THE
Journal
OF THE AMERICAN CHESTNUT FOUNDATION

MAY / JUNE 2014 | ISSUE 3 VOL. 28

Special Issue: Chestnut Growers' Guide to Site Selection and Environmental Stress

Chestnuts in the Land of Wamba: A Visit to Pujerra, a Chestnut Village in Andalusia

Join Us this Fall in Front Royal, Virginia

for

TACF's 31st Annual Meeting

October 17 - 19, 2014

at the Northern Virginia 4-H
Educational Conference Center

Look for more details in the next issue of *The Journal*

Northern Virginia 4-H Educational Conference Center

The Center is situated on 229 acres of land nestled in the Blue Ridge Mountains and located only minutes away from historic Front Royal, Virginia. The region is rich with Civil War history, busy with community celebrations, and full of small-town camaraderie.

Located 70 miles from Washington D.C. and only a few miles from Interstate 66 and Interstate 81, traveling to the Northern Virginia 4-H Educational Conference Center will be both relaxing and quick. Annual Meeting attendees will have ample opportunity to explore the outdoors throughout the weekend due to the Center's convenient proximity to Shenandoah National Park and the Appalachian Trail.

For more information about the venue, visit www.nova4h.com.

THE AMERICAN CHESTNUT FOUNDATION®

The Mission of The American Chestnut Foundation

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

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

About Our Cover Image

This issue's cover photo was taken by Brian Fox of Blythewood, SC. Called "Chestnut Leaves Aglow," the image was captured at Riverbanks Zoo in Columbia, SC. The photo was a finalist in TACF's 2013 Photo Contest. Stay tuned this summer for the opportunity to submit your chestnut photos to our 2014 Photo Contest.

Correction: In our March/April issue, the image caption on the President & CEO article was incorrect. The large, American chestnut pictured is the only known wild chestnut in Camden, ME. The photo was taken by Eric Evans. We apologize for this mistake.

TACF National Office

50 N. Merrimon Avenue, Suite 115 • Asheville, NC 28804
(828) 281-0047

THE Journal OF THE AMERICAN CHESTNUT FOUNDATION

INSIDE THIS ISSUE

MAY/JUNE 2014 | ISSUE 3 VOL. 28

Catawba rhododendron and American chestnut thriving along the Appalachian Trail in May. Photo by Jon Taylor

You've Come a Long Way, Baby!

By Bryan Burhans, TACF President & CEO

Jim Ulring, past TACF chairman, wrote in *Mighty Giants, an American Chestnut Anthology*:

> On a beautiful day in 1991 I made my first trip to the Chestnut Foundation's "new" farm. Fred Hebard had spent the last two years trying to make plantings on the old pastured clay hill near the interstate. I could see Phil Rutter's vision as we surveyed the landscape with the view of Mount Rogers to the south and the rolling highlands of the Cumberland north and west. Fred faithfully drove his rusty 1952 8N Ford tractor up and down the hillsides, pulling his broken boom sprayer and his 200-gallon watering device made from an old milk holding tank salvaged from an abandoned farm.

When Dr. Fred Hebard started with TACF 25 years ago, he had very limited resources to work with, but thanks to his tenacity, creativity, and perseverance he was able to get the breeding program up and running.

TACF has come a long way in the last 30 years. Our growth is similar to that of so many other nonprofits around the country—starting from meager beginnings, and slowly gaining steam thanks to dedicated staff, board, and donors. TACF's growth has been the result of the efforts of so many people!

While we continue to stretch every dollar, TACF has also made many wise investments in our programs. From funding critical research, hiring talented staff, and securing the right equipment to complete the work of expanding our state Chapter network, the organization's investments have provided real results.

The Foundation has successfully built a solid network of university, state, and federal partnerships. We have put in place the necessary infrastructure to advance our work, from our new Glenn C. Price Laboratory to property in Meadowview, Virginia, on which to plant our trees. We have amazing personnel: regional science coordinators, farm staff, and administrative staff. And most importantly, we have an engaged Chapter and volunteer network well positioned to move our mission forward. We have overhauled our communications

Fred Hebard bags chestnut flowers at Meadowview Research Farms.

efforts to include a revamped *Journal of The American Chestnut Foundation* magazine, a monthly e*Sprout* electronic newsletter, active social media sites, and a structured process to increase the number of news releases we distribute to the press.

Nonprofit organizations fail to fulfill their mission for many reasons, but one common thread in whether an organization is successful or not is its ability to change. Fortunately for TACF, the organization has shown great ability to adapt to new challenges and opportunities. Successful nonprofits must do more than just focus on their mission; they must also focus on the business of the organization. A nonprofit without the financial resources to move the mission forward is no more than just a great idea.

This past March, TACF's board of directors made a critical decision that will dramatically help the organization to increase its efficiency and allow TACF to more effectively fulfill its mission. First, the board adopted a new set of bylaws that provides for a more streamlined and effective governance structure. Second, as part of the bylaws, the board created a committee structure to better involve board members and volunteers in carrying out the important work of the organization. These committees provide the opportunity for *more* people to become active in our work and contribute in a meaningful way while still using a streamlined governance structure to provide efficient decision making.

As I look to TACF's next 30 years, I am excited about the position of this amazing organization. Our work is far from over, but our business plan is solid.

Arbor Day Foundation 2014 Public Awareness of Trees Award Presented to TACF

John Rosenow, chief executive of the Arbor Day Foundation presents the 2014 Public Awareness of Trees Award to Bryan Burhans, TACF president & CEO. Photo courtesy of Arbor Day Foundation

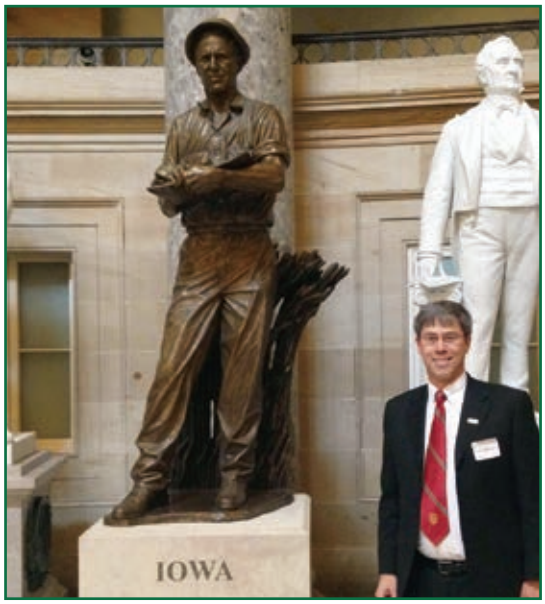
This spring, TACF was honored to receive the Arbor Day Foundation's 2014 Public Awareness of Trees award. For 31 years, TACF has worked with dedicated scientists and citizens to restore the American chestnut to the eastern forests, after the species was devastated by blight in the 20th century. Members from the Foundation's 16 state Chapters reach out in a myriad of ways to generate public awareness of the story of the American chestnut and to help educate the next generation of American chestnut planters, stewards, and caretakers.

TACF is one of 13 individuals, organizations, and companies recognized by the Arbor Day Foundation during the annual Arbor Day Awards. The award was presented to TACF president and CEO Bryan Burhans by John Rosenow, Arbor Day Foundation chief executive.

"We applaud The American Chestnut Foundation for elevating the public awareness and understanding of the importance of trees as they work to restore the American chestnut," said Dan Lambe, Arbor Day Foundation vice president of programs.

"TACF is deeply honored to receive this award," said Burhans. "The return of the chestnut to its former range will represent a historic restoration success story. We are honored that the Arbor Day Foundation would recognize the efforts of our state chapters, volunteers, and partners in creating a broad public understanding of the critical role our forests, and planting trees, play in our everyday lives."

Check out the slideshow Arbor Day Foundation produced for the award banquet at www.acf.org/video.php.



Patrick Schable, Director of the Plant Sciences Institute at Iowa State, beside Norman E. Borlaug statue at the US Capitol. Image courtesy of Iowa State University Plant Sciences Institute

Plant Scientist Norman Borlaug Honored at US Capital in March

American biologist and humanitarian Norman E. Borlaug was honored on March 25 with the unveiling of his statue at Statuary Hall in the US Capitol in Washington.

Dr. Borlaug, who died in 2009, won the Nobel Peace Prize in 1970 for developing new varieties of wheat that were resistant to disease and had high yield potential. He also was a strong supporter of the efforts of TACF, agreeing to serve as an Honorary Member of the Board of Directors. Borlaug's involvement with chestnuts developed from a friendship he maintained with his former professor, Dr. Charles Burnham.

Burnham became interested in chestnut in the 1970s after he had retired as a plant geneticist from the University of Minnesota. He was shocked to find that the efforts of the US Department of Agriculture and the Connecticut Agricultural Experiment Station to breed blight-resistant American chestnut had been a failure and that they had not used the backcross method.

continued

Eric Jenkins was hired as Technical Coordinator at Meadowview Research Farms. Photo by Jeff Donahue

New Faces at TACF

TACF is pleased to welcome **Eric Jenkins** as Technical Coordinator at Meadowview Research Farms. Eric has a master of forest resources from the University of Georgia and a bachelor of science in biology from East Tennessee State University. As a Tennessee native, his interest in the American chestnut tree developed early in life. His father lived in a house made of wormy chestnut. It was built around the time the blight killed most of the chestnut trees in east TN, so people were using all the wood they could salvage.

