



Kentucky

Volume 11 Issue 1

Woodlands

Magazine

Kentucky Landowners and Logging BMP's
Kentucky's Woodland Owners
Marking Your Woodland Boundary
Wildlife 101

Kentucky Woodlands

Volume 11 Issue 1 Magazine

Summer 2017

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:

With this issue we welcome Pamela Snyder as new co-editor of the Kentucky Woodlands Magazine. Pamela has been involved in woodland owner programs for a number of years as manager of the Kentucky Division of Forestry's Stewardship Program. This program encompasses the Stewardship Planning that the Division does for woodland owners in Kentucky and she is well positioned to understand woodland owner issues.

This issue has a broad spectrum of information ranging from the very practical that woodland owners can use to help with management and use of their property to some "big picture" issues that are emerging and will impact woodland owners in the future. On the practical side we have our Forestry 101 department providing information on boundary and tree marking paint and how to apply them. The "big picture" is provided by our article, in the three part series, on new genetic technologies and what they can mean to forestry. This is the last of this series and it provides a discussion of the controversies involving the use of new genetic technologies, including genetically modified organisms (GMOs). While many may think of GMOs as a food and traditional agriculture issue, the world of GMOs may make its way to Kentucky woodland owners. What if an American chestnut GMO is produced that allows us to re-establish that species. Are you interested?

We are also starting a new department "Wildlife 101" written by Matthew Springer, UK Forestry's relatively new wildlife Extension professor. Like Forestry 101, it will focus on practical information for woodland owners that are interested in wildlife. On behalf of Pamela and I we hope you continue to enjoy and are enlightened by the Magazine.


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About the Cover:

The cover image was taken by Reneé Williams, Assistant Editor for Kentucky Woodlands Magazine, and shows one of the high quality streams at UK's Robinson Forest.

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Attendees of the 2016 Kentucky Woodland Owners Short Course learning how to identify trees -- one of many educational sessions offered. The 2017 Kentucky Woodland Owners Short Course kicks off in August -- see page 25 for more information.

Photo courtesy: Renee' Williams



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(a)



(b)

Photos courtesy: Byron Nelson

Figure 1. This is an extreme example of a skid trail located directly adjacent to a stream (a) where the logger was required to stop using it and get it retired including the use of mulch and seed (b) to stop potential pollution problems.

Kentucky Landowners and Logging BMP's

by Jeff Stringer

In 2017, changes in logging Best Management Practices (BMPs) will go into effect as outlined in Kentucky Woodlands Magazine 10(2). These changes were predicated, to a large degree, on research to determine the effectiveness of Kentucky's logging BMPs.

The research showed areas within a timber harvest and specific operations that could cause water-quality problems as well as those areas and operations where there was little or no potential for problems. The results showed that many of the original BMPs are working to reduce pollution and these will stay in effect, including requirements to leave trees around water bodies for shade, properly disposing of trash and fluids, and keeping soil, tops, and other logging debris out of streams and channels. However, some BMPs were changed to strengthen or soften requirements based on results of the

important for protecting water quality. For example, the initial BMPs required that ruts were removed from all roads, trails, landings, and water-control structures developed to stop erosion. Seeding was required on any road, trail, or landing near a streams or where slopes were greater than 10 percent. The new BMPs do not require the retirement of roads, trails, and landings, including seeding, where the muddy water runoff cannot directly or indirectly reach water bodies (Fig. 1). This change would mean that roads, trails, and landings that are located in a flat field away from streams and channels, on top of a hill, or on a flat surface-mine site might not have to be repaired. Reducing BMP requirements on these areas and increasing requirements around streams and channels ensures that money and resources spent on BMPs will be more effective in controlling or eliminating pollution.

However, some landowners may be caught off guard by these changes. For example, loggers, as indicated above, are not required to retire haul roads, skid trails, and landings that will not generate muddy water pollution (Figure 2). Retirement



Changes in the logging BMP requirements will take effect in early 2017. While many of the requirements you have been using will stay the same there are a few changes that are important. This brochure contains the most prominent changes to the BMP minimum requirements for commercial logging operations.

research. The changes were made to ensure that loggers focused their BMP efforts and dollars on areas that research indicated are critical for water-quality protection. This process makes intuitive sense. For example, the new BMPs require loggers to increase their focus on:

- Correct placement of haul roads and skid trails near streams
- Implementing more practices to reduce muddy water runoff on roads and trails that are located in areas that could directly or indirectly impact water bodies
- Increasing protections at stream crossings
- Preventing ruts that will cause a water-quality problem

While some requirements were strengthened, some were lessened because research indicated that they were not



Figure 2. Under the new BMP requirements ruts like this may or may not be required to be fixed depending on whether or not they are causing a water quality problem or not.

ment normally includes smoothing ruts; resurfacing roads, trails, and landings; seeding; and installing water-control structures to stop erosion and muddy water runoff. This means that loggers have discretion on whether to fix ruts, reseed, and whether to build water control structures, such as diversion ditches or water bars, in these areas. Some loggers may do this as part of normal business practice; others may not. The latter may be especially true if landowners do not specify this work be done as a part of the harvesting agreement.

Why Is This An Issue?

Over the last 16 years the Kentucky Forest Conservation Act has required that loggers use BMPs and the Kentucky Division of Forestry (KDF) inspect logging jobs for their use. Many landowners have used this law to help ensure that good practices are conducted across all of their acreage, even areas that were not critical for water quality.

KDF will continue to inspect logging operations to ensure that a Master Logger is onsite and in charge and the logger is using the appropriate BMPs to protect water quality. As indicated above, there may be some ownerships where the logger is not required to retire some of the roads, trails, and landings. KDF will inspect the entire operation and may concur that there are areas that do not have to be retired to protect water quality. In these areas, it is at the loggers' discretion whether they are taken care of or not.

What Must Woodland Owners Do?

Woodland owners must take control of what is being done on their land. Woodland owners that are concerned about good forest practice must understand what good practices are and ensure that these practices are used. Often times this is above and beyond the use of BMPs for water-quality protection. For example, if woodland owners want a logger to repair all roads, trails, and landings, then this needs to be stipulated in a timber sale contract or a written timber sale agreement. If a woodland owner wants all of these areas to be reseeded then this needs

to be stipulated in writing. It is also a good idea and always recommended to have a clause in a contract or a written agreement that indicates that the logger should use all required BMPs and this statement should continue to be a part of contracts and agreements. However, as indicated, woodland owners cannot simply rely upon BMP inspections to fix all of these problems.

Recommendations for Woodland Owners

First, it is critical that your concerns are conveyed in writing to the timber buyer. If the timber buyer is not the logger, then make sure that the logger knows of your concerns. These concerns can be conveyed in a contract or in a timber sale agreement. Woodland owners can generate a contract or agreement, as can a logger or timber buyer. Be ready to work with either situation. Regardless, there are a number of concerns and/or practices that should be covered in an agreement. The following are some of the more common:

- Use of state required Best Management Practices
- Removing ruts, resurfacing, and seeding of appropriate roads and trails beyond those required by the BMPs
- Proper retirement of log landings
- Trees that are to be cut and those that are to be left
- Minimizing damage to residual trees in a selective harvest (Figure 3)
- Protection of all fences, roads, fields, buildings, and historic sites or other special places
- How to handle logging debris that is generated at a landing
- Provisions for wet weather

If you are uncertain how to proceed, it is recommended you obtain assistance from a consulting forester who can determine the value of your timber, help develop a contract, and sell the timber for you. It is also important to have a timber buyer and logger who understands good practice and is willing to conduct business accordingly.

It is your responsibility to know what good practice is, make sure your expectations are reasonable and appropriate, and ensure that the good practice occurs on your property. You are in charge of what happens on your property, and you need to make sure you are in control of the harvest. The state-required BMPs for water-quality protection can help, but taking care of the woods is ultimately your responsibility.

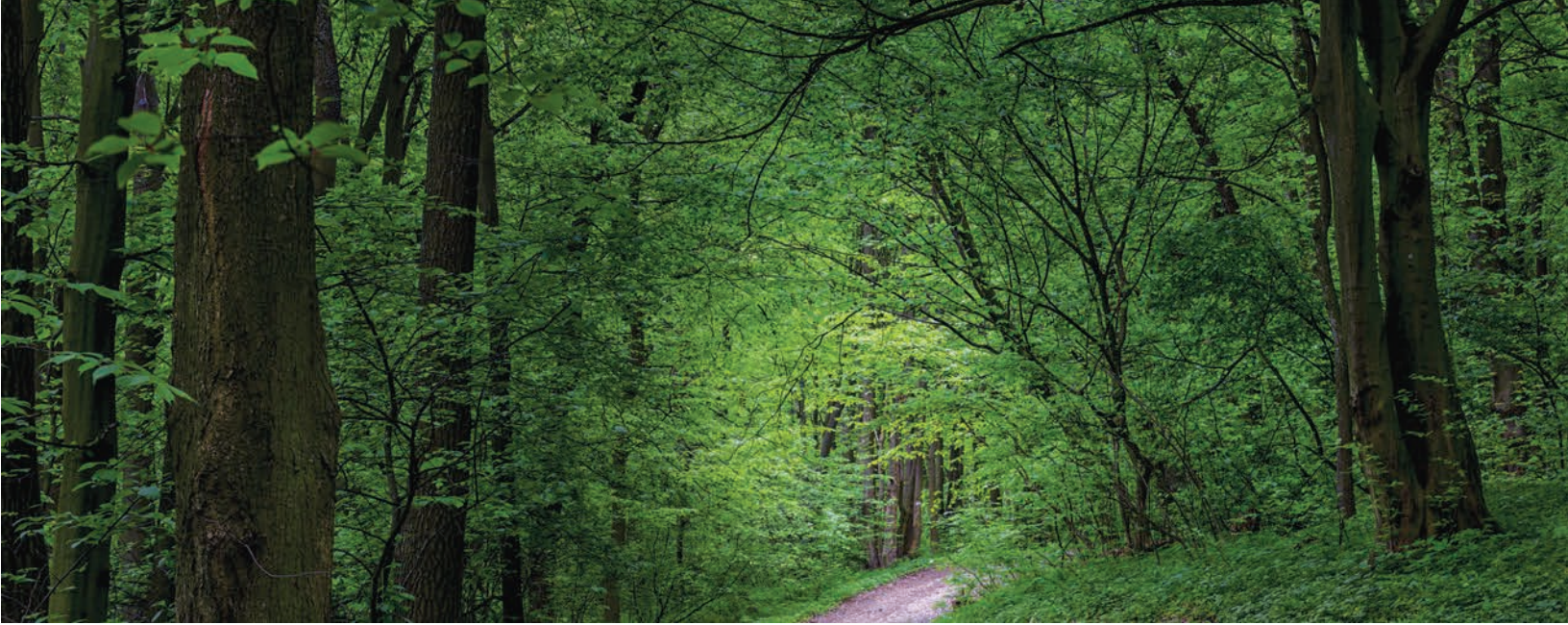
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Jeff Stringer, Ph.D., is an extension professor at the University of Kentucky and is responsible for continuing education and research in hardwood silviculture and forest operations. He is also an editor of the Kentucky Woodlands Magazine.

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Figure 3. Skidding damage on a white oak. This type of logging concern needs to be addressed in timber sale contracts or agreements. Typically damage like this should not appear on more than 10 percent of the large standing trees in a selective harvest.



