

A lush green forest with a waterfall cascading over rocks into a stream. The scene is filled with tall, thin trees and dense foliage, creating a vibrant and natural setting.

Kentucky

Volume 10 Issue 2

Woodlands

Magazine

**Strategically Assessing Woodland Health
Valuing Woodlands and Their Owners
Timber Theft and Trespass**

Kentucky Woodlands

Volume 10 Issue 2 Magazine

Spring 2016

Promoting stewardship and sustainable management of Kentucky's family private forests.

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Editors's Note: We are also pursuing the use of SFI paper produced on SFI certified and American Tree Farm System certified land.

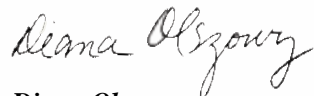
From the Editors of the Kentucky Woodlands Magazine:

This issue is the last with Diana Olszowy as co-editor. Diana and I started this magazine 10 years ago and she has been unwavering in her support and work for the magazine. Diana has worked diligently to secure funding through the Kentucky Division of Forestry to support the printing of at least two issues of the magazine a year so that you get it for free. As a subscriber she is your best friend. As her co-editor I will obviously miss her engagement and wish her the best of luck in her retirement.

The last issue had several readers comment about the Research in Brief article on box turtles. A concern was voiced over why UK was doing such esoteric research and why focus on it in the magazine. Good questions that have a good answer. One reason that helps address both questions is that the box turtle has been listed as a state endangered species in Indiana. There are concerns about the population in the region and the research was to provide information on how timber harvesting can impact, in some cases positively, habitat for the turtle. It is this type of focus that allows us to stay ahead of the curve on topics that will be important to woodland owners in Kentucky. The Research in Brief department gives you an insight to emerging issues and what we know about them.

This issue also provides several articles letting you know what is coming. For example, this issue contains information on changes in Kentucky's Best Management Practices (BMPs) for timber harvesting that will take effect in 2017. We also have some timely information on issues that are bubbling in Kentucky for example timber theft and trespass. Also take special notice of the News to Use section announcing a number of important changes to the Kentucky Division of Forestry and UK Forestry Extension.


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About the Cover:

The cover photograph taken by the late Dr. Thomas Barnes is a waterfall located on Black Mountain in Harlan, Kentucky.



Thank you Diana for all of your work and support for the Kentucky Woodlands Magazine.

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Strategically Assessing Woodland Health

by Jeff Stringer

The idea of growing healthy woodlands is one that is universally accepted by woodland owners. However, not everyone agrees on what constitutes woodland health or how to define it. One reason is that not all woodland owners have the same objectives or use for their woodlands and this influences how they perceive woodland health. For example, some woodland owners aspire to develop old growth. Typically, old growth will contain canopy openings where large trees have been allowed to die. There will be a buildup of debris on the ground and trees of different species may be developing into the canopy, changing the species composition of the woods. All of these changes are common to old growth and are considered indicators of a healthy old growth forest. However, there are woodland owners that would view old growth development as being unhealthy because trees are left to die and changes occur that may restrict their use and enjoyment of the woods. While there are accepted scientific definitions of forest health, the differences in ownership prerogatives and the inherent complexity of forest systems often complicates our ability to define woodland health in a manner that is helpful to woodland owners.

Despite these issues, there are scientifically based elements of woodland health that are understood and can be acted upon by most woodland owners. This article provides a method of systematically assessing woodland health for aspects common to all ownerships of native hardwood forests (woodlands) in Kentucky. It also provides information on assessing woodland health for those who want to maintain the vigor of their canopy trees and keep their woodlands in a more managed or cultured state. Typically, these owners want to maintain vigorously growing trees, enjoy knowing that their woods are resilient and capable of maintaining the current overstory, and have at least some interest in timber and/or wildlife.

Common Indicators of Woodland Health

Several universal indicators of health are common to all woodlands regardless of ownership objective. These indicators assume that part of the definition of healthy woodlands requires the maintenance and regeneration of native species that are common to and appropriate for the conditions (site and soils) present.

Exotic Species

Healthy woodlands are devoid of exotic (non-native) tree, shrub, and herbaceous species or, at the very least, exotic species do not represent a threat to the growth and development of native species (Figure 1). The latter requires that the exotics present are not invasive. Because invasive spe-

cies can respond to management practices, removal should be a serious consideration. Not only is it important to think about the effects of exotics on the existing trees, shrubs, and herbaceous species present but they must not interfere with the regeneration of these species.

Regeneration

Another universally accepted indicator of a healthy woodland is the ability to naturally regenerate the native species that are present or those native species appropriate for the woodland's conditions. As indicated above, invasive exotics can cause a loss or reduction in native species abundance. However, regeneration can be a problem with some hardwood species even without the presence of exotic species. For example, oaks growing on sites with moist rich



Figure 1. Example of healthy woodlands with native species of all size classes and no exotics present. This woods has vigorous overstory trees and the ability to regenerate itself from seed, small seedling and saplings.

All photos courtesy: Jeff Stringer

soils often have difficulty regenerating because they are out-paced by other native species that also naturally occur on those sites.

For all these reasons, assessing the regeneration potential of woodlands is important. Foresters do this by determining the abundance of seed as well as the size and abundance of seedlings developing in the understory. Some species, for example yellow-poplar, can develop by seed when canopies are opened up. Other species, like oaks and maples, require the development of seedlings and saplings prior to canopy opening for regeneration to occur. Maple seedlings are able to grow in shaded understories, slowly moving into the canopy from below. Oaks initially develop seedlings in the shaded understory; however, they require a mid-story or canopy disturbance to obtain enough light to grow into the main canopy. Conditions that reduce seed production or that kill small seedlings and saplings growing in the understory (ex. domestic grazing, wildlife, invasive plants) can impede regeneration. All these factors are taken into account in determining the regenerative potential of a woodlands. Ultimately, a forester can assess the regeneration potential and determine whether it is adequate to ensure the appropriate regeneration of native species.

Strategic Assessment

One strategy for determining woodland health is to divide the woods vertically into layers and assess indicators of health for each layer. Start with the main canopy composed of overstory trees, follow with the mid- and understory trees, the sapling and shrub layer (from approximately 2 feet to 10 feet), and the ground layer (Figure 2). This assessment can be done observationally while walking through the woodlands to determine the health of the entire woods or a portion of it.

Healthy Canopies

Healthy managed woodlands have native overstory trees that are fully occupying the main canopy and have crowns that are well balanced,



projecting in three or four directions. In woods that have not been recently logged, the presence of large tree-sized openings means that recent tree death and/or disturbance has occurred. In recently logged stands that are selectively cut, remaining overstory trees should be the proper species and crowns

should be well developed and balanced (Figure 3a). If overstory trees in either logged or unlogged stands are small or irregularly

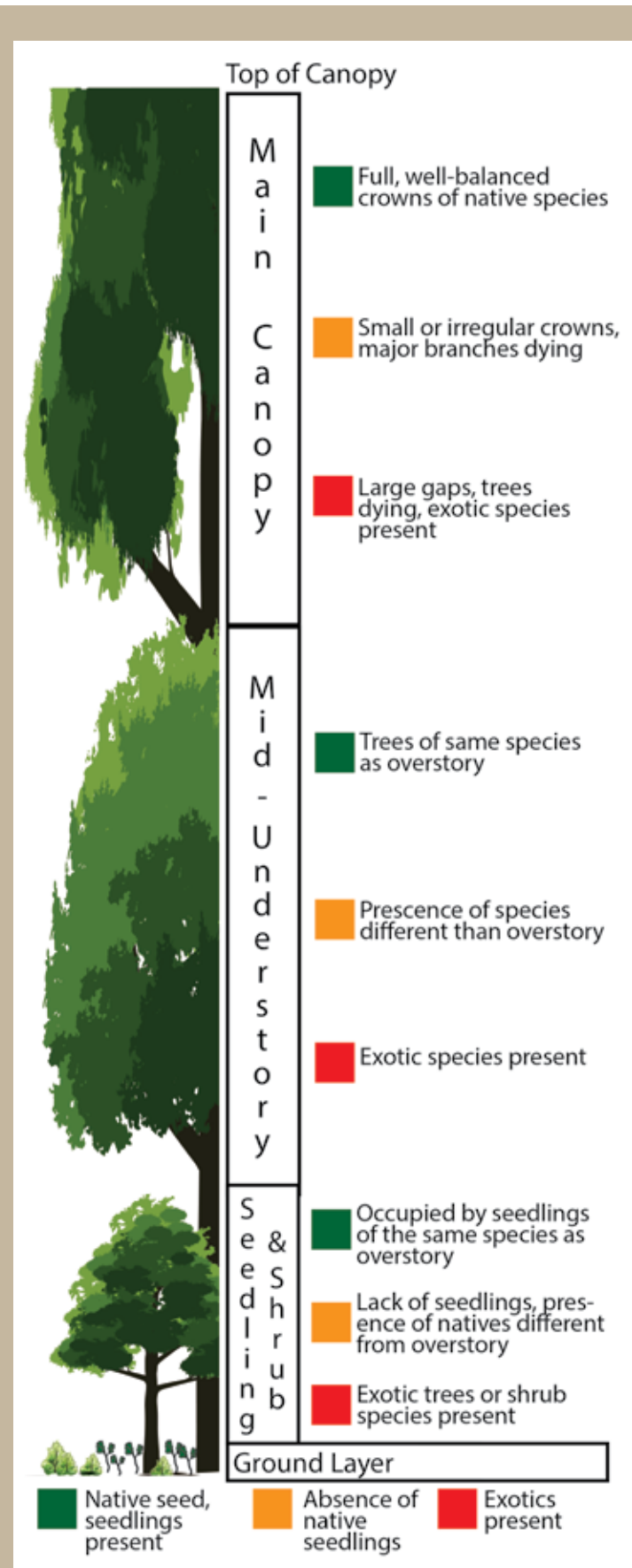


Figure 2. Assessing overall woodland health can be systematically accomplished by evaluating the condition of each layer of a woodlands using a simple good, medium, or poor designation.



Figure 4. Bush honeysuckle, an invasive extoic fully occupying the seedling and shrub layer.

shaped, they are overcrowded (Figure 3b). Large main branches that are dead or dying is a sign of overcrowding or of trees reaching their life expectancy. Thinning may be required to provide adequate growing space, and removal of exotic species is a must.

Mid- and Understory

Most woodlands have mid- and understory trees typically 15 feet to the bottom of the main canopy, which may be 40 to 50 feet off the ground. The number of trees in this layer can vary, and in some instances they are limited. The trees present should be the appropriate native species; if not, this is an immediate concern. If your objective is to grow woods that maintain the current mix of overstory species and the mid- and understory trees are a different species, practices can be used to keep these trees from ultimately replacing the current overstory trees and changing species composition of the woods.



