | 15% |
| <i>Xyleborus affinis</i> | 9% |
| <i>Xylosandrus germanus</i> | 5% |
| <i>Monarthrum fasciatum</i> ** | 4% |
| <i>Ambrosiodymus tachygraphus</i> ** | 4% |
| <i>Xyleborus ferrugineus</i> | 4% |
| <i>Cnestus mutilatus</i> ** | 3% |
| <i>Monarthrum mali</i> ** | 2% |
| <i>Cyclorhipidion bodoadum</i> | 1% |
| <i>Xyleborus viduus</i> * | 1% |
| <i>Xyleborus pubescens</i> * | 1% |
| <i>Xyleborus impressus</i> * | 1% |
| <i>Ambrosiodymus rubricollis</i> | 1% |

*Species new to chestnut orchards
**First time observed attacking chestnut

Table 1. Ambrosia beetle species captured in ethanol-baited traps in the GA-TACF backcross orchard at Berry College during 2012. (Relative frequency refers to the number of times a given species was present in trap collections, relative to the total number of trap collections.)

| Species | Percent Emerged |
|-------------------------|-----------------|
| <i>X. crassiusculus</i> | 68% |
| <i>X. saxesenii</i> | 25% |
| <i>X. germanus</i> | 1% |
| Other | 6% |

Table 2. Ambrosia beetle species collected from infested branches at the GA-TACF backcross orchard at Berry College during 2012.

susceptible to attack while in a particular size range. The smallest trees that we observed being attacked are from 0.1-0.2 in (0.25-0.5 cm) in diameter, while the largest are approximately 2.3 inches (5.8 cm). The average diameter of stems attacked in 2011 was 1.3 in (3.3 cm), and 0.9 in (2.3 cm) in 2012.

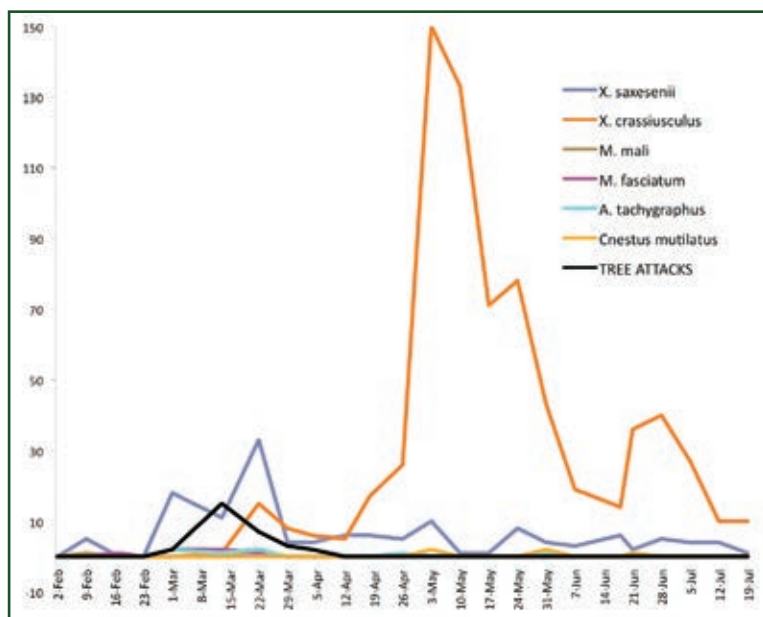


Figure 6. Weekly beetle species count from ethanol-baited traps in the GA-TACF backcross orchard at Berry College during 2012

