



The West Virginia Chapter of The American Chestnut Foundation NEWSLETTER



In the heart of American chestnut's natural range

July 2022

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WVU's Science Adventure School

On a hot, muggy day in late July, Mark Double met two members of WVU's Science Adventure School (SAS) at the WVU Agronomy Farm in Morgantown to talk about chestnut prior to SAS's programming that begins in August. The motto of SAS is: **Engage-Explore-Learn-Grow-Together**. The Science Adventure School is a 4-day, 3-night program offered at the beginning of a student's 6th grade year. Students will be asked to step out of their comfort zone, get to know new friends and find the scientist that lies within. The home for SAS is the world-class Summit Bechtel Reserve, 10,000 acres of wilderness, outdoor activity venues, and camping space. Students can experience archery, zip canopy tours, a rock climbing wall, wetlands as well as experience and learn about plants, insects and animals. Chestnut will be part of the curriculum and the WV chapter awarded the SAS with its first grant of \$1,000 to help 6th graders learn about chestnut.

Dr. Alice Morgan, Associate Director for programming and research and **Jessica Kaplan**, Environmental Education Coordinator met **Mark Double** to learn more about the chestnut story. The Agronomy Farm is located near the Morgantown airport and is home to six 150-tree plots of chestnut trees. Each plot contains 30 native American, 30 European, 30 Chinese and 60 backcross chestnut trees. Since both American and European chestnut are susceptible to the chestnut blight fungus, all of those trees have died. However, many of the dead/dying trees have sent up shoots that are thriving. This is a wonderful living laboratory where differences between American and Chinese chestnut can be viewed.



Jessica Kaplan (left) and Alice Morgan in a plot at WVU's Agronomy Farm.

WVU's Agronomy Farm

The Agronomy Farm is comprised of 190 acres (including 30 acres of woodland) and has implemented a detailed soil conservation plan that includes contour strips, diversion ditches and grass waterways. Some of the research activities include: forage crop genetics and breeding to improve yield and quality; mites affecting plants and honeybees; control of non-point source pollution from land application of waste; field crop variety testing; and sheep management. With the help of TACF's Meadowview crew, 900 chestnuts were planted in 2006. Six, 150-tree plots were established making a total of 900 trees. The plots were started with nuts not seedlings. After 16 years, some of the Chinese and backcross trees are nearly 50' tall.



One plot of chestnuts at the Agronomy Farm with trees in full bloom.

The purpose of the six plantings was to test the effectiveness of using hypovirulent isolates of the chestnut blight fungus to slow the progress of expansion of chestnut blight cankers. Hypovirulent isolates contain a virus that affects the growth, sporulation and pigmentation of the chestnut blight fungus. Successful deployment of the virus-infected fungus debilitates the fungus and allows the tree to use its own defense mechanisms to callus over the infection and allow the tree to continue to grow.



Dr. William MacDonald placed cages around newly planted nuts in 2006. Compare to the 2022 photo above that shows growth after 16 years.

The trees were allowed to grow until 2015 at which time the plots were divided into two treatment groups. Trees in three of the plots were untreated, and three were treated with hypovirulent isolates. Trees were examined periodically throughout the growing season and when cankers initially were detected, they were treated with hypovirulent isolates. Plugs of wood were removed from around the canker margin and hypovirulent isolates that had been mixed in a blender to the consistency of applesauce were introduced into the holes. After several years, data was compiled to see if any differences were evident.

Species/BC	Living Trees in Treated Plots	Living Trees in Non-Treated Plots
American	79%	57%
Chinese	94%	96%
European	64%	25%
B2F2	100%	60%
B2F3	86%	86%
B3F2	84%	73%

Treatment with hypovirulent isolates had an effect on some but not all of the trees. As expected, treatment of cankers on Chinese chestnut had no effect since Chinese chestnut contains the genes for resistance to the chestnut blight fungus. Treatment of American and European chestnut was highly effective, while the treatment of cankers on the backcross trees had mixed results.



Treatment of a canker on an American chestnut tree.

Seedling Versus Nut Planting

When planting chestnuts, the question is whether to plant nuts or seedlings. For several years, the WV chapter has raised seedlings in the WVU greenhouse in Morgantown. WV chapter members gather in mid-March to label pots and then plant chestnuts in 4" pots filled with potting mix. At the end of May or early June, seedlings are distributed around the state and planted. One disadvantage of planting seedlings is that they need to be watered weekly in the absence of rain events. If the seedlings are monitored closely and if it's not a problem getting water to the plants, seedlings can be a great way to start a tree. On the other hand, if seedlings are not watered regularly, the plants will be short-lived. Below is an example of a seedling that did not live more than a month before it died due to a lack of water.