Figure 5. Carpet of newly developed native chestnut oak seedlings.

Seedling and Shrub Layer

The seedling and shrub layer is the one we walk through (2 feet to 15 feet). As with the other layers, this layer should be devoid of exotics. If not, these exotic trees and shrubs often reduce sunlight reaching the ground, stunting the development of native species and ultimately hurting their regenerative potential (Figure 4). These invasive plants must be removed. Some native seedlings should be present in this layer. If they are not the same species as the overstory trees, they might indicate a problem with ultimately regenerating and thus maintaining the overstory species. There are practices that can be used to encourage the development of native seedlings in this layer.

Forest Floor

The forest floor is the layer we walk on, with seedlings and herbaceous plants less than two feet tall. This is also the layer where native regeneration starts. Assessing this layer is relatively easy. As with the other layers, it should be devoid of, or have a limited number of, exotics. Removal of exotics may be required if it is determined that they will harm the regeneration of native species. There should be small seedlings of native tree species present in this layer (Figure 5). If devoid of these seedlings, something is interfering with the development of regeneration, either a lack of seed production or particular conditions, such as limited light or browsing of seeds or seedlings by overly abundant wildlife. Management options exist to help with these problems.

Assessment and Improving Forest Health

By walking through a woods and systematically assessing the condition of each layer, you can start to determine the health of a woodlands or a part of a woodlands. This assessment requires that you can recognize important native species and the presence of exotics, particularly those that are invasive. To aid in this process, the assessment should normally be completed in the growing season, with early summer considered to be the best time. Another knowledgeable woodland owner or a forester may be needed to assist. Determining the condition of each layer helps to determine what practices are needed to improve the woodlands' health. Foresters with the Kentucky Division of Forestry provide this assessment as part of developing a Stewardship Plan for your woodlands. Consulting foresters can also provide this assessment for a fee that includes the development of a management plan for your woodlands. Periodically assessing the health of your woodlands is critical to being able to address woodland health issues as they arise.

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Valuing Kentucky's Woodlands and Their Owners

by Jeff Stringer, Billy Thomas, Bobby Ammerman, Alison Davis

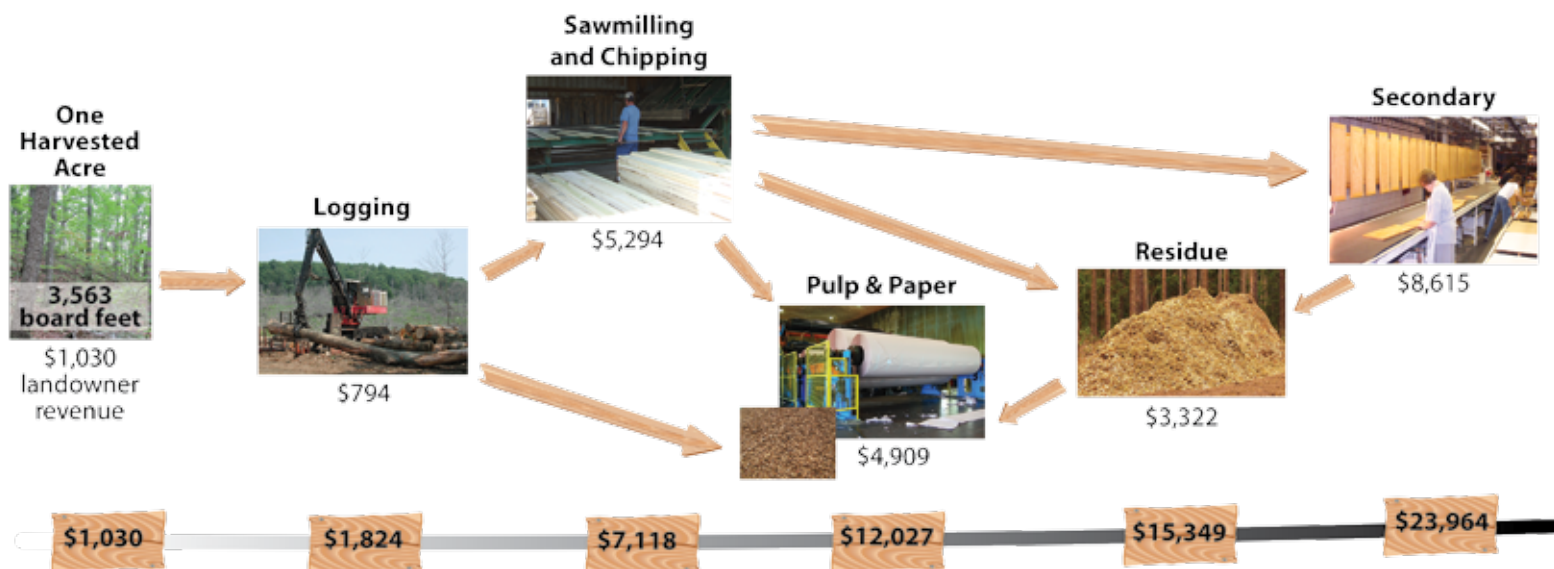
The forest industry in Kentucky is a significant economic force, estimated to have provided \$14.6 billion dollars to the state's economy in 2015. While the forest industry is credited for this economic contribution, it is family forest owners who provide the timber resources that are responsible for a significant portion of this \$14.6 billion, a fact that is often overlooked. This article provides information on the forestry sector's contributions to Kentucky in 2015 with a focus on the importance of woodland owners providing the timber resources that drive the sector.

2015 Economic Value of a Harvested Woodland Acre in Kentucky

A large part of the \$14.6 billion forestry sector contribution is based on the harvesting of Kentucky's woodlands. Economic, timber product output, and timber sales data, the later provided by members of the Kentucky Association of Consulting Foresters, were combined to determine the economic impact of an average acre of harvested timber in Kentucky. This includes revenues for landowners selling timber and revenues from logging, milling, residual products such as bark, and secondary industries that use lumber and other primary products. Therefore, every acre of timber that is harvested yields significant returns, not just for the landowner, but for the Commonwealth as a whole. Analysis shows that each acre of woodland harvested in 2015 was responsible for producing \$23,964 in direct revenues and

a total economic contribution of \$39,743 to Kentucky's economy (Figure 1). In 2015, the average value of standing timber was \$0.29 per board foot or \$1,030 of revenue for the landowner for each acre harvested. The average harvested acre also provided \$794 in direct revenue for the loggers who cut and haul the timber. The majority of our timber is processed at mills in Kentucky resulting in \$5,294 in direct revenues for sawmills and \$4,909 for pulp and paper mills. By-products such as bark from the mills also are an important revenue generator, yielding \$3,322 per acre of timber harvested. Finally, our secondary industries that manufacture finished furniture, furniture parts, flooring, barrels, and a host of other products contribute significant added value to the forest sector yielding \$8,615 per acre of harvested timber. In total, one acre of timber harvested results in \$23,964 to the Commonwealth in direct revenue and a total of \$39,743 including indirect and induced revenues. Does this mean that every acre of woodland harvested in Kentucky is worth \$1,030? Not necessarily, because of a wide variety of variables such as location, age, quality, quantity, access, and market demand, the timber value of a woodland acre will also vary. It is also important to understand the significant economic contribution that each step in this chain provides as well as the significant investments in personnel and equipment costs that are required to convert standing trees into the wood products we all use every day.

Figure 1. Cumulative Direct Economic Impact of a Harvested Woodland Acre



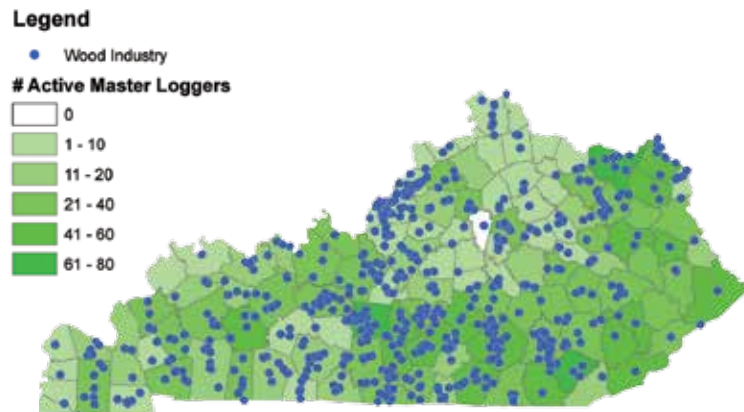
The Forestry Sector in 2015

The forestry sector, from logging to manufacturers of finished wood products, had an estimated direct economic impact of \$9.1 billion and a total economic impact of \$14.6 billion in 2015. This represents a significant increase over 2014 and an upward trend since 2012, when statistics were first compiled by the authors for this sector¹. This economic sector also directly employed 28,408 and contributed to total employment of 62,455, resulting in over \$1.5 billion in earned income. This sector includes 713 manufacturing facilities and more than 1,200 logging firms. The presence of this industry in 109 out of 120 counties as well as loggers in 119 out of 120 counties indicates broad distribution of the \$14.6 billion and highlights the importance of this sector to rural communities (Figure 2). However, as indicated by the clustering of industries in urban areas, forest industry is also an important economic force in many of our metropolitan areas. These industries include sawmills, pulp and paper mills, and a wide variety of secondary producers such as cabinet, barrel, and flooring manufacturers. The number of facilities increased slightly as 10 new facilities came online in 2015. Since the recession that started in 2008, the overall forestry sector has been steadily gaining ground with increases through 2015.

