

White Oak Genetics and Tree Improvement Program (WOGTIP)
Department of Forestry and Natural Resources University of Kentucky
Dr. Laura E. DeWald

Laura.DeWald@uky.edu
<https://white-oak-genetics.ca.uky.edu/>
facebook.com/whiteoakgenetics/

White oak (*Quercus alba*) occurs throughout the eastern US forests where it is important to the health and how these forests function. White oak also provides habitat for wildlife such as turkey and deer, and it has high value to the forest products industry.

Natural Range
of White oak



The White Oak Initiative (www.whiteoakinitiative.org) is working to ensure there is a never-ending presence of white oak in the eastern forests. It supports the sustainable growth and production of white oak for a wide range of environmental, social and economic benefits.



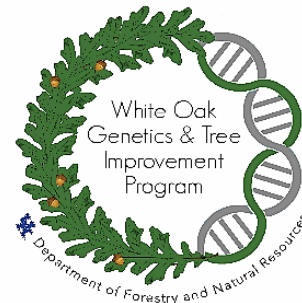
White oak research and the role of genetics and tree improvement is a focus area of the White Oak Initiative in recognition of the importance this work plays in our ability to respond to increasing pressures on the white oak resource. The White Oak Genetics and Tree Improvement program (www.white-oak-genetics.ca.uky.edu) also supports the goals of the James B. Beam Institute for Kentucky Spirits.



Unimproved

Improved

10-year-old white oak
growing in adjacent rows
at the Indiana DNR
Vallonia Nursery
(photo by L. DeWald)



Program Goals: collaborate with industry (forest, wood, distilling), and agencies and organizations (forestry, conservation, wildlife) to: (1) quantify genetic variation in white oak and, (2) improve traits that have economic and ecological value. The project will support white oak users by:

- providing a sustainable supply of high quality, improved white oak seedlings via a tree improvement program to meet current and future demands
- improving our ability to conserve and restore white oak in the forest to achieve a variety of ecological, conservation and economic goals at regional and national levels
- providing genetic resources for academic and industrial research and development

Program Description

Phase 1 - Collecting and Archiving Genetic Material: White oak genetic material is being collected from the entire geographic range of white oak. Acorn collectors include federal and state agency personnel, academic institutions, woodland owners, NGO's and many citizen volunteers including those in the Master Naturalist programs. Acorns are planted and seedlings are grown at the Kentucky Division of Forestry's (KDF) Morgan Co. nursery. Other than hand-planting, standard nursery operating procedures are followed (irrigation, weed control, fertilization, lifting and cold storage). Twigs (called scions) from the trees that acorns were collected from are grafted onto swamp white oak root stock and out-planted to create a clone bank to conserve genetic material of the parent trees for creation of future seed orchards. Acorn and scion collecting will continue until the entire geographic range of white oak is represented in the program.

Phase 2 - Progeny Testing: 1-year-old seedlings are planted in progeny tests to evaluate parent tree traits of interest to stakeholders. Depending on the trait, identification of superior performance can occur within 7-15 years.

A progeny test located at Maker's Mark Star Hill Farm in Loretto KY will include seed sources representing the entire geographic range of white oak. Planting began in March 2021. Many smaller regional progeny tests are also being established throughout the geographic range of white oak. These tests will allow us to describe genetic patterns to ensure seed sources do not get moved outside their range of adaptation, and we can look for local and non-local genetic superiority. Several partners have expressed interest in hosting a regional test including academic institutions, USFS National Forest system and Research Stations, and state natural resource agencies.

Phase 3 – Seed Orchard Establishment and Seedling Deployment: Parents of superior progeny based on the progeny tests results are used to create grafted seed orchards using material stored in the clone banks. Pollen mixing among top parents within seed orchards creates genetically diverse, high quality offspring. Controlled pollination can be used to breed for insect and disease resistance, or for other traits that will support ecological success in the forest and/or increased economic value for wood products industries.

State nurseries are a logical place for locating seed orchards because they are the most effective way to disseminate improved seedlings. The nurseries also save money by not having to purchase white oak acorns.

However, not all states have a nursery, demand for white oak acorns is very high, and acorn production is highly variable in white oak. Therefore, to ensure a sustainable supply to the nurseries, two additional types of acorn production areas of genetically superior trees will be established. Poorer performing trees will be removed from the progeny tests after 15 years and these tests will be converted to acorn production areas. Superior seedlings will also be planted in small areas on private woodlands and within National Forests to become additional acorn production areas. The establishment of many acorn production areas using superior white oak throughout its range will supplement the grafted seed orchards to ensure a consistent annual supply of acorns is available to the nurseries for the production of superior white oak seedlings.

Reforestation using superior white oak seedlings will achieve the goals of the white oak genetics and tree improvement program.

Collaboration and Partnerships

The white oak genetics and tree improvement program is designed to be 100% collaborative. While the program is coordinated at the University of Kentucky, it cannot succeed without the involvement of many different volunteers, partners and stakeholders across the eastern US. We welcome anyone interested in participating in the program to contact us about how you can be involved!

Initial funding for the white oak genetics and tree improvement program has been provided by Univ. KY Dept. Forestry and Natural Resources, KY Agriculture Experiment Station, USDA Forest Service Southern Research Station, and KY Division of Forestry