Eric first visited Meadowview Research Farms in 1998 with his genetics class from East Tennessee State University and it made quite an impression. His professor, Dr. Foster Levy, still brings his class to Meadowview every year. "I really just always wanted to be part of something that was personally meaningful to me," said Eric. "But it actually never occurred to me that I would be working for TACF someday!"

"Eric has experience with land conservation programs as well as GIS-based planning and analysis," says Jeff Donahue, director of operations at Meadowview Research Farms. "His primary responsibility will be managing the production of containerized chestnut trees for research purposes as well as establishing and assessing progeny tests."

Ruth Gregory Goodridge joined TACF National office as Communications Specialist. Photo by Judy Antaramian

Ruth Gregory Goodridge joined the TACF National office in April as Communications Specialist. She is an Asheville native and recently moved back to the area to be married. Her career spans more than twenty years in marketing and communications, specifically with academic and non-profit organizations.

Ruth specializes in digital and social media, printed materials, graphic design, web development, and photography. She is also proficient in both fund-raising capital campaigns and public relations campaigns. Most recently, she served as communications director for Georgia Tech's School of Civil and Environmental Engineering in Atlanta. She earned a bachelor of arts in journalism from the University of Georgia.

"Ruth's wide-ranging communications expertise and broad background in both traditional and new media are a tremendous asset to TACF," says Mila Kirkland, director of communications. "Many of our current and future members have already benefited from Ruth's skilled communications."

Ruth enjoys spending time outdoors with her fiancé Jeff, and two dogs, Arcadia and Myrtle.

Borlaug *continued*

Borlaug, who had an undergraduate degree in forestry, spent a day in the 1970s helping Burnham review the technical literature on the breeding effort. Undoubtedly, Borlaug fully supported Burnham's plan to backcross the blight resistance of the Chinese chestnut into American chestnut. Burnham went on to found TACF with Phillip Rutter and Dr. David French in the early 1980s.

Borlaug's advances in plant breeding led to spectacular success in increasing food production around the world. By lending his skills and prestige to TACF's efforts, he also had a lasting impact on the American chestnut, for which all TACF members can be grateful.

THE AMERICAN CHESTNUT FOUNDATION®

The power of ordinary Americans working in common purpose to achieve a worthy and visionary goal

There is no more potent symbol of the American wilderness than the American chestnut. This species once dominated the landscape of Appalachia and it played an enormous role in the lives of those living in the region.

The American chestnut has always been an important part of our heritage and with your support it **can** be restored.

We are 35% of the way to this year's goal. Help TACF by making a contribution today!

Three easy ways to donate:

- Fill out and mail the enclosed reply envelope
- Donate online at www.acf.org
- Call us at (828) 281-0047

THE AMERICAN CHESTNUT FOUNDATION 2014 SPRING APPEAL

Photo courtesy of the Herbert M. Webster Photograph Collection, University of Tennessee Libraries

At a Glance: 2014 Restoration Chestnut 1.0 Seed Distribution

Each year, TACF's Meadowview Research Farms employees pack and ship Restoration Chestnuts 1.0 seeds from the previous year's harvest to numerous partners, cooperators, chapters, and members. This spring, 44,406 seeds were distributed for various projects and programs throughout the country.

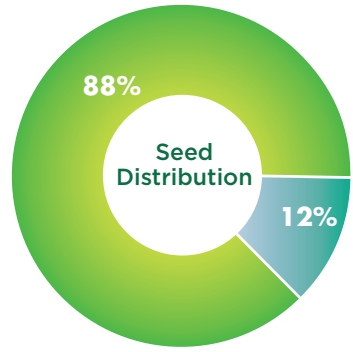
The majority of the production is used for research projects across the range of the species. This spring, 39,046 seeds, or 88% of the harvest, was designated for science and research projects including progeny tests, silvicultural trials, demonstration planting, *Phytophthora* root rot testing, university research projects, and bare root seedling production. This testing is critical to enhancing the quality of the Restoration Chestnut 1.0.

The remaining 5,360 seeds, or 12%, 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.

Members can participate in the Annual Sponsor program next year by renewing their membership as an Annual Sponsor. Go online for more information at www.acf.org/join.php.

TACF Restoration Chestnut 1.0 Seed Distribution

Harvest Year 2013 • 44,406 Seeds Total



- **Science & Research - 39,046 Seeds**
  - Progeny tests 28%
  - TACF special projects 30%
    - Silvicultural trials
    - Demonstration plantings
    - Phytophthora testing
    - Miscellaneous university research projects
  - Bare root seedling production 30%
- **Members - 5,360 Seeds**
  - Long-term members
  - Annual Sponsor members
  - Life Sponsor members
  - Legacy Tree sponsors

In Memory of and In Honor of Our TACF Members March-April 2014

In Memory of

Harold L. Bower
BJ Basinger
Gerald Bower
Phillip and Cynthia Chase
Larry and Deborah Daniels
Douglas and Sabrina Gifford
Linda Helzer
Joe Metcalf
Brenda Reed
Timothy and Kathie Skamfer
Richard and Linda Tucker

Essie Burnworth
Victoria Jaycox

Carmon and Denver Davidson
Mitch Davidson

Doris Ann Gower Friedli
Vicki Turner and Vadis Larrabee Pierce

Ralph Eugene Henry
Archibald Farrar
Michael Parham
Michelle Shope

Norman Hochella
Gail Leavitt

Kathie Kowalczyk
Haddon and Ethel Carryer

Rod and Joan Longley
Connecticut Chapter

Auden Orion Rafert
Ann Ainsworth
Bonnie Beck
Travis Beck
Anne Becker
Steven Castorani
George Coombs
Emerita Crockett
Krystian Czajokowski
Jacqueline Debrabander
Mary Patricia Delarosa
Catherine Enderle
Kelly Evans
Steven Ewers
Christine Farrance
Julia Gilden
Elizabeth Gray
Kelly and Jeff Haston
Janet Jones
Bev Kostek
Ryan Kellogg
Angel Lopez
Thomas Moriarty
Magdalena Nijander-Brock
Dorothy Payton
Bruce and Donna Rafert
Eugene Reiss
David Savory
Peter Shannon
Margaret Shillingford
Michele Talmadge
Henry Verrecchia
Claudia West

William Parana
Darlene and Gene Marrazzo

Joseph J. Scarpa
Mark Scarpa

Adres Wetzel and George Wetzel, Jr.
Douglas Sebestyen

In Honor of

Thomas M. Hunter
Anne Pope

Sandra S. Patty
Donald Strebel

Robert and Harold Rupert
Michael Rupert

Kenneth "K.O." Summerville

Kenneth "K.O." Summerville first heard about American chestnut from his father, who worked for Southern Bell and installed some of the first phone lines in North Carolina in the early 1900s. He told K.O. stories about seeing piles of chestnut bark by the railroad, on their way to a tanning factory.

K.O. has been a member of TACF since 1989 and has served as president and board member of the Carolinas Chapter. He is a skilled woodworker, always eager to share his talents with others, and in 2010, he designed and built the Glenn C. Price Research Lab conference table. He speaks to local groups about American chestnut restoration and is currently seeking grant money to outfit North Carolina Educational Forests with TACF's American Chestnut Learning Box.

"K.O. is a mentor, facilitator, and caretaker who inspires by example and deeds," said Doug Gillis, president of the Carolinas Chapter. "He is firmly committed to helping others in their efforts to restore the American chestnut tree to our eastern woodlands."

(L-R): K.O. Summerville with Bryan Burhans in 2010 as Summerville presents Burhans with a chestnut table he designed and built himself for the Glenn C. Price Lab at Meadowview Research Farms. The beautiful irises on the table are from K.O.'s iris garden. Note the chestnut design on the table's support leg. Photo by Doug Gillis

K.O. retired from the North Carolina Division of Forest Resources in 1998 and lives in Garner, NC, with his wife, Pat. During his professional career, he assisted with the development of genetic tree improvement programs for several species including: loblolly, longleaf, shortleaf, pitch, pond and eastern white pine, Fraser fir, Sycamore, and sweet gum.

Deb Ridgeway and her husband, Michel, have shared an interest in the American chestnut for more than 15 years. Photo courtesy of Deb Ridgeway

Deb Ridgeway

Nearly everywhere you see the work of the Pennsylvania/New Jersey Chapter of TACF, you are also seeing the hand of Deb Ridgeway. "From office organization and Web site assistance, to orchard work and fundraising, Deb does it all," said Stephanie Bailey, PA/NJ Chapter administrator. "We are grateful for her 'can do' attitude and tireless service to a cause that she is obviously passionate about."

