



Kentucky Woodlands Magazine Volume 1 Issue 1
July 2006

Kentucky Woodlands Magazine

Kentucky's Alien Invasion
Emerald Ash Borer
Sudden Oak Death
Forestry 101
Kentucky's Quiet Giants

First Issue!
Forest Health

Kentucky Woodlands Magazine

Promoting stewardship and sustainable management of Kentucky's non-industrial private forests.

From the Editors of
Kentucky Woodlands Magazine

Nearly 80 percent of Kentucky's 12 million acres of woodlands is considered private non-industrial forest and is owned by more than 423,000 individuals. This magazine is dedicated to these owners, who are stewards of one of our greatest natural resources. They provide the Commonwealth and its citizens with a wide range of economic, social, and environmental benefits.

The challenges of owning, managing, and protecting 47 percent of the state's land area are immense and varied. The aim of Kentucky Woodlands Magazine is twofold:

- to provide information vital to sustaining the health and productivity of our native woodlands for owners and the natural resource professionals who support stewardship of our woodland resources
- to ensure that woodland owners have the ability to make the best possible choices for themselves, their families, and ultimately for all of us.

On behalf of the University of Kentucky's Department of Forestry and the Kentucky Division of Forestry, the editors of Kentucky Woodlands Magazine commend you for the effort you put forth to manage our woodlands, and we hope that this magazine will help make your efforts more rewarding.

Jeff Stringer,
University of Kentucky,
Department of Forestry
Diana Olszowy, Kentucky
Division of Forestry

Kentucky Woodlands Magazine
www.ukforestry.org

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About the Cover:

Thomas Barnes, UK Extension Wildlife Professor, and award winning wildlife photographer and author contributed the cover photograph of Lily Cornet Woods. It has been designated as a Registered National Natural Landmark by the U.S. Department of Interior, and it is also a Registered Natural Area of the Society of American Foresters. Lily Cornett Woods is located in Letcher County, Kentucky in the southeast corner of the state.
www.naturalareas.uky.edu/lilley.htm

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Kentucky's Alien Invasion

by Joyce Bender

To most people, the phrase “alien invasion” conjures up images of a science fiction movie. The horrors of space invaders are the figments of a screenwriter’s imagination run wild, but the devastation from alien plants is only too real. The United States has been, and continues to be, invaded by aliens – plants that are not native to this country. Introduced from Europe or Asia, these non-native species have invaded our natural areas and upset the delicate ecological balances that were in place. With no natural enemies to control their numbers, invasive non-native plants multiply at the expense of our native species. They eliminate the beauty of our spring woodlands and displace wildlife by out-competing native species for space, light, and nutrients. Invasive non-native plants are considered to be one of the leading threats to biodiversity, second only to habitat destruction.

In addition to the ecological costs, invasive plants take a heavy toll on our economy. It is estimated that invasive plants cost the United States more than \$34 billion each year in lost productivity, lower quality, weed control and containment on croplands, rangelands, forests and aquatic resources.

Invasives are plants out of place; they are found beyond the limits of their natural distribution. There are a number of ways for a plant population to spread naturally. For example, some species can grow from fragments of roots or runners that break free of the parent plant; some species have seed coats with hooks that catch on animal fur; some seeds have hairs that enable them to float on the breeze. None of these methods alone are likely to account for the presence of the invasive plants that plague our country. With assistance from humans, either by accident or on purpose, these plants have moved beyond the continent of their origin and crossed an ocean to take up residence here in the United States. Early colonists brought some of these species to our shores as seeds mixed in the rock and soil of ship ballast. Some invasive species got their start when they were planted as a contaminant among the seeds of a valued food crop. Other plants have been introduced intentionally and promoted for erosion control, forage, and landscaping with disastrous results.

Many Kentuckians may not know garlic mustard and oriental bittersweet, but most have encountered kudzu. These species and the others listed here have been identified in Kentucky and many surrounding states as serious threats to the region’s biologically diverse forest ecosystems. Please consult the Southeast Exotic Pest Plant Council Web site <http://se-eppc.org/> for more information and useful links for identification and control methods.

Asian bittersweet (*Celastrus orbiculatus*) was introduced from Asia as an ornamental. The aggressive vines wrap around trees and their weight can break limbs. Their dense growth habit shades out tree seedlings and chokes out native ground cover. It has been documented as hybridizing with our native bittersweet vine, and this could lead to the extinction of the native species.

Bush honeysuckle (*Lonicera maackii*) was introduced from Asia as an ornamental shrub. It forms dense thickets that shade out tree seedlings and other native plant species to the point where nothing grows beneath this shrub. The abundant fruits are rich in carbohydrates but do not offer migrating birds the high-fat, nutrient-rich food sources

needed for long flights. This plant has overtaken the midstory of most forests in the Inner Bluegrass region.

Chinese privet (*Ligustrum sinense*) was introduced from China as an ornamental. This shrub also grows in dense stands that eliminate native species underneath, especially in moist areas. A prolific fruit producer, its seeds are spread by birds. It sprouts well from the roots, making it more difficult to control.