Sara Fitzsimmons, TACF's Chief Conservation Officer (a new title) is an advocate of planting nuts rather than seedlings if no raccoons are present. Raccoons are notorious for digging up chestnuts, but Sara stated that most areas in WV do not have raccoon problems. Sara likes to plant nuts in early March as the snow is melting. A nut is then allowed to germinate in the ground and slowly produce roots and then a shoot. By summer when temperatures begin to reach the 90s, nut-started plants are less prone to water needs as the shoot developed more slowly compared to greenhouse-raised plants that have full leaves when planted. By March, many but not all chestnuts have a radical, a sure sign that a plant will develop. However, not all chestnuts will produce a radical by March. Thus, when planting nuts, the planter cannot be assured that a

seedling will develop in the absence of a visible radical. In the photo below, the nut on the far left does not have a radical, compared to the other four nuts that have visible radicals.



I have my own 50-tree orchard in Marion County and I check on the trees regularly as well as follow the weather. Quite often, I wait to water when the weather forecast calls for rain. Often times, projected storms do not materialize and no rain falls. This has led to a half dozen seedlings that died due to a lack of water. Thus, the WV chapter may have a change of procedure in 2023 and offer our members nuts rather than seedlings. While we will still have to raise seedlings in the greenhouse for sale at fairs and festivals, we may suggest nut planting for our members rather than seedlings.

Proposed Alderson Planting

Prior to his leaving TACF as our Mid-Atlantic Regional Science Coordinator, **Tom Saielli** had plans for a chestnut project at the Appalachian Plant Materials Center (APMC) in Alderson. The APMC is operated by the USDA Natural Resources Conservation Service (NRCS), in cooperation with the USDA-Agriculture Research Service, the U.S. Forest Service and the Agriculture Experiment Stations of West Virginia University, VPI, the University of Kentucky and the University of Tennessee.

After Tom's departure, the chestnut project was in doubt. However, **Sara Fitzsimmons**, TACF's Chief Conservation Officer, toured the Alderson facility in early July and met with several key members of the various agencies. The following is Sara's recap of the meeting.

Idea for Main Project

Initially, the main project would focus on planting a variety of pre-screened, disease-resistant American chestnuts which have been challenged with the chestnut

blight fungus and selected for best resistance. These trees would represent a range of locations covered by the APMC including VA, OH, IN, KY, TN, and GA.

Planting these trees across three sites at the APMC will allow us to investigate the performance of these trees in very different soil conditions. The three sites would include a site to the south of the building along Old Prison Farm Road and among two power lines, working to avoid a noticeable swale in the site a fenced site to the north of the building, near the railroad tracks a site to the east of Old Prison Farm Road on which several Chinese chestnuts are currently planted but which are recommended for removal for this project to proceed.

Benefits of Main Project

The primary benefit of this main project is to look at three sites which are marginal in suitability for American chestnut, to ascertain the limitations for American chestnut growth and reproduction. As disease-resistant American chestnuts are made available to the public, the first and most important factor in establishing a successful reintroduction and restoration planting will be proper site selection. The most suitable sites are those on the rocky ridge-tops with highly permeable soil, but chestnuts can grow in other types of soils. To date, no direct research has looked the performance of American chestnut trees in different types of soils, and research at the APMC could work to add to the knowledge base for recommendations for site selection to private landowners for American chestnut reintroduction.

A side-benefit to the project is that in 5-7 years, seed from those disease-resistant American chestnuts could be made available to nurseries for distribution to the public for those reintroduction plantings.

Resources Needed and Resources Available

Requested time for staff at APMC = mowing of the chestnut sites 1x per month while grass/competing vegetation is actively growing.

Required time for TACF and other local volunteers = monthly review of the site and reset of fencing and/or tree shelters; 2x per year herbicide application around the trees for control of vegetative competi-

tion.

Who will provide the supplies necessary? = will need funding for fencing and/or tree shelters, herbicide, other materials?

