HARDWOOD TREE IMPROVEMENT
& REGENERATION CENTER E-NEWSLETTER – December 2016

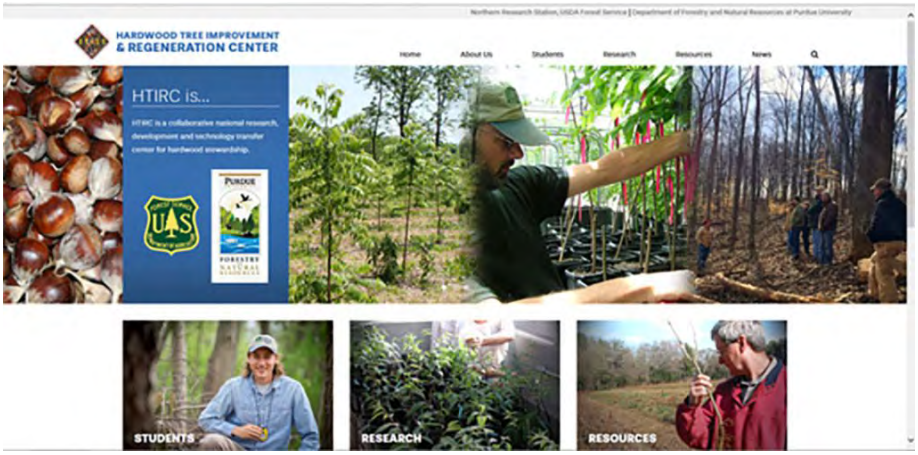
Volume 9 Issue 2

Articles in this issue:

HTIRC Launches Redesigned and Updated Website

This fall saw the launch of an updated HTIRC website to help scientists and landowners more easily access information and resources on HTIRC work. Sections on the center, students, research, and resources available highlight the scope of work and the people behind the research at the HTIRC.

We hope you will visit the site at https://htirc.org/



Exploring the Possibilities for Ginseng Plantings in Plantations

By Lenny Farlee, Extension Forester

Planting hardwood trees for timber production is an exercise in patience, often rewarding the planter with a legacy for those who will inherit the property, but little or no income in the owners' lifetime. The concept of agro-forestry, or forest farming, provides some options for those managing hardwood plantations to produce some income before the trees themselves are marketable.

One of the crops under consideration for tree plantations is American ginseng. Ginseng is a native long-lived perennial plant that grows under the shade of hardwood forests. The roots of ginseng have been used in traditional Asian medicine for centuries and remain in high demand. In fact, the demand is so high that ginseng stocks are depleted in many parts of its native range, leading to regulations on the harvest and trade in the plant. This rarity and continued demand for the plant provides opportunities for forest and tree plantation owners to plant ginseng to supplement the supply of wild roots and make some income in the process.

Growing ginseng is not a get-rich-quick plan. The plant is quite particular about where it grows, and must generally be at least 7 to 10 years old to have a commercially valuable root and to meet local size and age regulations for legal harvest. Limiting factors include site requirements for ginseng: 70 percent overhead shade or more, good soil drainage, a relatively open understory, and productive soil that has a good supply of calcium.

The fact that it grows well in shade provides an opportunity for owners of woodlands or plantations to grow ginseng as a source of income. Forests and tree plantations need to have an almost full canopy cover to provide this level of shade, so a young tree plantation may not provide enough overhead shade or an open understory.

We have tried some ginseng plantings in solid walnut plantations, but the light shade cast by walnut allows a relatively dense understory of plants that is not suitable for ginseng planting using the "wild-simulated" method where seed is planted and the plants are left to fend for themselves. Mixed hardwood plantations casting enough shade to limit understory weeds and grass should provide better results for ginseng using this planting approach. Also, areas with eroded soils, or poorly drained sites will generally not produce good results with ginseng.

There are several methods for growing ginseng, including high-intensity approaches using planting beds and shade cloth, but the method that seems to provide the best opportunity for a reasonable return on investment is the wild-simulated approach. In this method seed are planted in autumn at or shortly after the time of leaf-fall. Leaves are raked back and ginseng seed is scattered on suitable sites, then covered with leaf litter to over-winter. If the seed used was purchased as stratified seed, it should emerge the next spring. Seed that has not been stratified will normally lie dormant for a whole year before germinating. Seed can be purchased from ginseng seed dealers available on internet sales sites as well as from local dealers in some parts of the country.

The plants are allowed to grow in the understory, much as a wild ginseng plant would, so the effort required between planting and harvesting is limited. Seed and plants may be lost to rodents, deer, disease, and competition through time, but the remaining plants can represent significant value. Freshly-dug, undried roots have been valued recently at $100 to $200 per pound. Prices are volatile and also dependent on the age and condition of the roots. These high prices can lead to some ginseng theft, so consider the risks associated with your site.

If you want to explore the potential for growing ginseng, there are many excellent references available to guide your decisions.

