

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.

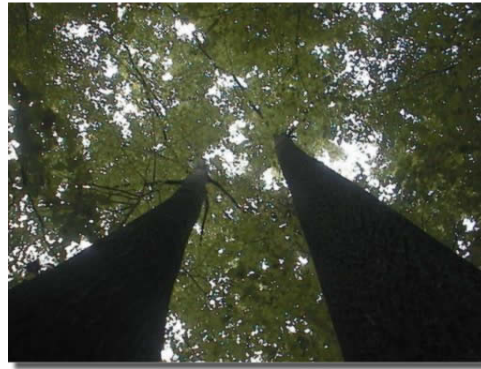


Current Projects:

- Restoration of butternut and American chestnut
- Enriching native stands with fine hardwoods

Principal Investigators

Charles Michler, Center Director
Keith Woeste, Molecular Geneticist
Matt Ginzl, Entomologist
Paula Pijut, Plant Physiologist
Douglass Jacobs, Forest Regeneration
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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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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.

Current Projects:

- Flower control in black cherry
- Genetic regulation of figured wood

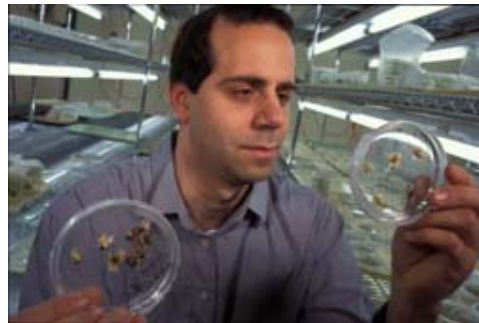
Tissue Culture

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.

Current Projects:

- Enhanced resistance to Emerald Ash Borer
- Enhanced water use efficiency



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. Work on butternut conservation genetics seeks to determine the impact of butternut canker on the

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. 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.

Current Projects:

- Tree improvement of black walnut, butternut, black cherry, white oak, red oak, and American chestnut.

Silviculture

Active forest management is necessary to increase productivity of stands. Research is focused on emulating natural disturbance as a means to enhance productivity and to influence wildlife habitat.

Current Projects:

- Enhancement of oak regeneration
- Strategies to increase success of hardwood underplanting



Forest Ecology

Our ecological research looks at how human-induced changes to natural disturbance and species pools have altered the current landscape of our native forests.

Current Projects:

- Deer browse effects on understory plant communities
- Use of natural disturbance to control invasive plants