Garlic mustard (*Alliaria petiolata*) arrived from northern Europe. This herbaceous plant forms a dense ground cover that excludes native plants in rich forests. It is harmful to wildlife because it eliminates native plants that serve as food sources for small mammals and turkey. Each plant produces numerous seeds that spread easily. It is very difficult to control once it is established.

Winter creeper (*Euonymus fortunei*) was introduced from China as an ornamental ground cover. It forms a very dense ground cover that eliminates native species from the understory. This thick carpet of leafy vines impedes recruitment of trees as well. The vines will climb up trees and can overtop small trees causing decreased vigor or death. These species and many others are changing the face of Kentucky's landscape. The ecological health of forests that wildlife and humans have come to depend on is declining as is our ability to use them sustainably. We must find ways to stop the explosive growth of invasives and protect Kentucky's natural heritage.

What can you do to help with this serious threat?

- Ask questions at the nursery about the invasive tendencies of any ornamentals you are considering for purchase.
- Work on eradicating invasive plants from your property.
- Use native plants or species proven to be non-invasive when landscaping your home. There are numerous native species that will provide the color, interest, and values for wildlife you are looking for.
- Urge your legislators to improve statutory requirements for listing and control of invasive plants.
- Volunteer with your local park or state nature preserve to control invasive plants.

<http://se-eppc.org/>

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Bush honeysuckle (*Lonicera maackii*) was introduced from Asia as an ornamental shrub. It forms dense thickets that shade out tree seedlings and other native plant species to the point where nothing grows beneath this shrub. This plant has overtaken the midstory of most forests in the Inner Bluegrass region.

Chinese privet (*Ligustrum sinense*) was introduced from China as an ornamental. A prolific fruit producer, its seeds are spread by birds. It sprouts well from the roots, making it more difficult to control.

Defending Kentucky's Forests

by Jeff Stringer

This first issue of Kentucky Woodlands Magazine has a special focus on forest health. The articles on the emerald ash borer, sudden oak death, and invasive plants cover only some of the most pressing threats to Kentucky's woodlands. While there are other insects and diseases not covered in this issue, including gypsy moth and the Asian long-horned beetle, there are also a significant number of forest health issues not directly related to insects and disease. Many forest health issues are caused by human actions such as wildfire, development pressures, parcelization, grazing, and lack of good woodland management. These are significant threats because for the first time since the 1930s, inventories of Kentucky's forests have shown a decrease in overall forest acreage. This is largely due to development pressures, not agriculture. The parcelization and development in the forest and the clearing of forests for highways, shopping malls, and golf courses are starting to take a toll on Kentucky's forests. Even as they take away forest acreage, they also provide avenues for invasive plants and diseases to move into our native forests. These also decrease and fragment the interior forest habitats necessary for many of our wildlife species. The U.S. Forest Service indicates that forest fragmentation is one of the biggest, if not the biggest, threat to forests in the Southeast. Kentucky is no exception.

The aging of our forests is also an issue. The majority of trees that dominate the canopies of our forests were generated from agricultural abandonment and timber harvesting during the late 1800s and early 1900s. The large trees in these forests are typically of the same age, and many species are approaching or have passed biological maturity. When droughts and defoliations occur, we see the death of some of these trees. While this does not indicate that our forests are being lost, it does indicate that the overall health of many of our forests is not what it was several years ago.

The bottom line is that our forests in general, and some of our important forest species, are at risk from a variety of causes. Some are caused by humans, such as wildfire, and are thus ultimately avoidable. Some are due to the biological maturing of our forests and can be dealt with by good forest management. Unfortunately, some are due to the invasion by exotic pests.

Due to these pervasive issues, forest health will continue at the forefront of political, economic, and ecologic debates. In Kentucky, the health of our forests is extremely important. Our forests provide the backdrop for much of our recreation and provide habitat for our diverse wildlife species. They provide Kentuckians with important green space and a landscape that is a joy to live in and they are the basis for a \$7.1 billion dollar forest industry that provides significant revenues for our rural communities.

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The U.S. Forest Service defines a healthy, sustainable forest as:

“A condition wherein a forest has the capacity across the landscape for renewal, for recovery from a wide range of disturbances, and for retention of its ecological resiliency while meeting current and future needs of people for desired levels of values, uses, products, and services.”

The Stories That Trees Tell

Tree rings provide

an important history of a tree and the environment in which it is growing. Children commonly look at tree cross sections or “tree cookies” in school and know the routine when they are presented a cross section of a tree. They quickly tell you that the age of a tree can be determined by counting the cross-sectional rings, or annual rings, of the tree because each annual ring represents one year of growth. Foresters daily use the information that tree rings provide. Foresters look at these rings and determine not only the age of a tree but also the “pulse” of the tree’s health.

A wide annual ring means that the tree grew significantly in diameter that year and usually indicates a favorable growing environment for the tree. Wide tree rings are the result of ample growing space for a tree in the forest, providing the tree with ample sunlight, moisture, and nutrients to maintain rapid growth.