Kentucky Log Values

The majority of our timber resource is harvested as roundwood, ranging from veneer logs to pulpwood, and the Kentucky Division of Forestry tracks the delivered prices for all of these. The 2015 sawlog production estimate of 762 million board feet indicates that Kentucky remains one of the leading national producers of hardwood forest products. While the overall strength of the forestry sector increased in 2015, the year resulted in mixed pricing trends for many roundwood products. Sawlogs used to produce lumber varied significantly by species. For example, grade one logs (higher quality logs yield high quality lumber) of yellow-poplar and black walnut exhibited increases in delivered mill prices in 2015 (Figure 3). Yellow-poplar increased by over 6 percent and black walnut increased 22 percent, the latter continuing a significant upturn since the end of 2013. However, other important species such as white oak, red oak, and ash remained stable or declined in value in 2015. Red oak lost 13 percent of its delivered log value for the highest grade logs, and white oak decreased 11 percent in value. Delivered price for higher quality ash logs remained stable in 2015; however, lower quality ash logs lost significant value in 2015. Hickory had increased significantly in value in

Figure 2. Kentucky Wood Industries and Master Logger Distribution 2015

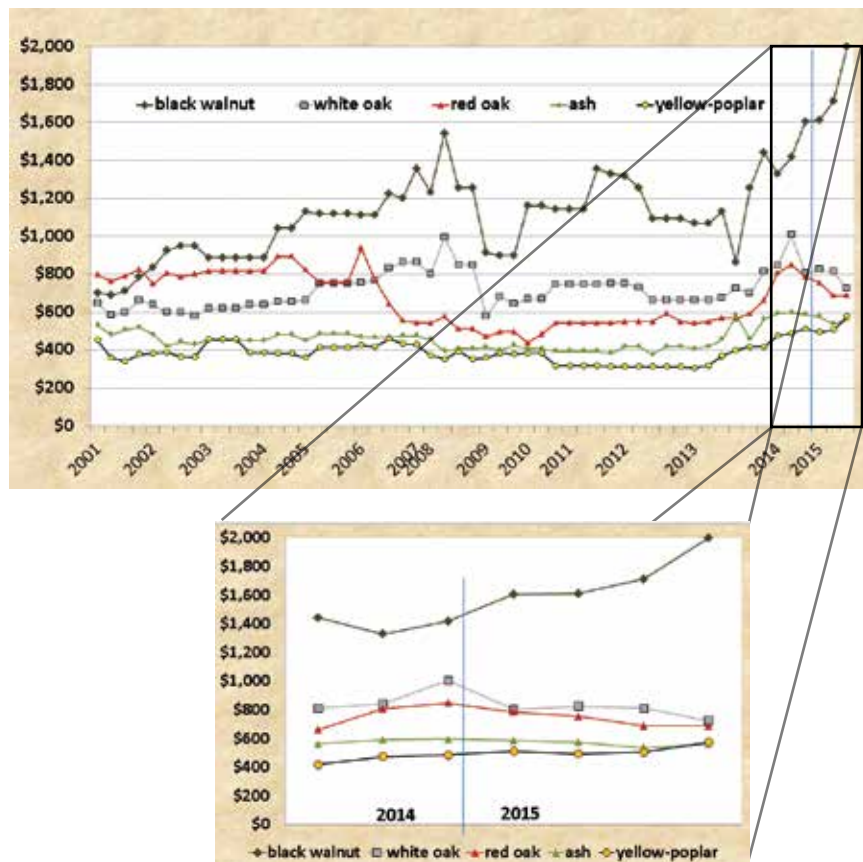


Source: Kentucky Master Logger Database and Kentucky Forest Products Industry Directory

2014 (greater than 30 percent for all grades) but all grades plateaued in 2015.

Tie logs, used for the production of railroad cross ties and stave logs for the production of barrels both continued an upward trend in delivered log prices in 2015. Tie logs increased compared to 2014 and oak tie logs reached almost \$400/MBF, outpacing non-oak tie logs, the first time this

Figure 3. Delivered Grade 1 Sawlogs Prices for Major Species in Kentucky



Source: Kentucky Division of Forestry's Delivered Log Price Data comparison between the 4th quarters of 2014 and 2015.

¹This article was based on "Forestry Economic Impact Report 2015", University of Kentucky, Cooperative Extension Service, Department of Forestry, FORFS 16-02. www.ukforestry.org

has happened since 2008 (Figure 4). Stave logs, high quality white oak logs used to produce barrel staves, reached \$1,300/MBF in the fourth quarter of 2015, a 27 percent increase compared to the fourth quarter of 2014 (Figure 5). This increase corresponds to the increase in projected worldwide whisky sales and is likely to continue.

Forestry Sub-sectors

The forestry sector is comprised of six sub-sectors, including logging, primary milling (primarily sawmilling), pulp and paper, secondary manufacturing (finished products and components), paper converters (industries that make finished paper products) and residues (primarily bark). While the entire forestry sector saw an increase in 2015, there were significant differences in how each sub-sector performed.

Logging: Logging firms had a direct economic impact of \$169 million in 2015, an increase of 27 percent over 2014. While this is the smallest sub-sector it arguably has the largest impact because of the harvesting and delivering the raw material for many of our forest industries.

Primary wood manufacturing: Primary manufacturing, comprised primarily of sawmills producing lumber, cross ties, and other dimensional products, increased significantly, over 32 percent, compared to 2014. This sub-sector increased production and revenues without a similar increase in employment. This indicates a capacity that has been under-utilized over the last several years.

Secondary manufacturing: In contrast to primary manufacturing, secondary manufacturing slipped to \$1.84 billion from \$2.04 billion in 2014, a 10 percent loss, with a reduction of approximately 1,000 employees. The reduction in secondary industry production is important as this sub-sector provides considerable indirect and induced impacts (almost equal to the direct contribution) to Kentucky's economy.

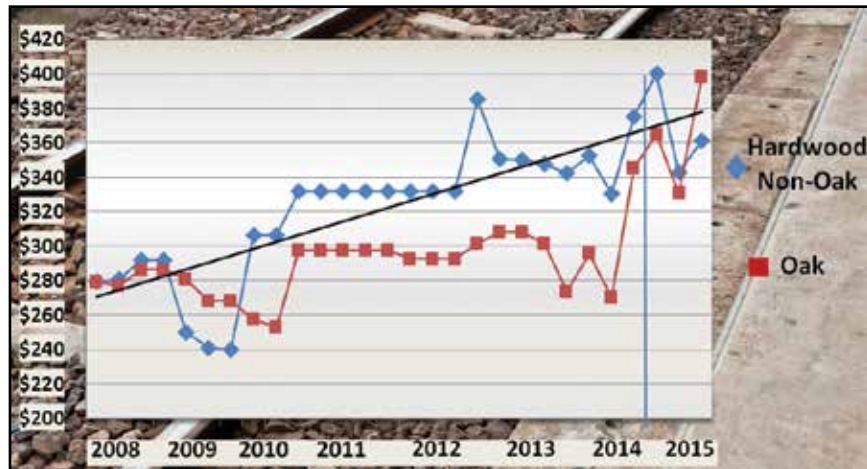
Pulp and paper: Kentucky's pulp and paper manufacturing occurs in two facilities: one located in Hawesville (Domtar Corp.) and one in Wickliffe (Verso Corp.). Pulp and paper decreased in 2015 due primarily to the idling of the



The pulpwood market in western KY is threatened by the recent closing of the Verso Mill.

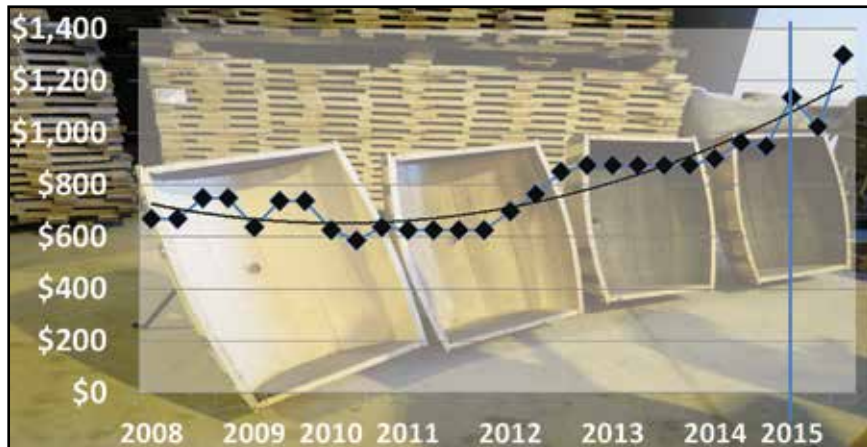
Photo courtesy: Jeff Stringer

Figure 4. Delivered Tie Logs Prices in Kentucky 2008-2015 by Quarter (\$/MBF)



Sources above and below: Kentucky Division of Forestry's Delivered Log Price Data

Figure 5. Delivered Stave Logs Prices in Kentucky 2008-2015 by Quarter (\$/MBF)



Wickliffe mill in November which is now scheduled to close this summer. This sub-sector is expected to decrease significantly in 2016.

Paper converters: Paper converters use paper produced in pulp and paper plants and manufacture-finished paper products, including packaging. This sub-sector is large and grew in 2015. Many of these facilities are located in urban areas and use paper that does not necessarily come from Kentucky.

Wood residue: Wood residues from both sawmilling and secondary manufacturers, including bark and wood mulch, increased in 2015, providing a direct contribution of over \$710 million, up 34 percent over 2014.

Sub-sectors outlook: Most economic forecasting indicates overall stability in 2016 for the sub-sectors with the exception of pulp and paper and logging. The idling of one of the two pulp and paper facilities in Kentucky in November 2015 may result in a 30 to 40 percent reduction of this sub-sector in 2016 if the plant does not reopen. Likewise, logging may be volatile owing to the reduction in this market for Western Kentucky loggers.

Kentucky Wood Exports in 2015

Wood related exports increased in 2015 with \$295 million shipped compared to \$272 million in 2014 (Table 1). While

Table 1. Top 5 Kentucky Wood, Paper, and Pulp Exports in 2015 (Millions)

Wooden Casks (Barrels)	\$103,287,884
Oak Lumber	\$67,927,578
Hardwood Lumber	\$25,085,404
Ash Lumber	\$15,898,818
Railroad Ties	\$12,341,996

Source: U.S. Department of Agriculture Foreign Agricultural Services

Asia significantly increased its imports of Kentucky wood products in 2015, Europe is still the leading export purchaser. Oaks continue to dominate Kentucky wood exports, led by wooden casks (barrels) at over \$103 million, followed by oak lumber at over \$67 million, accounting for over half of all wood-related exports.

While woodland owners are critical to Kentucky's economic health, the woods they own provide many environmental and societal benefits that largely go unappreciated. These include ecosystem services, such as clean air and water, carbon sequestration, biodiversity, and wildlife habitat, not to mention providing Kentuckians and thousands of visitors with recreational opportunities, aesthetic beauty, and many other intrinsic values. In total, the contributions of woodland owners to Kentucky is significant economically, environmentally, and socially. Our state, forest industry, and woodland owners all benefit from healthy, productive woodlands. Being better stewards of our resources is not only good for our environment but also for the industries that rely

on them. For those who are not woodland owners, we hope you gained a better understanding and appreciation for the contribution woodlands and their owners make to our lives and the need to support sustainable woodland management practices. If you are a woodland owner, thanks for all you do for Kentucky, and if you need assistance in better managing your woodland resources, visit www.ukforestry.org or give us a call.

