The West Virginia Chapter
of
The American Chestnut Foundation

NEWSLETTER

In the heart of American chestnut's natural range

February 2020

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New Logo

The year 2020 marks the third year for the WV-TACF newsletter. When I started the newsletter in 2017, I took the easy road and "borrowed" a masthead from a word processing program, Word. I inserted the historic photo taken in the late 1880s of loggers standing beneath massive American chestnut trees in the Smoky Mountains in western NC. That masthead served our newsletter well, but it did not represent the State of West Virginia. Thus, it was time for a change and the new masthead was developed with input from TACF's communications director, Jules Smith. As we move forward into a new decade, let's hope the new logo will be a harbinger of chestnut restoration success stories. -Ed.

Update List of Chestnut Sites

After the January 2020 newsletter that listed the location of sites of backcross chestnut trees in WV, five more sites were added. These previously undocumented sites bring the total number of sites in WV to 55. Thanks to Hardy Mason, Joe Golden and Robert Sypolt who informed the editor of sites in Jefferson, Summers and Preston Counties, respectively.

Grant for Transgenic Research at SUNY-ESF

Dr. Lewis Cook, WV-TACF member from Fayette County, provided an opinion of transgenic chestnut trees in the January 2020 newsletter. Biotechnology is one of the three foci of TACF (breeding, biocontrol and biotechnology). The brunt of the biotechnology work being conducted with chestnut is at the **State University of New York, College of Environmental Science and Forestry (SUNY-ESF)**. The following article by **Claire Brennan Dunn** details a major gift to advance the work of transgenic chestnuts.

SUNY-ESF received its largest-ever charitable gift, $3.2 million, to support one of the College's most impactful research projects - the restoration of the American chestnut tree. The gift from the Templeton World Charity Foundation, Inc., will support a full three years of research and restoration work.

"This is truly a transformational gift," said Dana Piwinski, senior director of major gifts in the ESF Office of Development. "It means that at this critical stage, with the project undergoing federal review, the researchers know they have the support they need to continue work with a full staff."

Dr. William Powell, who heads the SUNY-ESF American Chestnut Research and Restoration Project, said, "The Templeton support will allow us to 'kick-start' the restoration of the magnificent American chestnut tree and help improve the health of the forest from which they were lost."

The Templeton World Charity funds scientific breakthroughs and development of practical tools relating to the search for meaning, purpose and truth. The charity describes itself as serving as "a global philanthropic catalyst for discoveries relating to Big Questions of life and the universe, in areas of science, theology, philosophy, and human society."

The gift will support numerous aspects of the project, including completion of regulatory review; establishment of production orchards for public distribution of

the blight-tolerant trees; production of transgenic trees for use in larger-scale forest restoration; establishment of small educational plantings at botanical gardens, arboretums, parks, historical sites and other public venues; the planting of a demonstration/research restoration forest focused on public education and outreach; development of ecosystem and agricultural restoration protocols; and, finally, the start of distribution to the public.

Earlier in 2019, the research team submitted to federal agencies a 286-page petition that lays out the case for why officials should grant regulatory approval for public distribution of genetically engineered, blight-tolerant American chestnut trees that were developed at ESF. Powell said he expects the petition to be accepted for full review this winter. The request must be approved by the U.S. Food and Drug Administration, Environmental Protection Agency and U.S. Department of Agriculture. Because the chestnut's range extends into part of southern Canada, approval will also be sought from the Canadian Food Inspection Agency.

Although genetic engineering has been approved in use for agricultural crops, this is the first-time scientists have sought approval to use the technique to restore a native tree species.

The SUNY-ESF team has developed new strains of American chestnut that can withstand the invasive blight that killed billions of the economically and culturally important trees in the early 20th century. The scientists added a single gene from wheat to the tree's genome; the additional gene allows the tree to detoxify the oxalic acid produced by the invasive fungus. Lab tests show that subsequent generations of trees are also blight resistant and produce gluten-free chestnuts. Research shows the genetically engineered trees are not significantly different from wild-type American chestnut trees regarding their effect on insects and wood frog tadpoles that feed on leaves, leaf decomposition, seed bank germination in leaf litter or beneficial mycorrhizal fungi colonization of roots.