Kentucky Woodland Owners: Who They Are and the Challenges They Face

by Billy Thomas

Kentucky has some of the most diverse woodlands in the United States with over one hundred tree species naturally occurring in the state. These woodlands support clean air and water, wildlife habitat, biodiversity, recreational opportunities, and much more. In addition, Kentucky's woodlands provide the foundation for a large forest industry with a significant economic contribution. Given the woodlands' tremendous importance, it is vital to support their health. To help develop programs and initiatives focused on woodland health, it is important to know and understand those who own them and the challenges they face. Using Kentucky data from the National Woodland Owners Survey and other sources this article seeks to provide a fuller understanding of Kentucky's family woodland owners, what they are doing with their properties, and the key challenges they face in order to facilitate support to them and the woodlands we all depend on.

Ownership and Distribution of Kentucky's Woodlands

Based on the latest data collected by the U.S. Forest Service and the Kentucky Division of Forestry (KDF), more than 12 million acres of forestland (woodlands) occupy more than 48 percent of Kentucky. Unlike the Western United States, where much of the forestland is publicly owned, most of Kentucky's woodlands are privately owned. A quick glance at Figure 1 shows that the overwhelming majority (88%) of the woodlands in Kentucky are privately owned.

More than 73 percent of these privately owned woodlands are considered family

owned; this means that more than 8 million acres of woodlands in Kentucky are controlled by families. Kentucky's family woodland owners, like much of the general population, have a variety of backgrounds and interests. The recent National Woodland Owners Survey conducted by the U.S. Forest Service, provides the most comprehensive information we have available on Kentucky's family woodland owners who own 10 acres or more. There are 374,000 individual family woodland owners in Kentucky who make up 155,000 family woodland ownerships (Table 1 on page 4). The family ownerships are the focus of this article.

Figure 2 on page 4 shows the widespread distribution of woodlands across Kentucky; the forest green areas are family and privately owned forests, the hunter green areas are corporate owned forests, the orange areas are publicly owned forests, and the lightest green are considered not forested; however, these areas contain a significant number of small woodland ownerships.

Ownership of Kentucky Woodlands

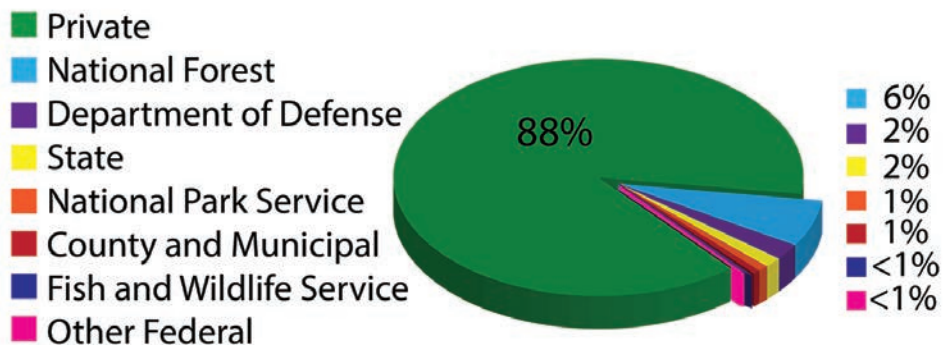







Figure 1. Ownership of Kentucky's woodlands. (Source: U.S. Forest Service)

Legend

-  County Boundary Lines
-  Not-Forested
-  Public
-  Family and Other Private
-  Corporate

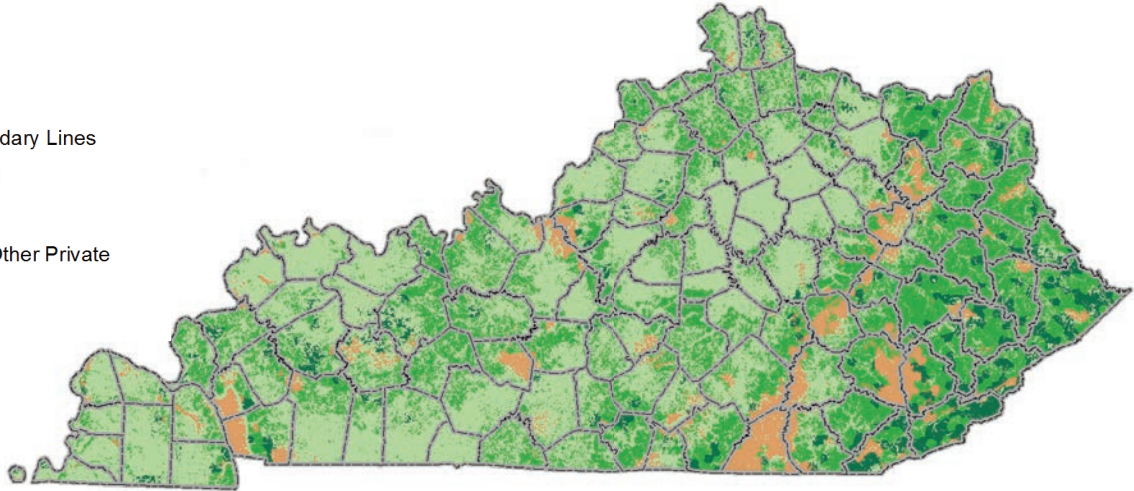


Figure 2. Distribution of forestland by ownership in Kentucky.

Source: Hewes, J.H., Butler, B.J., Liknes, G.C., Nelson, M.D., and Snyder, S.A. 2014. Public and private forest ownership in the conterminous United States: Distribution of six ownership types – geospatial database. USDA Forest Service, Northern Research Station: RDS-2014-0002.

Kentucky’s Average Family Woodland Ownership

This section explores key attributes of the average Kentucky family woodland ownership as estimated by the National Woodland Owners Survey. These statistics represent the 155,000 family woodland ownerships (10+ acres) in Kentucky. The same survey estimates that those owners with fewer than 10 acres own approximately 571,000 acres or just over 6 percent of all the family owned woodlands in Kentucky. While these smaller ownerships are important, the survey information from these owners was not included in this article.

Kentucky Family Ownership Types (10+ acres of woodlands)	% of Ownerships
Jointly Owned (i.e. wife and husband)	56.2
Individually Owned	30.6
Family Partnerships	10.9
Trusts or Estates	2.3

Table 1. Family ownership distribution in Kentucky.
(Source: National Woodland Owners Survey)

Average Family Woodland Size

The average family woodland is 54.9 acres, but that statistic can be misleading. Over 46 percent of all family woodland acreage in Kentucky is owned by the 12 percent of family ownerships who own more than 100 acres. The average family woodland size would be smaller if we included those woodlands smaller than 10 acres. As shown in Table 2, the majority of family ownerships are 20 to 49 acres.

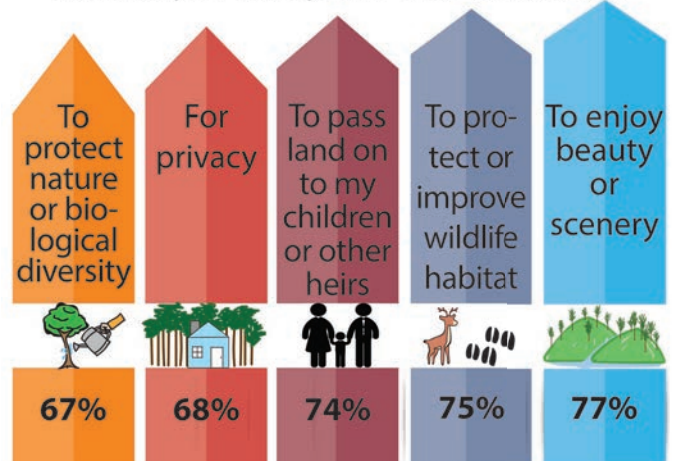
Family Woodland Ownership Acreage Size	% of Woodland Ownerships
10 – 19 acres	19
20 – 49 acres	47
50 – 99 acres	22
100+ acres	12

Table 2. Distribution of family woodland ownerships based on parcel size.
(Source: National Woodland Owners Survey)

Average Kentucky Woodland Owner Age, Land Acquisition, and Ownership Tenure

Individual owners and secondary owners for jointly owned properties were asked their age as part of the National Woodland Owners Survey. There is a modest gap in the ages of the primary owners (individual owners and primary owners of jointly owned woodlands) and secondary owners. The average age of Kentucky’s primary owners is 62 while the average age of the secondary owner is 54. Over 75 percent of woodland ownerships acquired their woodland through a direct purchase, and on average they have owned the woodland for more than 23 years. As many of these woodland owners approach retirement, the urgency of transferring the woodland to the next generation increases. The issue of intergenerational transfer of the woodland is a key challenge facing woodland owners.

Top 5 Reasons Kentucky Family Woodland Owners (10+ acres) Own Their Woodlands



Source: National Woodland Owners Survey

Primary Residence or Absentee Ownership

The survey indicated that nearly 35 percent of the family woodland ownerships lived greater than 1 mile from their woodland. These absentee owners account for almost 38 percent of all family woodlands in Kentucky.

Previous research indicates that a high percentage of these absentee woodland owners live in the three largest population centers—Lexington, Louisville, and Northern Kentucky. Absentee woodland ownerships face extra challenges compared to woodland owners living on the property. For example, absentee owners are more at risk for trespass, including timber trespass, and increased travel time and costs to visit, enjoy, and work in their woodlands. Absentee woodland owners are encouraged to cultivate relationships with neighbors, as they can help keep an eye on your woodland when you are not there.

National Woodland Owners Survey asked respondents several questions regarding ongoing woodland activities or those they plan to participate in.

Recent and Planned Activities

In the last five years, over 46 percent of Kentucky’s family woodland ownerships (10+ acres) have “cut and/or removed trees for sale or own use.” Nearly one third of family woodland ownerships indicated they had done some “road or trail construction or maintenance.” Invasive plants and wildfire are two problems, among many, faced by many woodland owners in Kentucky. Only 16.2 percent of the owners had “eliminated or reduced invasive plants” and 7.7 percent had “reduced fire hazard” in their woodlands. While these percentages are relatively low, there is reason for optimism that more work will be done. Higher percentages of family woodland owners indicated they planned to address these threats in the next five years, 25.4 and 10.6 percent respectively.

Non-Timber Forest Products

Timber is not the only valuable product that woodlands produce. The tremendous biodiversity found in Kentucky woodlands supports numerous plants, other than trees, that can be valuable as well. Most people recognize that ginseng is a non-timber forest product but there are many more plants in Kentucky woodlands that have value for personal consumption or for sale. Just over 29 percent of woodland ownerships indicated they had collected edible plants for personal use. Medicinal plants were collected by 2.9 percent of the ownerships for personal use and 4.5 percent collected them for sale. Decorative and landscaping materials also were collected by 10.7 and 5.5 percent of the ownerships, respectively. There are several benefits to using non-timber forest products, such as reducing food and craft expenses, providing supplemental income, and facilitating a closer connection to the woodland.

Timber Harvesting

Only 24.5 percent of the ownerships indicated they owned their woodland for timber products. However, more than 54 percent of the ownerships had logs cut or removed for personal, commercial, or other reasons.