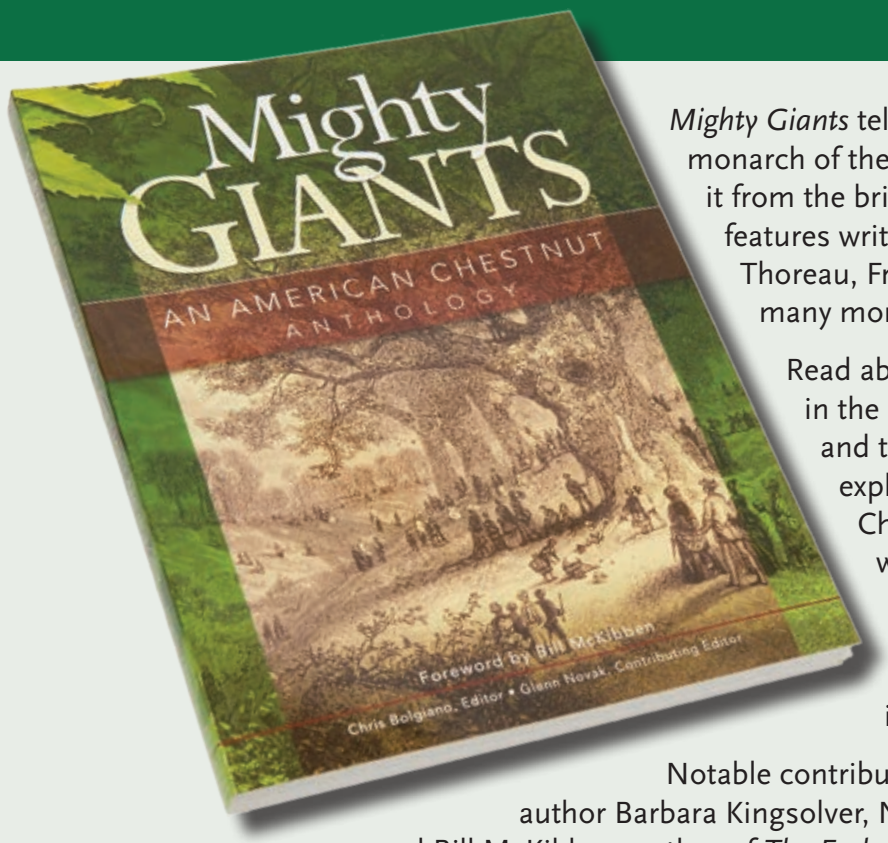
Deb retired from a career with Exelon Corporation (Philadelphia and Chicago), an American energy producer, trader, and distributor. After moving to central Pennsylvania in 2008, she became active in establishing the Raystown Restoration Branch of TACF with Jeff and Lori Krause, and serves as the Branch's secretary. Deb also created and maintains the Branch and Chapter Facebook pages. She has assisted in planting projects at Penn State University and organizing the Raystown Branch's annual chestnut celebrations.

Outside of her work with TACF, Deb has served as vice president of the Standing Stone Garden Club, and has helped a number of local organizations successfully develop their Facebook pages. She currently serves as a board member of Team USA Youth, the national youth fly fishing team. The team competes in Poland this year at the World Championships, where they will be defending the gold medal they won for the USA at the 2013 competition in Ireland.

Mighty Giants: An American Chestnut Anthology

A great gift for nature enthusiasts everywhere!

THE AMERICAN CHESTNUT FOUNDATION®



Mighty Giants tells the inspiring story of the once mighty monarch of the eastern forests and the struggle to save it from the brink of extinction. This full-color anthology features writings and artwork by Jefferson, Lincoln, Carter, Thoreau, Frost, Winslow Homer, Andrew Wyeth, and many more.

Read about the chestnut's importance to early settlers in the eastern wilderness and its value to wildlife and the ecosystem. Learn about the fearless plant explorer who tracked down the blight in war-torn China, and the plant pathologists and geneticists who labored long and valiantly to understand the blight and find a way to thwart it. It is a story of hope, of small but vital triumphs, as the secrets of the American chestnut and its deadly nemesis are gradually revealed.

Notable contributors include former President Jimmy Carter, author Barbara Kingsolver, Nobel Peace Prize laureate Norman Borlaug, and Bill McKibben, author of *The End of Nature*. Full Color, 296 pages.

Hardback $58.75 **Paperback $31.75**
prices include shipping

Order today at www.acf.org or call 828-281-0047.

If ordering more than one item, please call for shipping prices.

For the Hat Lover on Your List: Our Most Popular Chestnut Gift of All Time - TACF Ball Caps

The Mossy Oak camouflage cap is 60% cotton and 40% poly twill.

The Khaki cap is 100% cotton.

Both have embroidered TACF logos on the front and adjustable closures in back.

TACF Camo Cap $22.75

TACF Khaki Cap $19.75
prices include shipping

New! TACF Travel Tumbler

Our new, all-purpose thermal travel tumbler keeps hot drinks hot and cold drinks cold. Made of high-impact plastic and stainless steel and emblazoned with the TACF logo, this cup is perfect for taking your favorite beverage on the road.

TACF Travel Tumbler $17.75
price includes shipping

This idyllic orchard has benefited from good soil and irrigation. Photo by Tom Saielli

Chestnut Growers' Guide to Site Selection and Environmental Stress

By Elsa Youngsteadt

American chestnuts are tough, efficient trees that can reward their growers with several feet of growth per year. They'll survive and even thrive under a range of conditions, but there are a few deal breakers that guarantee sickly, slow-growing trees. This guide, intended for backyard and small-orchard growers, will help you avoid these fatal mistakes and choose planting sites that will support strong, healthy trees. You'll know you've done well when your chestnuts are still thriving a few years after planting. By then, they'll be strong enough to withstand many stresses, from drought to a caterpillar outbreak, with much less human help.

The two-foot-long taproot on this four-year-old root system could not have developed in shallow soils, suggesting that chestnut can grow better in deep soils. Taproot courtesy of Blair and Mary Carbaugh. Photo by Sara Fitzsimmons

Soil

Soil type is the absolute, number-one consideration when deciding where—or whether—to plant American chestnuts. These trees demand well-drained, acidic soil with a sandy to loamy texture. Permanently wet, basic, or clay soils are out of the question. So spend some time getting to know your dirt before launching a chestnut project. Dig it up, roll it between your fingers, and send in a sample for a soil test. Free tests are available through most state extension programs, and anyone can send a sample to the Penn State Agricultural Analytical Services Lab (which TACF uses) for a small fee. More information can be found at http://agsci.psu.edu/aasl/soil-testing. There are several key factors to look for.

Acidity

The ideal pH for American chestnut is 5.5, with an acceptable range from about 4.5 to 6.5. Outside this range, the roots absorb too much of some nutrients or too little of others, and the leaves begin to turn chlorotic (light green to yellow), indicating poor health. Fortunately, this problem

is easy to avoid. Your soil test results will indicate the soil pH and provide advice about how to amend it to reach the target acidity. Some labs may offer recommendations for chestnut specifically; if yours does not, simply indicate on the soil test paperwork that your target pH is 5.5. Get your suggested amendments worked into the ground *before* you plant.

Trees are stunted or dead at the top of this slope, but thriving at the bottom; the difference is associated with bedrock near the soil surface at the top of the slope but not the bottom. Photo by Kendra Gurney

Texture and Depth

Loose, airy, sandy soils are ideal, while dense, fine-textured clays are to be avoided at all costs. The latter stunt root growth and hold on to too much water, leading to weak, slow-growing trees. Soil survey maps (such as those available at http://websoilsurvey.nrcs.usda.gov) can help you find promising sites on your property. Use the maps to locate sandy or sandy loam soils in hydrological groups A or B, which are well drained. Also look for soils with high permeability, or high saturated hydraulic conductivity (K_{sat}). To accommodate chestnut's substantial taproot, prioritize sites with at least four feet of good soil above impermeable layers such as bedrock or fragipan.

Once the maps guide you to a promising site, check out the soil in person. When you pinch some moistened earth between your fingers, it should crumble. If it forms a ribbony strip, it contains too much clay. For another texture test, mix up a few shovels full of soil and scoop a cup of it into a quart jar. Add water until the jar is three-quarters full, and then shake it up. Sand, silt, and clay will settle into layers, with sand on the bottom and clay on top. (Tiny clay particles can take more than a day to settle out, so be patient!) In the ideal soil, the sand layer will make up half to three-quarters of the total, and clay less than a third. When performing these tests, dig deep! If you run into a hard clay layer just a foot or two down, keep looking. Finally, remember that even a nice, sandy loam can be ruined by erosion or compaction, so avoid areas recently subjected to intensive grazing, logging, or other compacting activities.

This seedling succumbed to too much watering, leaving tell-tale dark brown splotches along the leaf edges and between the veins. Photo by Sara Fitzsimmons

Excess Water

Even with perfect, well-drained soil, it is possible to overwater. Chestnuts aren't cut out for saturated soil, and trees subjected to too much moisture will develop dark brown or black patches on their leaves. Soggy chestnuts are also more susceptible to diseases such as root rot.