For the last several years, the chestnut project at ESF has been supported primarily by philanthropic funds.

Claire Brennan Dunn is a contributing science writer in the Syracuse area.

Ambrosia Beetles

Those of you with larger chestnut trees (2" diameter and larger) need to be on the lookout for "toothpicks" on your trees this spring (April) as seen in the photo below.

Ambrosia beetle toothpicks on chestnut.

The toothpicks are tubes of frass (insect waste) and wood that result from boring insects, namely bark beetles. The toothpicks can protrude up to 1.5" from the stem. The strands are fragile and are easily broken off by wind or rain leaving only pencil-lead sized holes. There are number of different species of bark beetles, but they are all generally dark brown-to-reddish in color and they are not visible unless the tree is cut open to expose the beetles.

Bark beetles are only 2-3 mm long.

The bark beetles are attracted to weakened trees via chemical signals. A tree can withstand a few bark beetles; however, when a tree is infested, there are generally hundreds of bark beetles on one stem. The beetles bore into the heartwood to lay eggs and their boring is quite destructive. One tell-tale sign of bark beetle activity is "little-leaf syndrome" in the early spring. Uninfested trees will have normal-size leaves while infested trees produce much smaller leaves.

The middle tree (arrow) is infested with bark beetles and its leaves are much smaller compared to the other trees in the row.

Beetles remain active through the summer and into the fall. Nursery

stock is attacked primarily in spring during the first generation, but landscape trees may be attacked all summer. Females bore into twigs, branches, or small trunks of susceptible hosts. They excavate tunnels in the wood, introduce ambrosia fungi, and lay eggs to produce a brood. It is the growing fungus on which the beetle grubs feed, not the wood.

Bark beetles can often be baited with ethanol. An article from the Agriculture Research Service was published in January 2020 and is reprinted below.

Scientists Bolt Down Defenses Against Ambrosia Beetles

by Jan Suszkiw, USDA Agriculture Research Service

Exotic ambrosia beetles are costly pests of ornamental and fruit trees nationwide—from front-yard plantings of Japanese maple and oak to commercially grown orchards of cherry, peach, plum and even avocado.

Now, however, Agricultural Research Service (ARS) scientists may have found a way to turn the tables on the beetles. Unchecked, the two-to three-millimeter long pests tunnel into the sapwood of host trees and expose them to symbiotic fungi that obstruct the flow of nutrients. The researchers' tactic exploits a key weakness of ambrosia beetles—namely, their attraction to ethanol emitted by stressed, injured or dying trees and a reliance on the alcohol to "farm" gardens of the fungi as food without interference from other competing microbes.

Trees severely infested by the beetle-fungus duo cannot be saved, so careful monitoring and preemptive measures must be taken beforehand. These include deploying ethanol-baited traps to monitor the beetles' flight and timing insecticide treatments to deter them from boring into the trees on which they land.

However, the traps also tend to capture non-target beetle species, obscuring accurate counts and monitoring. Entomologists in Wooster, Ohio, tried a different approach. Instead of the standard bottle traps, they used ethanol-infused bolts cut from the stems of young host trees—red maple, American elm, sassafras and dogwood among them.

In nursery trials, the researchers hung both the traps and bolts (with and without ethanol) about 1.6 feet off the ground using steel rods and compared the number and types of ambrosia and other beetle species that visited them.

Among results reported in the November 2019 issue of the *Journal of Economic Entomology*:

- The bolts worked as well as the traps but with the added benefit of attracting fewer non-target beetle species.
- *Xylosandrus germanus*, an exotic species known as the black stem borer, generally preferred the bolts over the traps and was the most common ambrosia species captured.
- TBolts cut from red maple tended to be most attractive to the pests—especially *X. crassiusculus*, another exotic species known as the granulate ambrosia beetle.
- Bolts began to lose their attractiveness after seven days. By 14 days, few if any beetles could be found in them.
- Drilling a hole down the middle of the bolts and filling them with ethanol—a variation to infusing them—also worked.

The researchers will further investigate this "drill and fill" variation to extend the bolts' use for monitoring purposes as well as to facilitate screening of different insecticide treatments.