Growing American Ginseng in Forestlands: http://pubs.ext.vt.edu/354/354-313/354-313.html

Producing and Marketing Wild Simulated Ginseng in Forest and Agroforestry Systems: http://pubs.ext.vt.edu/354/354-312/354-312.html

Costs and Returns of Producing Wild-Simulated Ginseng in Established Tree Plantations: https://www.extension.purdue.edu/extmedia/FNR/FNR-530-W.pdf

Extension YouTube Channel Ginseng Series: http://articles.extension.org/pages/70054/youtube-channel-ginseng-series

Growing American Ginseng in Ohio: An Introduction: http://ohioline.osu.edu/factsheet/F-56

Growing American Ginseng in Ohio: Site Preparation and Planting Using the Wild-Simulated Approach: http://ohioline.osu.edu/factsheet/F-57

Growing American Ginseng in Ohio: Selecting a Site: http://ohioline.osu.edu/factsheet/F-58

A mature ginseng plant.

Figured and Non-Figured Wood Updates

By Dr. Shaneka Lawson

Long been the subject of anecdotes and skepticism, the search for the genes involved in or influenced by figure formation is ongoing at the HTIRC. Dr. Shaneka Lawson has been working to examine gene expression differences in those trees with figure compared to those without figure using RNA transcriptomics technologies. A greater

understanding of this process would be useful for identification of the most valuable standing timber resources prior to harvest, thus making thinning and marketing a more strategic and profitable process.

At this point, the research model used by Dr. Lawson has been koa (*Acacia koa*), a tropical hardwood species endemic only to the Hawaiian Archipelago, and known for expressing some very attractive figured wood. Koa woodcraft and trade is the primary income source for a number of native Hawaiians and improvement in the quality of wood will also improve the financial benefit to those dependent upon the tourist trade for income to provide for their families.

Results of the study have yet to be published, however, a sneak peek at some of the expression patterns has proven enlightening. Thus far, scores of genes have been found to be differentially expressed in figured versus non-figured koa wood samples. It is not the goal of the project to state conclusively whether or not environment or genetic happenstance plays a larger role in figured wood formation, but to make progress towards enlightenment rather than speculation. Thus, genes identified in this study are hypothesized to play significant roles in figure initiation and development. Parallel studies in other figure-forming tree species (black walnut, maple) could be conducted to look at the possibility that the suite of genes differentially expressed in koa are also differentially expressed in other tree species.

Many more questions regarding how and why figure is initiated exist in the field of forestry, however, we are doing what we can to narrow down the list of possibilities from unsubstantiated anecdotes to reproducible data. Should this path provide answers as to why certain trees form figure while others do not, a number of additional studies can be put forth to screen individuals for figure before harvesting. Until this RNA transcriptomics study is replicated in other figure-forming species, our results can be applied to koa trees only.

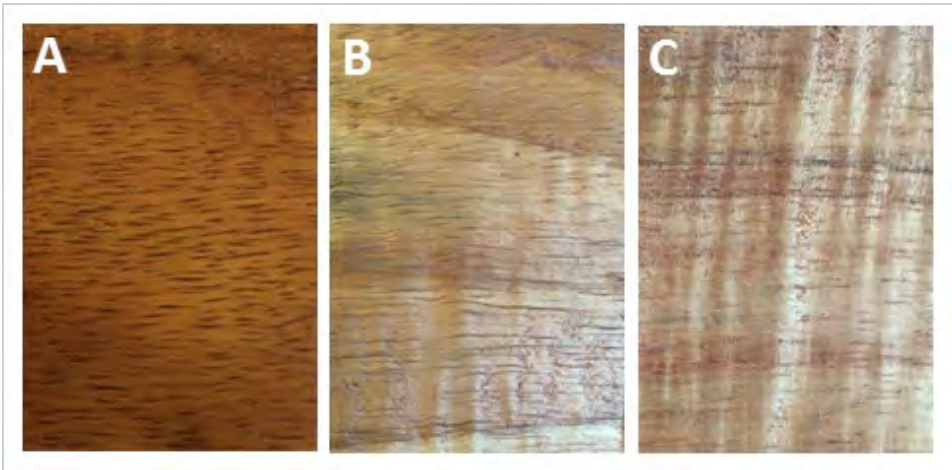


Figure 1. Figured wood designations. Examples of non-figured (A), lightly-figured (B), and highly-figured (C) koa wood.