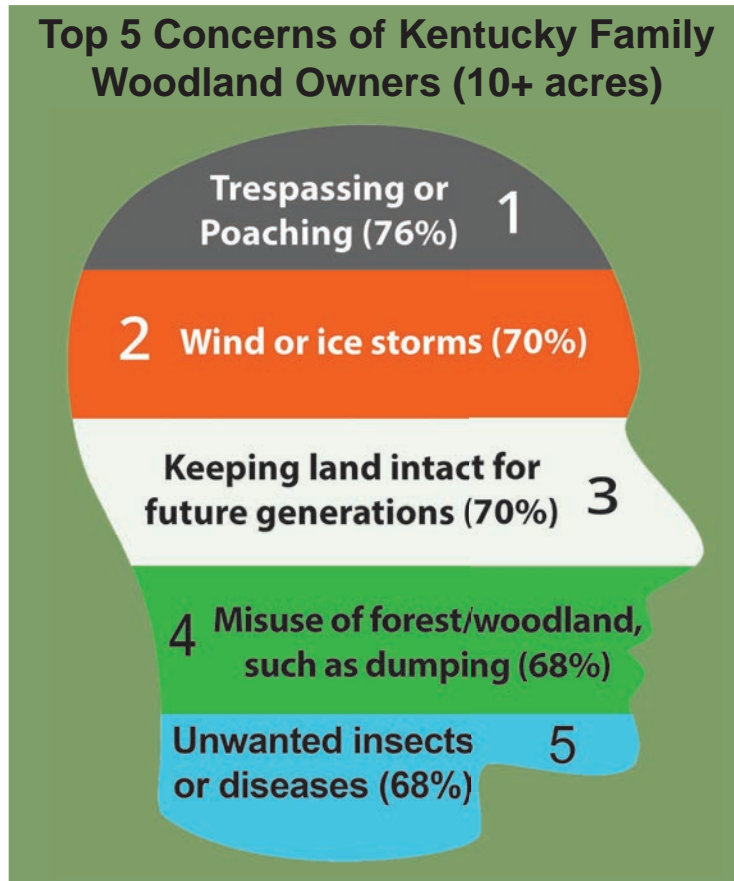
This means that while timber harvesting may not be the main or even one of the top reasons woodland owners own their land, it is a frequent activity. In fact, most of Kentucky’s woodlands have been harvested at least once and many



Timber harvesting is not the main reason most woodland owners own their property; however, more than half have harvested timber.

Photo courtesy: Billy Thomas

Top 5 Concerns of Kentucky Family Woodland Owners (10+ acres)



Farmers are Woodland Owners, Too

Many of Kentucky’s farms also contain woodlands. According to the 2012 USDA Census of Agriculture, there were 77,064 farms in Kentucky and 59 percent of them included woodlands. There are 2.7 million acres of woodlands on farms - 20 percent of all private woodlands in Kentucky. Of those farms with woodlands, over 27 percent of them treat at least part of their woodlands as pasture. Similarly, on the National Woodland Owners Survey, livestock grazing was reported on over 31 percent of all woodlands. While some of these farm woodlands are being sustainably managed, there are likely many opportunities to improve these woodlands through active management practices to increase the health and productivity of Kentucky’s farm woodlands.

Woodland Owner Activities

There are numerous ways that woodland owners are engaged with their land. Some woodland owners are very active while others rarely visit or engage in active management. The

of them multiple times. Less than 16 percent of the timber harvests on family woodlands involved a professional forester. This means there was a high probability that many of the harvests were driven solely by local markets without technical considerations needed to address long-term sustainability. Woodland owners are strongly encouraged to plan well in advance of a timber harvest and to seek professional assistance in ensuring the long-term sustainability of their woodland.

Management Planning

One indicator of sustainable woodland management is a written woodland management plan. In Kentucky, 6.5 percent of all ownerships have a written woodland management plan. Of those with a written woodland management plan, a high percentage (81.7) had implemented practices included in the plan. Respondents also were asked to identify who wrote their woodland management plan. KDF provided the majority of the assistance, developing 82.9 percent of the family woodland plans. Forest industry foresters wrote 11.7 percent of the plans and private consulting foresters wrote 1.1 percent of the plans.

Key Challenges Kentucky Woodland Owners Face

Unlike the pines that cover much of the Southern United States, Kentucky's woodlands are dominated by deciduous long-lived hardwood tree species. Kentucky's woodlands produce some of the most desirable hardwood in the world, but it does take longer for hardwood trees to grow compared to the faster growing southern pines. Of the more than 100 native tree species in Kentucky, more than half of them have commercial markets that furnish much of the interiors of homes and buildings. Not only do Kentucky's woodland owners face longer rotations, they also face a number of other key challenges that threaten their ability to sustainably manage their woodlands. There are three key challenges worth exploring: neglect and emerging threats, the intergenerational transfer of woodlands, and the declining availability of technical assistance to Kentucky's woodland owners.

Neglect and Emerging Threats

For many years, there were few problems with just leaving the woods alone and letting them grow. In today's era of globalization and a changing climate that is no longer the case. Abandoned or neglected woodlands are subject to an ever-growing number of threats, including invasive plants and insects that can quickly spread if unchecked and take over a woodland. Indeed, the problem has become so bad in Central Kentucky that addressing and controlling the invasive bush honeysuckle is one of the first practices that foresters are forced to recommend before anything else can be done in the woodland. Thirty or forty years ago, this invasive plant was mostly restricted to horticultural and wildlife plantings and rarely reported in woodlands. Not too long after bush honeysuckle began spreading into Kentucky woodlands, another threat was introduced: The

invasive emerald ash borer (an insect from Asia that attacks ash trees) was accidentally introduced into Michigan in 2002. It has now spread as far south as Alabama and as far west as Oklahoma, leaving millions of dead ash trees in its wake. These are just two recent examples of the need for greater monitoring and protection of woodlands today as compared to the past.

Intergenerational Transfer of the Woodland

Recall, that the average age of Kentucky's primary woodland owners is 62. That means the average Kentucky woodland owner is (or should be) preparing for retirement.

As part of the planning, many woodland owners can find it challenging to effectively plan for the transfer of the woodland to their heirs. A closer look at the National



Cliff Taylor, 4th from left, is a Central Kentucky woodland owner who is planning a smooth intergenerational transfer of his woodland to his heirs.

Woodland Owner Survey paints a clearer picture of just how much woodland will be transferring to new ownerships, whether that transfer occurs within the family or not. Over 41 percent of all woodland ownerships have primary owners that are 65+ years of age. Further, these "retired" woodland owners control over 43% of all the family owned woodlands in Kentucky. While they may not have all the answers on how to best do it, over 70 percent indicated that they wanted to keep the land intact for future generations. Woodland owners interested in passing their land to their heirs are advised to seek professional assistance from an estate planning team (a great place to learn more about estate planning is to visit <http://fcs-hes.ca.uky.edu/publications-list/12> and then scroll down to the "Estate Planning" section). Based on experience in assisting woodland owners with intergeneration transfer, it is important for current woodland owners to engage their daughters or sons



Bush honeysuckle is just one of the threats facing woodlands.

Photo courtesy: Chris Evans, University of Illinois, Bugwood.org

in the management of the woodland. This involvement helps to ensure that long-term objectives are established and the heirs are prepared to receive and manage the woodland at the appropriate time. Unfortunately, this is not always the case which means the long-term sustainability of that woodland is rarely assured.

Limited Technical Assistance Available

Another key challenge facing Kentucky woodland owners is the limited and shrinking amount of technical assistance available to help them sustainably manage their woodlands for optimal health and productivity. A number of agencies and organizations provide information, education, and resources to aid family woodland owners (i.e. Extension at the University of Kentucky). KDF is the lead agency in assisting woodland owners to sustainably manage their woodlands. Unfortunately, their capacity to do so has been seriously eroded over the last 10 years (see Figure 3). Since 2006, the KDF has lost nearly 45 percent of its employees as a result of a series of budget cuts. Not surprisingly, this significant reduction has had a direct impact on the amount and frequency of support they can provide to Kentucky's woodland owners. In some areas of the state, it can take more than a year for a woodland owner to have a woodland management plan prepared by a KDF service forester. KDF has 33 percent fewer service foresters than they did 10 years ago.



Kentucky's woodlands are mostly owned by families. These family and their woodlands provide multiple benefits to our state and they need support to address numerous challenges.

Closing Thoughts

Kentucky's woodlands are a valuable resource worthy of support. These woodlands provide countless ecosystem services and support a major economic engine for the Commonwealth, including more than 27,700 direct jobs and a more than \$14 billion total economic contribution in 2016. For the purposes of comparison, the Kentucky coal industry directly employed 6,261 people during the first quarter of 2017 and had a total economic contribution of \$3.9 billion in 2015. Unlike coal, woodlands are a renewable resource that can be managed in perpetuity.

Given the significant, and often overlooked, importance of woodlands to Kentucky, it is critical all woodland owners, Kentucky's citizens, and elected officials support healthy and productive woodlands. Because much of Kentucky's woodlands are owned by family ownerships, working to support them is essential. It is important for those concerned about our woodlands and particularly those engaged in good woodland management to enlighten all woodland owners about opportunities for assistance. Further, it also is important to let elected state and federal legislators know that family woodlands and their sustainable management is important to their constituents and vital to Kentucky's future.

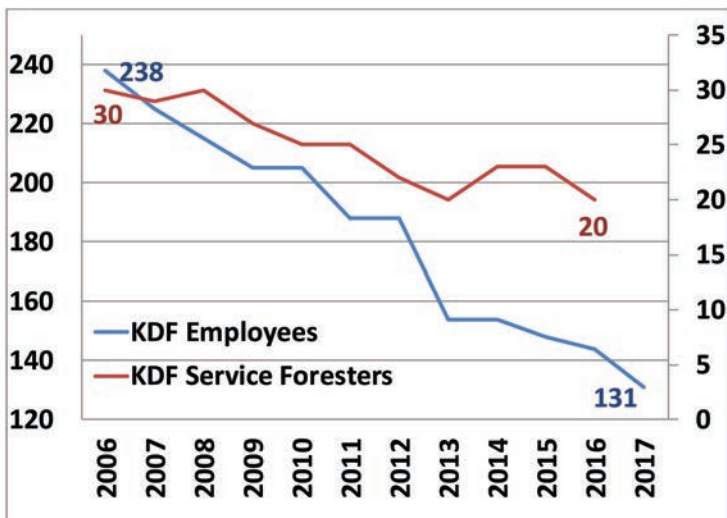


Figure 3. Number of Kentucky Division of Forestry employees from 2006 to 2017.

KDF is not the only provider of technical forestry assistance to Kentucky woodland owners. There are three other groups that provide direct assistance: consulting foresters with the Kentucky Association of Consulting Foresters, technical service providers with the Natural Resources Conservation Service, and industry foresters. In Kentucky, there are 21 consulting foresters, fewer than 10 technical service providers (most of whom are also consulting foresters), and a limited number of industrial foresters that work for sawmills to help supplement the 20 KDF service foresters. The need and demand for technical assistance far exceeds the supply, which is a serious threat to healthy and productive woodlands in Kentucky.

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- <https://www.fia.fs.fed.us/nwos/>
- <http://forestry.ca.uky.edu/economic-report>
- <http://energy.ky.gov/Pages/CoalFacts.aspx>
- <http://www.kentuckycoal.com/ky-coal-facts/>

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The Good, the Bad, and the Unknown: A close look at public concerns about GE trees

by Ellen Crocker

Photo courtesy: Kenton Sena

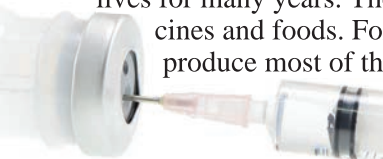
American chestnut trees (above) once dominated our forests but were wiped out by an invasive disease. Now researchers are looking at the possibility of introducing disease-resistant genetically engineered chestnuts. This is just one example of the potential for genetic engineering to impact forestry, but we must decide if and how we want to use this technology.