Such screening currently involves injecting trees with ethanol to lure the beetles so that the insecticides' effectiveness against them can be evaluated. However, using the bolts may help reduce some of the time, labor and expense that's involved, according to the researchers.

Using Science to Save the American Chestnut Tree

The following article helps explain the restoration efforts being conducted by TACF. All the efforts explained in the following article have been outline in previous WV-TACF newsletters, but the concise article gives a thorough explanation of each approach.

From Science Strategies, TACF's website

During the past 100 years, chestnut blight and ink rot disease decimated an estimated four billion American chestnut trees and brought the iconic species to the edge of extinction. Human interference triggered the American chestnut's demise–and now scientific innovation offers us the best chance to save it.

The American chestnut tree was a vital component of the eastern U.S. ecosystem, economy and landscape. Before the blight, it was an important food source for a wide variety of wildlife and a valuable cash crop for rural communities from Maine to Alabama. But as reliable and productive as the American chestnut tree was, it cannot recover fast enough to sustain itself in the wild. That is why The American Chestnut Foundation (TACF) is leading an unprecedented rescue mission.

Our species-saving strategy is a powerful combination of traditional breeding, biotechnology and biocontrol. Since our founding in 1983, the field of genomics and biotechnology has burgeoned in scope and affordability. Based on new insights into the complex inheritance of blight tolerance, TACF is charting a new course for our restoration program. We continue to improve the disease tolerance in our traditional breeding program, while embracing innovations which can integrate the mechanisms of disease tolerance at the molecular level. Our approach follows multiple pathways to create a disease tolerant and genetically diverse population of American chestnut that will be adaptable to broad and changing climate. We call it ***3BUR.***

3BUR: Breeding, Biotechnology and Biocontrol United for Restoration

B1—Breeding. Our traditional breeding program is carried out at our research farm in Meadowview, VA, and at more than 500 orchards planted largely by volunteers and partners across sixteen TACF chapters throughout the American chestnut's native range. During the past 36 years, offspring from two blight-tolerant hybrids have been bred with American chestnuts from across the species range. Three generations later, our traditional breeding program has produced a genetically diverse population of American chestnut hybrids with improved blight tolerance. Moving forward, our breeding efforts are focused on further improving blight tolerance and incorporating resistance to *Phytophthora cinnamomi*, which causes a fatal root rot in chestnuts. We are using genomics to increase the speed and accuracy of selecting trees with the greatest tolerance to chestnut blight and root rot.

B2 –Biotechnology. At the core of our biotechnology program is transgenics, the science of introducing genetic material across species in order to safely create desired traits. Scientists at the State University of New York, College of Environmental Science and Forestry (SUNY-ESF) have discovered a gene from wheat that produces an enzyme that enhances blight tolerance significantly. Incorporating transgenics into TACF's breeding program allows us to stack multiple blight resistance genes and increase the proportion of American chestnut genes in the resulting progeny. The SUNY-ESF research is so promising, that we believe TACF can obtain the governmental approval required from the USDA, FDA, and the EPA to plant transgenic American chestnut trees in the wild in three to five years.

B3 –Biocontrol. The primary biological control method being explored by TACF and its partners is called hypovirulence. This is the term used for the infection of the chestnut blight fungus by a virus, thereby sickening the fungus and reducing the ability of chestnut blight fungus to cause lethal infections. Using this method, the natural defenses of the chestnut tree may enable the tree to halt canker growth. These methods can keep blight-susceptible American chestnut trees alive and healthy so that they can be used in our transgenic and traditional breeding programs. Other fungi and bacteria are being investigated which may play additional roles in reducing the effect of the chestnut blight fungus on American chestnut trees.

The American chestnut is an historic and beloved part of America's landscape. Its extinction would be the loss of a symbol of American strength, endurance and resourcefulness. Saving the chestnut and restoring it to its native range at scale could

also help give other endangered tree species a new lease on life and directly offset the effects of climate change and deforestation. While no single intervention can completely eradicate chestnut blight, together the science of breeding, biotechnology, and biocontrol (3BUR) offer our best hope for rescuing the American chestnut tree.