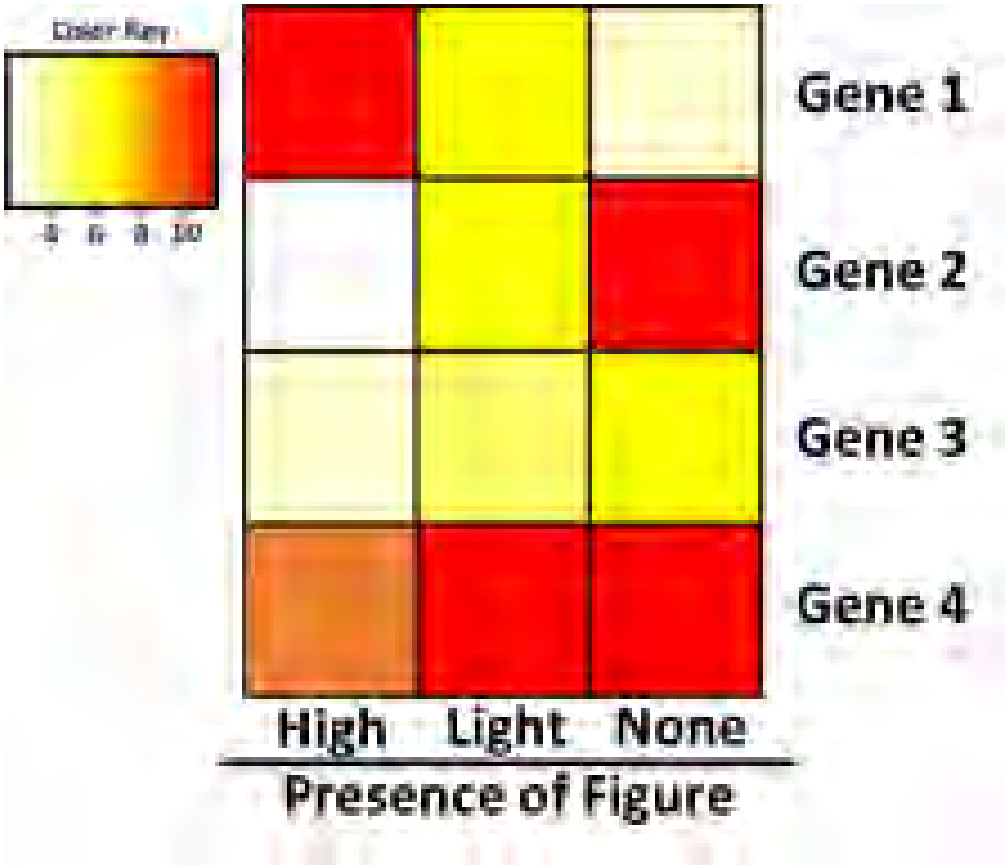


Figure 2. Wood transcriptomics. Genes in lignin biosynthesis were examined and their expression changes were noted in highly figured, lightly figured, and non-figured koa wood. White and yellow are low levels of expression, and reds are high levels of expression.

HTIRC Advisory Committee Meets to Help Advance a New Strategic Plan

The HTIRC Advisory Committee met at The John S. Wright Forestry Center west of the Purdue Campus on October 26, 2016. The advisory committee was introduced to Bob Wagner, the new Department Head for Purdue Forestry and Natural Resources, as well as Carrie Pike, Area Regeneration Specialist with USFS State and Private Forestry, James Warren, HTIRC Tree Breeder, and Lydia Utley, Data Base Manager. Presentations were provided on the development of a new data management plan for HTIRC by Jim McKenna, Carrie Pike, Lydia Utley and Jim Warren. Barry Goldfarb provided an overview and discussion of the future of the Center for Advanced Forestry Systems, a National Science Foundation Industry/University Cooperative Research

Center (NSF I/UCRC) that bridges top forestry research programs with industry members to solve complex, industry-wide problems. Purdue Forestry and Natural Resources is currently a member of the center. Bob Wagner provided an overview of the co-op model, a potential organizational model for the HTIRC in the future.

The majority of the program involved a facilitated feedback session with members of the advisory committee providing feedback on priority areas for research and engagement activities for HTIRC over the next five years. Responses from a survey sent to advisory committee members before the meeting were summarized and numerous suggestions of important areas to concentrate work were recorded in addition to the areas on the survey. Members then had an opportunity to indicate what areas represented their view of the highest priority work needing done. Results from the survey, input session, and continued input and feedback from the advisory committee, our partners, and cooperators will guide the development of the next strategic plan. Stay tuned as we prepare to roll out this new guide to our objectives and activities in 2017.

HTIRC graduate student attends National Walnut Council Meeting, sponsored by Indiana Chapter

The Indiana Chapter of the Walnut Council has provided a sponsorship to a graduate student doing work associated with the HTIRC to attend the National Walnut Council meeting. This opportunity provides students immersed in research an opportunity to see the landowners and field sites where the fruits of their research may be applied. Graduate student Mike Szuter was selected to attend the meeting in Indiana this year and describes his experience in some excerpts from a letter sent to the Indiana Chapter:

“I want to express many thanks to the Indiana chapter for generously offering a sponsorship to make my trip possible. The meeting was an excellent opportunity to learn a lot about black walnut and meet many interesting people, all generous with information, advice, and company.