You might question how a forester determines this cross-sectional view of the tree without the tree being cut down. Foresters carry with them a tool called an increment borer that is used to measure the growth pattern in a living tree. The hollow tube of the increment borer is hand turned into the tree and produces an increment core that clearly reveals the annual rings. The term increment core is used because foresters can determine how long it has taken the tree to grow a certain amount in diameter, or in other words, to attain a certain increment of growth. For example, by measuring the distance between the end of the core that came from the outer edge of the tree next to the bark back 10 annual rings, the forester can determine that the tree is growing so many inches in diameter every 10 years. This is the growth increment of the tree.

From the observation of this small boring of wood, the forester can quickly evaluate the growth rate and health of a tree. If the bands gradually become closer together as the tree grows older, the indication would be that the tree’s crown is small and producing little food for diameter growth. In most of these situations, if the objective is to maintain good growth, a thinning would be prescribed to remove competing trees from around the crown of the tree in question. This gives the tree more room to grow. A forester will always observe to see if this reduction in tree diameter growth could have been caused by insects feeding on the foliage, recent droughts, or even a recent fire that has damaged the bole of the tree.

If foresters observe any abrupt change in width of the annual rings, they need to re-evaluate the existing forest management plan with the input of the forest landowner and possibly adjust the plan to maintain the best potential growth for the stand. If a timber stand is being grown for future timber harvests, increasing a tree’s diameter growth is important.

It is important for you, the ultimate manager of your forest, to stop and determine the story that your trees are attempting to tell you about their health and growth patterns. Your forests, just like you, should have routine health checkups. This routine forest “checkup” will help in maintaining a healthy, vigorous, and economically sound future.

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University of Tennessee

Kentucky's Quiet Giants
Kentucky Big Tree Program

A Look at Kentucky's Big Tree Program

Photos courtesy Kentucky Division
of Forestry

The State Champion Pecan, Allen County.

Chances are you've seen at least one of these giant

trees in a city park, cemetery, or even in your own backyard. Some have been around since Daniel Boone roamed the state, while others have been around since before our country was founded. These magnificent giants capture our imagination for their size and strength; however, there's more to a champion tree than just its size. They are symbols of all the good work trees do for the quality of the environment and our quality of life. Big trees provide more cooling shade and more places for wildlife to perch and nest. They sequester more carbon dioxide, trap more pollutants, and purify more water. Although most trees can outlive us — a lifespan of 100 to 200 years is not unusual for trees — they succumb to age, disease and insects, wind, rain, and drought. And now, all too often, they fall victim to the onslaught of development. All trees work hard to improve our environment. It's our responsibility to maintain a healthy environment that allows trees to grow to champion status.

In 1940, the American Forests Foundation began a search for the largest species of American trees. This list, now called the National Register of Big Trees, contains the names of more than 750 species (13 of which are from Kentucky). The Kentucky Division of Forestry began compiling a list of state champions in 1968. The first list contained the names of only 51 species; the current list, which is restricted to only native or naturalized species in Kentucky, has more than 90 species reported. This list is continually updated as new giants are discovered or old friends fall. The latest list can be found on the Division of Forestry's Web page www.forestry.ky.gov.

Our list of state champions is restricted to tree species listed in "Trees and Shrubs of Kentucky" by Mary Wharton and Roger Barbour, which was last revised in 1994.

Do You Have a Champion Tree?

To nominate a tree, the species must first be identified and measured properly.

Measurements must be made for circumference, height, and crown spread. If your tree identification skills are somewhat lacking, consider contacting the Division of Forestry district office nearest to you for assistance.

Circumference

The tree's trunk should be measured at a point 4 1/2 feet above the ground to get a measurement called d.b.h., or diameter at breast height. If the tree forks below 4 1/2 feet, it is considered as two trees, and only one fork can be measured. If the tree forks above 4 1/2 feet, it is considered as one tree and can be measured at d.b.h.

Height

An estimation of height can be made using a yardstick. First, measure 100 feet from the tree. Next, hold the yardstick vertically, 25 inches from the eye. Align the zero inch mark

on the yardstick at the base of the tree and note the inch mark that aligns with the top of the tree. Every inch equals 4 feet.

Crown Spread

To determine a tree's average crown spread, you must first find the points in the tree's crown that are widest and narrowest. These points must then be marked on the ground. Walk underneath the tree and visually assess where the tree's branches extend the farthest from the trunk of the tree. Drive a stake into the ground directly beneath this point. Following a line directly through the center of the tree's base, find the opposite side of the crown's widest point, stand directly beneath the outer edge of it, and drive a second stake into the ground.

Next, you must determine the narrowest spread in the tree's crown. Find where the outer edge of the crown's branches are closest to the bole, stand directly beneath this point, and drive a stake into the ground. Do the same as before and find the opposite side of the crown, and drive a second stake to mark it. Measure the number of feet between the stakes marking the crown's widest dimension and write it down. Measure the number of feet between the stakes marking the crown's narrowest dimension. Add the two numbers together, divide by two, and the result is the tree's average crown spread.