What is the possibility of: Enlisting the help of women from the prison to help with installation and follow-up maintenance of the planting? Enlisting the help of researchers at either Concord or Virginia Tech for measurements and data analysis? Enlisting the help of FFA leaders at Summers County for measurements and/or installation and maintenance of the planting and/or subsequent nut production from the site (harvest and growing of seed into seedlings for distribution).

Timing of planting

The earliest planting timeframe of spring 2023, with the possibility of extending the start date to spring of 2024 depending on the alignment of and MOU and other available resources, is the current plan of action.

Secondary projects

Other possible planting installations include underplanting of American chestnuts in forest management demonstration areas in the wooded areas at the APMC, as well as at the forest edge along Old Prison Farm Road. These plantings would require some resources for installation of the planting, and some limited follow-up care, but not as much as those required by the field plantings outlined in the Main Project above. These secondary planting projects do not yet have a defined timeline, but have potential for demonstrating proper methods for artificial regeneration of hardwoods.

Details have yet to be worked out. The workers at APMC may not be able to mow as needed, but the West Virginia Forestry Association may be able to provide assistance with planting and maintenance. Since this project is a year off, there is plenty of time to finalize plans.

Juergen Wildman Receives Award

WV chapter member, **Juergen Wildman**, was inducted into the West Virginia Agriculture and Forestry Hall of Fame on July 23, 2022 at Jackson's Mill.

Juergen has been a member of the WV chapter since 2017, the same year he retired from the WV Division of Forestry. While Juergen worked for three years in Kanawha

County in the Milton District Office, he worked the majority of his career in north-central West Virginia in Region 1 (Brooke, Ohio, Marshall, Wetzel, Monongalia, Marion, Harrison, Taylor, Barbour, Tucker and Preston). One of the most important services Juergen provided to landowners was the development of forest management plans. A forest management plan outlines a family's vision for their forest, describing current forest conditions, and outlines a plan of action to achieve management goals. The plan is not solely about trees, but it encompasses all resources on a property such as roads, water sources, and wildlife habitat. These forest management plans are very comprehensive and take months to complete. Many of these plans are 50-60 pages in length complete with topographic maps.



Juergen stands next to an 18-year-old chestnut tree that he planted in Marion County. The tree came from the Clements Nursery in Mason County. It has the form of an American chestnut, but it does have flagging in the crown, indicative of chestnut blight.

Over the course of his 31-year career, Juergen wrote 250-300 forest management plans for landowners in north-central West Virginia and conducted 40-50 timber sales. In addition to writing

logging prescriptions, Juergen helped landowners navigate the bid process for timber sales. This can be somewhat daunting for landowners sorting through bids from various loggers. Juergen also worked on behalf of landowners to make sure the loggers performed all tasks as detailed in the logging prescription, including road construction, stream remediation and culvert installation. Additionally, Juergen helped oversee timber sales on several state agricultural lands, including Coopers Rock.

Juergen, in conjunction with **Dr. David McGill**, West Virginia University Extension Service, conducted countless farm tours around the state. Each farm tour had a press release in local newspapers detailing the time and location of each event. For forest owners, such tours are invaluable. Often, seeing forest management practices in person are much more informative than reading about them. Juergen was a wonderful tour guide, detailing many features that he himself instituted on some properties. Invasive species are often difficult to identify (i.e. Japanese stilt grass from other grasses), and Juergen patiently described identifications of not only invasives but also native trees and shrubs. His plant knowledge is impressive. For each farm tour, Juergen put together a 25-page spiral-bound booklet for each member of the tour. The guide outlined not only the stops along the tour, complete with detailed descriptions and colored photographs, but also Farm Bill notes, information about the WV Forest Land Enhancement Program, a current timber market report on stumpage values as well as a Water Quality and Logging Sediment Control Act information sheet.

Juergen is currently a consulting forester. He lives in Morgantown with his wife, Meghan.

Summer Presentations

A few chestnut presentations have been made this summer by members of the WV chapter. On June 20, **Dr. Lewis Cook**, retired physician, gave a chestnut talk to 20 people at the Fayette Study Club in Fayetteville. The state meeting of the WV Master Naturalists was held at Chief Logan State Park July 8-10. The meeting consisted of 3-hour workshops that included a wide variety of topics from pollinators to algae blooms to mushroom forays. **Sam Muncy** and **Mark Double** provided a workshop on chestnut. Sam talked about his work at the Summit Bechtel Reserve and gave a video presentation detailing five generations of his family and their interaction with American chestnut. Mark provided information on the history of chestnut, chestnut blight and efforts toward restoration.

