

TREE GROWTH REPORT 2022

The figures below show the annual tree growth of the trees planted during the span of the Brining Back the American Chestnut Tree project since its inception in 2018 and inspected quarterly. Initially, 26 American chestnut trees were planted in 2018 on one site (Ruhe farm in Emmaus, PA). In 2019, 81 more trees were planted on two additional sites: 41 trees planted at Columcille Megalith Park in Bangor, PA, and 40 trees planted at South Branch Preserve in Budd Lake, NJ. Additional 50 trees were planted in the Fall of 2020 on two sites: 25 trees planted at Columcille Megalith Park in Bangor, PA, and 25 trees planted at South Branch Preserve in Budd Lake, NJ. In 2021, a new site was added for another American chestnut planting at the Graver Arboretum in Bath, PA. In 2021, 36 more trees were added and replanted with 5 trees replanted at Emmaus, PA location, 15 in South Branch Preserve in Budd Lake, NJ, and 16 at the Graver Arboretum site.

Site 1: Ruhe Farm, Emmaus, PA

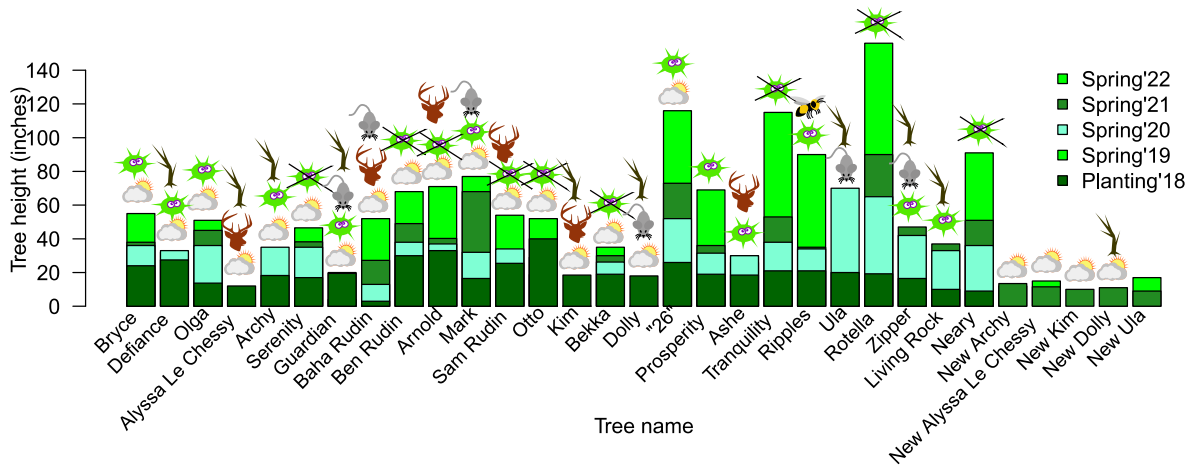


Figure 1. Hybrid American chestnut trees (Hybrid *C.dentata* x *molissima* from Musser Forests source) planted at Ruhe Farm Emmaus, PA in November of 2018. Growth increment is shown in the bar graphs and represents yearly data from aggregated quarterly monitoring between 2019-2022. Trees that are in the shade are marked with a cloud icon. Trees that have died are marked with a dead tree icon. Trees affected by blight are shown with a virus icon. Trees that were previously affected by blight, which then became inactive are shown with crossed virus icon.

Figure and data interpretation. The initial planting took place in the Fall 2018 and 5 additional trees were replanted to replace some dead trees in April 2021. The new trees are pure American chestnut seedlings from the American Chestnut Council in Cadillac, Michigan.

The growing seasons from 2019- 2020 and 2021-2022 show larger overall growth increment in most trees. Larger growth increment is seen in trees that are planted in sunny spots starting from the growing period 2019-2020, or about a year after planting. And even larger growth increment is observed in the growing season 2021-2022 for trees planted in sunny spots. Over the period from 2018-2022, 10 trees were lost. The year and causes of tree lost are as follows:

- Defiance lost in the Fall 2021 due to blight.
- Allyssa Le Chessy lost in the Spring of 2020 due to deer damage and fallen tree.
- Archy lost in the Fall of 2020 to root rot and blight.
- Guardian lost in the Summer of 2021 due to rodent damage and blight.
- Kim lost in the Spring of 2020 due to deer damage.
- Dolly lost in Fall of 2019 due to rodent damage.
- Ula lost in the Summer of 2020 due to rodent damage.
- Zipper lost in the Fall 2021 due to rodent, blight and leaf fungus damage.
- Living Rock lost in the Summer of 2021 due to blight damage.
- New Dolly lost in the Winter 2021 as it never established after planting. Site is not recommended for future plantings.