Data Sources:

A number of data sources were used in this analysis including IMPLAN data for 2014 (IMPLAN is a nationally recognized economic modeling company that aggregates economic statistics and develops industry specific multipliers for calculating economic impact) that was adjusted to 2015 levels based on employment figures from the Kentucky Forest Products Industry Directory, which is maintained by the University of Kentucky, Department of Forestry Extension, and the Kentucky Division of Forestry (KDF). In addition, other sources include the USDA Forest Service's Timber Product Output, KDF's Delivered Log and Product Prices, the Forest Inventory Analysis, provided jointly by KDF and the USDA Forest Service, the Kentucky Master Logger Program, and Kentucky Forest Industries Association members also provided value data used in this report.

The authors thank Kentucky Division of Forestry (KDF) personnel, particularly Stewart West, for providing necessary and invaluable information to this report; Chris Oswalt with USDA Forest Service's FIA unit in Knoxville; Mark Schuster, KDF coordinator of the Kentucky Master Logger Program; members of the Kentucky Forest Industries Association; and Terrell Baker with the University of Kentucky Department of Forestry.

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Direct and Total Impacts

Direct vs Total Impacts Economic analyses often use the terms direct and total to refer to the nature of the economic impact of a given industry.

Direct economic impact refers to the economic activity (ex. sales and employees) directly associated with an industry sector.

Total economic impact refers to the complete economic activity associated with an industry sector and includes direct, indirect, and induced effects. Indirect includes the impact of the Kentucky forest and wood industries' purchasing goods and services from other industries while induced impacts reflects the spending of the labor income earned by employees of the Kentucky forest and wood industries. Total economic impact is the value that is often used to make economic policy decisions.

Biotechnology: Scientific Advances That Could Save Our Native Forests

In the last issue of Kentucky Woodland Magazine we described what biotechnology is and how it is being applied. This is the second article in our featured series exploring the use of modern genetic technologies in forestry. In this article, we profile several research projects that are using biotechnology to help protect and restore native trees at risk of disappearing due to invasive pests.

by Ellen Crocker

Forests at Risk

Invasive insects and diseases are serious threats to the health of our forests and woodlands. These pests are exotic, many originating in Asia and Europe, and are accidentally or intentionally brought to the United States. While most of the exotic species that wind up in the United States are not a problem, many are, wreaking havoc on native plants that lack necessary defenses. Unfortunately, the number of new invasives will likely continue to increase as global trade provides ample opportunities for new introductions. As we plan ahead, better solutions are needed for both current problems and future infestations.

Already, invasive pests have decimated many of our important tree species. For example, the American chestnut once dominated eastern forests but since the introduction of Asian chestnut blight in the early 1900s, this species has been nearly eradicated. More recently, the emerald ash borer has spread throughout the Midwest and into the Southeast and Northeast, leaving millions of dead ash trees in its wake. Introduced to North America from China just 14 years ago, the emerald ash borer is a clear example

of how rapidly these invasives can spread and kill.

Unfortunately, our tree species are not able to adapt quickly enough to fend off these insects and diseases. Many scientists fear that our native trees lack both the defenses to fight these threats now and the time to evolve resistance before it is too late.



Chestnut blight is caused by a fungus that forms cankers and kills American chestnut trees like the one shown here.

Tree Restoration 2.0

In the past, restoration efforts following invasive attacks relied on time consuming (and in many cases unsuccessful) searches for resistant trees or cross-breeding with related species that happen to be resistant to the threat. More often, the losses of individual tree species were accepted as sad but unavoidable.

As the onslaught of exotic species increases, we no longer have the liberty of watching it occur unchecked. We must find ways to fight that are more effective and efficient than before. Unfortunately, keeping these pests out of the U.S. has proven difficult, as has control once they are here. Even breeding programs, trying to find and develop resistance, have been largely ineffective and take too much time. New methods must be developed to help us quickly develop resistant native species.

The use of biotechnology may prove to be of great

Photo courtesy: Linda Haugen, USDA Forest Service, Bugwood.org

Invasive insects and diseases can cause extensive tree mortality, as seen in this aerial photo of ash trees killed by the emerald ash borer.

Photo courtesy: Troy Kimoto, Canadian Food Inspection Agency, Bugwood.org



Photo courtesy: Ellen Crocker



Can these white oak seedlings defend themselves against invasive pests? New scientific approaches to testing resistance may provide a better (and faster) answer.

help us fight invasive pests.

Many researchers view biotechnology as the only reasonable way to restore native species that have been decimated as well as protect species from decline or ultimately from extinction. Here we will profile several different projects that use the same building blocks of molecular biology with the specific goal of giving native trees an advantage against invasive enemies.

Finding the Needle in the Haystack

One of the biggest challenges in restoring forests after the introduction of an invasive pest is identifying resistant trees. In a given population of trees, just as with a group of people, genetic diversity (variation) gives each tree slightly different traits. Even if most of the trees in a stand die, hopefully some trees will be less susceptible to or more tolerant of a particular pest and survive.

Finding these lingering resistant individual trees after a pest has swept through is an important first step. But, understanding the genetic basis for this resistance is key to long-term restoration. It allows us to rapidly screen a large number of trees that linger after the invasion for resistance. This screening is important as some trees are persisting due to luck while others may possess a genetic resistance. Previously, identifying genetically resistant individuals was a long process that involved growing the offspring of lingering trees to an age where they could be infected to see if genetic (inherited) resistance was present.

Fortunately, scientists are developing new tools to narrow down which trees are resistant to insects or diseases. One approach, called chemical fingerprinting, allows scientists to

assistance in fighting invasive tree threats.

Biotechnology is a broad term that encompasses a wide range of techniques. It is often equated with the development of genetically modified organisms (GMOs). While the development of genetically modified (GM) plants that are resistant to invasive insects and diseases is one use of biotechnology, it is only one of many ways in which biotechnology can be used by researchers to

analyze all of the chemicals present in a plant and distinguish plants that can defend themselves against invasives from those that can not. Dr. Anna Conrad, a scientist based at the University of Kentucky's Forest Health Research and Education Center, is testing this technique to screen chestnut seedlings for resistance. Her goal is to decipher the chemical code of chestnut resistance. This approach allows researchers to screen many chestnut seedlings over a relatively short period of time—minutes instead of months.

With this information, resistant trees could be strategically and quickly deployed to populate eastern forests with healthier, hardier American chestnuts. Dr. Conrad hopes that her work will “reduce the time and resources needed to identify disease resistant trees” and suggests that the trees identified in chemical fingerprinting will provide good “candidates for forest-restoration efforts.”



UK researcher Dr. Anna Conrad, shown here, is using chemical fingerprinting to find resistant chestnuts

Photo courtesy: Ellen Crocker

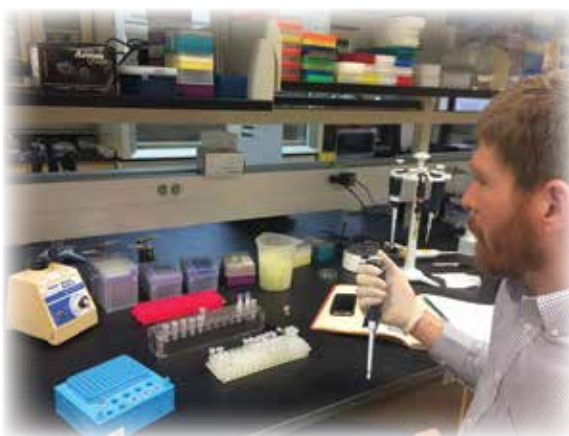
Quicker Tree Breeding

Biotechnology not only helps us find the best (and most resistant) trees for restoration use, but is also being applied to test and breed trees faster, speeding the potential rate of forest recovery from invasive pests. Right now, one of the biggest challenges in breeding resistant trees comes down to basic biology—trees grow very slowly. Even in optimal conditions, many of our native eastern forest trees take five to seven years to flower and much longer to grow to the stage where they are affected by diseases and insects in the field.

The slow development of trees means that breeding programs also progress slowly. It takes decades to grow seedlings, test their susceptibility and then propagate another generation. This process has been a major

bottleneck in breeding resistant trees. If breeding programs are to help in the battle against invasive threats, we need accelerated tree-breeding techniques.

In light of this challenge, Dr. Shenghua Fan, another Forest Health Center scientist, is working to breed trees faster



Forestry researchers, such as Dr. Tyler Dreaden shown here, are using a wide variety of molecular biology techniques to better understand and improve forest health.

Photo courtesy: Ellen Crocker



Tree breeding programs can take many years, as seedlings, like the one shown here, must grow to maturity, which can take a long time for trees.

that result from rapid cycle breeding are not genetically modified thus alleviating worries from those in the public who are concerned about GMOs. Although a transgenic virus induces the rapid flowering, Dr. Fan notes that its effect is “not passed to next generations through seeds” and in that way is more temporary than most applications of transgenic technology. Dr. Fan hopes that by improving the techniques for rapid cycle breeding his research “will help breeders quickly respond to threats and develop new varieties for rapidly changing environments.”

Building Better Trees

When thinking about biotechnology, GM trees, as discussed above, might be one of the first things that comes to mind. But, as you can see, it is actually only a small part of how biotechnology is being used to help with forest restoration. Nonetheless, it cannot be overlooked as an important and promising way to make trees more resistant to invasive insects and diseases.

In most cases, when researchers turn to transgenic breeding for forest restoration, it is because they have exhausted other options. The slow pace of tree breeding combined with a lack of existing genetic resistance in native trees has long hampered traditional breeding approaches. With biotechnology, researchers can now use a strategy similar to traditional breeding but take a much more direct route, specifically adding certain genes to make trees resistant with less of the searching and waiting.

For example, Drs. Bill Powell and Charles Maynard at the State University of New York College of Environmental Science and Forestry in Syracuse, N.Y., have found a way to make American chestnuts that are resistant to the invasive fungal blight using biotechnology. They did this by adding a few wheat genes previously known to be important in wheat fungal defenses to native American chestnuts. The genes enable the trees to break down oxalic acid, a compound that the blight fungus uses to infect the trees, and thereby make the trees resistant to blight.

While the disease resistance of these GM chestnuts is clear, their future role in forest restoration remains uncertain. These trees are still in a trial phase and will not be released

using biotechnology. He is piloting a new approach, called rapid cycle breeding, which uses a virus to add certain flowering genes to laboratory test trees. This method causes early flowering which speeds up traditional breeding programs. The seeds

until they have passed the necessary government approval processes. However, it is unknown whether the public will support the use of these trees in restoration. While these trees are transgenic, the argument could be made that they are more similar to native American chestnuts than the traditionally bred Chinese-American hybrids, containing only a few additional wheat genes instead of the high number of novel Chinese chestnut genes found in the hybrids.