There's no set watering schedule to keep you on track; your trees' needs will vary with the soil or potting medium, temperature, and humidity. For seeds started directly in the ground, don't water at all for at least a month after planting—doing so only encourages the nut to rot. Seedlings in pots will need more water than those started in the ground. A

good rule of thumb is to let the pot dry out almost completely (so it feels light when you lift it) and then give it a thorough soaking. When transplanting potted seedlings into the ground, try giving each tree about a half a gallon of water per week for the first month after planting, then let rain take over. Then adjust as needed for your soil and weather.

For those with a scientific bent, a soil moisture meter can be a good guide to optimal water levels. Chestnut grows best when a soil is wet to field capacity, but not wetter. This translates into a soil-moisture tension of -10 to -20 centibars. Higher tension, 0 to -10 centibars, is too moist, while lower than -30 centibars is too dry. Especially with young plants that are not using much water, levels closer to -20 are preferred over levels closer to -10.

Drought can be fatal for young trees, and this one is unlikely to recover. The dry, light-brown patches start around the edges of the leaves and, in severe cases, spread inward. Photo by Tom Saielli

Drought

Compared to other eastern hardwoods, chestnuts are relatively drought tolerant, and some growers succeed without ever watering their trees. It's still a good idea to be prepared with a watering plan in case of a severe dry spell, especially during the first two seasons of establishment. Drought-stressed trees will wilt or develop light brown to white crispy patches around the edges of their leaves. For young trees in their first few years, these conditions can be fatal; older trees probably won't die, but will still appreciate some extra moisture.

If it's hot, the soil is dry, and there's no rain in the forecast, don't wait for symptoms to appear; get out there and give your trees a drink. For the backyard grower, this probably means a short walk with the garden hose. In a small orchard, it could mean having an irrigation system or a way to haul around a tank of water. Absent this infrastructure, TACF scientist Tom Saielli suggests making friends with your local fire department. Saielli, a former volunteer fire fighter, suspects that most fire departments would be delighted to learn more about chestnut restoration and help you out of a pinch with a tank of water.

Light

For nut production, chestnuts need full sun. Period. The trees will grow faster, however, with about 30 percent shade. Under these conditions, chestnuts can grow four to seven feet per year—about twice as much as those in full sun. Saplings can survive indefinitely in shadier sites, but they won't grow much, so aim for zero to 30 percent shade depending on your goals of nut production versus growth.

One pitfall to avoid is transplanting trees directly from protected or indoor settings to full sun, causing leaves to be "sunburned" and die back. This problem is easily avoided by "hardening off" indoor-grown trees for a few weeks before transplanting them into full sun. Simply place the pots in deep shade for a week or so, then lessen the shade for another week before transplanting. Freshly transplanted trees also can be protected by sprinkling a few bits of straw over the leaves to break up the direct sun.

Don't let this happen! These grasses and weeds will slow the seedling's growth, or even kill it, by competing fiercely for nutrients and releasing chemicals toxic to the tree. Keep a two- to three-foot weed-free zone around small trees. Photo by Matt Brinkman

Weed Control

If trees could have nightmares, grass would surely haunt them. Grass and weed roots dominate the same top few inches of soil that most tree roots also use. They suck up the moisture and nutrients that you want the tree to get, and some grasses ooze chemicals that are toxic to other plants. Trees that have to fight it out with grass may grow several times more slowly than unhindered trees or even be killed outright. So give your chestnuts their much-needed weed-free zone, starting with a two- to three-foot-diameter ring for small trees and expanding it as they grow.

In a back yard, this likely means piling a mulch ring around each tree; in an orchard, it could also mean black plastic strips or landscape fabric that suppress weeds. In either setting, an herbicide such as glyphosate (Round-Up) can also work, but be cautious during application. Apply glyphosate in a manner to avoid getting any on the leaves or stem and avoid applying in windy conditions. Tree shelters are a good protection against this potential accident. If spraying is still required after trees outgrow their shelters, use a sprayer with a shield on it.

Mulch and landscape fabric have the drawback of harboring voles, which can be especially damaging to trees during winter months. Trees can be protected from voles by metal or plastic collars that extend two to three inches under the soil. Alternatively, the mulch ring can be pulled back from the trunk about a foot during winter months.

The black regions between veins are due to excessive amounts of fertilizer, primarily nitrogen. To avoid this fate for your trees, follow package dosage instructions and choose a water-soluble liquid fertilizer for potted saplings. Photo by Sara Fitzsimmons

Nutrients

Fertilizer is no substitute for good soil, light, and weed control, but well-situated trees will grow even stronger when properly fed. Potted trees, because of their small volume of soil, are most susceptible to over-fertilization. To avoid this problem, use a liquid fertilizer diluted in water for fine dosage control. Most general-purpose fertilizers will do; the exact N-P-K (nitrogen-potassium-phosphorus) ratio isn't that important. For potted trees, look for a formulation that includes micronutrients (sometimes also listed as "trace elements," such as iron and manganese). Fertilize every week or two according to package directions. In-ground trees can take a liquid or a granular fertilizer; the latter only needs to be applied twice per year. Again, look for a general-purpose fertilizer that contains N, P, and K.

It's worth being mindful of your soil pH when selecting a fertilizer. Some, such as those marketed for citrus and azalea, are intended to make soil more acidic, and this may be effective if you're

The yellowed leaves on these seedlings were likely caused by an iron nutrient deficiency; the plants recovered after treatment with a fertilizer containing micronutrients. Photo by Jeff Donahue

starting with a potting mix of unknown or neutral pH. But if you've already tested and amended your soil for correct acidity, further acidification could be harmful. Regular annual soil tests will help keep track of trends in acidity that may need to be adjusted with amendments or fertilizer choices.

Timing of fertilizer applications can also be important. If you fertilize too early in spring, you may push a tree to send out leaves before the danger of late spring frosts has passed. If you fertilize too heavily or too late in the growing season, the tree may not go dormant properly before the start of freezing weather in fall. Over-fertilized or late-fertilized trees also are more prone to winter injury. In general, liquid or solid fertilizers are applied in the spring a few weeks after leaves have sprouted, with the last application of solid fertilizer made by the beginning of July and liquid fertilizer by the beginning of August.

These trees all have kinks in their trunks where they got caught on their tall shelters and began to grow in the wrong direction. This is one of many reasons to avoid tree shelters more than two feet tall. Photo by Sara Fitzsimmons

Tree Shelters

Tree shelters can save young trees from an array of problems, from gnawing voles to the misdirected squirt of herbicide. But a poor shelter causes troubles of its own, so choose wisely. The ideal shelter is one to two feet tall, set about two inches deep into the ground, with no exposed sharp edges on the top that can injure the tree or its caregivers. Tall shelters alter the tree's environment too much, making it grow so fast that it becomes thin, floppy, and unable to support its own weight. Because air inside the shelter can be much warmer than the surroundings, trees also may get caught unprepared for winter, resulting in tip dieback. Finally, when the stem grows out of the top of a tall shelter, it suddenly branches out like an open umbrella—a weak and abnormal branching pattern. Hence, no shelters taller than two feet! A rolled or folded edge at the top of the shelter is important to keep the trunk from rubbing against a sharp edge.

In case you still haven't heard enough about this, a final word of caution: be sure to take off tree shelters before the trunk begins to grow around it, which can cause scars and deformity.

This 18-inch vented shelter by Tree Pro will protect saplings without causing problems. Also note the excellent weed control! Photo by Kendra Gurney

Mower Blight

Young trees are easily taken out by careless mowing. Even trees that aren't completely severed will send up resprouts from the base, which ruins the trees' form, and become more susceptible to disease. Tree shelters are the best protection against lawn-mower accidents—just be sure you're using the right kind of shelters, described above. Older trees should no longer have shelters, but with any luck they're also shading out the weeds so you won't have to mow near their trunks. On larger trees, small wounds from mowers or string trimmers should simply heal. Rings of mulch, in addition to suppressing weeds and reducing the need for mowing and trimming, can also help alert the mower operator to avoid a tree.

This tree shows signs of a harsh winter. The growing tip died back from cold exposure, but the rest of the tree leafed out and will recover.
Photo by Kendra Gurney

Winter Injury

Although a harsh winter can do some damage, rarely will it dish out more than your trees can handle. The main symptom of winter injury is branch dieback; the killed stems or branches turn dark brown or deep red. In the spring, these trees will leaf out only below the killed portion, leading to a shrubbier growth form. These bushy tendencies can be corrected with careful pruning a few years later (once the tree has fully recovered and is established).

These blackened leaves were injured by frost. Patterns of injury vary depending on the developmental stage of the leaf and the temperature.
Photo by Paula Murakami

Spring can also throw in a surprise freeze after trees have already leafed out. Even if a spring frost doesn't cause immediately visible damage, leaves will probably blacken within a couple of days and eventually fall off. Again, it's not a fatal problem, and trees usually recover. To minimize the effects of harsh winters, plant chestnuts in a protected area such as the edge of a field, where nearby forest can help moderate extreme temperatures. Keeping to the slopes and avoiding low, cold (and wet) spots is also a good idea.