There are 9 trees that had previous blight which is now inactive, 5 trees that still have active blight and 5 trees that were lost due to blight. Additional 4 trees died as a result of rodent damage. Only one tree survived rodent damage. Since 2020, rodent guards were added to all trees. Deer damage seems to be less deadly to young trees. Only 1 tree died as a result of deer damage and 3 survived. Mark experienced stunted growth due to rodent damage to the tree previously, but are currently recovering well. Ashe had deer damage in early 2020 but is recovering well.

Site 2: Columcille Megalith Park, Bangor, PA.

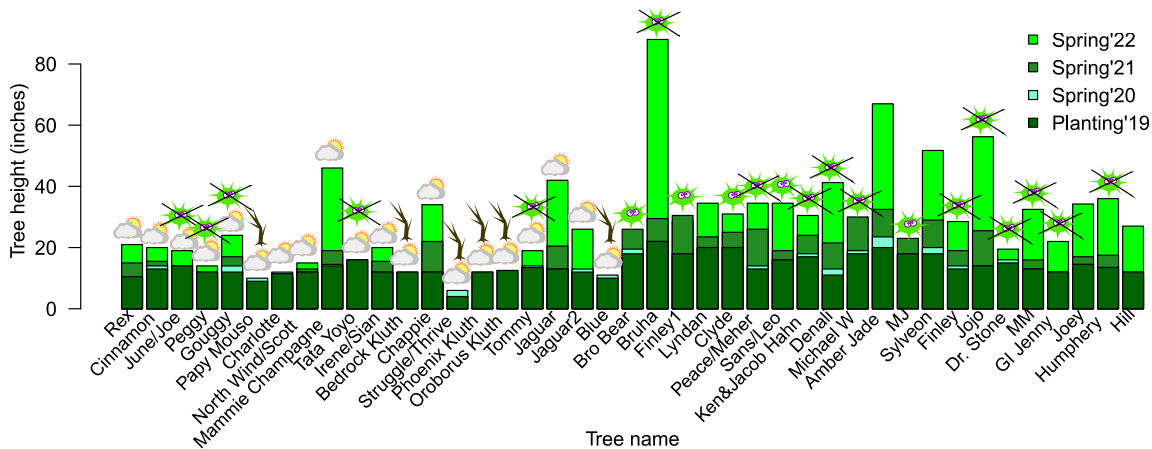


Figure 2. Pure and hybrid American chestnut trees (Pure breed seedlings from GONative in Manheim PA and Chief River, and Hybrid *C.dentata* x *molissima* from Musser Forests) planted at Columcille Megalith Park in Bangor, PA in November of 2019. The trees from Rex to Amber Jade are genetically native sources, and from MJ to Hill are genetic hybrids. Growth increment is shown with a bar graph from the planting in the Fall of 2019 and includes yearly inspections until Spring of 2022. Trees that are in the shade are marked with a cloud icon. Trees that have died are marked with a dead tree icon. Trees affected by blight are shown with a virus icon. Trees with inactive blight are shown with a crossed virus icon.

Figure interpretation: The graph shows increase and decrease in growth from planting in 2019 until Spring 2022. Trees that grow in the shade show slower growth increment overall than trees that grow in the sun. The greatest growth increment occurred in the 2021-2022 growth season for most trees. Trees that have stunted growth are: Peggy, Charlotte, North Wind/Scott, Tata Yoyo, Tommy, Bro Bear, Finley 1, Michael W, MJ, Dr. Stone.

Six trees were lost between 2019 to 2022. The causes are listed below:

- Papy Mouso was lost in the Summer of 2020 due to a fallen Ash tree.
- Bedrock Kluth was lost in the Summer of 2020 due to root rot.
- Struggle/Thrive was lost in the Summer of 2020 due to a fallen Ash tree.
- Phoenix Kluth was lost in the Summer of 2020 due to a fallen Ash tree.
- Oroborus Kluth was lost in the Summer of 2020 due to a fallen Ash tree.
- Blue was lost in the Summer of 2020 due to root rot caused.

Ash trees are affected by the Emerald Ash Borer disease and cause damage to neighboring young trees when they die and fall. Total of 20 trees were affected by blight, which is active in 4 trees, and inactive in 16. Of the trees affected by blight, none died from it, but 4 had a reduction in growth due to main leader shoot die off. Overall, blight does not seem to influence the growth of the trees unless it affects the main stem.