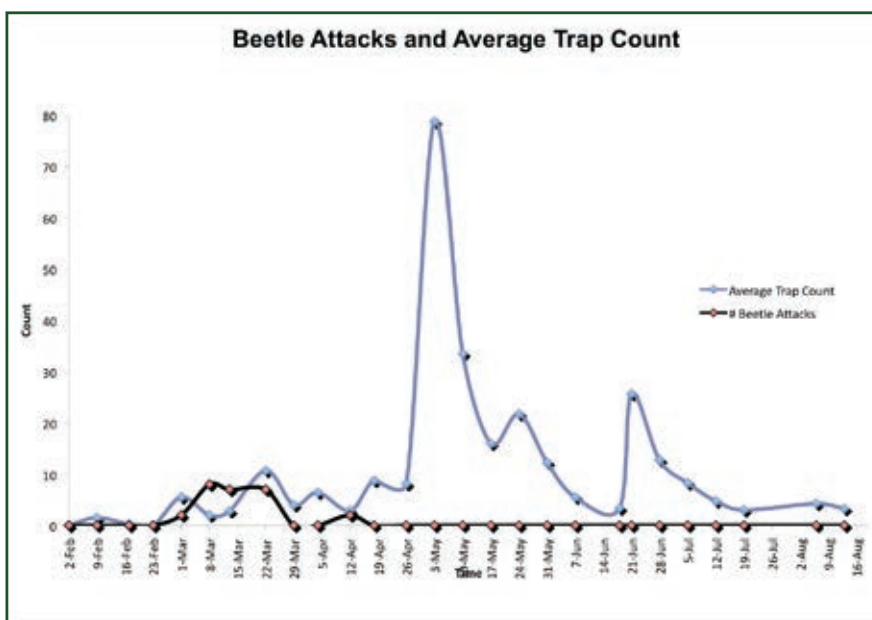


Figure 7. Weekly total beetle counts from traps and tree attacks in the GA-TACF backcross orchard at Berry College during 2012.

The biweekly treatment of bifentherin spray may have decreased the number of tree attacks in 2012. The ambrosia beetle attack rate in 2011 (no insecticide treatment prior to first attack) was almost 30%, while the attack rate in 2012 (biweekly treatment started before attacks) was below 10%. Our results suggest that ambrosia beetle monitoring is important in not only in preventing attack, but also in minimizing insecticide usage in chestnut orchards.

Summary

Although ambrosia beetles are not pests unique to chestnuts, they do present problems when trying to grow trees in uniform conditions in orchard settings. Under the more variable conditions presented in field conditions (wild areas), we suspect that they will not prove to be an important impediment to chestnut restoration. In the meantime, all that is required to combat them is paying close attention at the right time, and responding appropriately if they attack.

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Chocolate Chestnut Mousse

Recipe and photo by
Hillary Nelson



Ingredients

8 ounces peeled, chopped chestnuts
 ¼ cup sugar
 ½ to 1 cup whole milk
 ½ a vanilla bean, split in half the long way,
 or 1 teaspoon vanilla extract
 2 cups heavy cream, divided
 8 ounces chocolate chips
 Additional whipped cream for serving
 Caramelized chestnuts (recipe below)

Combine the chestnuts, sugar, ½ cup milk and the vanilla bean halves in a saucepan. Bring the mixture to a gentle simmer, then cover. Allow the mixture to cook, stirring often and adding more milk if necessary, until the nuts are soft and beginning to disintegrate. Remove from heat.

Lift out the vanilla bean halves and scrape their seeds into the chestnuts (or add the vanilla). Mash the chestnuts with a potato masher or a fork, and then put the mixture through a sieve to make a homogenous puree. Set aside.

Heat ¾ cup of the cream in a small pot on the stove until just below the simmer. Remove from heat and add the chocolate chips. Let them sit for two minutes and then stir until the chips have completely melted and the mixture is smooth. Stir the melted chocolate into the chestnut puree. Set aside.

Whip the remaining cream to soft peaks. Gently fold the whipped cream into the chestnut-chocolate mixture until just incorporated. Pour the mixture into dessert dishes and refrigerate until set.

Serve with additional whipped cream and caramelized chestnuts.

Caramelized chestnuts for garnish

1/3 cup granulated sugar
 1/2 cup coarsely chopped chestnuts

Place the sugar in a small, heavy skillet and place over medium high heat. The edges of the sugar will begin to melt and smoke a bit. Swirl the pan occasionally so the sugar browns and melts evenly.

When the sugar is about half melted, use a clean spoon to stir so that it melts completely and browns evenly without burning. When the sugar is completely liquid and brown, remove from the heat and stir in the chestnuts.

Pour the mixture onto parchment paper to cool. After cooling, the chestnuts will lift out of the caramel, retaining a liquid caramel coating.

Hillary Nelson's writing and photography are featured in her Concord Monitor column, "Home Plate," and can be found at her website, www.coldgarden.com.

CHESTNUT MOMENTS

They are beautiful in their peace,
they are wise in their silence.
They will stand after we are dust.
They teach us, and we tend them.

— Galeain ip - Altiem MacDunelmor
Celtic poet



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