



HARDWOOD TREE  
*Improvement & Regeneration*  
CENTER

# HTIRC

**Strategic Plan  
2011-2016**

***A collaborative national research, development and  
technology transfer center for hardwood stewardship.***

**Vision Statement:** *We are the internationally recognized leader in sustainable production, protection and utilization of hardwoods.*

## **Mission**

The mission of the HTIRC is to advance the science of hardwood tree improvement, genomics, physiology, protection, and utilization in the hardwood region of the United States by:

- Developing and disseminating knowledge on improving the genetic quality of hardwood tree species and conserving fine hardwood germ plasm;
- Developing elite hardwood trees for restoration and regeneration of sustainable hardwood forests and riparian zones for production of forest products and maintenance of genetically diverse ecosystems;
- Increasing knowledge and developing systems for nursery production and plantation establishment;
- Increasing knowledge and developing strategies for conservation, protection, utilization and marketing of the hardwood resource;
- Developing recognized and respected science leaders in forest genetics, physiology, regeneration, protection and utilization.

## **Organization Description and Characterization**

The Hardwood Tree Improvement and Regeneration Center (hereafter called “HTIRC”) is a national collaborative research, development and technology transfer effort. The partnership includes the USDA Forest Service Northern Research Station, National Seed Laboratory, and Northeastern Area State and Private Forestry, Purdue University Department of Forestry and Natural Resources, Indiana Department of Natural Resources Division of Forestry, Indiana Hardwood Lumbermen’s Association, National Hardwood Lumber Association, ArborAmerica, Steelcase Inc, American Forest Management, Indiana Forestry and Woodland Owners Association, Walnut Council and the Fred M. van Eck Forest Foundation. In addition, it is a site in the National Science Foundation Industry/University Cooperative Research Center (NSF I/UCRC) program called Center for Advanced Forestry Systems, a cooperative program with North Carolina State University, Virginia Tech, University of Washington, University of Florida, University of Maine, University of Idaho, and Oregon State University. It is unique in several aspects: 1) the HTIRC has a national focus on hardwoods; 2) it is a true partnership of federal, state, university, industry and landowner groups who contribute financial support and advice and; 3) it generating basic knowledge and technologies in hardwood tree genomics, improvement, regeneration, conservation, protection, and utilization for tree nurseries, industry, public agencies, and landowners.

HTIRC is located at Purdue University because of its role in the Midwest as a recognized center for biological genomics research. HTIRC is housed in Pfendler Hall with the Department of Forestry and Natural Resources. The molecular genetics laboratory is co-located with fisheries and wildlife genetics faculty in order to stimulate cross-fertilization of research ideas and multidisciplinary research. Research within HTIRC will benefit from Purdue University's development of hardwood scanning technologies and will aid in the development of nanotechnology applications for cellulose.

## Operating Environment

The idea for HTIRC was conceived in 1998 because of a perceived void in hardwood tree improvement research in the central hardwood region of the Midwest and Northeast. The birth of HTIRC occurred at the same time that the region was experiencing a severe production shortage of hardwood seedlings estimated anywhere from 25 to 50 million trees annually. In addition, the majority of seedlings being produced in state nurseries were of unknown genetic origin because nurseries relied upon seed collectors to collect and transport seed to the point of purchase at the nursery. Thus, the majority of seedlings being produced are unimproved, of unknown fitness for sustainable forestry, and of unknown genetic diversity.

The hardwood industry was also concerned about the future quantity and quality of the resource for its lumber and manufacturing sectors. Due to political and social pressures, federal forests have significantly reduced the volume of hardwood timber that is being harvested annually. Small private woodlots that supply a significant amount of hardwood timber and veneer are not being managed in a sustainable manner, ownership is not continuous over numerous rotations to insure sound forest management, parcel size is decreasing and fragmentation is increasing, and many woodlots are being converted to residential and recreational uses. In addition, the diameter of timber harvested today continues to be smaller than what it has been due to shorter rotations. Last, the hardwood industry was concerned that it was not taking advantage of new biotechnologies that could increase wood production through tree improvement activities that improve wood quality, growth, and pest resistance.

The professional forester community was also concerned about loss of genetic quality in remaining hardwood woodlots and natural forests. They felt that trees that are currently being managed for future timber harvest do not have the same desirable traits for straightness and vigor and that past forest harvest practices of continually taking the “best” trees may have resulted in loss of genetic quality of the remaining germ plasm.