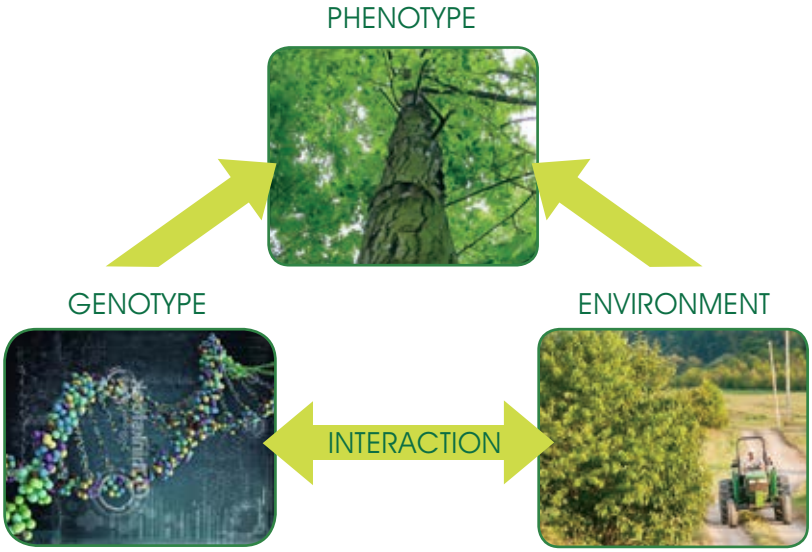
Wind

Even though American chestnut once dominated rocky ridge tops in its historical range, this is not an ideal habitat for your own stand. Apart from having overly dry soil, rocky ridge tops have a harsh environment, with a combination of winter cold and wind that will likely damage your trees, especially in northern regions. Even without leaves, chestnuts are susceptible to desiccation, or over-drying, in winter. Desiccation causes slow growth and tip dieback in the spring. To avoid this problem, pick a more sheltered site, or plant near a wind-break. Greenhouse fans also make wind—so beware if you're keeping young, potted trees indoors over the winter. Make sure your pots are not directly beneath or in front of a greenhouse fan.

Elsa Youngsteadt is an entomologist and science writer based in Raleigh, North Carolina.

P = G x E

By Sara Fitzsimmons



In the article "Regionally Adapted Seed Orchards within TACF's State Chapters," in the January/February 2014 issue of *The Journal of The American Chestnut Foundation*, we discussed the ratio of trees that should be homozygous for resistance in one generation. If three genes control blight resistance in an incompletely dominant fashion, as seen in the Punnett Square, only one out of sixty-four plants is likely to have all the alleles for blight resistance. The goal, then, is to find that one tree. But how can we find it?

Currently, TACF research staff and citizen scientists make selections by observing the **phenotype (P)**. The phenotype is the outward expression of the underlying **genotype (G).** But there isn't always a 1:1 ratio of phenotype to genotype. In many cases and for many traits, the phenotype will be a combination of the genotype and the effect of **environmental variation (E)**. This leads to a fundamental equation of plant breeding: **P = G x E**

As tree breeders, then, our goal when making a phenotypic selection is to determine how much of the variation in a given tree is due to its underlying genotype and how much is due to environmental variation. In the case of blight resistance, the phenotype is the induced canker on our trees, the genotype we are trying to find is RRRRRR, and the environmental variation would be things like soil type, temperature, rainfall, and so on. In some cases, the environmental variation and its effects are not always fully known or understood.

When we study the effect of environment on genetics, we want to have as similar a population as possible, i.e., clones. If we study the genotype, we want to have as similar an environment as possible to reduce the potential environmental effects. When planting our backcross populations, we don't really have the luxury of either! We have a field and a population of trees that can hypothetically exhibit a continuous range of canker expansion based on their underlying genotype. From one planting location to another, even in the same field, the environmental variation could make a tree with only five or even four R alleles (i.e. RrRRRR or RrrRRR) look like the RRRRRR tree that we ultimately want to select.

In this situation, where we cannot control either the phenotype or the genotype, how do we know that we are selecting the appropriate tree or trees? One of the best ways to do this is through **progeny testing**. By knowing the performance of the offspring, we can tell a lot about the underlying genetics of the parents. If a particular parent or a particular cross of two parents always produces offspring with a high expression of the trait of interest, it's a good parent. Of course, if that parent or combination of parents always breeds, in our example, highly susceptible progeny, then it's not a tree or combination we want to select.

Eventually, TACF research staff hopes to include molecular techniques, such as **marker-assisted selection (MAS)**, to both improve our selection techniques and make them more efficient. MAS will not replace phenotypic selection, but will complement it. We hope that we will have genetic markers available for use in the next four to five years. Until that time, use of phenotypic selection, in conjunction with progeny testing, will continue to be the main technique for advancing TACF's breeding program for blight-resistant American chestnuts.

Sara Fitzsimmons is TACF's North Central Regional Science Coordinator and is based out of Penn State University.

How to Save the Forest

Cutting the Right Trees is Better than Cutting No Trees at All

By Martin Melville

The Nature Conservancy's West Branch Research and Demonstration Forest in Pennsylvania. Photo by George C. Gress

There is tremendous irony afoot: Those who want to save our forests seem to be in cahoots with those who would exploit them. It is good to care about the environment. We all should. Yet, in order to save a thing (such as a forest), it is important to understand it. It is possible to love something to death. Even if you love something, it is possible to kill it through neglect if you don't know how to care for it. To be fully productive, forests need proper management, and that means cutting the proper trees. The issue must become not whether to cut all trees, the best trees, or no trees, but the *right* trees. Only by recognizing what it is that we see when we look at a forest can we reach environmentally sustainable decisions about how to manage our ultimate renewable resource. Forests are, in fact, captured sunlight, water, and air.

Well-managed forests result in better forest health and the retention of open forests. As a society and as individual landowners, it is crucial that we make the shift from resource extraction and allowing the forest to heal itself to intentional resource management.

Foresters study the art and science of forest establishment, growth, and maturation. The cutting of trees is the primary tool foresters use to manage what a forest becomes. In cutting the right trees, forest productivity increases, diversity is maintained, and wildlife thrives. In cutting the wrong trees, and sometimes in not cutting any trees at all, productivity suffers, regeneration often fails, and diversity and habitat are lost. We would not presume to second-guess our lawyer, doctor, or mechanic, but we aren't afraid to blithely make decisions about what should be done with our own or another's forestland. When one makes misinformed decisions about which trees to cut, the results can be the opposite of what might be expected.

For example, everyone assumes that big trees must be older than small trees. It takes longer to get big, right? The whole idea of human growth is to go from being small, immature, and childlike to fully grown mature adults. The plaintive cry to "Save the baby trees" tugs at our hearts, our sense of rightness. The adults have had their chance; the children have not. At first blush, the logic seems irrefutable.

But the irrefutable logic is shot with holes. Most of eastern North America was clear-cut sometime in the last century. The trees in any patch of woods are all about the same age even though they vary widely in size. Foresters call these patches "stands." In the full sun of the clear-cut, the mad dash for the light was a shotgun start: On your mark. Get set. Grow. Foresters call these stands "even-aged."

In the melee that ensued, different trees used different strategies for success. Success is providing enough offspring to at least replace yourself, and ideally to increase your market share. To succeed, some, like poplar, willow, or cherry, sing the song of "Grow fast, die young. If the competition is underneath me, I get the light; I prevail." Because these trees need full sunlight to thrive, foresters call them "shade intolerant."

Sugar maple, hemlock, and some others are heartier in the absence of sunlight. Termed "shade tolerant," these trees not only live in the shade, but are able to slowly grow and eventually capture their position in the forest canopy. When the poplars and cherries die young, the shade lovers are waiting. Their opportunity has arrived.

With too much shade on the ground for the sun-loving shade intolerant trees even to get a start, the shade tolerant trees stage a coup. The forest is theirs. This is a simplified version of the theory of forest succession. Things can get a bit more complicated by species like the "intermediately" shade tolerant American chestnut that can live, though not thrive, in the understory, and then take off in response to a disturbance (Wang et al. 2013).

There are other factors besides shade tolerance that affect the size of trees. Genetics, vigor, access to the sunlight that drives the tree's food-producing factory, and luck-of-the-draw factors such as good soil vs. growing on a rock all play a role (see accompanying article on P = G x E on page 16). Many of the small trees are actually runts and rejects, inferior in genetics, vigor, and form. Even if they are given more light, their production facilities—leaves and roots—are incapable of taking advantage of it to achieve rapid growth.

Larger trees produce more food. For instance, a 12-inch diameter chestnut tree might produce 3,000 chestnuts per harvest, while a 24-inch diameter chestnut might produce up to 10,000 chestnuts per harvest.

The de facto method of determining which trees will be cut and which will be left practiced by many landowners is known as "diameter limit harvesting," or D-cutting. In this practice, all trees larger than a given limit (12, 14, or 16 inches in diameter) are cut to make way for the future forest to grow. This method may have more aesthetic appeal, but it is not grounded in the science of forest management.

If we wrongly believe that the bigger trees are older and the smaller trees are younger, and we choose to harvest the "old" trees based on that belief, we are complicit in the degradation of the forest and the very ecosystems we propose to protect. We unintentionally change the species that are present. The fast growers will (usually) be larger in diameter. The shade tolerant trees, typically slower growing, are usually smaller in diameter. The concern of a D-cut is only about what resources can be extracted, not what can be left for the future.