I am a Ph.D. student studying the details of walnut physiology, exploring the uptake of carbon and nitrogen in black walnut seedlings. I am also studying how these elements are stored during the dormant season and how they are utilized for growth in the spring. Coming from a purely academic background, I had hoped to access the wisdom of those who have worked with walnut for years as well as the challenges that still need resolution. My experience at the meeting was invaluable in helping me understand how future research might aid in optimizing growth of mature walnuts. I also learned that, even in the relatively controlled environment of a timber plantation, there are variations in the responses and successes of walnuts, depending on the site.

Coming from a purely biological and ecological education, I learned a great deal about the operational side of walnut forestry that I had not been previously exposed to. I feel more qualified to call myself a student of forestry having had this experience. I learned things that straddle the line between purely industrial and more ecological interests, especially proper ways to apply herbicides for the control of exotic, invasive species. After my experiences this year, I look forward to future trips and getting to know more of the great people who are members of the Walnut Council!"

Sincerely,

Mike Szuter

Walnut Research Update

By Jim McKenna

Dr. Aziz Ebrahimi, our visiting scholar from the University of Tehran, Iran, has completed a large molecular breeding study measuring pollen flow in black walnut (*Juglans nigra*) seed orchards at Purdue HTIRC and at the IDNR Division of Forestry nursery at Vallonia. The photos below show him analyzing data on the road and measuring trees last spring in Union County, IN.

By genotyping every orchard tree at Vallonia (isolated) and Purdue (not-isolated), he has determined that the Vallonia orchard is pollinating more than 90% among itself while the non-isolated orchard at Purdue surrounded by native walnut had only 40% pollination among orchard clones.

His DNA fingerprinting further allows a glimpse into the paternity of open pollinated families being bred at the HTIRC. Now, for the first time, we can evaluate full sibling progeny to improve our breeding efforts.

Aziz has also completed a study on the genetic diversity of Persian (English, Carpathian) walnut (*Juglans regia)* in Indiana. The article will soon be published in a peer reviewed plant science journal. The results show more genetic diversity in our Indiana Persian walnut than we had expected to find.

Also, Aziz compared our Indiana sources of Persian walnut with southern Carpathian walnut sources from Slovakia and Hungary and found little similarity. Ultimately, he suggests that there was mixing of Carpathian and other European and perhaps Near Eastern Persian walnut when planted in the U.S.

Aziz's hard work, expertise, and passion for walnut molecular research has made him a great pleasure to work with and a productive colleague these last few years. Thanks to Indiana Nut and Fruit Growers Association for providing support for his work.

Aziz Ebrahimi measuring walnut trees.

Jim McKenna and Aziz Ebrahimi tagging research seedlings at Vallonia State Tree Nursery

Seed Zones: What Land Managers Should Know Before Planting a Tree

By Carrie Pike

Every tree planting enthusiast knows that the first step in a planting a tree is to match the species to the soils, climate, and other conditions of your site. Some species, for example black walnut, can be finicky about site and soil conditions. The next step, which is not as widely recognized, is to choose the seed source within the species. Trees retain a memory of their origin. We know this because when they are moved, they sometimes behave in ways that are appropriate for their origin, not their planting site. But how strong is that memory, and what does a landowner need to know about it before selecting the origin of trees to plant? In this article I will discuss the concept of a seed origin and provide some definitions and guidelines for moving plant material in the central hardwoods region.

Why does origin matter? Trees are generally well-synchronized with their local environment so that important biological events, such as bud-break and tree growth, are appropriately timed to maximize the growing season or other local resources. Reproduction (pollen shed, seed set) is also timed to match local conditions so that trees are in sync with their neighbors to increase the odds of successful pollination. Timing of bud-break, bud-set, growth and reproduction are mostly hardwired in the DNA although there are exceptions. Regardless of the mechanism, the implications are the same: planting a distant, or inappropriate, seed source can lead to poor seed set, reduced growth, or mortality.

The old adage “local sources of seed are best” is still good advice. But how local does it have to be? Should it be within 100 yards or 100 miles or something else? Forest geneticists use the concept of seed zones to define local. A seed zone is a geographic area within which seed and seedlings can be safely moved while minimizing the risk of mortality or reduced growth because of poor adaptation to the planting site. Areas within a seed zone are relatively homogeneous with respect to climate, elevation, and photoperiod, but soil types and land use may differ vastly within a seed zone. While the trees you plant may still die from other causes (browse, insect, diseases, fire, etc), planting ‘local’ material from your seed zone provides some insurance that if you chose the appropriate species, the plant material will be adapted to the site.