Editor's Note: *In the last two editions of Kentucky Woodland Magazine we described what biotechnology is and how it is being applied in forestry. In this article we explore the controversy that surrounds genetically engineered forest trees. Our goal with this article is to provide a scientific perspective to enable you to make your own assessments of the risks and benefits posed by various GE trees.*

Genetic engineering is a very contested issue. Look up “GMOs” online and you will find countless articles arguing that they are deadly evils as well as life saving heroes. While the development of genetically engineered (GE) forest trees has lagged behind other agricultural plants, the widespread availability of these trees is closer than most people realize. But, before they are in broad use, it is important for us to assess concerns about GE trees and weigh their potential risks and benefits. Here we will look at the controversy surrounding the use of GE forest trees in both ecological restoration and commercial plantation contexts. There are many unknowns with GE trees, but being informed will help us make better decisions for the future.

Current state of GE trees

Despite the controversy surrounding GMOs, it is important to recognize that GE products have been a part of our lives for many years. These include a wide range of medicines and foods. For example, GE bacteria and yeasts produce most of the insulin used to save the lives of people with diabetes. And, while relatively few species of crop plants have been genetically engineered, GE corn, soybeans, and cotton have dominated production in the United States since the



Genetic engineering is very important in the development of medicines. For example, most of the insulin used by diabetics is derived from genetically engineered bacteria and yeast.

mid-2000s, although their use is the subject of great public controversy. Currently, over 90 percent of corn, soybeans, and cotton grown in the US are GE. Trees, on the other hand, are only beginning to be genetically engineered by scientists. The limited trees currently approved are largely fruit trees, including virus-resistant papayas and apples that do not brown. But, this is likely to change in the future,



Here you can see chestnut seedlings planted on reclaimed mining land in efforts to restore forests. These projects are increasingly important as invasive insects and diseases kill native trees and land is lost to deforestation.

Photo courtesy: Chris Barton

and several different forest trees are undergoing government approval now. These include native trees for restoration (such as disease tolerant American chestnut trees) and industry-focused plantation trees (such as pines, poplars, and eucalyptus).

What makes GE forest trees different?

Given the rapid adoption of GE crops by farmers, it isn't surprising that people are looking to genetic engineering for forest trees. However, there are several key ways in which

forests (and forest trees) differ from agricultural crops that should cause us to carefully consider the potential future use of GE trees. Agricultural crops are grown in highly managed systems, dominated by monocultures of non-na-

Photo courtesy: G. E. Cardon, Bugwood.org



Over 90% of corn, soybeans, and cotton grown in the United States is genetically engineered, with genes for herbicide resistance and insect tolerance added to improve the crops' uniformity and growth in large-scale farming.

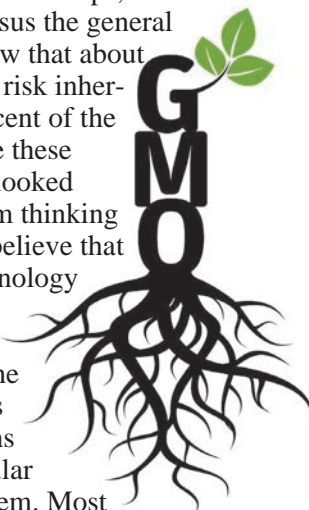
tive plant species that have been carefully bred by humans for thousands of years. Most of our forests, on the other hand, are naturally regenerating and populated by native tree species that play important roles in the ecosystem as well as the economy. The same forests that we rely on for timber and income are also important wildlife habitats and centers of biodiversity.

Increasingly, our native trees are under attack from invasive insects and diseases. From the recently arrived emerald ash borer to the historic American chestnut blight epidemic, native trees are increasingly facing threats they have no defenses against. Also, because resistant trees take much longer to develop than crop plants, traditional breeding programs that have worked well in other systems have been much less effective with trees. Both of these factors make genetic engineering an appealing option for improving forest trees.

The great divide:

Public opinions of GE risk vary widely

One of the most striking features of the debate about GMOs, particularly in the context of food crops, is the large difference in how scientists (versus the general public) view their safety. Surveys show that about 88 percent of scientists say there's no risk inherent to GE technology but only 37 percent of the general public shares this view. While these numbers seem at odds, an easily overlooked part of this discrepancy is that far from thinking that all GE plants are safe, scientists believe that any new plant, whether from GE technology or traditional breeding, should be assessed on a case-by-case basis. While GE technology could be dangerous, the risk is in the application of new plants (how these plants interact with humans and their environment) not the particular technique that was used to develop them. Most scientists view genetic engineering as an important part of



the modern tree breeding toolbox but a tool that must be applied wisely.

Common questions about GE plants (and how they relate to forest trees):

Are GE trees safe for human health?

GE plants pose no unique risks to human health. Scientific consensus agrees that there is no evidence that the GE agricultural crops we consume hold any inherent risk for people. This conclusion draws from extensive peer-reviewed scientific literature and investigations by government groups. Given that, in most cases, we won't be in as close contact with forest tree products (other than chestnuts, we don't eat them) the potential for GE tree risks to human health is even lower. However, this doesn't mean that GE applications can't be harmful, just that the GE technology itself is no more dangerous than other approaches.

Is genetic engineering an inherently risky process?

Public opinion of GE technology is that it is risky and more likely to result in problematic errors than traditional breeding. Scientists, on the other hand, say the opposite is true and that GE technology provides more detailed control over genetic changes than offered by traditional breeding. This divide comes down to different understandings about how people have bred plants over time.

While forest tree breeding is a much newer field, the history of agricultural crop breeding can provide perspective. All of the crops we currently depend on, whether organic or GE, are derived from thousands of years of plant breeding. People selected the best plants in their fields, products of random crossing with other plants. Although this type of shuffling of genes may be "natural" it is not very efficient and results in unpredictable outcomes. Farmers depended on chance to develop good gene combinations and had little ability to rapidly respond to changing environmental conditions (drought, insects), resulting in unpredictable good years or devastating famines. Modern breeding, on the other hand, is much more directed and allows for a faster, more targeted response to particular challenges and conditions. Even before GE breeding, scientists were very carefully managing plant breeding, selecting particular genes of interest, making crosses between plants and even randomly mutating



Scientists say that GE technology provides more detailed control over genetic changes than offered by traditional breeding.

plants to see if particular DNA changes would be useful.

Scientists see genetic engineering as more precise than traditional breeding because it results in fewer changes to the plant's DNA in general. In traditional plant breeding, you may only be interested in a particular trait (say insect resistance) but hundreds of extra genes tag along in sexual reproduction. In GE plants, on the other hand, only a few genes are altered. There can be no doubt that some amount of uncertainty is unavoidable when developing anything new, plants included. Because of this, many support strict testing of all new plants with novel traits, not just those derived from GE technology as is currently the case.

Are GE trees an environmental threat?

As with other factors, the environmental risks posed by GE trees will vary on a case-by-case basis depending on their interaction with the environment, not the technology used to create them. The issue of potential invasiveness of GE trees is primarily a concern in plantations developed for commercial production, as the goal of most GE restoration tree introductions would be to broadly spread improved trees in the natural environment. For example, one concern with the potential introduction of GE cold-tolerant eucalyptus, given their history of invasiveness in other locations, is that they would also become invasive nuisances in new areas. The potential for these and other newly bred trees to invade native forests and decrease biodiversity is something that some feel should be looked into closely before trees are introduced; however there are ways to reduce this possibility (for example, using trees that have sterile pollen or no seeds).

With agricultural crops, increased dependence on herbicide tolerant-GE plants has resulted in a similar increase in herbicide use, and the same could happen in commercial plantations.

Many pine plantations already rely on herbicide to exclude competition from weeds and other trees. Adding to the number of herbicide-tolerant plantation trees available to choose from might increase commercial plantation diversity (enabling a larger variety of trees to be grown) but may also lead to greater herbicide use. It is important to consider the non-target risks of this potential change, including increased herbicide use and herbicide tolerant weeds, as they have become more com-



While insects and diseases can kill forest trees, pesticide application is time consuming and expensive. Breeding trees with resistance to insects and diseases could provide an alternative to decrease these problems.

Photo courtesy: North Carolina Forest Service, Bugwood.org

mon in agricultural crop systems.

Pesticides targeting insects and diseases could be a different story entirely. Since their introduction, GE agricultural crops with insect resistance have decreased the amount of pesticides being sprayed on plants. Because some of these pesticides can be dangerous for humans and the environment, increased use of GE crops has a big benefit for reducing unintended pesticide risk and yield loss from insects. In addition, several studies have shown that insect diversity is actually higher when GE insect-resistant plants are used than when pesticides are sprayed on in the traditional manner. Widespread pesticide use in forest settings is currently rare because of prohibitively high costs. Therefore GE pest-resistant forest trees are unlikely to drastically reduce pesticide rates, but they may provide better options against invasive insects and diseases, particularly in a restoration context.

Will GE trees decrease biodiversity?

From a restoration perspective, the goal of GE tree breeding is to increase (or at least maintain) biodiversity. Spreading improved native trees that are able to tolerate invasive pests may help forests regain or retain balance and health. GE forest trees designed for restoration have the goal of restoring key native tree species, thereby supporting the many other species that depend on them for food and habitat. GE genes can spread through pollen, potentially contaminating native tree populations, but there are ways to minimize this risk. In addition, from a restoration perspective, the more genes for resistance to threats are spread into the native population the better, since they will enable the offspring trees to survive.

Monoculture commercial plantations may not provide the same level of biodiversity and ecosystem services as naturally regenerating forests (instead, compare them to highly efficient and highly managed agricultural crops), but they still provide environmental benefits. While plantations can thrive even without GE trees, it is likely that GE trees will play a major role in their future, increasing yields and profits. Proponents argue that plantations are environmentally sound because they require that less land be harvested to achieve the same amount of yield. Others,



Photo courtesy: Jeff Stringer

In addition to restoration, genetically engineered trees are of great interest to the plantation tree industry. For example eucalyptus trees (like those shown here) may become more common in southeastern plantations if the cold-hardy genetically engineered cultivars currently being tested are permitted.

however, doubt whether this trade-off would be realized or if increased commercial plantation profits would instead result in more plantations at the expense of naturally regenerating forests. While the amount of forested land worldwide has decreased, tree plantations have increased and the destruction of naturally regenerating forest in favor of plantations likely results in decreased biodiversity. In addition, in other parts of the world, conversion to plantations has resulted in human rights violations against indigenous people. It is important to note that, while GE trees might play a role in this conversion, they are not necessary for it, and socioeconomic factors, not the technology itself, are the driving forces.

Aren't the other alternatives to GE just as good?

In most cases, scientists turn to genetic engineering only after other approaches have failed. It is far simpler from a regulatory perspective not to use genetic engineering, since expensive testing must be done to for their approval. When GE plants are created it is usually because achieving the same goal would be challenging without the technology. However, it is still important to ask the question of whether the newly developed plant is truly of benefit. For example, despite widespread adoption, GE herbicide resistance has not brought major yield increases for agricultural crops although it has resulted in increased consistency.

The reasons people are excited about the potential for GE trees are in some ways similar to those for agricultural crops, but differ in two main ways:

- 1) trees take a long time to grow and
- 2) our native trees have few natural defenses to lethal invasive threats.

It is very hard to breed trees using traditional, non-GE breeding methods because trees have such long generation times. This means that it can take many decades to make even slight progress in the breeding of native forest trees. Genetic engineering can speed up the tree breeding process, allowing for faster responses to time-sensitive threats, and this can even be done in a way that results in end-product trees that are non-GE



Traditional tree breeding programs are challenging because it takes a long time to grow most of our native trees. In addition, scientists looking to breed increased disease and insect resistance in native trees have been hampered by a lack of natural defenses to invasive threats.