Several members of the WV chapter are willing to speak to civic organizations if needed. In addition to **Lewis Cook (Fayetteville)** and **Sam Muncy (Philippi)**, **Rick Sypolt (Glennville)** and **Bernie Coyle (Keyser)** have volunteered their services to talk to garden or Rotary clubs, etc. If you would like to arrange for one of our chapter members to speak at a meeting in your area, send an email to: **WVchestnut@acf.org** and a meeting can be set up for your audience. We love to spread the word about the work of the WV chapter and TACF.

Controlled Pollination: A Workshop in Kingwood

The following article and photos by Dr. Darrell Dean.



Sam Muncy talks to a group about chestnut at Chief Logan State Park.

Status of State Record American Chestnut

The state champion American chestnut is located in northern Randolph County. The tree was originally surrounded by a grove of Eastern Hemlock and went unnoticed for years. When hemlock wooly adelgid attacked and killed all the hemlock trees, the chestnut appeared in their midst. It appears that the hemlock trees acted as a shield for the chestnut as it was blight-free when the hemlocks were removed. Now in 2022, the crown is showing symptoms of chestnut blight. The following photo was taken by **Richard Wernicke**, WV chapter member and the Randolph County forester for the WV Division of Forestry. Richard plans to take pollen from trees in the Waddell orchard in Kingwood to hopefully pollinate this tree and obtain nuts so we can conserve the germplasm. Cuttings will be taken this winter for grafting and/or tissue culture.



Flagging in the crown of the state record tree. *Photo by R. Wernicke.*

A “dark and cloudy day” on July 9, 2022 did not curb the enthusiasm of the 12 participants at a workshop to learn about “matchmaking” among the planted chestnuts in the Waddell Orchard on the campus of Preston High School in Kingwood, WV. The event was arranged by **Robert Sypolt** and sponsored by the WV Chapter of TACF. The pollination procedure was taught by **Dr. Don Kines**, a dentist from Davis, WV. Dr. Kines, who recently served as vice president of the WV Chapter, is a highly experienced chestnut enthusiast and has practiced growing and breeding chestnuts for about 30 years. A visit to his webpage, <https://www.mountainstatechestnuts.com/home> will prove to be quite interesting.

American chestnuts rarely, if ever, self-pollinate. Of course, many chestnut trees in an orchard will cross pollinate one another. There are instances when controlling the pollination between certain trees is desirable. For example, in mixed provenance plantings, one might want to produce seeds or nuts from pure American chestnut trees. The production of chestnut hybrids with certain desirable traits is also an instance when controlled pollination is desirable. The time will come when pollen from the blight resistant, genetically modified tree from New York (see page 8) will be used to pollinate native American chestnuts. Consequently, learning about pollination now will have some benefit in the future.

The pollination workshop was about controlled pollination. Controlled pollination in the Waddell Orchard started by the bagging of selected female flowers on June 28, 2022. Dr. Kines explained that the bagging is initiated when the male catkins, those stringy looking white- or cream-colored flowers which we associate with chestnut.

A twig with bisexual catkins, is selected. The female flower thereon is found at the base of the bisexual catkin and is sometimes described as looking like a pineapple which becomes the chestnut bur that we are familiar with. The male catkins are clipped from the twig as are most of the leaves. Dr. Kines will leave a small leaf on the twig to aid in translocation of nutrients to the twig and flower.

The twig is stripped of male catkins and leaves back to a length so that a brown paper bag can be slipped over the twig and secured at the top with a double wrapped cord or string. Dr. Kines prefers to use brown paper lunch bags in the bagging procedure. The timing when bagging takes place depends on locality. In general, the chestnut flowers appear at lower elevations first, then later at higher elevations.

About two weeks after the first bagging, the pollination may begin. During the workshop, Robert Sybolt, with help from **Bill Guthrie**, accessed a bag high on a tree using a step ladder. The bag is removed from the twig. If the female flower is ready to be pollinated, the stigma, the flower part which will accept the pollen, will appear white and will radiate out from the top of the small bur. In fact, several radiating stigmas will be present. Once the target flower stigmas are exposed and ready for pollination, a mature male catkin from another selected tree is rubbed across the stigmas, a few times, to transfer the pollen to the stigmas of the accepting flower. This potentially pollinates the target flower.