Often, there is no thought about wildlife food or habitat. Larger trees produce more food. For instance, a 12-inch diameter chestnut tree might produce 3,000 chestnuts per harvest, while a 24-inch diameter chestnut might produce up to 10,000 chestnuts per harvest (Gilland, Keiffer, and McCarthy 2012). Also, larger trees are more likely to have cavities for nesting, or beneficial branch structure needed by songbirds.

Diameter limit harvesting also ignores the spacing of the trees that remain. Appropriate light levels on the forest floor are very important. They are largely responsible for which seedlings will survive and which won't. In the Northeast, diameter limit harvesting favors species such as black birch, red maple, and striped maple. These lower-value trees, one might even refer to them as weeds, retard the establishment of more desirable trees. Also light levels on the forest floor after a D-cut are very favorable for the establishment and takeover of competing vegetation such as hay scented fern and stilt grass. This can delay regeneration success indefinitely.

Furthermore, genetics are often ignored. "We cut the best and leave the rest," one forester said, speaking of practices such as D-cutting that degrade the forest. "It's like shooting the winner of the Kentucky Derby when we harvest that champion tree without giving it a chance to establish its seed." Big trees are big for several reasons, and genetics is an important one. Eugenics is the science of improving the genetics of a population. Cutting the biggest—also frequently the best, genetically—is the opposite. It degrades. It can be called *dis*eugenic.

Clear-cuts are controversial. They are a tool. A mechanic can't change a sparkplug with a screwdriver. It takes a special kind of socket wrench. There are times when a clear-cut is the correct tool; there are times when it is not. Clear-cuts are often the best way to take a low-diversity forest, one which perhaps is the result of a D-cut, and make it productive once again. The immediate result of a clear-cut may not be aesthetically pleasing, but it is often the best way to increase forest productivity, diversity, and sustainability. In fact, due to chestnut's intermediate shade tolerance and response to disturbance, clear-cuts or heavy shelterwood harvesting, which leave a few remaining trees to shelter the regeneration below, will likely be the best locations for chestnut restoration (McCament and McCarthy 2005; Jacobs et al. 2013).

Just about everybody wants to help, preserve, and improve the environment. That should go without

Author Martin Melville pollinates an American chestnut tree at the Nature Conservancy's West Branch Research and Demonstration Forest in Pennsylvania. Photo by George C. Gress

saying. Much effort has been devoted to restricting harvesting on public lands. But in the eastern US, more than half the forested land—in some states, as much as 90%—is privately owned (Butler 2008), so efforts to improve management of private forested lands could pay huge dividends.

Education is the first step to saving our forests. Actions that are appropriate today rest on past events we cannot control. Learning about the history of our forests can lead us to correctly interpret what it is we see today: the big trees are sometimes the same age as the little trees. We must preserve species diversity. We must preserve habitat. We must preserve genetics.

Once we have a correct understanding of this reality, conservation organizations have the infrastructure, membership, and credibility to approach landowners. The message is not that cutting trees is wrong, for trees are one of the few truly renewable resources we have on this earth. Landowners need the ability to gain income from their land, and managed forests are more likely than unmanaged ones to stay undeveloped.

The message is that forest landowners also need to understand their forests. The message is that harvesting should be done based on a timetable laid out in a written management plan, not because there was a knock on the door and a guy said: "Hey. You have some nice trees. I'll pay you for them." The message is that we need to pull the "weeds" and plant more "carrots." We need at least to be sure that the next forest is successfully started. The message is that if we cut the right trees, forests are a renewable, sustainable resource that can help society meet its resource needs and maintain diversity and habitat while providing landowners with healthier forests.

The results could be transformative. Let's get started.

REFERENCES

Butler, B.J. 2008. Family Forest Owners of the United States, 2006. Gen. Tech. Rep. NRS-27. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 72 p.

Gilland K.E., C.H. Keiffer, and B.C. McCarthy. 2012. Seed production of mature forest-grown American chestnut (Castanea dentata (Marsh.) Borkh). *Journal of the Torrey Botanical Society*. 139(3): 283-289

McCament C.L. and B.C. McCarthy. 2005. Two-year response of American chestnut (*Castanea dentata*) seedlings to shelterwood harvesting and fire in a mixed-oak forest ecosystem. *Canadian Journal of Forest Research*. 35: 740-749

Jacobs D.F., H. Dalgleish, and C.D. Nelson. 2013. A conceptual framework for restoration of threatened plants: the effective model of American chestnut (*Castanea dentata*) reintroduction. *New Phytologist*. 197: 378–393

Wang G.G., B.O. Knap, S.L. Clark, and B.T. Mudder. 2013. The Silvics of Castanea dentata (Marsh.) Borkh., American chestnut, Fagaceae (Beech Family). USFS General Technical Report SRS-173. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station. 18 p.

Martin Melville lives in central Pennsylvania where he practices logging, forestry, tree climbing, philosophy, and writing (among other things). More of his writing can be found at www.martinstrees.wordpress.com.

Chestnuts in the Land Of Wamba

A visit to Pujerra, a Chestnut Village in Andalusia

By Louis Acker

The edge of the chestnut forest lies on a sharp geological boundary. The chestnut forest is on the right half of the photo.
Photo by Louis Acker

The Spanish Chestnut

The European chestnut tree (*Castanaea sativa*) can be found from Turkey and Eastern Europe to the Atlantic shore in France, Spain, and Portugal. It is believed to be indigenous to the Eastern Mediterranean and to have been introduced into Spain by the Romans (Lloyd 2014). It has been under attack by ink disease (*Phytophthora cambivora*), a close relative of the root rot that attacks our native species; it has survived the chestnut blight (*Cryphonectria parasitica*), which was introduced in 1950 from an American tree (ibid.); and it is now under assault by the gall wasp (*Dryocosmus kuriphilus*). In previous visits to France, my wife, Allie, and I saw numerous European chestnut trees, few of which could be said to be entirely healthy. Roasted chestnuts are still a common sight, and aroma, on the streets of European cities in the fall; and condiments such as chestnut butter and candies are generally available. The commercial production of chestnuts is still a going concern in Europe and part of a long tradition. But how long will the native chestnut tree continue to be a highly productive economic resource under the three-pronged attack of the blight, the ink disease, and the gall wasp? One report on the chestnut blight in Europe states that the only blight-free regions are in the Netherlands and the southern United Kingdom (Robin and Heiniger 2001).

My wife and I recently returned from a vacation in Spain. Our trip took us to Andalusia, Spain's southernmost province, to its cities of Seville, Jerez, and Ronda, and to the delightful "white villages" draped across its mountainous terrain and nestled in its high valleys. Andalusia is famous for those villages, and for its bullfights, its fiery flamenco rhythms, and its Moorish

heritage that can be seen in such architectural masterpieces as the Alhambra in Granada. It is known for its fine horses, for its cork that caps the bottles of Europe, for its acorn-fed, Iberian cured ham, and for its jet-set destinations on the sunny beaches of Malaga and Marbella. But it is not well known as the home of what must be some of the healthiest and most productive chestnut forests in Europe.

Pujerra, its mountains, and its forest. Photo by Louis Acker

Most of Spain is inhospitable to the chestnut tree. In geological terms it is a limestone platform, lifted from the seabed in the same crustal tumult that created the Alps. Limestone is not a good substrate for chestnuts. Furthermore, the Spanish climate is dry—chestnut trees need at least a moderate amount of rainfall. The chestnut forests of Spain, therefore, occur only in isolated areas—in the northern, Atlantic region and in a few of the interior mountain ranges that catch a little rainfall. The best known, most productive region is in the province of Galicia, which borders Portugal on the north. So in planning our trip, Allie and I were surprised to stumble upon a tiny village in the mountains of Andalusia whose claim to fame is that it is a major source of chestnuts for the European market – that and its historic significance as the home of a legendary king of the Visigoths, with the improbable name of Wamba. We were determined to see the place.

Allie and I stayed in the tourist-friendly village of Grazalema, a white gem tucked into the head of a mountain valley less than an hour west of Ronda. To get to our destination, the chestnut village of Pujerra (*pu-HAY-r-r-rah,* trill the *r*'s if you can), we headed east through Ronda and then south through the ever-steeper mountains of the Serrania de Ronda. The mountains are not especially high; the highest peak, called Torrecilla, is a little over 6,000 feet, while most peaks in the range are around 4,000 feet. But the terrain is rugged. Coming at the end of the hot Mediterranean summer, we saw a dry landscape of dun-colored slopes and white limestone cliffs, dotted in some places with dull green oak trees and occasional olives. The annual rainfall in Ronda is less than 20 inches, but probably is a little higher toward the south as you approach the Mediterranean coast. Pujerra is about halfway between picturesque Ronda and the coastal resort city of Marbella.