The central hardwoods of the US is a landlocked area, sandwiched by the great plains to the west, northern hardwood forests, and southeast pine/hardwood forests to the east and south. This area is approximately 1000 miles east to west and north-south. The central hardwood region has little topographic relief, except for the Appalachian Mountain areas in the east, but that does not mean conditions are uniform. Travelling from north to south you’ll find fairly steep gradients of minimum temperature and

growing season length. In addition, forest ecologists subdivide the central hardwoods into eco-regions. These subdivisions are based on landforms, soils, climate and species composition. (For more information about the eco-regions of the US and the central hardwood region
see: http://www.nrs.fs.fed.us/pubs/ch/ch13/CHvolume13page001.pdf)

At this time there are no widely recognized seed movement guidelines for the eastern United States. As a result, most tree nurseries do not separate seed or seedlings by seed zone, per se, but many nurseries can identify the state or sometimes the region within the state where seed was collected. Currently, it is up to the buyer to be proactive; talk to your grower about what seed source is best for your planting site, and make your own judgements.

Scientists and staff of the US Forest Service in the eastern US are working with state governments and others to delineate seed zones for all of eastern United States including the central hardwoods region. A series of webinars is planned and a website will be launched soon to propose and discuss alternative seed zones. Seed zones are not a novelty to the eastern US – back in 1965 Limstrom suggested seed zones for the central states (See Figure 1 below). These zones suggest that seed can be moved from northern Missouri across to northern Ohio with little problem. However, these proposed zones differs from provisional seed zones that were recently proposed for the entire US (http://www.fs.fed.us/wwetac/threat_map/SeedZones_Intro.html). The provisional seed zones are based on minimum temperatures (colors on the map) and ecoregions (bold black lines), but depicts too many zones than are practical for forestry. Our goal is to develop a set of universally accepted set of seed zones (likely a hybrid between these two approaches) and define common terminology for use by landowners, agencies, and industries.

It's important to note that seed zones are intended to serve as *guidelines,* not barriers. Landowners who live near or adjacent to a seed zone boundary can use seedlings from either zone. Keep in mind that as the climate continues to warm, you might consider seed sources that originate from points south of your planting site. Most importantly, the seed or seedlings you plant will dictate the genetic makeup of the future forest. A vigorous seedling, that was well-tended in a nursery, is essential to maximizing survival the first year; planting locally sourced-seed provides a measure of security for a successful planting in the long term.

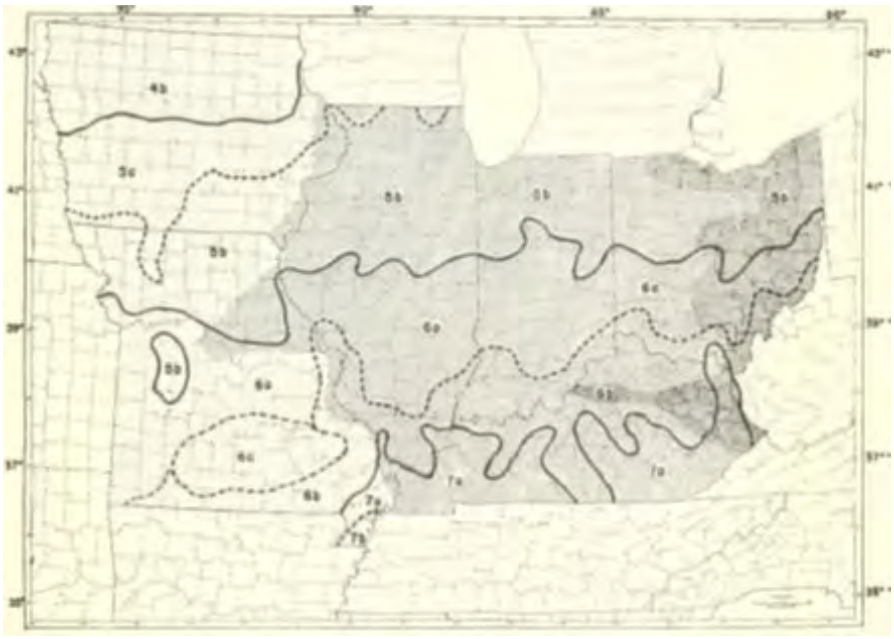


Figure 1 Seed zones in Limstrom's 1965 for the central US. The seed collection zones are delineated with black lines; subzones are delineated with dotted lines. Zones are based primarily on minimum temperature but also consider precipitation gradients, latitude, and frost occurrence. For example, subzone 6c (Ozarks) was identified because of the tendency for frost.

Figure 2 Provisional seed zones for the mid-central US. Different plant hardiness zones (average minimum temperature isotherms) are indicated with different colors. Ecoregions are delineated with bold black lines. Map created by Andrew Bower, J. Brad St Clair and Vicky Ericson with the USFS (Bower et al 2014).

Butternut seeds cleaned for storage and planting.

References:

Bower, A., B. St Clair and V. Erickson. 2014. Generalized Provisional Seed Zones for Native Plants. Ecological Applications, 24(5): 913-919.

Fralish, James S. The central hardwood forest: its boundaries and phsiographic provinces. IN: Van Sambeek, J.W.; Dawson, J.O.; Ponder, F., Jr.; Loewenstein, E.F.; Fralish, J.S., eds. 2003. Proceedings, 13th Central Hardwood Forest conference; 2002 April 1-3; Urbana, IL. Gen. Tech. Rep. NC-234. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station. 565 p.