Photo courtesy: John D. Hodges, Mississippi State University, Bugwood.org

(see previous articles in this series). Invasive insects and diseases pose serious threats to forests, and there are currently few options to fight these pests. GE approaches may provide new ways to control these problems in a sustainable manner, a big contrast to the existing pesticide applications that are expensive, can have negative effects on other species, and are not feasible to use in most forest settings.

Why not let nature take its course?

Especially in a naturally regenerating forest, this is a reasonable question. While we may not like the fact that invasive species are drastically changing our forests, in most cases these forests will persevere. At the same time, some may feel an ethical obligation to correct the damage we've done to forests through the introduction of invasive insects and diseases.

Since we caused these major disturbances, do we also bear responsibility to fix them if we can?

It is likely that our eastern forests are still recovering from the removal of American chestnuts due to the human introduction of the chestnut blight fungus. Because very little resistance to chestnut blight has been found in our native trees, it is likely that without our intervention American chestnut will never again be a major component of our eastern forests. With more invasives here and on the way, this scenario could be repeated again and again, calling into question the feasibility of a "leave it to nature" approach in the long-term. Recently, new invasive species are eliminating our ash and hemlock. What happens if oaks are next? It is important to anticipate these future problems so that we can plan a strategy for these potentially devastating scenarios.



Invasive species, like the emerald ash borer shown here, are rapidly changing our forests. It is up to us to decide how we respond in the face of these increasing threats to ensure that our forests continue to provide ecosystem benefits and economic opportunities.

Photo courtesy: Jared Spokowsky, Indiana Department of Natural Resources, Bugwood.org

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Ecosystem Services

by Frank Hicks, KWOA President

www.kwoa.net



Recently, I went to my farm, Cedar Riffle Farm, with plans to do some timber stand improvement work. A small timber sale about three years ago has left some areas that are being overrun by small stinkwood trees. (I know that the *Ailanthus altissima* is often referred to as Tree-of-Heaven, but I refuse to apply that name to such a pernicious weed.) Anyway, just as I was about to start work, the weather changed to one of those heavy thunderstorms that necessitated a revised plan. Fortunately, there is always plenty of work to be done inside: sharpen the axe and chain saw, change oil in the tractor, sweep out the garage, etc.

After it rained hard for about an hour, the rain stopped and the sun came out. Walking out into the pasture, I noticed that the water in the intermittent stream that originates in the woods was murkier than it should have been. I followed the creek up to where it passes through a culvert under the gravel road that goes through the farm. There two streams of water merged. The torrent running down the road ditch was quite muddy. The trickle coming from the woods looked clean enough to drink. That stream drains a little more than 50 acres of mixed hardwoods on very steep land. That tract was clear cut in 1986, and was thinned for crop-tree release in 2008. The road ditch, which drains about two tenths of a mile of road, ran for about another half-hour and then quit. The stream from the woods was still trickling the next morning. I did not get around to killing any stinkwood bushes that day, but I did get to observe first-hand something the forestry professionals have been telling us for years. Forests help provide us clean water. And managed forests do that better than unmanaged forests. Yes, we will stir up some dust or mud for a brief time when management activities are happening, but most of the time the forest is cleaning the water that goes downstream.

As woodland owners we do not, and maybe never will, get paid for the ecosystem services that our forests provide. But we should never miss an opportunity to remind the people we meet that our forests do help to provide clean air and clean water for everyone. The Kentucky Woodland Owners Association works to promote good woodland management, to advocate for policies that will encourage such management, and to spread the word that well-managed forests are valuable to society as a whole. We should always take advantage of opportunities to gain a better understanding of the forest ecosystem, and keep in mind that a day in the woods is never wasted.

Photo courtesy: Gretchen Carmean

For more information log on to www.kwoa.net



Kentucky Tree Farm Committee Newsletter

The American Tree Farm System (ATFS) recently celebrated its 75th anniversary this with more than 700 tree farmers in Kentucky. The System has evolved from a recognition program to encourage forest management to a third party certified program that offers a wide range of educational opportunities and assistance to forest landowners. Among the many benefits to members is an engaged government-relations staff that is heavily involved with the political process in Washington, D.C. ATFS is working hard to forge partnerships with a number of organizations and has been successful in addressing a number of issues that have had a positive effect on landowners' ability to manage their woodlands. Below are a number of current issues that are being followed closely in an attempt to improve markets and conditions to sustain management on private forestlands.

Taxes - Private forests are critical for safeguarding the air we breathe, the water we drink, and the wildlife we manage. ATFS supports tax policies that encourage sustainable management of family forests and that recognize the important societal benefits family forests provide. Tax policies should encourage family ownership and adoption of sound forest management practices. Overall, tax policies should create a positive environment for keeping forests as working forests—providing clean air, clean water, wildlife, and recreational opportunities in their communities.

Climate Change - One of the greatest threats to the health of our planet is climate change. Our nation's forests are a critical piece to fighting this serious threat. Around the world, forest ecosystems sequester about a quarter of all carbon pollution that contributes to climate change. ATFS supports climate-change policies that encourage long-term sustainable management of family forests for carbon storage and other environmental, economic, and social benefits. Climate-change policies should allow both market and non-market opportunities for working family forests to contribute to emissions reductions through carbon capture and storage.

Renewable Energy - Families and individuals own roughly 260 million acres of forestland and are the largest forest ownership group in the United States. These lands can supply a large portion of renewable materials for biomass energy production from sustainably managed family forests. Materials harvested from private forests and used in production of renewable energy must be harvested sustainably with verification through appropriate mechanisms to ensure continued health and long-term viability of forests and related resources. Policies that encourage renewable energy production from

forests must consider both the short- and long-term impacts of renewable energy markets on forest resources to prevent unsustainable forest-management practices.

Forest Health - Some estimate the damages from invasive species at over \$138 billion annually due to losses in the forest products industry, the tourism and recreation industry, and woodland owner income. If a forest pest infests a family woodland owner's land, it can mean complete destruction of their land and a severe reduction in land-based income. As forest owners adjust to this new threat and work tirelessly to conserve our nation's working forests, decision-makers must provide these woodland owners with the tools they need to do right by their land, while ensuring laws are in place to protect our borders from future foreign pests.

Water Quality - Approximately 80 percent of our nation's water originates in forests lands. Most forestland in the United States is owned privately, covering roughly 262 million acres, and is essential green infrastructure that supplies the nation with clean water. However, many of these forests are at risk—roughly 1.5 million acres of forest are lost each year to development. ATFS supports voluntary approaches to encourage water protection while ensuring laws are in place to protect our nation's freshwater resources.

For more information on the Tree Farm Program in Kentucky or legislative issues at the state or federal level contact Bob Bauer at 502-695-3979.

Kentucky Tree Farm Awards

In April, as part of the Kentucky Forest Industries Association Annual Meeting the Kentucky Tree Farm Committee announced the Tree Farm Awards.

Jack Stickney of Estill County was selected as the Tree Farmer of the Year. Steve Thacker of Bell County was selected as the Logger of the Year and Lisa Armstrong KDF Service Forester in the Central



Teresa and Jack Stickney received the Tree Farmer of the Year Award from Steve Gray, Kentucky Tree Farm Chairman.

Region, was selected as the Tree Farm Inspector of the Year. In addition, Doug McLaren, Retired UK Department of Forestry, was selected as the Communicator of the Year. The Kentucky Tree Farm Committee congratulates all the award winners.



Why You Should Care and How to Tell What Wildlife are in Your Woodlands

by Matthew Springer

Wildlife in Kentucky

Kentucky, with its many geographic features and habitats, is extremely diverse. The number of wildlife species present within the state is almost equally as diverse. We have more than 350 bird, 15 bat, 56 reptile, 57 amphibian, and several more game-mammal species such as white-tailed deer, bear, elk, and squirrels. Each of these species plays an important role within the environment—an ecosystem service that a lot of the time isn't noticed until they are no longer present to perform it.

Recreational Enjoyment and Potential Income Source

With so many natural resources present within Kentucky, one that is sometimes overlooked by landowners is wildlife. Wildlife provide multiple recreational enjoyment opportunities, from bird watching and photography to hunting and trapping. With this in mind, it is easy to see how wildlife possess both intrinsic and economic values to landowners. Recently, the economic value has been increasing. Hunt leasing is an option growing in popularity across the country that may offer a means to collect income on a prop-

erty. Income rates vary depending on: the size of the individual property; amount of forested areas; oldfield, grassland, and agriculture acres; the location in the state; the different species of wildlife present on the property; and the amount of opportunities for hunters to create their own hunting experiences. These opportunities may include the opportunity to plant food plots, use of ATVs, or camp on the property. The average hunt-lease income within Kentucky is \$10 to \$20 an acre annually, however rates can go as high as \$30 to \$40 an acre for highly valued properties. If your strategy is eventually to harvest the trees on your land, you know that economic benefit may take decades to realize, so hunt leasing may offer a more consistent income over time. Understanding the wildlife resource you have on your property will aid in getting a fair market value for your property if you choose to go this route.

How Do I Determine What Wildlife I Have?

To determine what wildlife are on your property, you can use multiple methods ranging in time, effort, and cost. Each has its upsides and downsides, but all provide you with more information about the wildlife utilizing your property. Some basics you may need to help with identifying the wildlife you find are a pair of binoculars, a field guide or two, and the ability to spend some time in the woods. Here is a quick breakdown of a few methods you can utilize singularly or in tandem:

Taking a slow and observant walk

Nothing can beat the combination of enjoying your property while trying to learn a little more about it. This is why a slow but observant walk through your property can tell you a lot about what wildlife species you have present. Paying close attention for tracks or scat can reveal a lot about what mammals are utilizing your land. Listening to the birds that are singing in the spring is very good indicator of those species that are present but having a pair of binoculars will aid in identifying birds outside of the breeding season. Bringing a field guide or multiple guides with you will help as you learn what species you encounter. The

Knowing whether you have a large population of game species on your property allows you to market your land if you desire to hunt lease it.





Simple tools, such as binoculars or field guides, can provide you with a good starting point to determine which wildlife are on your property.

Photo courtesy: Matt Springer

downside to this method is that it is dependent on your property's layout, trails and access, and how well you can detect the signs and songs of species.

Trail cameras/game cameras

Trail cameras, sometimes referred to as game cameras, are an excellent tool to determine what wildlife you have on your property. Placing these cameras at game trails, along logging roads, or near food or water sources would all be excellent places to get pictures of the many species that are using your property. Being in Kentucky also allows you to legally create feeding stations for deer, which helps increase your odds in detecting some wildlife on your property. While it is legal to feed deer, the intentional feeding of bears is not legal in Kentucky. Using cameras to survey your property does have the upfront cost. Good cameras will run about \$100 each plus batteries and memory cards, but they will

be able to be used for years. There are more expensive models that do perform well but for simply identifying what species are on your property, they are not necessary. To perform a good survey of your property, you will want to have a camera setup for every 100 to 200 acres. However, you can somewhat get around this by moving cameras around to different parts of your property after a few weeks. These cameras provide an



Using trail cameras is a simple, relatively inexpensive, and enjoyable way to survey the wildlife on a property.

Photo courtesy: Laurie Thomas

interesting look into the daily activities of wildlife and can produce some really interesting pictures. In addition, they can help to monitor for trespassers on your property. If you are interested in using cameras for both wildlife and security purposes you may want to purchase a camera that has an infrared flash or black flash to help keep the camera hidden at night.