Total Your Points

Add together the points for the tree's circumference (in inches), tree's height (in feet), and of the average crown spread (in feet). The result is your tree's total point index. Champion status is based on the number of points, and only a forester can determine whether your tree has enough points to be a champion.

Example: sugar maple – 120 inches in circumference + 80 feet tall + average crown spread of 60 feet.

Circumference (in inches): 120

Height (in feet): 80

Average crown spread (in feet)/4: $60/4 = 15$

Total Index Points: 215

After determining the index points for your champion tree nominee, contact the district office (if you have not already done so) that serves your area and make arrangements for a forester to certify your results and submit your nomination. To check how large your tree is in comparison to other state champs or to see how many big trees are in your county, visit the Kentucky Division of Forestry's Web site:

www.forestry.ky.gov/programs/championtree, or call 1-800-866-0555 for additional information about Kentucky's Champion Tree Program.

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This Bur oak is the National and State Champion, Bourbon County.

The National and State Champion sycamore, Montgomery County

KWOA
Kentucky Woodland Owners
Association Assists Private Forest
Landowners with Woodland Management

For adults who have long forgotten

their scouting badge for tree identification and now wonder just exactly what all those trees are in their back forty and whether those bugs are a cause for concern, help is on the way. The Kentucky Woodland Owners Association (KWOA) promotes economically and environmentally sound forest management and provides technical assistance to its members to improve their forest holdings.

Since 1994, KWOA has provided a forum for Kentucky's 423,000 private woodland owners to consult with forestry experts, the logging and wood products industry, and professionals in related fields such as wildlife and agriculture. Whether a farmer, an absentee landowner, or a rural resident, all owners of forested land have questions from time to time on how to manage their woodlands. KWOA ensures that the latest information from national and state level research is made available to its members through its reports, newsletter, Web site, field days, conferences, and business meetings. KWOA's primary goal is to help Kentucky forest landowners attain the best long-range dollar return from their forestry operations while at the same time maintaining a healthy, beautiful forest. The association provides marketing information, educational programs, and technical assistance on managing forest holdings to support forest health, economy, and outreach. Its officers and regionally based board of directors brief the state legislature and coordinate with local businesses and government agencies to ensure that woodland owners' interests are represented in fiscal, economic development, and environmental policies affecting them.

As a sustainable industry, timber production must address long-term issues of forest health and landowner education regarding the status and value of their holdings. KWOA approaches these concerns on several fronts:

- KWOA informs the public about the importance of woodland management and what it contributes to the state's economy, recreation, natural lands preservation, wildlife habitat, water quality, and the environment.
 - KWOA puts woodland owners in direct contact with experienced local timber owners who have proven they know how to get the best long-range dollar return from their forestry operations while maintaining a healthy, beautiful forest.
 - KWOA negotiates for better markets and prices for Kentucky forest products and organizes support for bringing modern wood processing industry to Kentucky.
-
- KWOA assisted the Revenue Cabinet in changing the way forest land is assessed;
 - lobbied the state legislature to enact a special Classified Forest Act granting favorable assessments to forests under certified management programs;
 - helped develop a "one pass" management practice with cost share to combine tree planting, timber stand improvement, fire lanes, erosion control measures for roads, and wildlife habitat improvement;

- expanded the forest health task force to address invasive vegetation, insects and disease problems threatening Kentucky's forests;
- created a new model program with the Kentucky Agricultural Development Board to help woodland owners develop production profit potential, forest management and stewardship in their woods; and
- built solidarity among its members and the 27 state woodland owners associations across the United States to bring forest landowner issues to the attention of Washington, DC lawmakers.

Whether a property owner has ten acres or a thousand acres of woodlands, KWOA can assist in all aspects of maintaining and improving forest health. For information on how to become a member of KWOA and participate in its numerous events during 2006 visit its website at www.kentuckywoodlandownersassociation.com.

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Photo by Doug McLaren

2006 Woodland Owners Short Course

The 2006 Woodland Owners Short Course is scheduled for the 2nd Thursday of June through September. The Woodland Owners Short Course consists of four segments spread out across Kentucky and each segment covers a variety of woodland related topics.

There are a wide range of management possibilities available to woodland owners in Kentucky including generating income from timber harvests and forest crops, recreational use, and wildlife management to name a few. Regardless of the management objective, basic information about forest management is vitally important to help ensure the future sustainability of your woodlands. To get the most out of their woodlands, owners need a basic knowledge of all aspects of sustainable forest management. The 2006 Woodland Owners Short Course will provide that information through experts from around the state.

This is a great opportunity for woodland owners to learn more about woodland management, sources of assistance, harvesting and marketing, invasive species, and woodland recreation. It is also a great opportunity to make beneficial contacts with natural resource professionals and other woodland owners. Space is limited so if you are interested please register early.

The Woodland Owners Short Course is sponsored by the University of Kentucky Department of Forestry, the Kentucky Division of Forestry, and the Kentucky Woodland

Owners Association. Participants are encouraged to attend as many of the segments as possible. The final segment will include a presentation of a certificate of participation to those landowners that attend at least three of the four scheduled segments.

For additional details and to view the brochure, which includes the registration form, go to www.ukforestry.org or call (859) 257-7597.