The Value of Tree Shelters

Written by Charles "Rick" Sypolt, Professor Emeritus, Glenville State College

In past articles in this newsletter, there has been discussion of using tree shelters to regenerate stands of hardwoods. Many people have complained that they make stems spindly and unable to stand erect once the shelter is removed. They are mostly right concerning this problem and other issues with tree shelters. But with care, tree shelters can be used to regenerate hardwoods, including chestnut.

Before planting, I cut landscaping cloth into 1-foot squares and split them to the center for placement beneath the shelters. These are very necessary so that no other vegetation grows inside of the shelters. In March of 2011, students and I planted 1300 sawtooth oak from Arkansas and 100 chestnuts from the West Virginia nursery on the two sites with about 430 seedlings per acre, which equates to about a 10-foot by 10-foot spacing. Planting early allows for better root-to-soil adhesion and the ground is softer for the use of planting bars. This was a cost-sharing endeavor with the Natural Resource Conservation Service and their WHIP (Wildlife Habitat Improvement Program) program. I am not an advocate of spending tax dollars on non-threatened wildlife, but like many farms, mine had grown up into pole size timber which is almost a desert for wildlife. The two sites were old fields which had grown up sparsely with low quality hardwoods and were cleared the previous winter. **(Do not wait a year to plant!!)**

Tree shelters at the Sypolt planting.

The trees were root pruned and planted with a planting bar (dibble), the electric conduit pipes (stakes) were pounded into the ground, and the shelters were affixed using two zip ties. **Do not use wooden stakes as they rot at ground level and cause the shelter to fall**. We had good tree survival and over the next few years, we had a stiltgrass plantation. Slowly the oaks and chestnuts grew with the herbaceous and woody vegetation and the stiltgrass disappeared. I have no idea where all the blackberry species came from, but it choked out a lot of the other species and helped the rabbit, turkey, deer and songbird populations.

I quickly realized that if I left the seedlings get 5-foot tall and come out of the shelters, they were too spindly to stand on their own, so I starting tying them to the stakes for support and in some cases, snipping about 6-inches of the top off so that they would put on more diameter growth. Then I started taking the shelters off when the plants were 4-foot tall and tying them to the stakes. If the trees get above deer browse level, they are safe except for the rubbing of the bucks. The stakes discourage rubbing, so I left them by the stems even after I removed the strings. The strings should allow the plants to move and build up more diameter growth and eventually stand on their own.

Tree staked following shelter removal.

I still go through the stand and cut competing trees or vines, but the trees are close to closing their crowns and shading out the competition. I expect in the next few years that the briars and other lesser vegetation will disappear, and the oaks and chestnuts will fully occupy the site and start bearing seed. Yes, it does take a lot of care to establish a hardwood stand, and no, you cannot expect good results if you stick a seedling in the ground and

walk away forever. There are too many competing plants and animals that will cause it to fail.

Start of canopy closure.

The good news is that the landscaping material, shelter, and stakes can be used again and again. If the planting is done right with shelters, it can be successful.

Rick Sypolt is leading a tour of his own farm prior to the WV-TACF spring meeting (April 4) at Glenville State College prior to the spring WV-TACF meeting. The pre-meeting tour will begin at 10:00 am at the **Alice and Rick Sypolt farm**, where Rick will lead a tour of an oak/chestnut site that was planted using tree shelters in the spring of 2011. Directions: at the red-light intersection (Routes 5/33) in downtown Glenville (at the McDonalds restaurant), turn left on Route 5 and travel 3.88 miles toward Grantsville. The number 3888 is on the mailbox as well as a sign for Old Place Farm (on right-side of road). If you pass a park on the left, you have gone too far. Meet at the house and travel up the driveway to the top of the hill to the planting. If anyone is late, come up and join the group. Lunch will be on your own at the local diners prior to the 1:00 pm meeting at the Waco Center.

Updates on WV orchards

With 55 sites in WV that are planted to chestnut, it is good to inform WV members of the status of some of our orchards. This edition highlights two Preston County orchards.

Waddell Orchard at Preston High School, written by Robert Sypolt

I will start with the bad news that Phytophthora Root Rot (PRR) killed ten trees in August. We had a very wet June that may have contributed to the problem. **Agri-Fos** fungicide was applied to all trees in an effort to control the spread of PRR. Two of the dead trees had burs on them.