Hiring a consulting wildlife biologist

Another option to survey your property is to hire a wildlife biologist consulting company. This method is usually used when you are trying to determine whether there are any potential issues with endangered species prior to major development or land changes. This method is not a commonly used one for individuals who just have a curiosity about the wildlife on their property as it is not a cheap tool. Contacting a biologist can be done by performing internet searches for environmental or wildlife consulting. An option similar to this that is free to Kentucky landowners of 25 acres or more is to consult with a private lands biologist from Kentucky Department of Fish and Wildlife Resources (KDFWR). By utilizing this resource you can obtain a wildlife management plan for your property and ask them questions relating to what wildlife are most likely present given your region and habitat available. Those plans can provide you advice on strategies to potentially attract wildlife you may desire and potentially help you locate farm-bill programs that can provide income or cost-share for management activities.

Summary and Potential Resources

Overall, wildlife possesses both an intrinsic value and may potentially provide landowners with an annual income source if hunt leasing is used. Knowing what wildlife you have on your property may change your future management strategies and goals for your property. And really, it never hurts to know more about the property you have invested money, time, and effort into.

Kentucky Department of Fish and Wildlife Resources:
<http://fw.ky.gov/Wildlife/Pages/Landowner-Services.aspx>

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FORESTRY 101



Marking Your Woodland Boundary

by Laurie Taylor Thomas

An important part of caring for your woodlands is ensuring that your boundaries are clearly marked. Unfortunately, many privately held woodlands do not have marked property boundaries, which can lead to a host of problems. This article addresses: the importance of marking and maintaining your woodland boundary lines, determining property boundaries, properly marking the boundary, and materials to use for marking the property boundary.

Why is it important to mark your woodland property boundary?

A clearly marked boundary helps avoid several problems common to many woodland owners. First, it can help avoid conflicts with neighbors. Clear boundary marking keeps

those working on your property, for example a logging operation, from accidentally straying on to your neighbor's property. A properly marked boundary can also keep people from accidentally trespassing onto your property. Lastly, a well-marked boundary can help prove an intentional trespass, which is helpful in timber theft, unauthorized ATV use, and dumping cases. All of these issues indicate a properly marked boundary is a part of good woodland management.



A properly marked woodland boundary can help to reduce the risk of timber trespass.

Photo courtesy: Jeff Stringer

Determining and Marking Your Property Boundary

The first step in marking your property boundary is to contact a licensed land surveyor. Most states have lists of licensed surveyors as well as associations of professional surveyors that will help you locate a licensed surveyor in your area. There are several things to consider when choosing

ing a licensed land surveyor. First, choose a surveyor who is familiar with and has experience surveying forested land.

Second, choose a surveyor who is willing and able to represent you in court if a boundary dispute should arise. You should also make sure to understand what the surveyor is going to provide you in their survey and get this in writing as surveyors vary in the way and the rigor that they mark boundaries.

Make sure to specify that you want the boundary lines between the corners marked through the woods with wooden stakes at 50 foot intervals; this will most likely cost extra, but will be helpful when you start marking the boundary. You should also ask the surveyor to notify adjacent landowners to ensure property line agreement. It is in your best interest to meet with your land surveyor on your property to ensure you understand how the property lines and corners are marked.

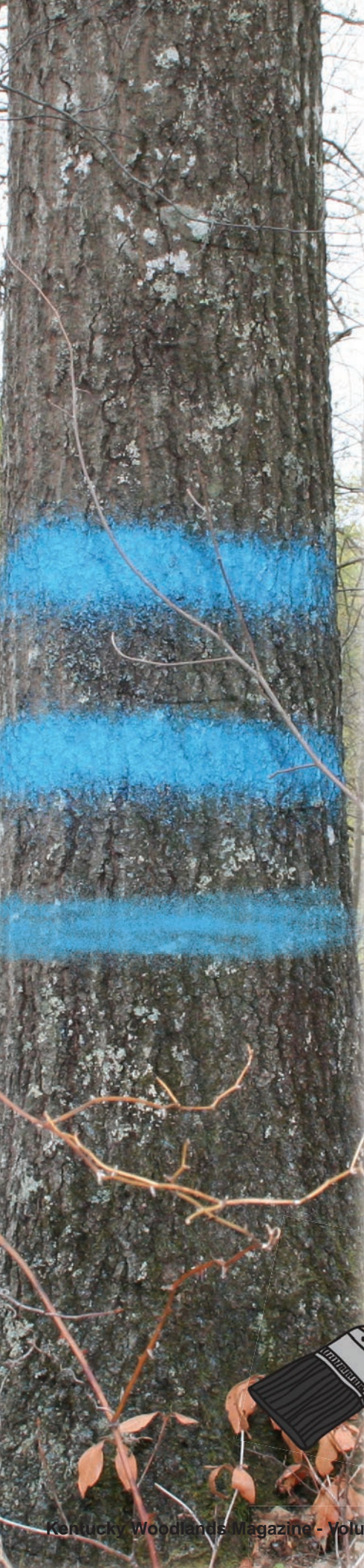
It is also recommended to file a copy of the survey plat at your county courthouse. There are many different variables used to determine the cost of a property survey, such as when the original



If your woodland property boundaries are not known you should work with a licensed land surveyor to make sure they are properly marked, recorded, and communicated to neighbors. Make sure to use boundary marking paint to mark boundary trees soon after the boundaries are established.



Photo courtesy: Chris Osborne



deed was created and the remoteness and accessibility as well as size and shape of the property. For example, in Kentucky a general estimate would be \$40 to \$100 per acre with larger properties (over 300 acres) \$30 to \$40 per acre. Right after the land surveyor finishes the survey, or even while it is still in progress, you should start to permanently to mark your boundaries. Many times this is done by the landowner, but if the landowner is unable to carry out the task, a consulting forester can be hired to mark the established property boundary. It is important that this boundary marking be done during or shortly after the land survey because the wooden stakes and plastic flagging the surveyor will use are only temporary. There are a variety of materials that can be used to mark your property boundary; the most common are boundary marking paints and aluminum or metal boundary markers or signs.

Boundary Marking Paint

Boundary marking paint is oil-based and typically lasts 5 to 10 years. Make sure you choose boundary marking paint NOT tree marking paint, which is designed for short-term use. Also choose a highly visible color such as orange or blue; red is not a preferred color due to fading, and it is difficult to see for people who are color blind. Boundary marking with paint is the least expensive method of marking your property boundaries, but remember it must be repainted as it begins to fade in 5 to 10 years.

Boundary marking paint comes as “brush type” boundary paint or “gun type” boundary paint. The “brush type” boundary paint is typically purchased in gallon cans and applied using a paint brush. The “gun type” boundary paint can be purchased in quart or gallon cans. The “gun type” paint also requires the purchase of a paint gun. The paint gun screws directly onto the paint can. The “brush type” paint is typically a little less expensive but also messy and can be difficult to carry over rough terrain.

It is recommended to mark trees at frequent enough intervals along the boundary line, so that as you stand at a marked tree you should be able to see your last marked tree. If you cannot see the marked tree, your spacing is too far apart. The boundary marking paint should be applied only to trees on your property. Paint should be applied in bands across the face of the tree trunk at eye level. The boundary paint can be applied with marks facing out toward the adjoining property or facing into your property, depending on your objective; in some cases it is best to paint both sides or make a complete band around the trunk. Property boundary corners should be denoted by painting three horizontal bands. When painting your boundary line you may also have to prepare the tree bark surface to allow for adequate surface area for paint application which can add to the time it takes to mark the boundary. Trees with rough or deeply fissured bark (ex. chestnut oak or black walnut) can be smoothed using a draw knife, and for trees with loose flaky bark (ex. white oak) a bark scraper can be used. You should remove just enough bark to smooth the surface and not damage the tree. You should always wear safety glasses when preparing the bark surface and applying boundary paint. For more information on tree marking refer to Forestry 101 “Tree Painting”; Osborne, C. *Kentucky Woodlands Magazine Vol. 8 Issue 2*.



Photos courtesy: Chris Osborne

Specialized tree marking paint is used to mark boundaries. When applied correctly boundary paint can last ten years.



Boundary Marking “brush-type” Paint and Time Estimates		
Distance	Paint Quantity	Work Hours
1,000 feet	24 ounces (if only using one color)	45 minutes (using 3 workers)

These estimates are based on a recent boundary marking done in Eastern Kentucky over rough, rocky terrain using “brush type” boundary paint. The boundary crew consisted of three workers, two to paint and one to carry extra gallons of paint. The time estimates include walking to the boundary line and tree bark surface preparation.

Boundary Markers and Signs

Boundary markers such as metal or fiberglass posts as well as metal or plastic signs can be used instead of paint or in addition to painting the boundary lines. Boundary marker posts can be useful to mark your property line when there are too few trees in an area, the trees are too far apart, or just to improve visibility and permanence. Many of the commercially available boundary marker posts are fiberglass, 5 to 6 feet long, blank or pre-labeled, and can be installed in the ground using a post driver. Other materials such as rebar or steel posts that have been painted with boundary marking paint can also be used. Boundary signs can also help improve visibility and permanence. Property boundary signs are commercially available, range in size and shape from 3" to 5" squares or circles, can be metal or plastic and are typically pre-labeled. The signs should be installed with a long aluminum nail (up to 9" long) to trees on or near the

property boundary line. It is important that these signs not be nailed flush to the tree trunk, you must allow room for the tree to grow. The number of signs used will depend on if they are being used in

conjunction with boundary paint; remember using the signs increases visibility. Having a good property boundary project plan before you start marking will be important when considering property boundary posts or signs since most of these must be purchased in advance and with some expense depending on the size of your property. Remember, your property boundary markers will need to be checked periodically and the boundary remarked as needed.

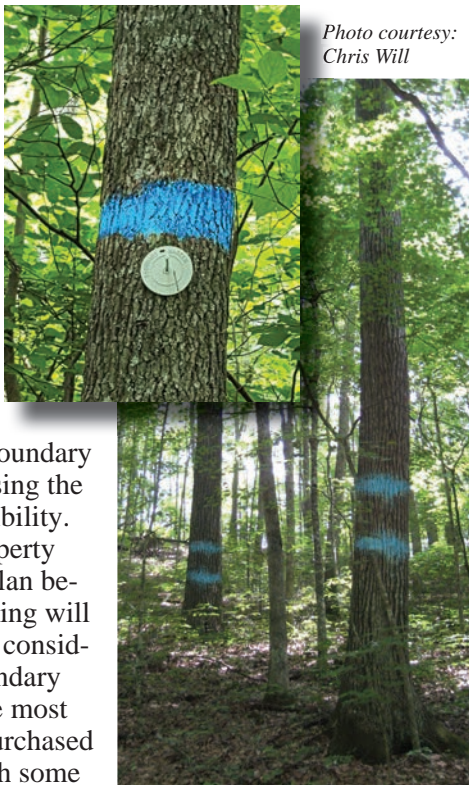


Photo courtesy: Chris Will

Photo courtesy: Jeff Stringer

Trees can be marked with boundary marking paint, signs, or a combination of the two. An advantage of signs is that they are typically more visible.

Property Boundary-Marking Equipment

- Boundary-marking paint: Available from Forestry-Suppliers, Ben Meadows, or Nelson Paint Company (\$23 - \$37 per gallon)
- Hand-held marking guns: Available from Forestry-Suppliers, or Ben Meadows (\$153 - \$275)
- Marking guns with backpack tanks: Available from Forestry-Suppliers (\$450 - \$530)

- Bark or draw knife: Available from Baileys, Forestry-Suppliers, or Ben Meadows (\$40 - \$70)
- Boundary marking posts: Available from Bernsten International (\$14 - \$21 per carsonite post depending on post type and quantity)



Photos courtesy: Chris Osborne

Boundary marking guns and bark knives are tools that can make boundary marking project easier to complete.