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Kentucky Division of Forestry
Programs to assist woodland owners and protect
and enhance the forest resources of Kentucky
Hemlock Woolly Adelgid

This aphid-like insect attacks only eastern hemlock trees. It removes nutrients from the tree through its feeding activity and slowly kills the tree over a three- to ten-year period. This pest has killed large numbers of hemlock to the east, northeast, and southeast of Kentucky.

Hemlock is not an economically important tree species in Kentucky, but it occupies some very ecologically delicate sites in the eastern part of the state. It is found along mountain streams in moist soils. It helps keep streams cool in the summer for cold-water organisms to thrive and provides some nesting sites as well as winter protection to wildlife.

This insect is active in the winter months and can be easily seen as white, woolly masses on the undersides of hemlock branches. This pest has been recently detected in Harlan County and is being controlled by chemical soil injection in the limited outbreak. The Kentucky Division of Forestry surveys hemlock stands in eastern, southeastern and northeastern Kentucky twice per year.

If you have questions regarding forest health issues, please contact your local Division of Forestry office, or call Tim McClure in Frankfort at 800-866-0555.

Forest Health Program

The forest health office deals with insect and disease problems, as well as exotic invasive plants in Kentucky's woodlands. While there are always mini-outbreaks of an insect or disease problem, there are a few major pest threats that this office is closely monitoring.

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Hardwood Silviculture

Technical information on hardwood silviculture for foresters

The following information and guidelines were developed to assist foresters in evaluating labels of glyphosate herbicides and providing a legal and effective recommendation to landowners. Glyphosate products marketed by firms other than Monsanto, coupled with the repackaging of Roundup, has resulted in a large number of glyphosate products on the market with products and labeling changing annually. This has resulted in confusion over labeling and forester's oftentimes recommending off-label and illegal use of a number of glyphosate products.

Clarifying the Use of Glyphosate Herbicides

The following information and guidelines were developed to assist foresters in evaluating labels of glyphosate herbicides and providing a legal and effective recommendation to landowners. Glyphosate products marketed by firms other than Monsanto, coupled with the repackaging of Roundup, has resulted in a large number of glyphosate products on the market with products and labeling changing annually. This has resulted in confusion over labeling and forester's oftentimes recommending off-label and illegal use of a number of glyphosate products.

How to Determine What Product to Prescribe

Glyphosate is commonly used in a wide range of silvicultural operations. However, what glyphosate product can be used in what operation is based to a large degree on the landscape where the operation occurs. Currently only one brand is labeled for use in forests (regenerating or intact). However, a number of brands can be used for tree plantings in agricultural lands and in industrial non-crop areas.

The EPA views the release of herbicides in forest environments to be fundamentally different from their use in agriculture and industrial settings, where natural ecosystems have been seriously disturbed. The limited demand for forest use herbicides compared to the demand for herbicides that can be used in agriculture, industrial, and turf and ornamental areas has induced many companies to abandon the labeling requirements needed for authorizing a chemicals use in a forest environment in favor of more lucrative labeling. Fortunately, a number of agriculture and industrial chemicals can be used for site preparation treatments prior to tree planting in previously cropped areas or general noncrop areas (excluding forests). For example, Roundup Pro can be used in tree plantings in fields but not for silvicultural treatments in forests.

Forest Use

A review of the labels of the most widely used and commonly available glyphosate products indicates that only one currently manufactured product, Accord, can be used in forest environments for site prep, release, thinning, and improvement work including the removal of invasives from forests.

Brand Name	Manufacture	Label Type
Accord (all types)	Dow AgroSciences	Forestry

Label information: "For control of annual and perennial weeds and woody plants in noncrop areas and industrial sites, forests, habitat management areas, railroads, roadsides

and similar sites.” This product is basically the original Roundup product and can be used for injection, cut-stump, hack and squirt, and foliar application in forests.

Tree Planting in Agricultural Fields

A large number of brands can be used in crop fields that are fallow and in grass fields for the pre-plant removal or burn-down of grass and weeds prior to planting and for directed and spot spraying after planting. They have non-crop labeling but do not include forests as a non-crop area.

Brand Name	Manufacture	Label Type
Roundup Original (Max)	Monsanto Company	Agriculture
Roundup UltraMaxII	Monsanto Company	Agriculture

Label information: “Tree, Vine, and Shrub Crops: Preplant (Site Preparation) Broadcast Sprays, General Weed Control, Middles, Strips, Selective Equipment, directed sprays, spot treatment, perennial grass suppression, cut stump.” and “Non-Food Tree Crops - This product may be used as a post-direct spray and spot treatment around established poplar, eucalyptus, Christmas trees and other non-food tree crops.”

Roundup Pro Monsanto Company Industrial

Label information: “General Noncrop Areas and Industrial Sites

Use in areas such as airports, apartment complexes, Christmas tree farms, ditch banks, dry ditches, dry canals, fencerows, golf courses, industrial sites, lumberyards, manufacturing sites, office complexes, ornamental nurseries, parks, parking areas, petroleum tank farms and pumping installations, railroads, recreational areas, residential areas, roadsides, sod or turf seed farms, schools, storage areas, substations, warehouse areas, other public areas, and similar industrial and noncrop sites.”

