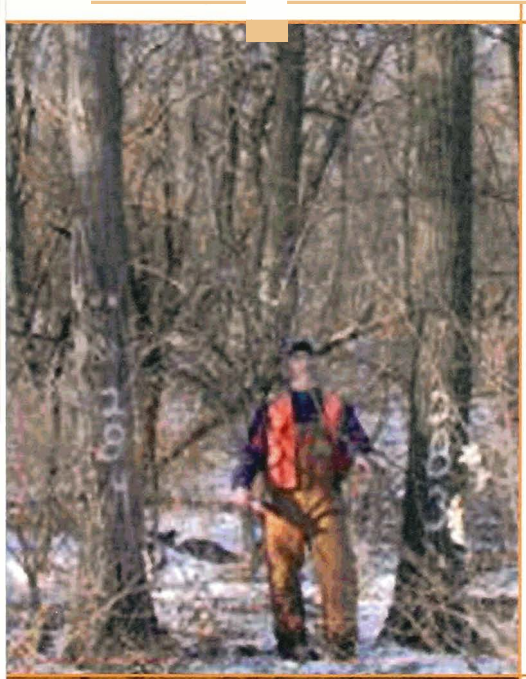
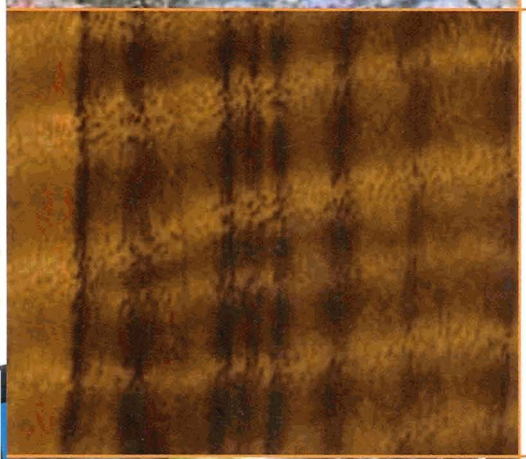
The Hardwood Tree Improvement and Regeneration Center Looks to the Future

- Charles Michler, Douglass Jacobs, Richard Meilan, Paula Pijut, and Keith Woeste.





The Hardwood Tree Improvement and Regeneration Center (HTIRC) at Purdue University has completed its first five year research and development effort. With strong support from the hardwood forest products industry – including the National Hardwood Lumber Association and the Indiana Hardwood Lumbermen's Association – HTIRC has been able to use industry funding to leverage strong federal, state, and local support.

Production of genetically improved trees

Now with more than 50 people on staff, HTIRC is in the midst of breeding efforts for black walnut, black cherry, American chestnut, and butternut, with plans to expand northern red oak and white oak. Improvement with black walnut has reached the point where elite trees have been planted in trials in states surrounding Indiana to determine adaptability to various climates. These tests will help determine which trees to recommend for planting in various regions. In 2007, improved trees from HTIRC will be available for purchase at a nominal cost from the Indiana state nursery in Vallonia.

Threatened and Endangered Hardwoods

HTIRC is working with the American Chestnut Foundation first to produce blight resistant trees, and ultimately to restore this species. Once a major component of Appalachian forests, little is known about management of the American chestnut as a timber species.

Butternut has been listed as a threatened species in Ontario and a species of concern in most states of the eastern US due to butternut canker. This species is rarely identified in forest inventories,. When it is, it is often a hybrid with heartnut, resulting in a tree less desirable for lumber. HTIRC's collection now encompasses trees from 18 states, including pure butternuts that appear to be resistant to blight. (In some cases, these trees are characterized by a dark bark.)

Decorative woods

For those who enjoy decorative woods, HTIRC has collected examples of curly maple, curly walnut, curly cherry, curly poplar, and birdseye maple. The goal is to make these available for planting. In the meantime, research is needed on production techniques and planting methods to insure these trees duplicate the desired decorative wood, and to determine what genes lead to these unique woods.

Wood boring insects

The most recent addition to the HTIRC, forest entomologist Matt Ginzel, will focus on insect problems, both native pests and newly introduced exotic insects such as Emerald ash borer. Introduced from Asia, the Emerald ash borer has moved out of the Detroit area into upper Michigan, Ohio and Indiana. It appears none of our native ash have resistance to this pest. Without intervention, all ash may be killed or reduced to small, residual populations. The pallet, handle, and molding segments rely on ash as a staple resource for their production.