Robert Sypolt in the Waddell Orchard.

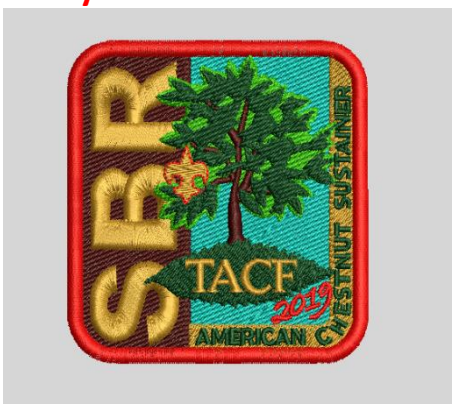
The good news is that four trees produced chestnuts. One tree produced 31 chestnuts while 3 other trees produce 17 chestnuts for a total of 48 chestnuts. One of those four trees was a tree from a Minnesota nursery that Mark Double treated for chestnut blight in 2018 and it produce 6 burs with total of 12 chestnuts. As of now, no other tree are showing signs of chestnut blight. The trees had good growth and several had bloom but did not produce burs. We planted 4 B3 trees with 3 still alive and doing well. We planted native seedlings from Hardy County, native tree sprout from the Wotring Farm and one from TACF. We planted three native American trees from North Carolina and Tennessee. As of December, 2019, there are 110 trees in the orchard. No other trees in Preston County produced chestnuts, although one tree at McGrew house produced a bur.

Sandra Wales Orchard (Green Valley), data provided by Darrell Dean and Robert Sypolt

Trees in the Sandra Wales orchard.

The Sandra Wales orchard was planted in 2013 by Darrell Dean and Robert Sypolt. There are 31 living trees representing mixed species (Americans from WV and NY) and backcross trees from TACF. Only two trees have died and they have added 2-3 trees per year since 2013.

Boy Scout Patch for SBR



The above campaign patch was designed for scouts and non-scouts who volunteered to work sustaining the American chestnut at Summit Bechtel Reserve Boy Scout Camp in 2019. The patch was designed by WV-TACF

treasurer, **Sam Muncy.** Sam intends to create a new patch each year for anyone who participates that year at the SBR to sustain American chestnut. The next scout jamboree to be held at the SBR is 2021, so stayed tuned for forthcoming information.

Should You Have Your Soil Tested?

TACF states that soil is **THE** most important consideration when planting chestnuts. The ideal soil is well-drained and acidic (pH 4.5-6.5). Avoid heavy clay soils. If a soil is too wet, it's possible that you will have issues with *Phytophthora*, ink disease. Too dry or too shaded and chestnuts will not grow well. Uncontrolled weeds will choke out young seedlings. These are all important, but soil quality is extremely important.

As the editor of this newsletter and a long-time chestnut researcher at West Virginia University, and someone who has planted lots of chestnut trees, I thought I was experienced enough to start my own small chesntut orchard. In 2013, I planted about 40 trees of mixed parentage on a former pasture land on our farm in Marion County. Prior to 1990, the land was grazed by cattle, but the cattle were removed 30 years ago and the ground has been left to pasture grass. I dug deep holes, put down landscape cloth, added mycorrhizal fungi and sprayed periodically with glyphosate to kill weeds around each tree. I watered during droughts and fertilzed throughout the year. I thought the young seedlings would be well prepared to grow optimally. For those of you who read this newsletter last year, there was discussion about tree shelters and sunlight. Since most of my trees were in full sunlight, I expected good growth each season. After six years, many of the trees were spindly or had died. Only in 2019 did I have the soil tested. Much to my surprise, the pH of the soil was 4.5 (at the low end of chestnut's preference of 4.5-6.5).

Marion County chestnut planting. Some trees are above the 6' tree shelters but others are less than 2' tall after 4-5 years.

The effect of soil pH has a marked effect on the solubility of minerals or nutrients. Before a nutrient can be used by plants it must be dissolved in the soil solution. Most minerals and nutrients are more soluble or available in acid soils than in neutral or slightly alkaline soils.