More recent, invasive plants including many that are exotic and exotic pests have invaded hardwood forests. These intruders are changing the ecological dynamics of the forest environment and threatening several hardwood species with extinction. The ecology of our hardwood forests may be further disturbed by climate change. Forest regeneration of target hardwood species is being inhibited and the forest products industry is gradually losing part of the resource that is necessary for their product mix.

Over the past decade, the state of Indiana has lost jobs in many sectors including manufacturing. After thorough analysis, the state produced the BioCrossroads report in 2005, which described the forest products sector as the 6<sup>th</sup> largest in the state and 1<sup>st</sup> in the agricultural manufacturing sector for number of jobs and average salary. As one of the strategic objectives from that report, the state focused its attention on production of genetically improved hardwoods from HTIRC and associated spinoff technologies as one key for future economic development in the state.

## **International Economic, Social and Political Environment**

Human population growth continues to expand rapidly, and consumer demand for quality hardwood, at some point, will outstrip the region's ability to produce it unless consumers are willing to accept substitute materials. Much of the US and European demand for hardwood lumber is currently met within the United State's northern and central hardwood zones, and hardwood production has not shifted to developing countries in any significant manner. The time may come when this pattern of production for world markets can no longer be maintained because of decreased supply and the environmental consequences of heavy timber extraction on natural environments.

In the central hardwood region, water quality has been degraded by agricultural intrusion along waterways and flooding has further degraded these riparian zones that include major rivers and their tributaries. A significant effort is being made to restore hardwood trees and other native vegetation in these riparian zones. For the most part, unimproved trees are being used, and knowledge of how to restore these degraded areas is lacking, which has resulted in failure of many plantings. The opportunity exists for this significant portion of the land base to be a future site for quality hardwood regeneration although political forces will influence that reality.

Funding for many conservation plantings comes from the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP), and Wetland Reserve Program (WRP). These programs, when funded by federal appropriations, account for the majority of hardwood tree planting and they are increasingly focused on improvement of water quality and wildlife habitat. The genetic characteristics of the trees being planted are unknown and the potential exists for genetic failures as these plantings reach maturity.

Many consumers do not differentiate between the role of plantation forests and natural forests. However, they readily accept that agronomic crops are grown for the purpose of food production and consumption rather than for regeneration of annual vegetation. But, consumers have similar aesthetic and spiritual values that they hold for trees whether they are in an urban, plantation or natural forest setting. If this does not change, plantations may not be accepted as the alternative method for growing highly productive crop trees that would allow the country to maintain natural forests as preserves for biodiversity and recreation. These attitudes exist despite the fact that it would take only a marginal set aside of land currently in forestland cover to produce all of the wood necessary to meet human demands for wood consumption.

Few cities have been able to resolve the conflict that occurs when urban sprawl imposes upon the rural and forest environments. As community planners continue to struggle with these issues, more forest and farmland continues to be converted into residential use. The increase in economic affluence of American households will continue to put pressure on the urbanization of these environments because the desirable qualities of forest environments for residential communing.

## **Relationship with Other Organizations**

Central and northern hardwoods are more desirable than southern hardwoods because of slow, more even growth and the supply of European hardwoods is limited. Because of this, the HTIRC will hold unique importance in the United States to develop superior hardwood trees for markets that supply developed and developing nations. There are no other hardwood tree improvement research centers in the world and few individual hardwood research programs that have a mandate to satisfy a national clientele and are financially supported to undertake a long-term program in tree improvement.

HTIRC is vertically integrated with molecular and classical geneticists, tree physiologists, silviculturists, entomologists, ecologists, and nursery and regeneration specialists. Its strength is its ability to perform basic, applied and developmental research so the basic genetic knowledge that is created will be delivered to industry and private landowners in value-added products rather than knowledge that only benefits the scientific community.

HTIRC will not be the sole institution performing hardwood research desired by the hardwood industry, nursery operators, government agencies, forest landowners, and general public. The region has many outstanding scientists who perform valuable basic and applied research on various species, and it will be essential that the whole hardwood scientific community remains viable to meet these research needs. In addition, HTIRC will not employ biochemists, enzymologists, economists, and all of the other scientific disciplines that will be necessary for research collaborations to provide scientific data for evaluation of the ecological and environmental fitness of HTIRC products. Productive working relationships with scientists from Purdue and other institutions are necessary for the success of the Center.