Traditional chestnut breeding programs have relied on searching for resistant native trees (shown in this photo) as well as hybridizing native chestnuts with Asian chestnuts resistant to blight.

Photo courtesy: Joseph OBrien, USDA Forest Service, Bugwood.org

Decisions regarding the use of transgenic trees in forest restoration will need to be made in the near future, and it is increasingly important that woodland owners, land managers, policy makers, and the general public seriously consider this issue.

Conclusions

As these case studies show, new biotechnological techniques are changing the way we approach forest restoration. From helping researchers pick resistant trees faster to speeding up breeding efforts to adding particular resistance genes, biotechnology is providing scientists and land managers with a bigger toolbox for responding to invasive insects and diseases.



Many hope that the American chestnut will once again be an important component of eastern hardwood forests. The development of new biotechnological techniques, combined with traditional breeding programs, may help make this dream a reality.

However, in each case, the end goal of stronger native trees and more resilient woodlands and forests remains constant.

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Kentucky Tree Farm Committee Newsletter

Looking Back and Ahead

by Pam Snyder, Forest Management Chief, Kentucky Division of Forestry

The Kentucky Tree Farm Committee (KTFC) made the big decision to remain in the third-party certification system utilizing the state voice–state choice process developed by the American Tree Farm System. The KTFC had prerequisites to complete and developed a memorandum of agreement between the state program and the American Forest Foundation (AFF), a written strategic plan, a state leadership manual, a Tree Farm interest response plan, and a communication/outreach plan. The KTFC sent out a comprehensive contact letter to every Kentucky Tree Farmer to encourage engagement/interest and to verify landowner information within the national database.

The KTFC continues to administer the following: the state and regional tree farmer of the year and inspector of the year contests, training Tree Farm inspectors, participating in fundraising programs with AFF, educational grants, financial reports, state assessments and audits, required Tree Farm inspections, setting goals, and achieving the Tree Farm mission and promoting forest sustainability. I want to thank every one of the committee members who has assisted in the year-long process. If you have any questions or concerns, please contact Bob Bauer or Michele Brewer at the Kentucky Forest Industries Association concerning the state voice–state choice process at 502.695.3979 or Michele@kfia.org.

Kentucky Legislative Session & Forestry Issues

by Bob Bauer, Kentucky Tree Farm Committee Treasurer & Kentucky Forest Industries Association Executive Director

The 2016 Kentucky Legislative Session has concluded and the Kentucky Forest Industries Association (KFIA) who co-sponsors the Tree Farm Program in Kentucky followed a number of issues that could potentially impact Tree Farmers. KFIA tracked legislation that affects all forestry interests and has started to update tree farmers by email concerning legislation. The state budget dominated the session and resulted in cuts to many agencies including the Division of Forestry but on the positive side we were able to get some existing money set aside for the two state nurseries which will hopefully keep them operational. House Bill 208 passed and was signed into law by the Governor and allows burning during fire season for those certified with proper training and requires burning notification to the Division of Forestry. Once again a Resolution was introduced in the House to establish a Timber Theft and Trespass Task Force to develop recommendations to address

related issues but it did not get a hearing in the Senate. KFIA will be working to bring forestry partners together to see how this issue can be addressed to find potential solutions. Repeat Bad Actor Legislation that was introduced and passed by KFIA during the 2015 Legislative Session is now in full effect. The law requires all loggers on the bad-actor list who have not paid fines and fixed sites to notify the Division of Forestry before logging and any logger on the list three or more times are not allowed to log in Kentucky until they fix sites and either pay all fines or abide by a payment plan. Interested Tree Farmers can contact the KFIA office with any legislative concerns or questions at 502.695.3979.

Congratulations!

Please join the Kentucky Tree Farm Committee (KTFC) in congratulating the recently announced KTFC award winners. The award winners were announced at the 2016 Kentucky Forest Industries Association annual meeting.



Kentucky Tree Farmer of the Year

Herbert Davis (2nd from left) of Casey and Taylor counties was honored as the 2015 Kentucky Tree Farmer of the Year. Accompanying Mr. Davis is KDF Service Forester Amy Carmicle-Rabich (left), Mr. Davis' wife Wanda, and KDF Chief Forester Robert Bean (right).



Kentucky Tree Farm Inspector of the Year

KDF Service Forester Tammy Rodgers (right) was honored as the 2015 Kentucky Tree Farm Inspector of the Year. Presenting the award is KDF Forest Management Chief Pam Snyder.

Kentucky Logger of the Year

Sutton Logging was honored as the 2015 Kentucky Logger of the Year. Pictured are outgoing KTFC Chairman Lloyd Foe (left), Mike Sutton (center), and Justin Sutton.





Photo courtesy: Jeff Stringer

Unauthorized timber harvesting can leave landowners with a number of issues that must be dealt with including loss of timber value, land that needs to be reclaimed, and a host of other issues that are not easily resolved.

Protecting Woodlands from Timber Theft and Trespass

by Jeff Stringer, Chad Niman, and Billy Thomas

Timber theft and trespass are important issues to all woodland owners. It is important for those who need to protect their woodlands from theft and trespass, and it is also important for those conducting operations such as a timber harvest or a hunt lease to ensure that loggers and hunters stay on the property. There are some basic practices that can be done to help in both situations. This article provides information on the difference between timber theft and timber trespass and how they occur as well as conditions that contribute to unauthorized cutting and how to reduce risk¹. While it is impossible to reduce all risks associated with woodland ownership, having a good understanding of timber trespass and theft issues can help woodland owners develop plans to minimize problems.

Defining Timber Trespass and Theft

Unauthorized cutting of timber occurs either intentionally (timber theft) or unintentionally (timber trespass). Timber theft occurs when a boundary line is knowingly crossed to steal timber. This can occur on a large scale, covering acres where all valuable trees are cut, or on a limited scale, where only a few trees near a boundary line are removed. Timber trespass, on the other hand, typically occurs through one of two circumstances. The first is when boundaries are not marked and/or are unclear, leading to an unintentional cutting. The second is when the boundary is misrepresented or unknown by the landowner or their representative leading to unintentional cutting of adjacent timber by the logger. The key point is that unauthorized cutting of trees can result from both unintentional and intentional actions of landowners and loggers.

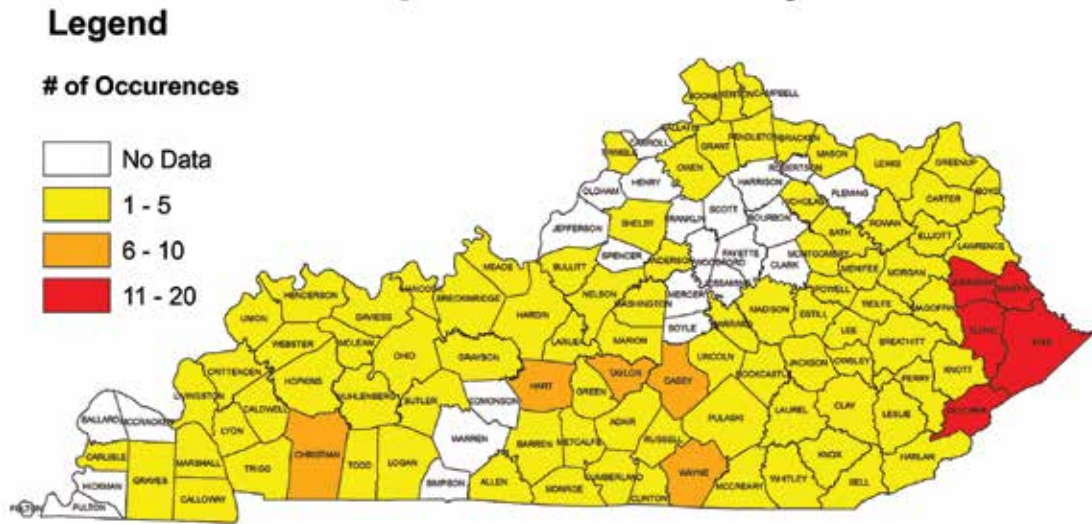
¹This article was based on the report "2016 Report on Timber Theft and Trespass in Kentucky" authored by Extension faculty J. Stringer, and Extension associates C. Niman, and B. Thomas of the University of Kentucky, Department of Forestry. Data used in the report and this article were generated in part from a survey of members of the Kentucky Association of Consulting Foresters (www.kacf.org) conducted by the authors. The authors thank the consultants who participated in this survey.

Figure 1. Occurrence of Timber Theft and Trespass in Kentucky

Occurrence in Kentucky

Because there is no formal reporting mechanism for timber theft or trespass, determining detailed information on the distribution and magnitude of these problems is difficult. However, case data from Kentucky's consulting foresters provides information on the relative distribution of unauthorized harvesting in Kentucky (Figure 1). The figure clearly shows that unauthorized cutting has the potential to occur throughout Kentucky with several Eastern counties subject to a higher frequency of unauthorized cutting. The higher incidence of unauthorized harvesting reported by consulting foresters is consistent with anecdotal reports.

There is also a relationship between geographical area and the size of an individual case of unauthorized harvest. For the entire state, the average number of trees involved in an individual case was 74 on 11 acres (Table 1). This involved a total of 13,939 board feet of timber, roughly one truckload, with a fair market stumpage value of \$4,909. Stumpage is typically the value received by landowners when they sell



Source: Results based on a survey of Kentucky Association of Consulting Foresters on timber theft case activity in the last five years. (2015-2010)

Figure 2 indicates that landowners on average in Eastern Kentucky could receive \$23,625 dollars per case just for timber damages, compared to approximately \$7,500 in Western Kentucky due to the greater size (# of trees) of unauthorized harvest occurring in the eastern third of Kentucky. The values above are regional averages and there are cases that greatly exceed the average. Further, damages other than timber including professional fees can increase the total value of each case.

While immediate stumpage value loss is one of the most significant damages for landowners experiencing an unauthorized harvest, there are others. Poor logging practices can lead to bark damage on trees resulting in wood rot and future timber loss, soil compaction and erosion, and logging debris not disposed of properly all of which are damages.

Table 1. Number of trees and acres of individual cases of unauthorized harvest.