The Emerald Forest

We turned off the highway south of Ronda onto a local road that would take us through the village of Igualeja and on to Pujerra. Our rental car was a little Ford Fiesta, about the right size for the paved, one-lane road that skirted the cliffs without much of a shoulder nor any guardrail. Many times we wanted to stop and enjoy the breathtaking scenery, but there was nowhere to pull off and we were almost always on a blind curve. So we went on, guarding the shoulder and gaping at the scenery. Then we saw the chestnut trees, another world of brilliant emerald green, backlit with a Mediterranean sun. Chestnut trees covered the mountain slopes as far as we could see, and the trees were filled with burs as big as baseballs. It was not at all as I had imagined. It was an unexpected delight as we drove beneath bur-laden limbs overhanging our sun-dappled little road. We caught glimpses of Pujerra high on a slope in the distance, white like a pearl on the breast of an emerald gown.

We had plunged into the forest all at once, as if crossing an invisible line. First there were no chestnut trees, then we were in a forest that was almost all chestnut trees. We found a place to pull over. I looked at the rock and soil on the road bank. It was a familiar rock called mica schist, familiar because that is what trees in the North Carolina mountains are growing on. We had left behind the limestone platform we had been driving on all the way there and had entered the faulted and folded region that borders it on the south – and immediately we were in a chestnut forest.

In many areas, including the mountains around Pujerra, the chestnut forests have been encouraged, tended, and cultivated for most of the time since they were introduced by the Romans 2,000 years ago. They are not exactly orchards and they are not exactly wild either. The chestnut trees around Pujerra have a rounded, spreading form, each tree almost touching the limbs of its neighbor. From a distance they can look like

Pujerra is one of the "White Villages of Andalusia," albeit a little-known one. Photo by Louis Acker

thousands of pincushions covering the mountain slopes. There is no dense understory of smaller trees and brush, it is open country except for the trees. And chestnuts comprise eighty to ninety percent of the forest. The trees are wonderfully healthy, with no sign of disease – no cankers, no dead limbs or twigs, no yellowing leaves, just vibrant green. We arrived about two weeks before harvest time, and already we could pick up an occasional chestnut from a bur that was opening prematurely. They were enormous, almost the size of golf balls.

Our road plummeted down into the valley of the Rio Genal and crossed the stream on a quaint little stone bridge in the village of Igualeja. It rose again through the overhanging boughs, and in fifteen minutes we were in Pujerra, population 350, with brilliant white walls, red tile roofs, clean-swept stone paved streets, begonias and roses, and a lone donkey with copious saddlebags waiting at a doorway.

We explored the little village, ate a real Spanish country meal at a rustic café, and visited the statue of Wamba that has been erected in a little plaza beside the church. It was, at least, a statue of someone whom the artist thought must have looked like Wamba, for there is no real documentation of his existence, much less any true depiction of him. He lives mainly in Andalusian folklore as a simple country man who became a king.

"Castañas Valle Del Genal"

We had arranged a meeting with Senor Francisco Cerban, assistant manager of Sociedad Cooperativa Andaluza "Castañas Valle Del Genal" – The Genal Valley Chestnut Cooperative of Andalusia. The cooperative, founded in 1994, manages a share of the local chestnut harvest, prepares the nuts for shipment, and sells them all over Europe under the label "Castañas Valle Del Genal"(*castaña* is the Spanish word for "chestnut," and it is the root of the word "castanet"). The cooperative occupies a modern steel building a few kilometers out of Pujerra, with offices

and a warehouse floor lined with modern equipment for processing and packaging the chestnuts. Señor Cerban was at the warehouse supervising some repairmen readying the equipment for the harvest. He very graciously gave us more than an hour of his time, and was quite interested in the story we had to tell him about the American chestnut and The American Chestnut Foundation's efforts toward its restoration. Although he is responsible for marketing, we had a wide-ranging discussion about the diseases affecting the European and American trees, differences between the species, and soils and environment suitable for the species. Chestnut producers in Andalusia are watching with trepidation the approach of the gall wasp, which is making is way down into Spain from the north. Señor Cerban said that the gall wasp has cut production by as much as seventy percent in areas where it is now established. He then explained how the harvest is conducted and how and where the nuts are marketed. Finally, he gave us a tour of the facility and explained the function of each piece of equipment on the production line.

The harvest of various natural and agricultural products is the economic mainstay of the small villages in the region. People support themselves by working from harvest to harvest in the proper season. Those products consist chiefly of olives, almonds, cork, grapes, and chestnuts. Most of the chestnut forests around Pujerra are privately owned, and workers are hired by the landowners for the harvest. Some of the land contiguous with the cooperative facility is Andalusian public land, and open for harvest to the general population.

Not much is required to maintain the forest in a healthy and productive state. No fertilizers, pesticides, or herbicides are needed. There is only a little pruning, and after the harvest the ground is burned over to remove the burs, leaf litter, and whatever brush has grown up over the year.

Migrant workers from all over the region, and others from as far away as North Africa and Eastern Europe, come to work in the chestnut harvest, which begins around the first week of October. The workers go into the hills with whatever vehicles they have in order to bring out the chestnuts and, Señor Cerban said with a smile, they always use the oldest, most beat up vehicles for the harvest—never good ones. Donkeys are still used in the most difficult areas. The collected chestnuts, without the burs, are brought to the cooperative and put into large boxes, or movable bins about a meter on each side, that are used to temporarily store the nuts.

The chestnuts of Pujerra: healthy fruit of a healthy forest. Photo by Louis Acker

Señor Francisco Cerban, on the left, with the author touring "la cooperativa." Photo by Allie Funk

There are chiefly two problems that must be dealt with in processing: cracked shells and worms that will hatch out within the shell. The first step in treatment is hand culling on a conveyer belt to remove all nuts with cracked shells and other visible defects. The nuts are then put into a hot water bath, 48 degrees Celsius (about 140 degrees Fahrenheit) for 45 minutes, to kill the worms and eggs. The nuts then go into a cold water bath to cool them, and this affords the opportunity to remove all the "floaters" – good nuts will sink to the bottom. The nuts then pass through a dryer, a machine that sorts them by size, and one that polishes them with soft rotary brushes. They are packaged in 1 kilogram and 5 kilogram bags. Finally they are stored in a large refrigerated room that is maintained at a temperature just above freezing, where they await being shipped all over Europe in refrigerated trucks.

The region around Pujerra ships approximately 5,000 metric tons of chestnuts per year. Of that amount, the cooperative's share is about 1,200 tons. Chestnuts from Pujerra command a premium price that varies from about 1.20 to 1.40 Euros (US$1.60 to US$1.90) per kilogram. Señor Cerban mentioned Italy, Switzerland, France, the Netherlands, Germany, and other parts of Spain as destinations for Pujerra's chestnuts. In addition to the long tradition of roasted chestnuts sold on the streets in the fall, chestnuts are also popular in Spain during their autumn fiestas, including some that are dedicated to the chestnut itself.

The Legend of Wamba

Allie and I took leave of Señor Cerban with many expressions of thanks for his kindness. We passed through the little village and left it behind as we made our way back to Grazalema in the last hour of daylight. Memories of an emerald forest, giant chestnuts, and a king named Wamba from a tiny village were already becoming fixed in our minds.

The legend of Wamba is of special interest because it contains an allegory for American chestnut enthusiasts and our dream of restoring the giant to its proper place in our forests. The story goes that once upon a time the king of the Visigoths died without an heir. There was no one near the center of power who could take his place. So the wise men of the Visigoths searched far and wide for a man who was worthy to be the new king. Word reached them of a man named Wamba, who lived in a little village far to the south, whom all there held in high esteem.

The wise men of the court found the village near where Pujerra commands its forest. They approached Wamba and told him they would make him king. Wamba replied that he was just a simple man and not worthy of such an office; but the courtiers insisted that he was the man they wanted, for they had found no other man as good as he. Finally Wamba laughed, and holding out his wooden staff said, "When this staff sprouts new branches and leaves, then I will be a king." You can guess what happened next, for he did indeed become the king of the Visigoths.

Could it be that Wamba's staff that sprang to new life was of chestnut? We would like to think so, and that is not at all unlikely, if the legend is somehow true. And it is not too much to hope that new branches and leaves will sprout in our own land and in our own time as they did for Wamba in his faraway kingdom.

Wamba, king of the Visigoths. Photo by Louis Acker

REFERENCES

Lloyd, Nick. "IberiaNature: A guide to the environment, climate, wildlife, geography and nature of Spain." Last modified April 23, 2014. http://www.iberianature.com.

Robin, Cecile and Ursula Heiniger. 2001. "Chestnut Blight in Europe: Diversity of *Chryphonectria parasitica*, hypovirulence and control." Swiss Federal Institute for Forest Snow and Landscape Research 76 (3): 361-367.

Louis Acker is a retired geologist who, with his wife Allie, operates a Mother Tree orchard on their farm in the mountains of North Carolina.

The author, Louis Acker, stands at the entrance to Pujerra, Spain. Photo by Allie Funk

How Things Happen:
The Chestnut and a Chemist

By Dr. William Lord

Rufin Van Bossuyt is a founding member of the Massachusetts/Rhode Island Chapter of TACF, and also a member of the national board and its policy-making governance committee. He is often known as a problem solver. In evidence, he witnessed the daunting struggle when Chapter members first began pollinating the top branches of flowering chestnut trees. He contacted his former employer, a utility company. "With my connections, I was able to get bucket truck time paid for by the utility companies." This obvious benefit to life and limb was quickly adopted throughout the Foundation.