Limstrom, G. A. 1965. Interim Forest Tree Improvement Guidelines for the Central States. U. S. Forest Service Research Paper, CS-12.

Preparing for Tax Season - Some Resources for Woodland Owners

Minimizing your tax liability while not running afoul of tax law can be a delicate dance. Fortunately, several resources are available to help landowners and resource professionals understand how the tax code impacts financial management and tax reporting for woodlands. An annual update, *Tax Tips for Forest Landowners for the 2016 Tax Year* by Dr. Linda Wang, National Timber Tax Specialist, U.S. Forest Service, is produced each year to provide a brief overview of tax considerations for woodland owners.

If you need more detailed information, the National Timber Tax Website provides tools and information to better understand how the different types of woodland ownership and management impact your tax situation. The annual timber tax tips publication and the National Timber Tax Website can be accessed at: http://www.timbertax.org/

The HTIRC has a publication, *Financial and Tax Aspects of Tree Planting,* to help you understand the potential financial and tax implications of conservation tree planting. Access this and other HTIRC landowner publications at https://htirc.org/resources/landowner-information/

Tree and Shrub Species Selection for Mine Reclamation in the Midwest Region of USA

By R. Rathfon, J. Groninger, D.F. Jacobs, J.A. Burger, P.N. Angel, C.E. Zipper

A forest reclamation publication, authors including Ron Rathfon, Purdue Forestry and Natural Resources and Dr. Doug Jacobs, Purdue FNR & the HTIRC, is available to provide guidance for selecting tree and shrub species for planting on mine sites that are reclaimed in the USA's Midwestern coalfield (Illinois, Indiana, and western Kentucky). Many areas mined for coal in this region have deep native soil and are reclaimed to an agricultural post-mining land use. This guide is intended to be used when the reclamation goal is forested post-mining landscapes that produce commercial timber and environmental services such as wildlife habitat. The full publication can be viewed at http://arri.osmre.gov/FRA/Advisories/FRA-13TreesSpeciesMidwest-Oct2015.pdf

Thinking of Planting Trees in the Spring – Start Planning Now!

By Lenny Farlee, Extension Forester

Planting trees for conservation purposes can yield a lot of benefits for the environment and landowners. Strategically placed tree plantings can help landowners manage soil erosion, wind stress, shade, snow drift, water runoff, and even odor and noise. Tree cover provides wildlife habitat and associated recreation opportunities. If you have enough high-quality wildlife habitat on your farm, you may be able to lease hunting rights for additional income. A variety of species like black walnut, oaks, black cherry,

and maple may have good income potential for timber, once they have reached large enough sizes to produce good logs.

To realize all this potential requires some purposeful planning and execution. Many tree planting attempts fail as a result of poor planning or lack of information on how to do it right the first time. Before you pick your trees to plant, think about what you want to accomplish. Am I planting for windbreak benefits, wildlife habitat, timber production, or a combination of the above objectives? You may be able to achieve all of these if your selection of species and planting design is well-planned. What site limitations am I working with? Check the soils and site characteristics of your planting site to be sure your chosen species will perform well there for the lifetime of the plant. Excessively wet or very shallow soils are not suited to black walnut, so planning to grow it on marginal sites for timber production will lead to disappointment. Some other species may do much better and still provide a chance to grow some good timber with time. Local experts like professional foresters, Extension professionals, and conservationists with the USDA can help you with evaluation of your soils and site, as well as appropriate species and design of plantings.

Young trees will perform better if they are not in competition with perennial grasses and weeds. Eliminate competing weed growth from your planting area prior to planting your trees. This can be done with herbicide applications, tillage, or a combination of these. Establishing a tree-friendly cover to keep weeds in check and reduce erosion may also help you manage the planting. Some annual grasses like winter-wheat, rye, and some small legumes like small clovers or hairy vetch may make a good temporary cover. If the soils on the planting site have been compacted by equipment, consider disking or ripping the area to help tree roots penetrate and expand in the soil horizon following planting.

Locate a high-quality public or private tree seedling nursery for purchase of your planting stock. Conservation trees are often sold as bare-root seedlings or as containerized stock, so consider costs and logistics of shipping and planting in your planning. Your local forester can provide recommended nurseries, or you can consult the USDA Reforestation, Nurseries, & Genetics Resources site (http://rngr.net/) for nurseries in your state. Ordering early may be important to make sure you get the stock you need

If you are planning on planting trees for a conservation purpose on your farm, you may be eligible for cost-sharing from the USDA under one of a variety of programs providing incentives for planting trees. Check with your local USDA Service Center to see if you are eligible and learn more about the program requirements.

The Hardwood Tree Improvement and Regeneration Center provides several publications designed to help you plan and manage your tree plantings. You can access these publications and additional resources at https://htirc.org/ .

