

Forest Regeneration



Regeneration research is focused on factors that will optimize performance of seedlings from the nursery through establishment

in the field. Plant mineral nutrition, cold hardiness, stress resistance, dormancy, and drought resistance are areas of research designed to create hardier and more tolerant seedlings.

After establishment in the field, studies focus on planting design, fertilization, and browse and vegetative control. Improvements in the regeneration process will lower mortality and accelerate growth, allowing more successful stand establishment.



Principal Investigators

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Partners

- Purdue University, Department of Forestry and Natural Resources
- USDA Forest Service
Northern Research Station
Northeastern Area State and Private Forestry
NFS Region 8 Cooperative Forestry
- Indiana Department of Natural Resources, Division of Forestry
- Walnut Council
- Indiana Hardwood Lumbermen's Association
- American Chestnut Foundation—Indiana
- Indiana Forestry and Woodland Owners Association
- National Hardwood Lumber Association
- ArborAmerica Inc.
- American Forest Management
- Steelcase, Inc.

Hardwood Tree Improvement and Regeneration Center

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Research Activities



Hardwood Tree Improvement and Regeneration Center

*Improving Genetic Quality
and Productivity of Fine
Hardwoods*

USDA FOREST SERVICE

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www.htirc.org

Our mission is to develop genetic, molecular, and tissue culture technologies and forest and nursery management guidelines for improvement of central hardwood forest productivity.

Molecular Tree Physiology

The focus of this work is to investigate the genetic mechanisms by which key aspects of tree growth and development are controlled at the molecular level. Our primary goal is to add value to fine hardwood tree species by genetically engineering them to express genes that impart commercially and environmentally beneficial traits.



Active research projects include efforts to insert genes that affect the onset of maturation and the production of flowers, insect resistance, and herbicide tolerance. Researchers are also trying to identify genes that regulate the transition from sapwood to heartwood and the formation of figured wood. Uniformly figured wood is highly valued but rarely occurs in nature. We seek to find ways to initiate the formation of figured wood and to clonally propagate trees exhibiting figure, and other useful traits, to create higher valued wood products.

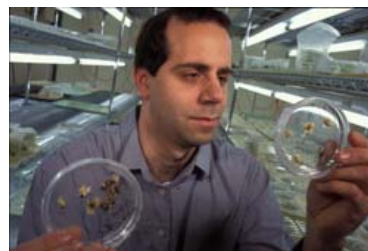
Tissue Culture

Research is underway to develop protocols for in vitro selection, somatic embryogenesis, micropropagation, genetic transformation, and clonal propagation. These protocols are used to develop disease or pest resistance and induction or control of flowering in fine hardwood species. Species of interest include black walnut, black cherry, butternut, northern red oak, and green and white ash.



Success has already been achieved with several species in vitro and with rooted cutting propagation. These protocols are now being refined, results applied to other species, and plant materials are being acclimatized to the greenhouse and field environment.

This research will allow germ plasm improvement, which in turn will lead to improved hardwood tree characteristics. These improvements may include increased resistance or tolerance to disease, insects, and other environmental stressors.



Forest Genetics



Forest geneticists are working to enhance the quality of hardwood trees by developing populations with superior growth and timber characteristics, including straighter boles and reduced branching. DNA-marker assisted breeding techniques are being used to increase the speed and efficiency of classical breeding.

Superior rootstocks are under development that may permit landowners to grow fine hardwoods under more varied conditions than previously possible. Work on butternut conservation genetics seeks to determine the impact of butternut canker on the genetic diversity of this endangered species and to identify disease resistance genes.

Population genetics research at HTIRC seeks to understand the link between genetic diversity and the physical environment. The influence of forest fragmentation and harvesting practices on genetic diversity is an important ecological issue under investigation.