- Boundary marking signs: Available from Voss Signs (\$0.20 to \$0.96 each depending on quantity)
- Paint brush and 6"- 8" long aluminum nails: Available at local hardware stores.

Professional Assistance:

To Find a Licensed Land Surveyors in Kentucky
Kentucky Board of Engineers & Land Surveyors:
<http://kyboels.ky.gov>

Kentucky Association of Professional Surveyors:
www.kaps1.com

Kentucky Association of Consulting Foresters:
www.kacf.org/

Marking Your Woodland Property Boundary Webinar



Visit forestry.ca.uky.edu/previous_webinars to watch a webinar on how to go about marking your woodland property boundary.

The author would like to thank the following who provided information for this article: Christopher Will, Central Kentucky Forest Management, Inc.; Chris Osborne, Management Forester, University of Kentucky Robinson Forest; Nathan King of KWM Engineering and Surveying of Kentucky; and Gregg West of Gregg West Land Surveying of Kentucky Incorporated.

About the Author:

Laurie Taylor Thomas, is an extension forester at the University of Kentucky and is responsible for providing forestry and natural resource education programs for youth and adults across the state.

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The Battle Plan: Defining a Strategy to Manage the Emerald Ash Borer in Kentucky Forests

by Ignazio Graziosi, Bill Davidson and Lynne Rieske-Kinney

Kentucky virgin forests were described by early explorers as “Giant forests of oak and tulip, beech and ash, ... grow so close that their leafy branches spread a canopy through which the rays of the sun could scarcely penetrate, producing twilight effects even at high noon.” (from: Robert Collins’s “A History of Daniel Boone National Forest). Now, after benefiting in innumerable ways, we may be on the edge of losing one of those very trees.

A Native Tree and a Beetle From China

The emerald ash borer (*Agrilus planipennis*), commonly called EAB, has killed some 38 million ash trees since its discovery in Michigan in 2002. Native to China, the ½ inch long metallic green beetle attacks all American species of ash (*Fraxinus sp.*) and the native white fringe tree (*Chionanthus virginicus*), and can infest trees of all ages in cities, parks and forests. Larvae feed under the bark disrupting the phloem and causing extensive canopy dieback. Attacked trees die rapidly. Clear signs of EAB presence are serpentine larval galleries visible under the bark, and D-shaped holes that adult beetles chew through the bark when they emerge in late spring and summer (Figure 1).



Figure 1. Signs of EAB include extensive canopy mortality, larval galleries visible under the bark, and D-shaped holes where adult beetles chew through the bark.

Invading Kentucky

The borer has invaded most states east of the Mississippi River, and the Canadian provinces of Quebec and Ontario. It has been detected as far west as Colorado and Texas. Movement of firewood and timber facilitates its spread. EAB has

been reported in Kentucky since 2009, and currently over 2/3 of the counties are reportedly infested. Urban trees were the first to be impacted, but natural forests are now equally affected. With the exception of blue ash, which shows some resistance, our ash trees in North America are highly susceptible to EAB, and the beetle is not constrained by natural enemies like predators and parasitoids. Without any factors to keep EAB numbers in check and limit their spread, ash trees will no longer be a significant component of Kentucky forests (Figure 2). Insecticides can be

Predicted change in Ash Resources	Year	2010	2020
	# of stems/acre	38.9	.36



Map courtesy: Kentucky Division of Forestry

Figure 2. Without factors to keep EAB in check, ash trees will no longer be a significant component of Kentucky forests. Source: Kentucky Division of Forestry, June 17, 2017 (map), Levin-Nielsen and Rieske 2014 (prediction).

effective, but EAB kills ash trees so quickly, and populations move so rapidly, that developing a long-term, broad range management strategy has been difficult.

The Tools

Systemic insecticides are effective but they kill both EAB and their natural enemies. Trees treated chemically are defended for 1-3 years and some can recover from the EAB infestation. But applications are costly, time consuming, often require specialized gear and certified applicators, and are not without risk to non-target organisms including pollinators and honeybees. The approach is well suited for cities and ornamental trees, but is clearly impractical for extensive use in forests. In contrast, biological control has the potential for sustainable, long-term regulation of EAB on a regional scale, perhaps saving trees over large areas. Biological control involves the intentional release of natural enemies into infested areas to help regulate pest populations. Two species of parasitoid wasps targeting EAB larvae (*Tetrastichus planipennisi* and *Spathius agrili*), and one egg parasitoid (*Oobius agrili*) were discovered in the forests of China as effective population regulators for the beetle and approved for release in the US in 2007. But establishment of natural enemies requires time, appropriate conditions, and some luck; EAB kills trees so quickly that populations move to new areas, making establishment of natural enemies challenging.

The Strategy

Our aim is to slow ash decline and EAB development by ap-

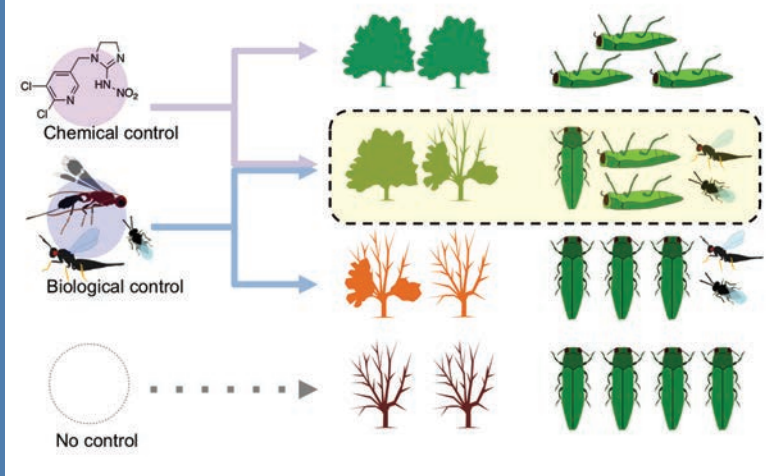


Figure 3. We are slowing ash decline and beetle development using low-dose systemic insecticides while simultaneously releasing parasitoids, thereby creating a longer window of opportunity for biological control to establish.

plying a low-dose of systemic insecticide while simultaneously mass-releasing parasitoids. This is creating a longer window of opportunity for parasitoids to establish and provide long-term regulation of EAB populations (Figure 3). We used imidacloprid soil drench applications applied at lethal rates and also applied at sub-lethal rates (full and 1/2 label rate) with weekly releases of parasitoids in forests with varying levels of EAB damage. During the period 2013-15 more than 180,000 parasitoids were released. We measured EAB infestation levels, parasitoid establishment, and changes in the community of insects inhabiting the forest.

Beetle Response to Management

Emerald ash borer infestation numbers were lower in trees that received imidacloprid, either full or half strength, relative to trees in plots that did not receive imidacloprid (Figure 4, top). Adults and larvae of the parasitoid *T. planipennis* were recovered in high numbers from plots where releases took place, even when insecticide was applied (Figure 4, bottom), suggesting that imidacloprid does not impede successful establishment of biological control agents. Chemical applications did not negatively impact the main

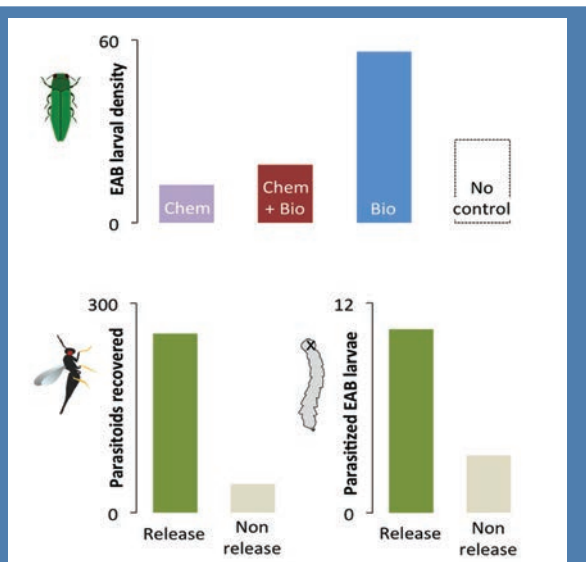


Figure 4. Emerald ash borer infestation levels are lower even with a sub-lethal imidacloprid dose; this does not prevent establishment of introduced natural enemies.

groups of resident wasps and bees, as we consistently found similar numbers in imidacloprid-treated and untreated plots.

How are Forest Insect Inhabitants Responding to Declining Ash?

We have high hopes that some of our native insects can act as natural enemies of the emerald ash borer and help to contain the invasion. We've recovered 11 native species of parasitoids, including *Atanycolus hicoriae* and *Phasgonophora sulcata*, two wasps that appear to

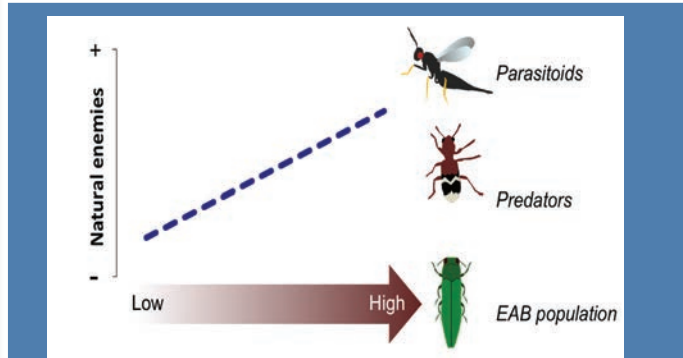


Figure 5. As EAB populations increase, the number of introduced and native natural enemies also increases, providing hope for mitigating future EAB outbreaks.

increase in abundance in EAB-infested forests, and the parasitic beetle *Catogenus rufus*. As EAB outbreaks progress and ash trees decline, the numbers of introduced or native natural enemies increase; we're hoping this will create population regulators to keep EAB in check in newly invaded areas or when our ash forests regenerate (Figure 5).

Additional Perspectives

We continue our approach of blending chemical and biological control for EAB management. We are closely evaluating native natural enemies to evaluate their role in regulating EAB populations, with the hope of facilitating their effects. Understanding all components in the system is key to developing a sustainable integrated management approach to reduce the effects of the emerald ash borer invasion in Kentucky.

To learn more:

EAB spread in Kentucky: University of Kentucky EAB information page <http://pest.ca.uky.edu/EXT/EAB/welco-meeab.html>

Results of the project: Davidson and Rieske "Establishment of classical biological control targeting emerald ash borer is facilitated by use of insecticides, with little effect on native arthropod communities" Biological Control, 2016.

Natural enemies in Kentucky: Davidson and Rieske "Native Parasitoid Response to Emerald Ash Borer (Coleoptera: Buprestidae) and Ash Decline in Recently Invaded Forests of the Central United States" Annals of the Entomological Society of America, 2015

EAB Management – Definitions

Biological control: To regulate pest populations (in this case, EAB) with the use of natural enemies

Population regulation: To keep EAB numbers below a damage threshold

Parasitoids: Often small wasps that locate the pest (EAB) and insert their eggs into them. Parasitoid larvae feed and grow, thus killing the EAB

Predators: Often other insects or birds (especially woodpeckers), hunt the pest (EAB) for food

About the Authors:

Ignazio Graziosi is a Post-doctoral Research Associate and **William Davidson**¹ was a Research Assistant in the laboratory of **Lynne Rieske-Kinney**, PhD, Forest Entomologist at the University of Kentucky. Her research program examines interactions among forest arthropods and forest regeneration, restoration, and sustainability and includes studies on the effects of invasive species on Kentucky's forests.

