

BUTTERNUT CONSERVATION AND BREEDING TO MITIGATE BUTTERNUT CANKER DISEASE

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Butternut (*Juglans cinerea*), a valuable fine hardwood in North America, is no longer regenerating in the wild due its demise from an exotic fungal stem canker pathogen butternut canker disease (BCD) caused by the Ascomycete (*Ophiognomonia clavignenti-juglandacearum* [O-cj]). The most effective way to mitigate BCD, will be to develop genetically resistant trees. Natural hybrids with the Japanese walnut (*J. ailantifolia*) have been found to have much wider resistance than pure *J. cinerea*; however, some *J. cinerea* families have shown a significant level of resistance but will require more breeding. Seed from our clone banks and orchards has become available in enough quantity to support conservation plantings. Our project aims to deploy and conserve regionally adapted and genetically diverse pure butternut seedlings. Conserving genetically pure butternut is important since natural selection over the last decades has left only hybrid trees alive in many places.

Dramatic differences in disease between upland and bottomland sites has been observed for nearly a decade. Artificial inoculation on bottomland sites has led to complete disease across the entire planting within 8–10 years. In contrast, two inoculated upland sites have shown as little as 3 to 10 percent natural disease spread. We will present new results from two new bottomland and one new upland site in Union County, Indiana established in 2013. Resistant stock combined with site selection and other cultural or biological controls can integrate several pest management strategies to minimize butternut canker disease.

From a large seed crop from our regional seed orchards and clone banks in 2013, we planted

a new screening block in 2015 under naturally diseased trees. This extreme screening produced significant BCD in the first year after planting rapidly eliminating highly susceptible trees. New data will be presented on this and on our 10- and 9-year canker ratings from our 2nd screening blocks established in 2008–09. Our most productive seed orchard, located in the Pacific Northwest in Walla Walla, WA, comprised of 26 grafted trees of 15 genotypes, has yielded over 6,000 seeds the last few years. This past winter, we used DNA markers to determine each trees identity and hybridity and to thin it down to one individual *J. cinerea* tree per genotype.

Conserving pure and largely susceptible *J. cinerea* began last year and is continuing through 2019. We are providing seedlings from our Walla Walla, WA and Hoosier National Forest seed orchards to state and private foresters and interested woodland owners to plant in southern Indiana and Ohio, the geographic region of these orchard clones. 2018 marks the 10th consecutive year that our collaborators in the Indiana DNR have sold random hybrid butternut seedlings in Indiana. We harvested our first seed crop from a second generation resistant orchard in the fall of 2017 (300 nuts) which contain a mix of the most resistant hybrid and pure selections from our screening. Such seedlings, or supplemental pollen, can be a source of resistance to add into these new conservation plantings over the next decade. Our presentation will show seed production over the last 10 years, the new conservation sites being established, and discuss our various breeding and screening strategies.

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