The pollination process is completed by returning the paper bag and securing it with a string or cord as before. Additionally, a label identifying the tree from which the pollen originated is attached to the twig. The pollination date is also included on the label. For the label, Dr. Kines prefers the type of metal tag which when written on with a ball point pen, embosses the information on the tag. He says that the information does not fade with time as do labels created with permanent ink markers. The bags should remain in place on the tree until time to harvest the chestnuts inside, maybe 3 for each bur pollinated.

In summary, controlled pollination is a 2-step procedure. First, before the male catkins of the chestnut flower begins producing pollen, a twig with a bisexual flower is chosen for pollination. The female flower looks like a pineapple and will be found at the base of a male catkin. All male catkins and all leaves, except perhaps a small leaf, are removed from the twig, leaving only the female flower. The male catkins and leaves are removed back a sufficient distance to allow placing a bag over the twig and female flower. The bag

will prevent pollen from nearby chestnut trees from pollinating the enclosed female flower. Second, about 2 weeks later, the stigmas of the female flower will be ready to accept pollen. The bag is removed and a mature male catkin from another chestnut tree is rubbed over the mature stigmas to complete the pollination. The bag is replaced and should remain in place until time to harvest, if the pollination was successful, 3 chestnuts will be produced in each bur. The following photos depict some of the workshop highlights.



Dr. Don Kines led the workshop.



Female flower were pollinated with a male catkin.



Female flowers were bagged after pollination.



Robert Sybolt bags flowers with the help of Bill Guthrie.

The 'DarWin' American Chestnut: A New Line of Transgenic Blight Tolerant Trees

by John Neumann, NY-TACF Secretary and Vice President for Education

The following article was taken from the Spring 2022 edition of *The Bur*, the New York State Chapter of The American Chestnut Foundation.

'DarWin' is the newest line of transgenic blight-tolerant American chestnut trees since 2015, when Darling 58, the world's first proven line of transgenic

blight tolerant trees, was announced. The Darling 58 trees have a version of the oxalate oxidase gene (OxO) that is enhanced all the time. The 'DarWin' trees, on the other hand, have a version of OxO that is reduced most of the time but activates when blight infections occur. This is accomplished using a genetic regulatory element from poplar called the "win" promoter. (The "Win" part of the 'DarWin' name comes from this "Wound inducible" promoter.) One motivation for developing this new line of trees is to save the tree energy, since it only produces oxalate oxidase when wounded. Not only does this give the tree a better chance to survive, but it now has the tools to efficiently compete with other tree species and reclaim its territory.

Another science breakthrough: The new 'DarWin' line of transgenic blight-tolerant American chestnut is another scientific breakthrough and significant achievement by the State University of New York, College of Environmental Sciences and Forestry (SUNY-ESF) American Chestnut Research and Restoration Project. Our NY Chapter is grateful for these achievements and our partnership with the ESF team since our mutual beginning in 1990.

What's in a name? ESF's American Chestnut Project came up with a most fitting name for this new line of transgenic trees. While the tree is pronounced Darwin, as in Charles Darwin, the father of evolutionary science, it is written as 'DarWin' to show it is basically the Darling 1

tree (Dar) with the Wound-inducible promoter (Win). It has the Ellis2 American chestnut background, like the Darling trees. Referring to the name Darwin also alludes to the idea that these blight-tolerant American chestnut trees are evolving one step at a time.

Developing the 'DarWin':

Like the original Darling 58, the 'DarWin' was developed by the ESF American Chestnut Project through cutting-edge biotechnology. The original win-OxO vector was constructed by Kathleen Baier under Dr. William Powell's direction and the trees were transformed by Linda McGuigan. Kristen Stewart and Tobi Culpepper did some testing along the way, and Erik Carlson brought the project to fruition and tested the expression and blight-tolerance. (Erik earned his Master's degree at ESF under Dr. Powell and is continuing the win-OxO project as a PhD student). It takes a team to accomplish these breakthroughs and our chapter remains immensely proud of the ESF team throughout our 32-year partnership. **Current work:** The ESF team is now involved with outcrossing 'DarWin' to different mother trees. Currently, this new line is being propagated in tissue culture and planted in field sites under USDA permits. Plantlets in high-light growth chambers are producing pollen for future controlled crosses with wild type American chestnut mother trees. These trees will serve as an additional source of blight-tolerance in future restoration efforts, alongside the Darling 58 trees.