	Average	Low	High
Number of trees per case	74	1	5,000
Acres per case	11	0.01	250
Board feet	13,939	150	316,727
Value of stumpage	\$4,904	\$1,300	\$111,568

timber. It's generally 30 percent to 50 percent of the delivered mill price for logs, with the balance reflecting timber harvesting costs and logger profit. Table 1 also indicates that there is a wide range associated with unauthorized harvests, from 1 to 5,000 trees and up to 250 acres. As indicated above timber losses vary by region. Figure 2 provides information on the average case of unauthorized harvesting across Kentucky. The highest loss occurs in Eastern Kentucky with the average unauthorized cut occurring on 31 acres with 143 trees harvested. These 143 trees yielded 30,167 board feet of timber with a stumpage value of \$7,875, equivalent to a loss of \$256 per acre. Central and Western Kentucky experienced less acreage, trees, and value per case with Western Kentucky having the smallest dollar loss, \$2,515 per case.

Kentucky's timber trespass law (KRS 364.130) indicates a potential compensation of three times the stumpage value and damages. Three times the stumpage associated with

How Unauthorized Cutting Occurs

One of the pre-eminent questions that arise in discussions over unauthorized harvesting is, whose fault is it? Many might immediately indicate that it is the loggers' fault. However, survey information from consulting foresters directly involved in investigating unauthorized harvest cases indicates this may not necessarily be the case. This information indicated that unauthorized harvesting could be classified into one of four types (Table 2). Two of the types representing 62 percent of the cases occurred because boundaries were not clear or the boundary was misrepresented to the buyer of the timber or the logger. The cause of these cases can vary and include overlapping surveys or deeds that are contradictory, boundaries that have been incorrectly marked, or an unmarked boundary that is difficult to follow. The remaining 38 percent are clearly timber theft with intent to



Timber theft can lead to problems other than the loss of timber revenue, such as water quality issues. Here logging debris has been left in a stream and will need to be removed.

Photo courtesy: Jeff Stringer

steal, nine percent being the most blatant where a logger sets up to specifically steal an entire tract of timber. This shows that there can be a number of reasons for unauthorized harvesting, and both landowners and loggers can be at fault.

Magnitude of Unauthorized Harvest

Another issue associated with this problem is determining how significant unauthorized harvesting is, as it relates to the entire timber supply. While the latter is not necessarily an important question for an individual whose timber has been cut without authorization, it is an important question from an industry and trade standpoint. Anecdotal information varies widely depending on the source of the information. Fortunately, some information has been generated from a portion of Kentucky, specifically far Eastern Kentucky, where research indicates that 0.35 percent of the total timber volume cut each year comes from unauthorized harvesting. This same analysis indicates similar results for counties in surround states, including 0.86 for Tennessee, 0.63 for Virginia, and 0.17 for West Virginia. Regardless, while the percent of stolen timber in the overall timber supply is low, the impact of unauthorized cutting for the landowners (particularly in the egregious cases) can be significant.

Damages and Compensation

Collecting evidence and successfully prosecuting felony timber theft has proven difficult in Kentucky and the majority of timber theft cases are settled either out of court or in civil court. As a result, landowners are in adverse positions; they must seek compensation through their own means, including paying for expert witnesses (ex. surveyors, foresters) and legal fees. The relatively low average stumpage value associated with many cases of unauthorized harvesting indicates that landowners may not find it palatable to pursue compensation. With larger cases of theft or trespass, the monetary loss can be significant, warranting pursuit of compensation. In cases of unauthorized harvesting where the outcome is known, 58 percent were settled outside of court and

Occurrence type	Percentage
Property line unknown or disputed	41
Landowner misrepresents boundary	21
Logger intentionally crosses boundary	29
Logger harvests entire absentee landowner property	9

only a little over 18 percent were settled in court or through arbitration. However, in these cases it is not guaranteed that the victim of timber theft will recover the total compensation outlined in Kentucky’s timber trespass law (KRS 364.130). This could be up to three times the stumpage value plus other damages, including the stumpage value of the timber removed and fees for professional services if needed, typically consulting forester and surveying fees, and potentially fees for legal representation. Based on survey data from consulting foresters, Table 3 shows that triple damages were paid most often (48.9%) as stipulated in KRS 364.190, followed by single damages (31.9%) and double damages (17%).

As stipulated in KRS 364.130, the landowner is also entitled to recovery of legal costs incurred as a result of the trespass. Forty-five percent of the time the trespasser paid the rightful owners legal fees, 32 percent of the time partial payment was made and 23 percent of the time the legal fees were unpaid. This variation can be expected given that

Trespasser Paid Single Damages	Trespasser Paid Double Damages	Trespasser Paid Triple Damages	Trespasser Paid More Than Triple Damages
31.9%	17.0%	48.9%	0.02%

the majority of cases are settled out of court and given the high degree of variability and fault associated with unauthorized cutting.

Research data from U.S. Forest Service surveys of Kentucky woodland owners indicates that for many, the primary reason for woodland ownership is not timber.

Recreation, aesthetics, and wildlife are weighted more heavily than timber,

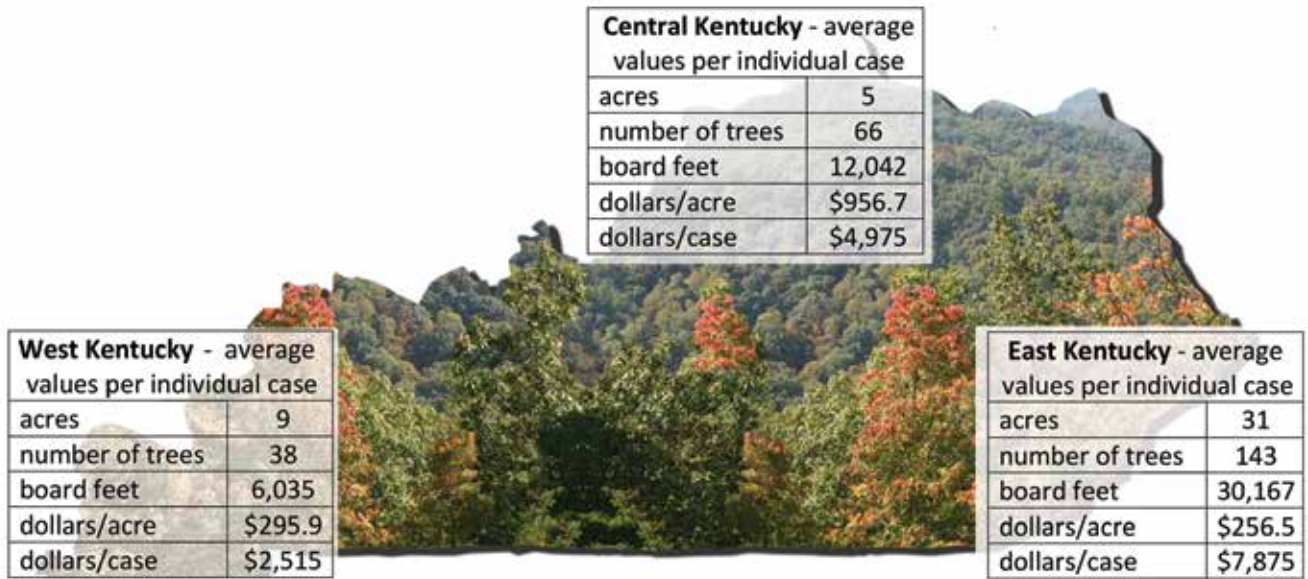
indicating that there are both tangible and intangible losses associated with unauthorized harvesting, particularly in cases of significant timber theft, that need to be considered when discussing this issue. Victims of unauthorized cutting represent credible sources of information on these factors (ex. www.timbertheft.org), which we fully recognize should be considered in deliberations on this issue, but are not documented in this report.

Reducing Risk for Woodland Owners

The following information should prove useful to woodland owners who want to help protect their property from unauthorized cutting. To help decrease the risk of unauthorized harvesting one or more of the following should be considered.

1. Thoroughly mark and sign property boundaries. This requires that accurate survey or boundary delineation is available. The marking does two things: It makes it difficult for someone to claim they did not know where the boundary was and it indicates that you are an interested and involved woodland owner who cares about their property.
2. Maintain good property records, deeds, maps, surveys, and other information that can provide anyone interested a clear definition of your harvest boundary.
3. Be vigilant to what is occurring around your woodlands. If a timber harvest is occurring on an adjacent property, it would be prudent to contact the adjacent landowner or logger to let them know where your boundary is and how it is marked. Absentee owners face special challenges with this issue and having local assistance is important. Notification instructions should be given to

Figure 2. Regional Variation in Timber Theft/Trespass Cases in Kentucky



The average acreage, size, and timber value associated with unauthorized harvesting varies across the state. The average case being more significant in eastern Kentucky compared to central and western Kentucky.

those watching the property to alert you and local law enforcement of an ongoing or a potential issue.

4. If you receive a letter indicating a timber harvest is going to occur on an adjacent property, you need to respond immediately. The timber trespass law has a provision that adjacent landowners are to be notified via certified letter seven days in advance of a harvest on an adjacent property. As an adjacent property owner, you have seven days to offer an objection to the proposed boundary of the harvest if you have one. If you do not respond and an unauthorized harvest occurs then you may only be entitled to the stumpage value and damages. If you object and there is a problem, you can sue using the timber trespass law for three times the stumpage value and damages.

For those who are contemplating a timber harvest or other operations, steps should be taken to help reduce the risk of those operating on your property from straying over the boundary.

5. Use a timber sale agreement or contract that contains information on property line delineation (attach deeds, maps, boundary descriptions, etc.).
6. Ensure that boundaries are marked toward the inside of your boundary. If marks or signage are only placed facing the outside, loggers or others may easily stray over the boundary only to realize the situation after they have trespassed.
7. Use flagging to delineate harvest boundaries. If a timber harvest runs up against your boundary line, this will enhance boundary identification, especially paint that may have faded or signs facing away from the prop-

erty. There are loggers who flag boundaries to ensure that they do not wander. However, it is the landowner's responsibility to know where the boundaries are and properly convey them to loggers or timber buyers.

8. If you are unsure of your boundary, it is good to mark a harvest shy of where you think the boundary is, thus providing a buffer to help avoid trespass.
9. Use a walk through with a logger or others operating on your property to ensure they understand boundary delineation, and check boundaries during operations where feasible and safe.

It is possible to help reduce the risk of an unauthorized harvest; however, due diligence is required. Foresters, particularly consulting foresters, can assist with timber harvesting. They can also help those who have had an unauthorized harvest of trees. You can find a list of Kentucky consultants meeting the Association of Consulting Forester standards at www.kacf.org. Consulting foresters provide assistance in all aspects of timber sales including delineating boundaries and work as your advocate in dealing with timber sale issues including trespass or theft. Industry foresters can also provide assistance. In many instances, particularly if they have purchased the timber, it is in their best interest to ensure that the logger they are contracting with to harvest the timber does not trespass. Kentucky Division of Forestry foresters, while unable to assist directly with timber sales, can help advise on where to seek assistance. In summary, understanding how timber trespass and theft occurs, engaging in active management and observation of your property, and following some simple steps to help reduce trespass issues can help reduce the risk of unauthorized cutting.