Planting trees is an activity that leaves a legacy extending past our own lifetime. Make sure that effort is successful with good planning.

A tree planting machine and experience crew can plant thousands of trees per day.

Bundles of hardwood seedling ready for planting.

US Forest Service Northern Research Station Produces a Review of Two Diseases Threatening Walnut Species

A group of Forest Service Northern Research Station scientists, including Jenny Juzwik, Jim McKenna, Paula Pijut, and Keith Woeste with the HTIRC, have produced a research review of Butternut Canker and Thousand Cankers Disease. These two diseases threaten butternut and black walnut, native tree species that provide ecologic and economic benefits to forests and landowners in the eastern deciduous forests of the United States. The review, *Two Fungal Diseases Spreading and Endangering Walnut Species: Butternut Canker and Thousand Cankers Disease,* Provides a summary of the diseases and the research work being done by the Northern Research Station to address the threat, as well as additional references. You can view the full document at: http://www.nrs.fs.fed.us/news/review/28

Additional information on black walnut and butternut can be found on the HTIRC website under *Resources*: https://htirc.org/resources/

Dr. Matt Ginzel setting traps for walnut twig beetles as part of a Thousand Cankers Disease survey.

Butternut canker in early spring.

Walnut Council Annual Meeting and Thousand Cankers Disease Symposium to Team Up in Lafayette, Indiana

The HTRIC will be helping to host two cooperating walnut-related events in the Lafayette, Indiana area next summer. The Walnut Council Annual Meeting will be held from June 11 to 14, 2017 at the Courtyard by Marriott, Lafayette, IN. The Walnut Council is an international association representing nearly 1000 woodland owners, foresters, forest scientists, and wood-producing industry representatives in 45 states and seven foreign countries. The purpose is to assist in the technical transfer of forest research to field applications, help build and maintain better markets for wood products and nut crops, and to promote sustainable forest management, conservation,

reforestation, and utilization of American black walnut and other high quality fine hardwoods. The website for the annual meeting can be found at: https://www.walnutcouncil.org/annual-meeting/

Thousand Cankers Disease impacts black walnut and other members of the walnut family and represents a potential threat to the valuable walnut resource in North America. HTIRC has been cooperating with and participating in Thousand Cankers Disease research and continues that relationship by hosting a Thousand Cankers Disease Symposium in Conjunction with the Annual Meeting of the Walnut Council from June 13 to 15, 2017. More information will follow as an agenda and arrangements progress. Updates will be available on the websites for the Walnut Council, HTIRC, (https://htirc.org/) and Thousand Cankers Disease (http://www.thousandcankers.com/meetings.php)

Dan Harris, Walnut Council President, presents information on walnut veneer at the Walnut Council Annual Meeting.

Jim McKenna, Tree Breeder for the HTIRC, speaks at a tour of the William Hammitt walnut plantation at the 2016 Walnut Council Annual Meeting.

Welcome Lydia Utley and Jim Warren

The HTIRC welcomes two new staff members, Lydia Utley and Jim Warren.

Lydia serves the Purdue Department of Forestry and Natural Resources and the HTIRC as a Data Analyst, organizing and managing spatial and tabular research data.

Lydia has a Master of Environmental Management from the Nicholas School of the Environment, Duke University, Durham, NC and a Bachelor of Science from Trevecca Nazarene University, Nashville, TN. Lydia came to Purdue from a position as a GIS Analyst and Database Manager with the State of Florida Fish and Wildlife Conservation Commission.

Jim is a US Forest Service Biological Scientist/Operational Tree Breeder and holds a bachelor's degree in Zoology with a minor in Geology, and a master's in Environmental and Forest Biology, specializing in insect chemical ecology.

Prior to coming to the HTIRC, Jim assisted in running the daily operations of the Minnesota Tree Improvement Cooperative at the University of Minnesota's Cloquet Forestry Center for 17 years. His primary duties entailed designing, implementing, and measuring field trials, assisting with orchard management, conducting tree breeding and grafting, and collecting data. Jim led efforts to organize and modernize Cooperative data in a relational database management system, and managed records for all orchards and trials. He also assisted with monthly and annual reporting.

Lydia Utley

Jim Warren

Trees That Like To Live With People

By Nick LaBonte and Keith Woeste

USDA. Forest Service Hardwood Tree Improvement and Regeneration Center

When visiting a National Forest or a local Nature Preserve we are often impressed by the complex communities of trees growing there. As forest geneticists, we also notice what species are present and how competition for water and sunlight shapes where they grow and how long they survive. Of course trees grow in cities and suburbs too, but the urban forest is quite different from most natural habitats. Cities are tough on trees, so it's not too surprising that some dominant forest trees are uncommon and often struggle when planted in the city; most oaks and hickories fall in this category. Other species that are abundant in natural forests, like red maple and hackberry, are equally at home in urban environments. Finally, there is a small group of unusual trees that seem to be happier in the city than in natural forests.