## **Funding**

Annual funding appropriations are expected from the USDA Forest Service Northern Research Station, Northeastern Area State and Private Forestry, Region 8 Cooperative Forestry, Purdue University Department of Forestry and Natural Resources, and the Fred M. van Eck Forest Foundation.

Scientists within HTIRC will be expected to apply for federal grants including NSF, NASA, APHIS, DOE, and USDA. In addition, as long as industry research funds are available, grants will be sought from programs such as the Hardwood Forestry Fund, Walnut Council Foundation, The American Chestnut Foundation, and Consortium for Plant Biotechnology.

The Indiana Hardwood Lumbermen's Association, National Hardwood Lumber Association and Indiana Forestry and Woodland Owners Association have each made funding commitments for the next five years. Landowner groups and other hardwood associations may be approached in the future to provide annual funding allocations.

Several private citizens have already indicated a willingness to provide funds and land for endowments that would fund scholarships, assistantships, and basic research. Similar opportunities will be pursued as they arise.

As products are developed and discoveries are made, protection of intellectual property and products may be patented or trademarked. Partners and HTIRC endowment would benefit from revenue generated by these instruments.

### **Strategic Directions**

HTIRC has seven strategic directions:

1. Improve the genetic quality and regeneration of fine hardwoods, including black walnut, black cherry, butternut, northern red oak, white oak, ash, and American chestnut through application of classical breeding, genomics, molecular markers, genetic modification, advanced propagation and seed production technologies, and silviculture.
2. Continue to develop a highly credible hardwood research center that will be recognized as a leader and thereby become a leading graduate education and training facility for future scientific leaders in hardwood research.
3. Hire and nurture pre-eminent scientists who will build the credibility of the research program and be highly competitive for federal research grants.
4. Establish the Martell Experimental Forest and John S. Wright Research, Education and Conference Center as a significant site for education and training of consulting and industrial foresters, nursery practitioners, and landowners in nursery management and hardwood culture.
5. Establish HTIRC as a national laboratory for hardwood research and investigate the additional component of tropical hardwood improvement.
6. Investigate the permanent relocation of the National Seed Laboratory to HTIRC.
7. Communicate, convey, and market the work of HTIRC in order to be perceived as the pre-eminent international center for hardwood research and development.

### **Objectives**

The following are objectives for implementing the strategic directions categorized in terms of programs, facilities, staffing and funding.

#### Programs

Develop research and technology transfer programs that provide knowledge for management and maintenance of sustainable, genetically diverse native forests and highly productive domesticated trees for plantation hardwood crops that provide a wide array of products.

For black walnut, black cherry, butternut, northern red oak, white oak, ash, and American chestnut: develop molecular markers, tissue culture and genetic engineering technologies, advanced seed orchard, and seed handling technologies, breeding orchards, and experimental nurseries for production of elite families and cultivars, identification of superior seed trees, and assessment of genetic quality and diversity in natural stands.

Take leadership in documentation of hardwood research discoveries and dispersal of knowledge by hosting scientific conferences, symposia, workshops and field days and publish books, proceedings, and brochures that convey this knowledge to a wide array of end users.

Provide for annual evaluation and other periodic review of HTIRC programs to insure that the mission and vision remain focused and relevant to our stakeholders.

#### Facilities

Assess need for acquiring properties for the future expansion of seed and breeding orchards and progeny tests.

Serve on the FNR Woodlands Committee to aid in coordination of land and facilities use on Departmental properties.

Continue to work with the Southeastern Purdue Agriculture Center to establish field trials, progeny tests, and demonstration plots for hardwood genetics and silviculture research.

#### Staffing

At least annually, assess staffing needs to insure that current staff has appropriate support so that they can be productive and meet the expectations for their level of research outputs.

When positions are vacant, pursue national recruitment for the highest qualified staff and do not fill positions unless the candidates meet the highest standards of excellence that are expected of staff at HTIRC.

Evaluate the scientific disciplinary needs of HTIRC and based on that analysis, prepare a long-range staffing plan that will identify deficiencies and provide for their rectification.

Periodically evaluate membership of the Coordinating and Advisory Committees to insure that important partners and interest groups are represented.

## Funding

Develop a fundraising brochure and identify individuals and groups for solicitation of donations.

Identify basic research topics and develop proposals with research partners that would be competitive for NFS, NASA, DOE, APHIS and USDA competitive grants.

Identify applied research topics and develop proposals that would be appropriate for submission to the Hardwood Forestry Fund, Walnut Council Foundation, The American Chestnut Foundation, and Consortium for Plant Biotechnology Research.