At the initial planting, we planted companion plants with each tree that included a mix of herbaceous plants: *Senna hebecarpa*, *Phaseolus polystachios*, *Agastache foeniculum*, *Monarda didyma*, *Rudbeckia hirta*, *Desmodium glabellum*, *Desmodium canadense*, *Dalea purpurea*, *Baptisia australis*, *Lespedeza virginica*, *Lobelia siphilitica*; and tree species: *Cercis canadensis*,

Robinia pseudoacacia, Gleditsia triacanthos, Asimina triloba.

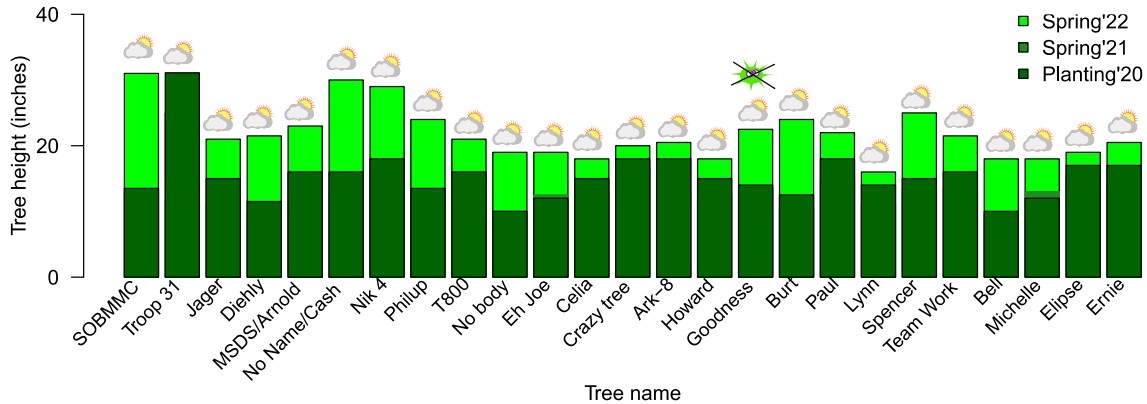


Figure 3. Pure genetic source American chestnut trees (source: N from GONative in Manheim, PA) planted at Columcille Megalith Park in Bangor, PA in November of 2020. The initial planting size is shown with dark green while subsequent inspections are marked with lighter shades of green. This site is located under a tree cover and all planted trees are in the shade shown with a cloud icon. Trees with inactive blight are shown with a crossed virus icon.

Figure interpretation: The figure shows initial planting size of 25 new American chestnut trees planted in November of 2020. The trees were planted under a forest cover. The trees were planted with rodent guards made out of chicken wire and plastic tubes for deer guards. In 2021, all plastic guards were replaced with more robust stainless steel guards. Each tree was inoculated with a granular mycorrhizal inoculum consisting of 4 species of endomycorrhizal fungi and 7 species of ectomycorrhizal fungi to enhance nutrient uptake at planting and thereafter. Quarterly growth inspections show that most trees grew well between the planting in 2020 and 2022 with a larger growing season in 2021-2022, except for Troop 31. None of the trees died. One tree had blight (Goodness), but blight has since become inactive.

Site 3: South Branch Preserve, Budd Lake, NJ

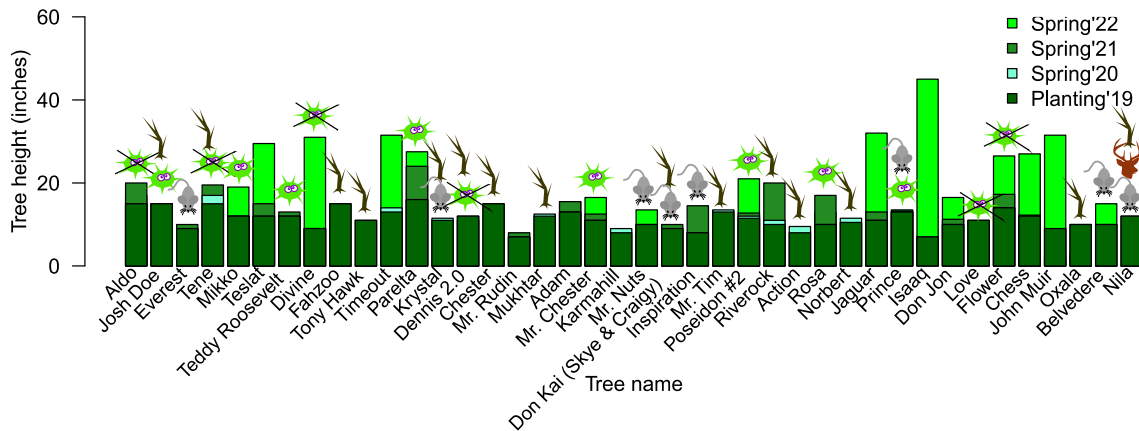


Figure 4. Pure genetic source American chestnut trees (source: GONative in Manheim, PA) planted at South Branch Preserve in Budd Lake, NJ in November of 2019. Growth increment is shown with lighter shades of green from planting to 2022. Trees that have died are marked with a dead tree icon. Trees affected by deer damage are shown with a deer icon. Trees that are affected by rodents are shown with a rodent icon. Trees that had blight are marked with a crossed virus icon. Trees with active blight are marked with a virus icon.