A great example is yellowwood (*Cladrastis kentukea*), a small tree with cascades of white flowers in the spring and showy yellow foliage in the fall. Human preference often determines which trees occur in the urban forest: yellowwood's fine ornamental features make it a favorite of city foresters and homeowners who have planted it in nearly every state of the U.S. and several Canadian provinces. Yellowwood is often seen in parks and greenways where it grows happily among the lawns and parking lots of the human-built environment. It is easy to imagine that a tree that handles the rigors of big city life in states from California to Massachusetts will grow almost anywhere, but not so. In the wild, yellowwood only grows in small, isolated pockets in forests of a few states, including Arkansas, Kentucky, Indiana, and Tennessee. Furthermore, the rare sites where wild yellowwood occurs are steep, somewhat moist, thickly wooded hillsides, sheltered from harsh sunlight and wind- as different from the average city street as it gets!

Most people are familiar with crop plants and animals that have become well-adapted to human environments. Some are unrecognizable or even extinct in the wild. In other cases, new species of plants or animals resulted from thousands of years of human interaction. Corn is one such plant, and cattle, dogs, and cats are examples from the animal kingdom. Species that thrive as human partners are often domesticated; we depend on each other for survival and well-being. Other species have discovered how to use human assistance to spread. Dandelions for example, have completely integrated their lifestyle with human habitats (quite successfully if my lawn is any indication). Others, like yellowwood, have made tentative first steps.

We don't often think of trees as joining with humans, but several tree species appear to have made that jump and found a way to thrive in human environments. They are far

more numerous and widely distributed by having adapted to human needs and urban life. City life is not for everyone, and it comes with its own set of perils and promises (remember the children's story of the country mouse and the city mouse?), but now more people live in cities than rural areas, so it figures that we would want to bring our friends along and make an urban environment that suits both trees and people. If the past is any indication, future city dwellers will want to live with trees. Maybe there are trees that want that, too.

Yellowwood Bark

Yellowwood Bloom

Leaf of the yellowwood tree.

Investing in Our Future by Investing in Our Youth: The Environmental Investment Challenge

By Dr. Shaneka Lawson

The Environmental Investment Challenge is a community service project implemented by Shaneka Lawson of the HTIRC as a "Survivor" inspired venture to introduce 300+ minority students across Indiana to forestry using a rather unusual, but effective, platform. This three-year venture was proposed to the USDA Forest Service's Special Project Fund grant committee in 2014 for funding 2015 – 2017.

Last year, students were exposed to a fictional scenario where knowledge gleaned from presentations on various technologies used to generate power (solar, wind, wood, coal, hydroelectric) was required for survival on a deserted island after being shipwrecked. They had to think fast to build shelter, provide water for themselves and their fellow islanders, and make sure that they had a back-up plan for when Mother Nature delivered unpredicted surprises (tsunamis, hurricanes, tornados…etc.).

This year, a different group of students was stranded on the island. Instead of using technology to purify water, build shelter, and generate power, this new cohort of students was challenged to grow food (agricultural crops, fruit and nut trees) as a way of providing sustenance for the island population. In addition, "Mother Nature" was back

to bring extreme weather events and surprises to the island. The students used information obtained from short presentations on various aspects of agriculture such as how fast crops grew, how much water is required, and the negative ramifications of harsh weather on crop development and harvest sizes. Games and quizzes during the presentations made it more exciting. This project built upon existing relationships between the HTIRC and USDA Forest Service with minority groups in the community.

Next year will be the final stage of the challenge. The students will once again be marooned on an island but must work toward controlling invasive insects that threaten their forests and food supply. Previously, these students were interested only in science, technology, engineering, and math but have now chosen to consider agriculture. In years to come, it is believed that the field of forestry and natural resources will become more popular with minority students through this and similar programs. Below are screenshots from the PowerPoint presentations given to the students during the program

.

Congratulations to the Recent HTIRC Graduates

Dr. Micah Stevens

Micah Stevens received his PhD in Forest Genetics. His principal investigator was Dr. Paula Pijut. His dissertation title was, "Improving and elucidating factors regulating black walnut (*Juglans nigra*) clonal propagation".

Dr. Mekala Sundaram

Mekala Sundaram received her PhD in Wildlife Science. Her principal investigator was Dr. Robert K. Swihart. Her dissertation title was, "The Role of Seed Attributes in Eastern Gray Squirrel Foraging".

Shaneka Lawson received Gold President's Volunteer Service Award

Shaneka Lawson, USDA Forest Service-Research Plant Physiologist with the HTIRC & FNR-Adjunct Assistant Professor, has been chosen to receive a Gold President's Volunteer Service Award (PVSA) from U.S. Secretary of Agriculture Tom Vilsack at the USDA's Abraham Lincoln Honor Awards Ceremony. She is being recognized for her numerous community volunteer efforts in support of environmental sustainability. The award ceremony was held on September 13th at Jefferson Auditorium in Washington, D.C.