These products listed for use in tree planting in agricultural fields, as well as other similar glyphosate products, can be used prior to the planting of trees or for the removal of woody plants in general noncrop areas. However, once trees have been planted and/or the area is deemed a forest environment they can not be used, and only a forest use label (Accord) can be prescribed. In many areas, the site is considered forested as soon as trees are planted.

There are a number of other glyphosate products that can be used for silvicultural operations in agriculture or non-crop areas outside of forests. For a list of glyphosate herbicides, go to www.cdms.net.

Home and Garden Products

A number of glyphosate products are packaged in small containers that are available locally at discount retailers, hardware, and lawn/garden stores for use home and garden use. Some of the common brands (with the % glyphosate) include: Roundup Brush Killer (27%), Roundup Concentrate (18% + 0.73% Diquat), Roundup Weed and Grass Killer (<2 %). However, these are specifically marketed for home and garden use and should not be used in forested environments.

Note: The brand names listed are the ones more commonly available in Kentucky and do not constitute endorsement. A wide range of effective glyphosate products are available that have similar uses and properties as the ones listed.

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Photo by Jeff Stringer

Are Kentucky Forests Threatened by Sudden Oak Death?

By Patricia de Sá & John Hartman

Sudden oak death (S.O.D.)

was first seen in the mid-1990s in the United States in coastal areas of Central California on tanoak and on several oak species including California black oak and coast live oak. S.O.D. was later shown to be caused by the same organism causing dieback and leaf spot symptoms on rhododendrons and viburnums in Germany and in the Netherlands in 1993. The diseases were found to be caused by a new species of *Phytophthora* (pronounced “fy-TOFF-thor-ra”). These organisms are similar to fungi and are sometimes called water molds. Many species of *Phytophthora* are common in the United States causing a number of diseases in agriculture, including black shank on tobacco, and on horticultural and forest plants. The newly discovered species is *Phytophthora ramorum*, or *P. ramorum* for short.

Where Is Sudden Oak Death Found?

In coastal California and Oregon forests, S.O.D. has killed hundreds of thousands of trees. While the oaks in California are generally not high quality or important timber species, they are closely related to oaks that are native to Kentucky. *P. ramorum* is also found infecting understory plants such as California bay laurel and rhododendron. At present *P. ramorum* is not known to occur in other North American forests, however, the pathogen can be transported long distances infected nursery stock, and soil or potting mixes. Nursery surveys of 48 U.S. states in 2005 revealed that 99 nurseries in seven states had plants that tested positive for *P. ramorum*; in 2004 infected plants were found in nurseries in 22 states. Infected nursery stock was destroyed.

Although it is not known where *P. ramorum* originated, it has been isolated from plants in Germany, the Netherlands, the United Kingdom, Poland, Spain, France, Belgium, Sweden, Canada, and the United States. There are regulations and quarantines in place to prevent the spread of *P. ramorum* within countries and from one country to another and to keep the European and North American strains (mating types) apart, since mating could produce progeny with increased genetic variability and virulence.

Due to the significant tree death that can occur from this new disease and the fact that it can be easily spread across the country with the shipment of nursery stock, the U.S. Forest Service has developed risk maps for the United States. These maps are used to show where *P. ramorum* could easily gain a foothold, spread rapidly, and have great impact. Unfortunately, the central Appalachian Mountains were consistently considered high risk areas for the establishment of *P. ramorum*. This pathogen is a nursery and forest problem, and if it were to be introduced into the Appalachian region, it could have devastating consequences for the state of Kentucky. Forty-seven percent of the state is covered with forests that are largely dominated by oaks that are susceptible and ecologically and economically important. Forests in eastern Kentucky would be especially vulnerable.

The Forest Service report can be viewed at

www.cnr.berkeley.edu/comtf/html/modeling_phytophthora_ramorum.html.