Figure Interpretation: The site has full sun exposure and no forest cover. Several trees are starting to show good growth increment, however, many also struggled to establish due to poor soil conditions, wind and potentially extreme dryness from the open sun. We applied mulch to the trees to keep the moisture in to remedy site conditions. We planted companion plants during the planting that included a mix of herbaceous plants: *Agastache foeniculum*, *Monarda didyma*, *Rudbeckia hirta*, *Desmodium glabellum*, *Desmodium canadense*, *Dalea purpurea*, *Baptisia australis*, *Lespedeza virginica*, *Lobelia siphilitica*; and tree species: *Asimina triloba*, *Diospyros virginiana*.

Thirteen trees were lost between 2019 and 2022:

- Josh Doe was lost in the Summer 2021 due to blight.
- Tene was lost, but cause unknown.
- Fahzoo was lost in the Winter of 2019 due to soil and site conditions.
- Tony Hawk was lost in the Winter of 2019 due to soil and site conditions.
- Krystal was lost in the Fall of 2020 due to rodent damage.
- Dennis 2.0 was lost in the Winter of 2019 due to soil and site conditions.
- Chester was lost in the Winter of 2019 due to soil and site conditions.
- Mukhtar was lost in the Winter of 2019 due to soil and site conditions.
- Don Kai was lost in the Fall of 2020 due to rodent damage.
- Mr. Tim was lost in the Winter of 2019 due to soil and site conditions.
- River Rock was lost in the Summer of 2021 due to soil and site conditions.

- Action was lost in the Winter of 2020 due to soil and site conditions.
- Norbert was lost in the Summer of 2020 due to soil and site conditions.
- Oxala was lost in the Winter of 2019 due to soil and site conditions.
- Nila was lost in the Winter of 2019 due to soil and site conditions.

Eight trees were affected by rodents, with 5 surviving and 3 dying, possibly also from site conditions. One tree was also affected by deer and died due to the combination of deer damage, rodent damage and site conditions. Fourteen trees were affected by blight: 6 recovered, 7 have active blight, and 1 died.

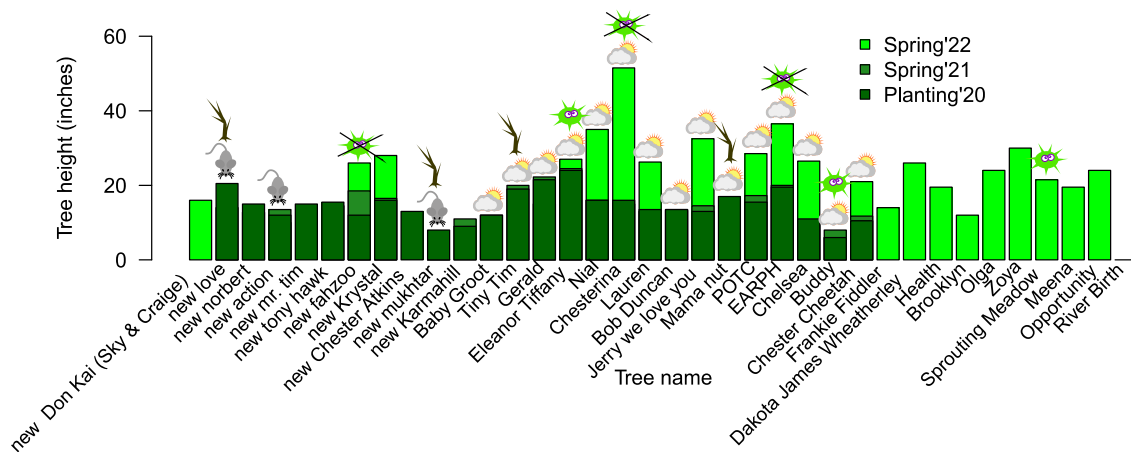


Figure 5. Pure genetic source American chestnut trees (source: American Chestnut Council in Cadillac, Michigan) planted at South Branch Preserve in Budd Lake, NJ in November of 2020 and their growth increment up to Spring 2022 shown in lighter shades of green. Trees that are planted in shady spots are marked with a cloud icon. Trees that died are marked with a dead tree icon. Trees that had rodent damage are marked with a rodent icon. Trees that had blight are marked with a crossed virus icon. Trees with active blight are marked with a virus icon.