This January I received an email from Rufin. "Bill, last week Lois and Dennis Melican and I gave a talk at the annual meeting of the Laurel Hill Association in Stockbridge, Massachusetts. One of the association members, Patricia (Pat) Flinn, told us her father, Dr. Edwin S. Flinn (1906-2000), managed a tannin extract factory that used chestnut. Pat has a memory of the tannin industry. I told her you might be interested in talking to her."

I had some acquaintance with Stockbridge, an all-seasons resort town nestled in the Berkshire Mountains of western Massachusetts, and home of Norman Rockwell (1894-1978), America's beloved "people's artist," for the last 25 years of his life. The Laurel Hill Association, per Rufin, "is the oldest village improvement association in the US, founded in 1853. They own Laurel Hill and other lands in Stockbridge. The MA/RI Chapter currently has a breeding orchard on their property."

This was nourishing material to feed my interest in compiling chestnut history and I dialed Pat's phone number as provided by Rufin. Pat answered the phone and I was immediately aware of a daughter's pride in the accomplishments of her father. "Dad graduated with a degree in chemical engineering at Northeastern University in 1928 and began his industrial experience as a chemist at the A.C. Lawrence Leather Company in Massachusetts. His research on tannin compounds produced improvements that saved the company $10,000 (a considerable sum in those days). This brought an offer from Rohm & Haas, a prominent tannin compound manufacturer in Philadelphia, that dad was happy to accept. The company financed his masters (1935) and doctorate (1937) degrees in organic chemistry at Penn State. He then served the company as a research chemist and assistant manager in leather chemicals until 1945."

Ed Flinn at the labs at Penn State, while he was a student from 1933-1937. Photo courtesy of Patricia Flinn

I was busy taking notes but was soon aware that this story merited much more detail than I could obtain over the phone. "Do you have any published articles or photos about the chestnut tannin industry and your dad's involvement?" Pat's answer was a reassuring, "I'll do my best to see what I can dig up."

Very promptly I received three emails each with an attachment that contained nuggets of pertinent data. Dr. Flinn was involved in the use of blight-killed chestnut for tannin. In 1945, he joined the paper manufacturer, Mead Corporation, for a 23-year career as manager of the tannin extract division in Lynchburg, VA, 1945-1953. He knew, beforehand, that the division would have a limited life span, but it was quite a ride while it lasted. The reason, of course, was that by 1945 the blight had killed most of the chestnut population.

From colonial times through the 19th century the ground bark of chestnut, oak, and hemlock provided the tannin to replace much of the water content of raw hides, converting it to leather. During this time tanning was a small-scale operation. Change in the industry came to

Ghost forests of American chestnuts dead from blight in Virginia. Photo courtesy of Shenandoah National Park

America around the 1900s, with the use of a method developed in France that extracted tannin from the European chestnut and utilized the entire tree. The efficiency of this process led to the production of tannin on a much increased scale by new and large extract plants, phasing out the "one horse" tanneries. The new enterprises were all located in southeastern states, primarily in Virginia, North Carolina, and Tennessee, all states with a high density of chestnut. Studies by the US Department of Agriculture during the 1920s determined that blight-killed chestnut provided high-grade tannin, enabling the extract industry to survive into the 1950s.

In 1929 the Mead Corporation purchased a tannin extract plant in Lynchburg, Virginia, begun in the late 1800s, which produced tannin primarily from chestnut. In the Southeast, some of these plants supplied tannin to firms that produced leather, some leather manufacturers produced their own tannin, and some companies used the chestnut, first leaching tannin from wood chips, and then using the leached chips to produce paper. The latter use was applied by Dr. Flinn's employer, the Mead Corporation.

One of the nuggets of information provided by Pat Flinn is an article, titled "Blighted Chestnut Gives Tannin," in the December 11, 1949, *Richmond Times Dispatch Magazine*, by Charles McDowell, Jr. Photos show the stark tragedy of the "ghost forest," where crews hewed the wood into billets and transported it by rail to the plant where it was shredded into chips from which tannin was leached and concentrated into either a liquor or a powder for sale to tanneries.

The initial planning for this process is vividly described by McDowell: "Extracting companies like Mead Corporation in Lynchburg 'prospect' for chestnut groves in airplanes, then send agents to scout the lay of the land and examine roads and hauling conditions. But each year the company's agents must look farther and overcome more difficulties if the flow of chestnut logs to the extracting mill is to be maintained." Ironically, "the stark skeletons . . . are worth more dead than they

In this photograph from the December 11, 1949, *Richmond Times Dispatch Magazine*, a tank car of tanning fluids leaves Mead Corporation's Lynchburg plant for the tannery.

These leather hides were tanned with tannin extracted from dead chestnut trees in Virginia. Published in the *Richmond Times Dispatch Magazine*, December 11, 1949.

were alive. Extract mills are paying three times more for chestnut now than they did before the blight swept the ranges of Virginia. The price rise is due, of course, to the growing scarcity of chestnut and to the increasing difficulty of bringing it out of the woods."

The demise of chestnut tannin is chronicled in another of the information nuggets provided by Pat, "The American Chestnut Extract Industry Comes to an End," as described in the December 17, 1955, edition of the trade journal, *Leather and Shoes*:

> John Teas, president of Teas Extract Company, Inc., Nashville, Tenn., has announced that the company will stop all operations and liquidate Dec. 31. In making the announcement, Teas said, "Time marches on, and it has caught up with us." . . . The closing of the Teas plant follows closely to that of the Mead Corp's five chestnut extract plants. The Mead Company, during the past two years, has been slowly converting the making of paperboard from chestnut to mixed woods such as oak and maple. The latter have good fiber but no tannin. The quality of chestnut has been deteriorating continually until now it is doty [timber affected by incipient or partial decay] and cannot be used anymore in the production of paperboard. As the mixed woods do not contain tannin contents, the Mead chestnut plants were gradually closed and as soon as the inventory of chestnut extract is sold Mead will be out of the chestnut extract business.

The same article pays special homage to Dr. Flinn and his successful years utilizing blight-killed chestnut. "Dr. E. S. Flinn, who was former head of the Tannin Extract division of Mead, is assistant director of research at Mead Papers Inc. at Chillicothe, Ohio. He has been converting his efforts to paper research during the past one and one half years. Dr. Flinn is president of the American Leather Chemists Association."

Dr. William "Bill" Lord, a retired veterinarian, is a naturalist and author who spends much of his time in libraries, researching material with a focus on chestnuts.

RECIPE

Chestnut Polenta Drop Biscuits

By Phillip A. Rutter,
Badgersett Research Corp

Photo courtesy of Phillip A. Rutter

Ingredients

4 cups unbleached flour

1/2 cup chestnut polenta

2 tablespoons baking powder

2 teaspoons salt

1 1/3 cups milk (or substitute 1-2 eggs for part of milk; add milk to make 1 1/3 cups total)

2/3 cup oil (I use peanut oil)

Founding TACF President Phil Rutter has shared with the Foundation a collection of great recipes using chestnut polenta. We decided to publish his Drop Biscuit recipe just in time to eat with summer fruit preserves. If you need help getting your hands on some chestnut polenta, no worries! Phil has also published a great instructional video on cooking, preparing, and storing chestnut polenta. Check it out on YouTube at: http://youtu.be/P9P5UNWQRmo

Directions

Beat ingredients together. The result should be a bread-like dough that can be kneaded a few times to finish mixing the ingredients. I like a batter that leaves the mixing bowl nearly clean at the end of the process. Form into "drops" - this usually gives me 5-6 rows of biscuits, 3 biscuits per row, on one cookie sheet. I usually form the biscuits by hand, not spoon.

Put biscuits in a pre-heated 400°F oven and immediately turn the heat down to 350°F. Keep an eye on the browning, as the chestnut polenta browns at a lower temperature than wheat flour.

Note: I often add any kind of savory ingredient that I have on hand: garlic, rosemary, cheese, etc. However, I also like these biscuits entirely plain. They are very "whole-grainy," and very satisfying hot out of the oven (or reheated) with a dab of butter.

Chestnut Moments

On Granddad's Lap
By Ralph S. Coleman

When I sit
on Granddad's lap,
I see Model-T Fords
crawling down dirt roads,
old men playing
checkers
and sipping Nehi
in country stores,
neighbors talking
at white-washed fences,
and I see
passenger pigeons
resting in the shade
of American chestnut trees

Originally published in *The Journal of The American Chestnut Foundation* Volume XI, Number 1, Summer 1997.

The successes of The American Chestnut Foundation will be seen and appreciated by our children and our children's children. Here, two-year-old Sagan Somma is being attacked by a "tickle monster"—a wild American chestnut on the top of Virginia's Pearis Mountain. Photo by Vicky Somma


APPALACHIAN
ANTIQUE HARDWOODS, LLC
WE'RE MAKING HISTORY... AGAIN
WWW.AAHARDWOODS.COM
877.817.7758
RECLAIMED WORMY CHESTNUT
AND OTHER FINE RECLAIMED WOODS