Disease symptoms and host plants

P. ramorum has a broad host range infecting woody and herbaceous plants and ferns, causing trunk cankers, leaf blight, and shoot dieback. On mature oak trees, *P. ramorum* causes cankers on the main stem that can vary in color from red to brown to black (Figure 1). Dark to reddish sap oozes out of the bleeding canker, and sometimes the sap will dry and leave a dark stain on the outer bark. Cankers that develop on the main stem and branches can coalesce and girdle the tree, leading to crown death — often rapidly; hence, the name sudden oak death (Figure 2). On plants other than oak trees, the symptoms appear mostly on the shoots and on leaves and twigs, and cankers on the stem and branches may also develop. Leaf blight symptoms may appear as triangular blotches at the leaf tip (Figure 3) or brown, necrotic, rounded leaf spots (Figure 4). Shoot dieback symptoms result in drooped shoots that turn brown and necrotic. Unfortunately, the leaf symptoms for *P. ramorum* are similar to the untrained eye to other foliar diseases. An updated list of host plants and plants associated with *P. ramorum* is available from APHIS at the USDA. The list currently includes 100 plants and can be viewed at www.aphis.usda.gov/ppq/ispm/pramorom/pdf/files/usdaprlist.pdf. The list includes Kentucky plants such as northern and southern red oak, rhododendron, and mountain laurel. However, there are other common Kentucky trees susceptible to *P. ramorum* based on greenhouse tests that are not on the list. These species include white oak, cherrybark oak, chestnut oak, laurel oak, willow oak, sugar maple, and black walnut. Understory plants like rhododendron and California bay laurel (Figure 3) can produce large numbers of spores and provide a means for *P. ramorum* to spread to overstory trees. Rhododendrons are abundant in some Eastern Kentucky forests, and other understory plants such as maple, viburnum, and mountain laurel could have an important role in the establishment of *P. ramorum* in Kentucky. There are likely many more yet-to-be-identified susceptible plants. Of concern here is that *P. ramorum* may spread to parks and native woodlands from introduced infected ornamental plants such as rhododendron, mountain laurel, and camellia. Most Kentucky native plants have not been tested for infection by *P. ramorum*, and their vulnerability is not known.

The search for *P. ramorum* in Kentucky.

P. ramorum has not been found in Kentucky based on nursery and forest surveys in 2003, 2004, and 2005. It is important to note that there are several native species of *Phytophthora* and many native fungi in forest and nursery environments that cause similar symptoms on leaves and shoots and even bleeding cankers on tree stems. These organisms are part of the ecosystem, having established a balance with native plants over thousands of years. Introducing a pathogen such as *P. ramorum* into Kentucky forests could be very damaging because our native plants have not adapted to this exotic pathogen. Not every bleeding canker or leaf blight is caused by *P. ramorum*, and it is not possible to diagnose it correctly based on symptoms only. Presently two highly technical approaches involving microscopic and DNA analysis by trained professionals are required to correctly diagnose *P. ramorum* infection.

In 2005, a forest survey was made in Kentucky in 26 counties (Figure 5) that included forested areas around six nurseries; four Kentucky state forests; eight privately owned forests; one national, two city, and eight state parks; and a national recreation area. From the 30 locations, 42 leaf and bark samples from common tree species and horticultural

plants showing suspicious symptoms similar to those found with *P. ramorum* infections were analyzed by the Plant Pathology Department Laboratory at the University of Kentucky. The DNA analyses were all negative, and no *P. ramorum* was found in any of the samples.

This analysis indicates the difficulty in visually establishing the presence of *P. ramorum* in Kentucky. Regardless, the potential for this exotic pathogen to do considerable harm to Kentucky's important forest species and drastically harm yard trees and ornamental plants is significant. Certainly, continued sampling and vigilance are warranted.

Acknowledgments: The forest survey was carried out in cooperation with the Kentucky Division of Forestry (KDF). Thanks to the Kentucky Commerce Cabinet, Department of Parks for providing us with a Scientific Research Permit; the USDA Forest Service for permission to sample in the Daniel Boone National Forest; to the private land owners who gave us permission to survey and sample their property; and to Bernheim Forest, Land Between the Lakes National Recreation Area, and Mammoth Cave National Park.

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Photo by John Hartman

Figure 1. Coast live oak bark cut away to reveal dark-streaked S.O.D. canker; normal internal bark has a pinkish color.

Photo by John Hartman

Figure 2. Coast live oak killed by S.O.D.

Photo by John Hartman

Figure 3. California bay laurel leaf tip necrosis caused by *P. ramorum*.

Photo by John Hartman

Figure 4. California bigleaf maple leaf spots caused by *P. ramorum*.

Figure 5. Kentucky counties where plants were collected for the *P. ramorum* forest survey.

Threats
to Forest Health:
The Exotic Emerald
Ash Borer
By Lynne K. Rieske-Kinney

Ash trees in urban areas had been declining for several years throughout southeastern Michigan. Tree crowns were thinning, branch dieback was common, excessive sprouting was evident, and trees were dying. Homeowners, landscapers, and urban foresters were attributing the decline to a variety of diseases, and it wasn't until 2002 that a small, shiny green beetle, the emerald ash borer, was identified as the causal agent.

Since its initial discovery in the Detroit area, it has been found throughout Michigan's Lower Peninsula and was also discovered in the Upper Peninsula, affecting more than 50 counties. It was soon discovered across the Detroit River in Windsor, Ontario (Canada). It has since spread to 15 counties in Ohio and seven in Indiana, with spot infestations in Maryland and Virginia (distribution as of March 2006).

Although the beetle was discovered in 2002, evidence suggests that the infestation had been present in southeastern Michigan for about five years prior to its discovery and probably arrived in this country in solid wood packing material. Human movement of infested nursery stock and firewood allowed it to spread at such a rapid rate.

Adult emerald ash borers are 1/2 inch long, elongate, and bright metallic green. After mating, female beetles lay their eggs in bark crevices. Eggs hatch and the small larvae immediately burrow into the bark, feeding on cambial tissue, and later sapwood, as they develop. Larvae overwinter within the sapwood, protected from temperature extremes. They are cream-colored and mature to a length of 1 1/4 inch.