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Secondary Ash Problems

by Jeff Stringer

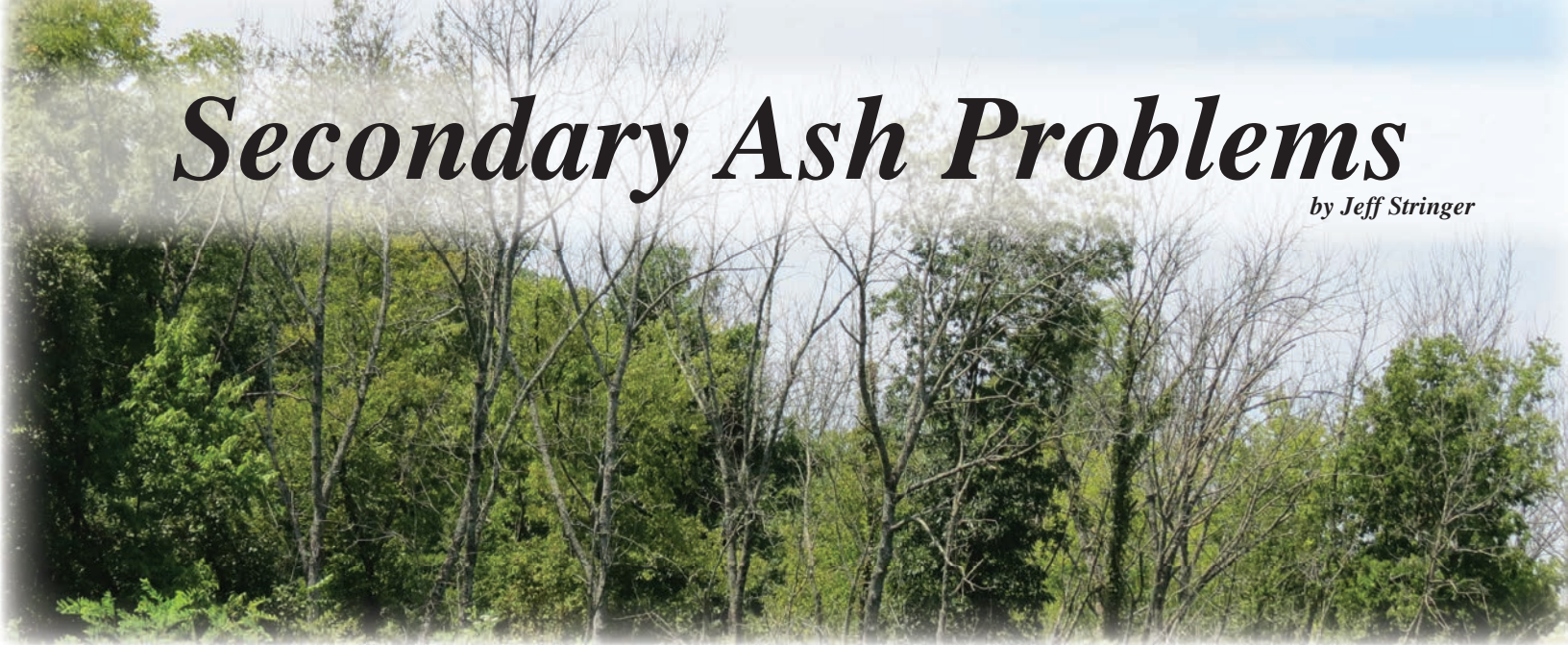


Photo courtesy: Renee' Williams

Kentucky's ash continues to die as the emerald ash borer (EAB) spreads throughout the commonwealth. The small grub type larva of the borer feeds primarily on the inner bark and typically does not damage the underlying wood. This allows trees to be harvested after they have died. However, as trees die and are left standing they are susceptible to a host of insects that can damage the wood. When EAB first hit northern Kentucky many loggers found that they could salvage trees that had seen standing dead for over a year. However, in the summer of 2016 there started to be reports of logs cut from dying or dead ash that were full of small holes. These holes went entirely through the wood and lowered the delivered log price significantly. Unaffected logs were at the time going for \$400 to \$450 per thousand board feet and those with the holes went for \$100 to \$150. This basically meant that loggers would choose not to cut the affected trees, leaving them to stand in the forest, or after cutting them down and seeing the holes leave the logs. Whether the logger left logs or trees in the woods or loaded them on the truck it ultimately results in a loss for landowners that have ash.

The culprit is a small (1/8- to 1/4-inch long) wood boring insect called an ambrosia beetle. The ambrosia beetle is native and has been long known to sawmill owners that have learned to quickly mill ash logs and not hold them on the log yard for any length of time. The ambrosia beetle attacks trees that are dying or have just died. Not all standing dead ash

are infested and these are merchantable. However, loggers are starting to take a hard look at dead or dying ash to determine if they contain the small shot-sized tunnels that indicate an ambrosia beetle infestation. Often the ambrosia beetle carries a fungus that starts to grow in the tunnels and causes the lining of the tunnel and the wood directly next to it to turn black. Figure 1 shows the small holes with the black stain. These holes, while small, are visible on standing dead or dying ash. You can often see the holes in the bark, but with EAB-killed trees it is easier to pull the bark off and look at the wood underneath. The holes may or may not show the black staining. If the ambrosia beetles are still active, you may notice a string of fine ground wood (frass) coming out of the holes.

While sawmill owners have long had problems with ambrosia beetles degrading ash logs, the occurrence of EAB-killed ash is relatively new to logging and landowners in Kentucky. As discussed previously this problem emerged last year in northern Kentucky, quite probably because there are significant amounts of dying ash in the woods resulting in a buildup of ambrosia beetles.

Landowners with ash dominated stands should be aware of this potential problem and make plans accordingly. This is especially true if you are concerned with timber value, have mature ash trees, and EAB has infested your stands or is near your property. In this case it is prudent, to contact a forester and get advisement on current ash pricing and the potential to conduct a pro-active harvest. This also indicates that if you have dead and dying ash already you need to act quickly. All of this means that landowners should be aware of the occurrence of ash in their woods and the movement of EAB.

About the Author:

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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Figure 1. Ambrosia beetle damage on ash trees.

Photo courtesy: Ellen Crocker

kentucky WOODLANDS

Kentucky's New Director of the Division of Forestry: James Wright

James R. Wright has been appointed Kentucky Director of the Division of Forestry effective April 16. James is a graduate of the University of Kentucky, where he earned a Bachelor's degree in Forestry. He began his career with the Division of Forestry in 1994, working as a service forester. He was promoted to the position of chief forester in 2002 and was elevated in 2009 to the position of regional forester. He had been serving as Acting Kentucky Fire Chief since January 2017. Wright has served as a Division



supervisor on numerous fire incidents during the most recent Spring and Fall fire seasons and has worked closely with the U.S. Natural Resources Conservation Service (NRCS) on developing Conservation Reserve Program (CRP) and Habitat Improvement Program (WHIP) guidelines for Kentucky. He lives in Lexington where he has been a longtime youth basketball and baseball coach.

UK Forestry Department Chair Changes



Dr. Terrell Baker

After six years as chair of the UK Department of Forestry Dr. Terrell "Red" Baker stepped down on March 31, 2017 to become the new director of the University of Florida Institute of Food and Agricultural Sciences. We thank Red for his many contributions to forestry in Kentucky and wish him the very best in his new position. Dr. Jeff Stringer, an Extension Professor at the University of Kentucky Department of Forestry and one of the editors of Kentucky Woodlands Magazine, has been selected to serve as interim department chair by Dean Nancy Cox of the UK College of Agriculture, Food and Environment. Jeff is well known and respected in the forestry community and is excited to lead the department through the transition of finding a permanent chair.



Dr. Jeff Stringer

Welcome to KY Woodlands Magazine's Newest Editor: Pam Snyder

Kentucky Woodlands Magazine is pleased to have Pam Snyder of the Kentucky Division of Forestry (KDF) join us as editor. Pam has been a strong advocate for Kentucky woodland owners for more than 20 years. In addition to this new position, Pam is also the Stewardship Branch Manager for KDF. You can reach Pam via email at pamela.snyder@ky.gov.



Upcoming Dates To Remember:

2017 Dates:	Event:	Location:	Contact:
August 12	East Woodland Owners Short Course	Laurel County Extension Office	www.ukforestry.org
August 26	West Woodland Owners Short Course	Warren County Extension Office	www.ukforestry.org
Sept. 15 - 16	KY Wood Expo	Lexington, KY	www.kfia.org
September 23	Central Woodland Owners Short Course	Kenton County Public Library—Erlanger Branch	www.ukforestry.org

NEWS TO USE

2017 Kentucky Woodland Owners Short Course

Registration is now open for all sessions of the 2017 Woodland Owners Short Course (WOSC). This regionally based program is an excellent opportunity for you and your family to learn how to care for your woodlands. Unfortunately, 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 then the WOSC is right for you! For more information visit <http://forestry.ca.uky.edu/wosc> or call 859.257.7597.

- East WOSC, August 12, Laurel County Extension Office
- West WOSC, August 26, Warren County Extension Office
- Central WOSC, September 23, Kenton County Library – Erlanger Branch

Kentucky Woodland Owners Short Course



Kentucky Wood Expo 2017

The Kentucky Wood Expo will take place on September 15 & 16 in Lexington at Masterson Station Park. The event is open to the public and contains a wide variety of activities, demonstrations, and educational events. UK Forestry Extension is partnering with the Kentucky Forest Industries Association to put on several educational programs including: Small Scale Logging Demonstration, Your Backyard Woods, and the ever popular Critter Tent including a new mammal display with skulls and skins of native Kentucky animals. In addition, Wood Expo attendees will once again have a chance to make and take home their own cutting boards.

Other planned activities include live Country and Bluegrass Music, Chain-saw Carving Demonstrations, and a competition between local police and fire departments in forestry related events. There are also a number of other contests that the public can participate in and a wide variety of crafts, food and fun for the entire family. Make sure to come out to the Kentucky Wood Expo to cheer on the UK Forestry student team as they compete in the Collegiate Lumberjack Competition against seven other universities! Mark your calendars now and plan to join us at the 2017 Kentucky Wood Expo!

Photo courtesy: Laura Lhotka



Above: Come watch UK students compete in lumberjack competitions at the Kentucky Wood Expo. Left: The Kentucky Wood Expo is for all ages, as even younger children can participate in making a cutting board.



Photo courtesy: Renee' Williams

Snake Identification Website UPDATED

The University of Kentucky Department of Forestry has recently updated the snake identification website, www.kysnakes.org. The update added more pictures of all the snakes present within Kentucky, a map showing their known ranges, and the ability to use a drop-down menu of characteristics to help identify snakes. One of the newest additions includes the ability to report the snake you observed to the depart-



Photo courtesy: Lisa Powers

ment. The website will ask for some basic information on the species you observed including the county where you observed it, the date, and it will ask if you are willing to be contacted by the department if more information is needed. If you are curious about snake species in Kentucky or would like to report a snake you have seen please visit <http://kysnakes.ca.uky.edu/>



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***Register Now for the
Woodland Owners Short Course***

August 12 - Laurel County
East Region Woodland Owners Short Course

August 26 - Warren County
West Region Woodland Owners Short Course

September 23 - Kenton County
Central Region Woodland Owners Short Course



If you would like to register for the WOSC or learn more about the Expo visit www.ukforestry.org

***Mark Your Calendars for the
Kentucky Wood Expo***
September 15 - 16
Masterson Station Park,
Lexington, KY