Got Woodlands?

Need answers? Register now for the
2016 Woodland Owners Short Course at
<https://forestry.ca.uky.edu/wosc>

July 16

Central WOSC - Henry Co. Extension Office

July 30

East WOSC - UK Robinson Center for Appalachian Resource Sustainability in Breathitt County

August 13

West WOSC - UK Princeton Research Center in Caldwell County

Sources of Information

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Jeff Stringer, Ph.D., is an extension professor at the University of Kentucky and is responsible for continuing education and research in hardwood silviculture and forest operations. He is also an editor of the Kentucky Woodlands Magazine.

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Changes to Kentucky's Forestry Best Management Practices

by Jeff Stringer and MacKenzie Schaeffer

Kentucky has required the use of practices to reduce water pollution from forestry operations for over 15 years. Research indicates that changes are needed in these practices and they are on the way. Two laws help protect water quality that directly addresses agriculture and silviculture (forestry): the 1994 Kentucky Agriculture Water Quality Act (AWQA) and the 1998 Kentucky Forest Conservation Act (KFCA). The AWQA established a set of Best Management Practices (BMPs) to protect water quality during agriculture and forestry operations. The AWQA also requires that each landowner with 10 or more contiguous acres engaged in agriculture or forestry have a written water-quality plan that stipulates what BMPs are to be used on their property. BMPs are practices that are implemented to help reduce or eliminate water pollution resulting from agriculture and/or forestry activities. The KFCA requires that a Kentucky Master Logger be on-site and in charge of operations and that timber harvest operations use the appropriate BMPs as set forth by the AWQA. These two laws clearly indicate that both landowners and loggers are responsible for the use of BMPs.

Changes in BMPs are Coming

Periodically, changes occur to the BMPs after research shows more effective ways to protect water quality during timber harvesting and other forestry activities. Changes to the BMPs have been made this year, and beginning in 2017 loggers and landowners will be responsible for making sure those changes are implemented. The changes were largely based on a Streamside Management Zone study conducted by forestry researchers at the University of Kentucky's Robinson Forest. This study was designed to test the effectiveness of the current BMPs, which have been required since 2000. The research showed that many requirements in the BMPs were working to protect water quality; however it also showed there were areas that needed to be addressed. The Kentucky Forestry BMP Board worked for nearly a year determining the changes that were required as specified by the research. Changes also were based on knowledge gained through 15 years of experience with logging BMP inspections. The studies and experience in logging inspections led to several changes regarding stream crossings, minimum distances of woods roads, logging trails, and log decks to bodies of water,

Figure 1. Muddy water runoff from a skid trail in close proximity to a small stream.

All photos courtesy: Jeff Stringer



and giving loggers more discretion on areas of the operation that do not contribute to water quality issues.

Basic Concepts of Forestry Water Quality and BMPs

A few principles are important to understand in order to fully grasp water quality issues associated with forestry operations. This includes understanding the hydrologic network, the web of streams, channels and ditches that convey surface water to our rivers and lakes, and understanding the areas and harvest activities that can produce pollutants (Figure 2). Ultimately our water-quality laws are focused on protecting perennial streams—streams that have water in them all year long. Forestry operations, particularly timber harvesting, can result in direct pollution of a stream if the operations are adjacent to a stream. However, operations that are not directly on a stream can also pollute. This is because muddy water, logging debris, and trash placed anywhere in the hydrologic network—including intermittent streams (flowing only during the winter and spring), naturally occurring ephemeral channels and man-made ditches (carrying water after a rain storm), or sinkholes—invariably wind up in perennial streams, including our large rivers and lakes. While only 20 percent of Kentucky’s logging sites have perennial streams in or directly adjacent to them, over 90 percent contain ephemeral channels and 60 percent intermittent streams. This is why our BMPs cover what can and cannot be done around intermittent streams and ephemeral channels that are often far away from a perennial stream or river.

Changes to Kentucky’s Forestry BMPs

The following is a summary of the changes that have been made to Kentucky’s Forestry BMPs for water quality protection and why.

- 1. Streamside Management Zones (SMZs)** – SMZs are areas directly adjacent to streams where a specific number of trees are left to shade streams and disturbed soil is kept to a minimum (Figure 3). Previously, the minimum requirement for SMZs stipulated that 50 percent of the original overstory trees be left within 25 feet of the bank for ground with less than 15 percent slope, or 55 feet for steeper slopes. This same distance was used to determine how far roads, trails, and log decks needed to be from the bank of perennial water bodies. The new requirements separate the standing tree distance and the minimum distance from the bank that roads, trails, and log decks should be. The latter has been extended to 50 feet and 100 feet depending upon slope steepness. For roads, trails, and decks closer than that, special measures must be used above and beyond the norm to keep muddy water runoff from entering streams.

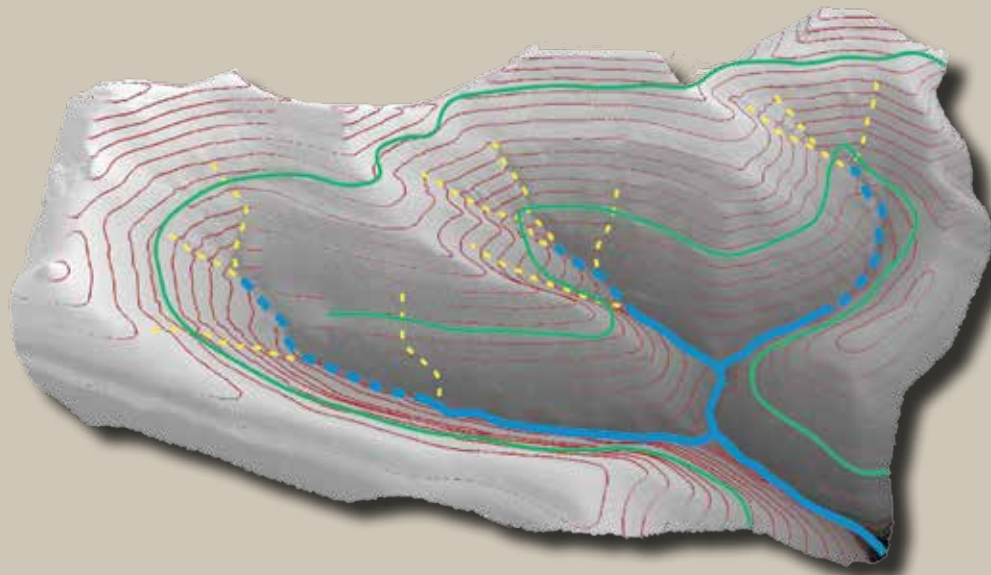


Figure 2. The hydrologic network is composed of perennial streams (solid blue line), intermittent streams (dashed blue line), and ephemeral channels (dotted yellow lines). Solid green lines represent skid trails used in logging.

- 2. Stream Crossings** – Research showed that the current requirement to use elevated crossings was appropriate (Figure 4). However, the new BMPs require techniques to stabilize disturbed ground associated with a crossing be immediately implemented. Also, where it was not feasible to cross with an elevated structure, a firm bed must be present at the crossing point, either naturally occurring or improved.
- 3. Temporary BMPs** – when a harvest operation is temporarily suspended (defined as 14 days or longer) or a logging road, trail, or landing is temporarily not in use, then some type of measures are required to control erosion and runoff.
- 4. Measures to Improve Revegetation** – Over the last 15 years with our BMPs, we have been inspecting only for the presence of seed on areas that need to be revegetated (i.e. roads and trails with greater than 10 percent slope). Only inspecting for seeding has led to a revege-



Figure 3. A Streamside Management Zone (SMZ) around a small headwater stream in Eastern Kentucky.

tation success rate of less than 40 percent in most years. The new BMPs require that one or more practices associated with seeding are used to help revegetation success.

- 5. Logger Discretion** – the new BMP requirements place more focus on areas next to streams and channels, often ramping up the requirements and costs for working near streams and channels. In recognition of this, the new BMPs allow for more logger discretion in areas of a harvest where there is no possibility of creating pollution. For example, loggers will not be required to fix all ruts if they are not in an area that will contribute runoff to a stream.



Figure 4. Wooden mats used to form a temporary elevated stream crossing for skidding logs in south-central Kentucky.

Woodland Owner Responsibility

Woodland owners are required to have a water-quality plan and make sure that loggers follow the BMPs. The University of Kentucky Department of Forestry publication FOR-96 “Forestry Water Quality Plan” (available at www.ukforestry.org) is designed to help woodland owners develop their plan and understand the BMPs. This publication is provided by the Kentucky Division of Forestry to every landowner receiving a Stewardship Plan. It is also strongly encouraged, even though loggers will be inspected for BMP use, that woodland owners stipulate Kentucky BMP use in a timber sale contract or agreement. If an operation is creating significant pollution, Kentucky’s water quality regulations provide for fines for both the landowner and the operator (in this case a logger). Selecting a good logger is extremely important, and Kentucky has many. However, there are loggers who have proven that they have a hard time adhering to the BMP standards and have been deemed “Bad Actors”, a designation established by the KFCA. You can go to www.masterlogger.org for a list of Bad Actors. You can also search for the Kentucky Master Logger database for names of loggers in your area, and it will indicate whether they are a bad actor or not. Regardless, as a woodland owner you are responsible for operations on your property and understanding your water quality responsibility is important.



Common Pollutants from Forestry and Timber Harvesting Operations

Suspended Sediment – commonly referred to as muddy water. The majority of sediment comes from erosion during a rainstorm on log decks, woods roads, and trails used for skidding timber from the stump to the landing. The closer the roads, trails, and landings are to water, the more potential there is for pollution. An especially sensitive area is where trails and roads cross streams or drainage channels. Suspended sediment is the most common and prevalent pollutant from logging operations.

Increased Temperature – often referred to as thermal pollution. The trees directly along streams produce shade that moderates water temperature.

Fluids and Chemicals – resulting from equipment leakage and spills are obvious sources of pollution. Chemicals (pesticides) can also be generated from forestry operations, however this issue is relatively minor in Kentucky.

Trash – defined as man-made articles left on-site that can be carried or deposited into streams.

Logging Debris – limbs, tops, and discarded parts of trees in streams and channels can cause altered flow which erodes stream and channel banks.

About the Authors:

Jeff Stringer, Ph.D., is an extension professor at the University of Kentucky and is responsible for continuing education and research in hardwood silviculture and forest operations. He is also an editor of the Kentucky Woodlands Magazine.