Figure 1. (left top) In some instances, resistance to butternut canker occurs in butternut trees with a darker than normal bark. On the left is a susceptible tree and on the right is a tree with resistance to the disease. Photo credit - Jim McKenna

Figure 2. (center) Example of curly walnut in HTIRC's collection of figured grain woods. Photo credit - Keith Woeste

Figure 3. (bottom left) Green ash shoots are grown in a sterile laboratory environment before bioengineering experiments are performed. Photo credit - Paula Pijut

Figure 4. (right top) Each dot represents a gene from black walnut. By sampling the DNA in different seasons of the year, it is possible to tell if a particular gene is "turned on" or "turned off." Green dots are for genes turned on more; red dots are for genes turned on less. Yellow dots are in between. If researchers find a gene with a green dot only during a particular time of the year, they know this gene is important for a particular function being studied. Photo credit - Julie Huang

Bioengineering to improve timber production and wood quality

Some commercially important traits such as herbicide resistance and resistance to the Emerald ash borer will only be possible through bioengineering. HTIRC is developing these technologies for black walnut, ash, black cherry and northern red oak. At the same time, it is collaborating with corporate owners of important genes and discovering genes important for economic traits within our laboratories. In the near future, bioengineered trees will be tested for ecological fitness. Once it is determined they are viable in plantations and have passed regulatory scrutiny, they will be released for private landowners.

Improvements in nursery production

Whether it is production of genetically improved or bioengineered trees, it is necessary to continue to improve nursery production methods and outplanting performance. HTIRC is developing container production methods for hardwoods to influence seedling quality, automate planting operations, and increase plantation establishment success. These improvements are needed for trees to compete against from weedy species and destruction from foraging of white-tailed deer.

Forest sustainability

Besides trees grown in plantations, HTIRC is interested in management of native forests. In particular, it is interested in maintaining good genetics of hardwood species grown in smaller, fragmented stands. The center has developed models for maintenance of genetic diversity that will lead to guides for landowners and forest managers. In addition, through a new partnership with other natural resource agencies, HTIRC is determining silvicultural prescriptions for regeneration of fine hardwoods on difficult sites. It is paramount to the industry forest stands be managed in a sustainable manner to continue to meet the demands for wood from the industry's sawmills.

Charles Michler is Director of the Hardwood Tree Improvement and Regeneration Center. Paula Pijut and Keith Woeste are USDA Forest Service scientists in HTIRC and Douglass Jacobs, Assistant Professor and Richard Meilan, Associate Professor are Purdue University faculty in HTIRC.

More information is available at: *http://axe.agriculture.purdue.edu/fnr/HTIRC/*

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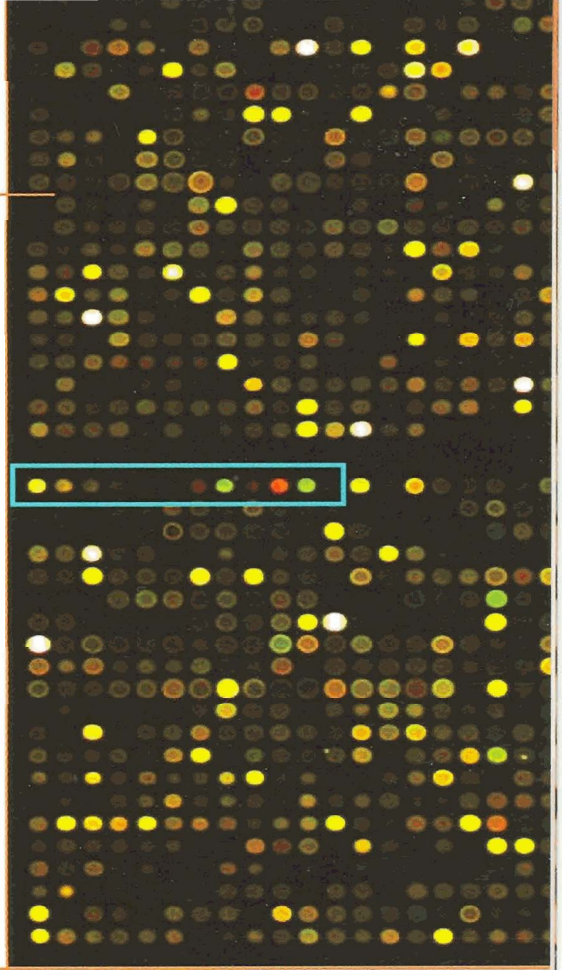

Figure 5. (below) Plantation of genetically improved black walnut. Photo credit - Douglass Jacobs.