Figure interpretation: The figure shows planting size and increment of 25 new American chestnut trees planted in November of 2020 and inspected quarterly until Spring of 2022. Ten additional trees were planted in the Fall of 2021 and inspected quarterly until 2022. The trees were planted under a forest cover and in an open field spot. The same mix of companion plants as in the previous figure was also planted at this time. The trees were planted with rodent guards made out of chicken wire and plastic tubes for deer guards. In 2022, all plastic tubes and wooden stakes were replaced with sturdier and roomier stainless steel protectors. Each tree was inoculated with ectomycorrhizal fungus to enhance nutrient uptake and protect the trees from

blight outbreak. Three trees show rodent damage. Four trees were affected by blight with 3 being inactive and 1 active.

Four trees were lost since planting:

- New Love was lost in the Winter of 2020 due to rodent damage.
- New Mukhtar was lost in the Winter of 2020 due to rodent damage.
- Tiny Tim was lost in the Fall of 2021 due to mowers.
- Mamma Nut was lost in the Spring of 2021 due to soil and site conditions.

Site 4. Graver Arboretum, Bath, PA

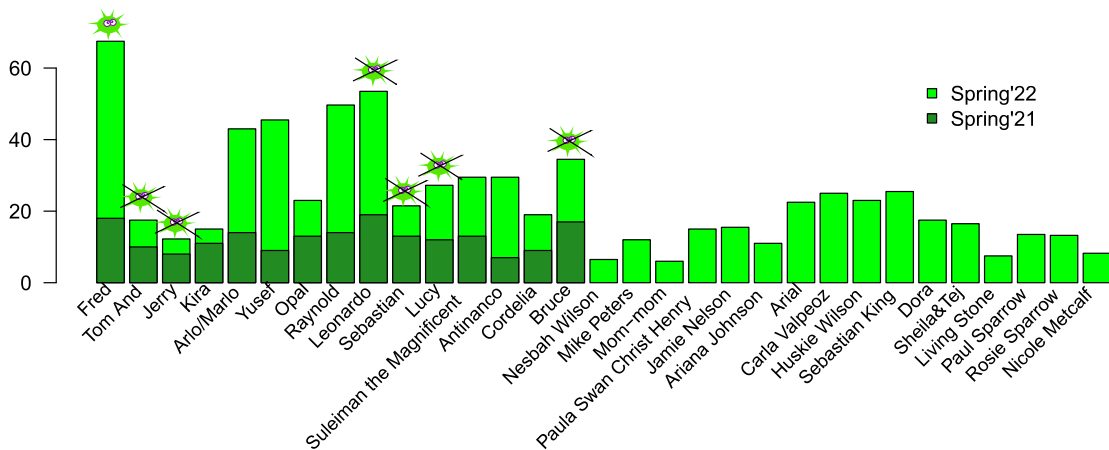


Figure 6. Pure genetic source American chestnut trees (source: American Chestnut Council in Cadillac, Michigan) planted at Graver Arboretum in the Fall of 2021 and their growth increment up to Spring 2022 shown in lighter shades of green. Trees were planted in sunny spots. Trees with active blight are marked with a virus icon. Trees with inactive blight are marked with a crossed virus icon.

Figure interpretation: Most of the trees that were planted in the Fall show good growth increment except for Tom And, Jerry, and Kira. Blight was found to be present in 7 trees, 6 inactive and 1 active.

Overall summary of trends:

- Out of 214 American Chestnut Trees planted to date (37 hybrid and 177 pure breed), blight occurred in 66 trees (31 %), 26 of which are hybrid and 40 are pure;
- There were 41 trees (62 % of blight cases) that are growing well or thriving with the blight now inactive, 26 of which are pure and 15 hybrid;
- There are 18 cases of active blight currently present (27 % of blight cases), 6 are hybrid and 12 are pure;

- From the Project inception in 2018, we lost 33 trees (15%) due to the following causes:
 - 6 trees (11 % of blight cases) died from blight and other causes, 5 of these were hybrids and 1 native;
 - 6 lost to rodent and 2 to deer damage and fallen tree;
 - 11 lost to drought/unfavorable soil conditions;
 - 2 lost to root rot;
 - 4 lost to fallen Ash trees;
 - 1 lost to mowers;
 - 1 cause unclear, no signs of blight.