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Kentucky
Woodland
Owners
Association

If Granddad Only Knew...

www.kwoa.net

Like most woodland owners, I have a limited amount of formal education about forestry and forest management. Since I took over management of the wooded portion of the family farm a little over 30 years ago, I have depended upon the advice of professional foresters and participated in all the landowner education programs that I could work into my schedule. It has become increasingly clear that the forest when I was a child and the forest into which it has grown did not just happen. That forest is a result of events that occurred over the past two or three hundred years. For some of those events, such as relatively recent harvests and ice storms, we have written records. For occurrences such as the chestnut blight and long-ago forest fires, we have only family legends and the forensic evidence that is provided by the forest itself. Almost everything that happens in a forest stand has consequences for the future of that forest. The things that we do today, and the things that we avoid doing, will have an effect, either positive or negative, on the forest of the future.

In my grandfather's day it was widely believed that if you harvested the useable trees from an acre of forest and then went away and left it alone, it would naturally grow back to much the same forest that was there before. We now know that Granddad was mistaken. If Granddad had known the things that we can now learn from professional foresters, and taken some of the actions that we now know to take, today's forest could be much healthier and more productive. We also know that our current forests face challenges that Granddad had never seen. Non-native insects, exotic plant diseases, invasive plants, changes in wildlife populations, and climate change are but a few of the issues that pose problems for forest managers. We cannot know all the challenges that will affect our forests in the future, but we can certainly take actions to address some of the challenges that exist today.

Photo courtesy: Diana Olszowy

How healthy is your forest? How do you know? What can you do to help? A forest inventory by an experienced professional forester is a good first step toward answering these questions. And those answers will inevitably bring up more questions. Participation in the educational programs offered by organizations such as the University of Kentucky Department of Forestry, UK Extension Service, and the Kentucky Division of Forestry can provide answers to many of those questions. The Kentucky Woodland Owners Association is dedicated to the promotion of good forest management and serves as an advocate for policies that will support good forest management. Everyone with woodlands in Kentucky is encouraged to consider joining and becoming an active member of KWOA. For more information, please visit www.kwoa.net.

-- Frank Hicks, KWOA President

**KWOA is dedicated to
promoting
economically and
environmentally sound
forest management.**

**Join today by visiting
www.kwoa.net**

For more information log on to www.kwoa.net

Kentucky Champion Tree Program: A Powell County Treasure – Shumard Oak



Photos courtesy: Diana Olszowy

The state and national champion Shumard oak is located in Powell County, KY.



The leaves of Shumard oak are similar to other red oaks as they have bristle tips (left). Shumard oak acorns are an important food source for wildlife (above).

by **Diana Olszowy**

For the last ten years, each issue of this magazine has featured one of Kentucky's largest and most treasured residents – its champion trees. Kentucky's Champion Tree Program recognizes the largest specimens of over 100 native tree species, and the list continually changes as new giants are discovered or old friends fall. While keeping up this tradition, this issue will highlight our state and national champion Shumard oak, which resides in Powell County. Shumard oaks are considered the largest of the red oaks, with this champ definitely keeping up that reputation at 24 feet, 2 inches in circumference (that's 290 inches around) and 110 feet tall! Shumard oaks are native to the Atlantic coastal plain, primarily from North Carolina to Florida and west to central Texas, along the Mississippi River Valley and into the Ohio River Valley, and as far north as Michigan, New York, and into Ontario, Canada.

Shumard oaks are considered a bottomland species and are able to survive in soils with low oxygen content due to flooding or in an urban landscape where soils are compacted. They are an excellent shade tree, often used in lawns, parks, along streets and have earned a place of honor amongst arborists looking for large, tough trees that fend well for themselves. They thrive under both acidic and alkaline conditions and never show the iron defi-

ciency so common in other urban-planted oaks when the pH is above 6.8. Because of this tolerance for alkaline conditions and its ability to withstand drought, it is a widely recommended tree to plant in Kentucky. The leaves remain green long into the fall and then turn a deep orange-red. Acorn production begins at 25 years of age, but like other red oak varieties the acorns take up to two years to fully mature. The acorns provide food for various songbirds, game birds such as turkey, quail, waterfowl, white-tail deer, wild hogs and various rodents such as squirrels. The acorns are bitter, but edible if the tannins are leached out. They can be ground and used as flour, roasted and ground to make coffee, and eaten whole. The wood of Shumard oak is close-grained, hard, strong, and heavy. It is generally marketed with other red oak lumber for flooring, furniture, interior trim and veneer, cabinetry, and lumber.

Shumard oaks are a strong, long-lived species with the potential to live several hundred years and hopefully this stately and majestic champion will continue to produce future champs because *"this mighty oak was once just a little nut that stood its ground, too."*

About the Author:

Diana Olszowy is the former Stewardship Branch Manager with the Kentucky Division of Forestry. She also served as an editor of the Kentucky Woodlands Magazine since its inception in 2006.

kentucky WOODLANDS



Kentucky's New Director of the Division of Forestry: Bill Steele

William (Bill) Steele, Jr., was appointed Director for the Division of Forestry on February 8, 2016. Bill is a native of Columbia, Kentucky, and has been the President and CEO of Kentucky Tie and Lumber Company, a family business employing 80 people, in Columbia. Bill has a BS degree in Forestry from the University of the South and is past President of the Kentucky Forest Industries Association. Bill's forestry business experience is a great addition to the excellent forestry personnel at the Division of Forestry.

UK Forestry Extension Welcomes Two New Team Members: Dr. Matthew Springer and Laurie Taylor Thomas

The University of Kentucky Department of Forestry is proud to announce the appointment of two new Extension employees: Dr. Matthew Springer and Laurie Taylor Thomas.

Dr. Springer is our new wildlife Extension faculty and has wildlife management experience in Pennsylvania and most recently southern Illinois. Matt will be handling wildlife and habitat issues in Kentucky and is replacing the late Dr. Thomas Barnes. You can reach him via email at mattspringer@uky.edu.



Laurie Taylor Thomas is our newest Extension Associate. Laurie was with Extension a number of years ago and has returned filling the position left vacant from Doug McLaren's retirement. Laurie will handle both general forestry and youth programming including 4-H. You can reach her via email at laurie.thomas@uky.edu.



Kentucky Forest Leadership Program; June 6 - 10 -- Jabez, KY

The Kentucky Forest Leadership Program is designed for high school students to gain hands-on experience with forestry and related disciplines. Students are challenged to comprehend a wide range of issues and learn how to think and make decisions on their own. This year the Kentucky Forest Leadership Program, in addition to the traditional Forestry program, is offering an Entomology and Wildlife

option. So if a student wants to learn about Kentucky's forests, but is interested in insects or wildlife they will get the opportunity to focus on these areas while learning about the forest. The program helps youth develop life-long learning skills based on observation, action and evaluation. For more information visit <https://kflp.ca.uky.edu/> or contact Laurie Thomas at laurie.thomas@uky.edu or 859.257.2703.

2016 Dates:	Event:	Location:	Contact:
June 6-10	Kentucky Forest Leadership Program	Jabez, KY	859.257.7597
July 16	Central Woodland Owners Short Course	Henry County Extension Office	http://forestry.ca.uky.edu/wosc or 859.257.7597
July 30	East Woodland Owners Short Course	UK Robinson Center for Appalachian Resource Sustainability in Breathitt County	http://forestry.ca.uky.edu/wosc or 859.257.7597
August 13	West Woodland Owners Short Course	UK Princeton Research Center in Caldwell County	http://forestry.ca.uky.edu/wosc or 859.257.7597
Sept. 16-18	Kentucky Master Woodland Stewards Program	Robinson Forest; Applications due August 15!	http://forestry.ca.uky.edu/woodland-stewards

NEWS TO USE

KY Master Woodland Stewards Program Accepting Applications

Applications are currently being accepted for the 2016 class of the Kentucky Master Woodland Stewards Program, a joint-partnership between UK Forestry Extension and the Kentucky Division of Forestry. The goal of the program is to provide interested woodland owners with more advanced woodland management skills and to create forestry ambassadors across the Commonwealth. Following the training, participants, called Kentucky Master Woodland Stewards, agree to return to their communities and serve as ambassadors of sustainable woodland and wildlife management,

contributing to education and outreach efforts. Space is limited so if this is an opportunity you are interested in please complete and submit the application by August 15. The training school will be held from September 16 - 18, 2016, at UK's historic Robinson Forest. Selected applicants will be notified by August 22. To complete an online application or for more information about this unique opportunity please visit <http://forestry.ca.uky.edu/woodland-stewards> or contact Billy Thomas (billy.thomas@uky.edu) at 859.257.9153.

2016 Kentucky Woodland Owners Short Course

Make plans to join us for the 2016 Woodland Owners Short Course (WOSC). This program is a great opportunity for you and your family to learn how to enhance your woodlands and get the most from your ownership experience. Most woodland owners are not aware of the wide variety of organizations and programs available to help them care for their woodlands. If you want to maximize your woodlands and get answers to your questions about them then the WOSC is right for you! For more information visit <http://forestry.ca.uky.edu/wosc> or call 859.257.7597.

- Central WOSC, July 16th, Henry County Extension Office
- East WOSC, July 30th, UK Robinson Center for Appalachian Resource Sustainability in Breathitt County
- West WOSC, August 13th, UK Princeton Research Center in Caldwell County



Thanks for Your Service:

Doug McLaren, Leah MacSwords, and Diana Olszowy

There have been many retirements from forestry in Kentucky over the last year. However, there are a few that have been of special significance to the Kentucky Woodlands Magazine and we would like to say thank you to: Doug McLaren, Leah MacSwords, and Diana Olszowy.

Doug recently retired from UK Forestry Extension after a long and very successful career touching a wide range of forestry and natural resource professionals, students, youth and has been a great ambassador for UK and our profession. Doug has not slowed down one bit though, as he is now the vice-president of the Kentucky Woodland Owners Association.



Leah MacSwords retired from her role as the Director of the Kentucky Division of Forestry in February of 2016. She has been an ardent supporter of the magazine and of course

provided long-term leadership for the Kentucky Division of Forestry and recognition for the Division and for Kentucky at the national level.

Diana Olszowy retires as longtime Stewardship Branch Manager at the Kentucky Division of Forestry. She holds a special



place with the Magazine as co-editor of 25 issues since its first publication in July of 2006. She has secured much needed funding for the Magazine, so that you can get it for free, wrote many articles and helped ensure its quality and longevity.

Thank you Doug, Leah, and Diana for your dedicated service to Kentucky's woodland owners and all those that depend on woodlands!





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