Phosphorus is never readily soluble in the soil but is most available in soil with a pH range centered around 6.5. Extremely and strongly acid soils (pH 4.0-5.0) can have high concentrations of soluble aluminum, iron and manganese which may be toxic to the growth of some plants. A pH range of approximately 6-7 promotes the most-ready availability of plant nutrients. In addition to a low pH, my Marion County soil had no calcium and very little magnesium. Interestingly, the fertilizer that I used contained no calcium or magnesium. The recommendation from the **WVU Soil Testing Lab** was to use dolomitic limestone.

West Virginia University offers free soil analysis to WV residents. Your county extension agent can assist you in your effort to collect good soil samples and also to understand the results of analysis.

When to Sample

Soil samples taken in late summer and fall are better than those taken in winter through early spring because they come closer to representing the soil's nutrient status as it affects crops. Avoid taking samples when soil is wet or frozen because it will be difficult to handle and mix them. Do not take soil samples immediately after applying lime or fertilizer; wait several months or even longer if the weather is dry.

Send samples to a soil testing laboratory well before you need the recommendations. Allow about three weeks for the samples to be processed and the results to be sent to you.

Where to Sample

Adequately assess the nutrients that plant roots may encounter in soils, at least five to ten randomly selected soil borings should comprise the composite sample submitted to the laboratory. Five to eight borings will be enough for

small areas such as lawns and gardens. If a field is large, subdivide it into 10-acre sections and take at least 20 borings from each 10 acres (or about two to three borings per acre). In West Virginia, it is helpful to divide the field into distinct slope/soil classes and take borings within each class to make a sample. Different slope classes generally have different parent materials and different soils.

Exclude or take separate samples from areas not characteristic of the field, lawn or garden such as wet spots, eroded areas, bare spots, back furrows, field edges. When the field has several soil types or crop conditions, take separate borings for each soil type or slope class and send a separate sample for each. No single sample submitted to the laboratory should represent an area larger than 10 acres.

How to Sample

Using an auger, shovel or spade and a clean plastic pail or container, take small uniform cores or thin slices from the soil surface to the recommended depth (see the following paragraph). Gently crush the soil and mix it thoroughly, discarding any roots or stones. **Do not send wet soil, but air dry it** on a clean surface in a shady spot before mailing. Not only does wet soil cost more to mail, but your results also will be delayed because the laboratory must still air dry the sample. Do not heat the sample.

Send at least 1 cup (a handful) of soil to the laboratory in a plastic bag. Remember to include your name, address and email along with other information on the sheets provided by the laboratory https://extapps.wvu.edu/soiltesting/soil-test-submission-form.pdf.

How Deep to Sample

Sample the soil to the depth in which your crops are or will be growing.

Permanent pastures: Remove organic debris from the soil surface; sample the top 2 inches.

Hay fields: Remove organic debris from the soil surface; sample the top 4 to 6 inches.

Row crops: Sample the soil to the depth of tillage.

Reading the Results

The soil test analysis tells you if key soil elements are present in low, medium, high, or very high levels based on the land use (garden, pasture, etc.) The results also provide recommendations on what additives, if any, are needed to bring the soil nutrients to an optimum level.

The **WVU Soil Testing Lab** conducts tests free for West Virginia residents. Drop off soil and information sheets (1405 Ag. Sciences Building) or mail to:

Division of Plant & Soil Sciences
1405 Agricultural Sciences Building (Soil Testing Lab)
P.O. Box 6108
1194 Evansdale Drive
Morgantown, WV 26506-6108
Phone: 304-293-6023

Upcoming Chestnut Talks/Meetings

February 29, 2020 Morgan County Board of Education Office, 247 Harrison Avenue, Berkeley Springs, WV, 11:00 am (note new location)

March 26, 2020 Harrison County Master Gardeners, 43 Recreation Drive, Clarksburg, WV, 6:30 pm

April 4, 2020 Spring WV-TACF meeting, Waco Center, Glenville State College, Glenville, WV (Park behind Waco center on the left-side of the building. An open-door stairwell will lead to 2nd floor classroom), 1:00 pm

April 18, 2020 WV Extension's Master Gardener Annual Conference, Oglebay Resort and Conference Center, Wheeling, WV, 4:00 pm

May 13, 2020 Berkeley County, sponsored by Potomac Valley Audubon Society, (no venue yet), 7:00 pm

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