Because they feed beneath the bark, larvae are rarely seen. Larval tunneling beneath the bark destroys the plant vascular system, effectively girdling the stem or branch. Pupation occurs in the outer sapwood, and adult beetles emerge through exit holes in the trunk and branches. Adults are excellent fliers and are visible on warm, sunny days. Adult beetles live two to three weeks and are present in late May through early July. One generation is produced each year.

Look for yellowed, thinning foliage, branch dieback, thinning crowns, and excessive suckering, which are all signs of an emerald ash borer infestation. Unusual woodpecker activity is a sign of borers, since the birds readily feed on larvae developing beneath the bark. Looking closely at the bark, D-shaped emergence holes about 1/8 inch in diameter will be visible where newly developed adults emerged from their pupal chambers.

Meandering, S-shaped galleries are visible beneath the bark of infested trees; the bark will have to be peeled back to see this sign.

Infestations of the emerald ash borer are difficult to detect because symptoms are easily confused with various ash diseases, the decline of infested trees is relatively slow, and the insect is visible only for a brief period in early summer. Although the adults are highly mobile, movement of infested firewood and nursery stock poses the greatest threat to its spread. Because of its long life cycle, larvae remain in cut firewood for several months. The emerald ash borer appears to be capable of completing development in relatively small trees, heightening the risk of its movement in infested nursery stock.

State and federal quarantines are in place to prevent movement of this pest. These quarantines restrict movement of ash trees, branches, logs, and firewood out of infested areas and also require removal of ash trees within a half mile radius of an infested tree. Destroying host trees has proved costly and only marginally effective, and so in areas where emerald ash borer is well established, this approach may no longer be mandated. In its native Asian range (China, Mongolia, Korea, Japan, Taiwan, and far eastern Russia), the emerald ash borer attacks not only ash but also elm, walnut, and butternut. In North America, the emerald ash borer appears confined to ash. Of the 16 North American ash species, five are native to Kentucky, playing an integral role in forests and urban landscapes. All are probably susceptible to emerald ash borer. Since the emerald ash borer is not found in Kentucky, it is difficult to predict its impact. However, it undoubtedly poses a threat to the ash species in our forests and has the potential to devastate our urban landscapes. Research on approaches for controlling infestations is under way. Our best approach to guarding against emerald ash borer is to comply with all quarantine restrictions regarding movement of nursery stock and firewood and immediately contact the State Entomologist's Office if you suspect emerald ash borer (859.257.7450).

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Quarantine restrictions against emerald ash borer prohibit movement of nursery stock and firewood from infested areas.

Branch dieback and thinned crown due to emerald ash borer

Photo by Ed. Czerwinski,

www.forestryimages.org

Photo by Katovich, Steven. USDA Forest Service www.forestryimages.org

Photo by Czerwinski, Ed. www.forestryimages.org

Where Does the Financial Value of Trees Come From?

By Tamara L. Cushing

Trees are valuable in many ways, including ecologically, socially, and financially. From a financial standpoint, we know that trees have value for forest products such as furniture, flooring, and pulp and paper products. The big question is how do trees gain financial value throughout their lifetime?

Trees as living, growing organisms continue to grow throughout their lives. This biological growth contributes to a gain in value due to increasing volume. The more volume a tree has, the more value it has because volume is multiplied by price to determine the value of the tree. In addition, as the tree is gaining volume, the tree can change from one product class to a more valuable product class. Figure 1 shows the change in value of a log as it increases in size resulting in a change in product. This change in product class leads to a higher price paid for that tree. Pulp is a low value product and selling a log when it is pulp-size forgoes potential future income of that tree. A pulpwood tree is worth pennies compared to a grade three sawlog which at 10 inches could be worth around \$1.75. Grade three logs are 10-13 inches in diameter. Looking at the value of the log, it would make sense to wait for the jump in value that occurs when the tree becomes 13 inches. If you had harvested at 12 inches you lost the opportunity to double the value of the log by waiting for that last inch of growth. If you have a log today that is 13 inches in diameter it is worth almost \$8. However, if you allow that log to continue growing and reach 16 inches, it could be worth almost \$28 (a 360% increase in value!). You could choose to cut that log when it reaches 16 inches or wait until it reaches 20 inches when it would be large enough to be veneer. A 20-inch veneer log could be worth \$173! This is now a 625% gain in value for allowing the tree to grow to a larger size (assuming the log is veneer quality). Allowing the tree to grow can be a valuable way to gain financial value.

Biological growth is not the only way that trees can increase in financial value. Timber prices, as part of the value equation, can affect what you receive for a particular tree. Prices paid for timber depend on factors related to the economy and the environment. Economic factors such as consumer spending levels and supply and demand of forest products contribute to current timber prices. If consumers are not purchasing oak furniture then, all else equal, it can be expected that prices paid for oaks will be down at that time. Figure 2 shows trends in stumpage price for 2004 and 2005 for four species groups. Of the four, yellow-poplar remains the lower-priced species. Based on this data, it would be better to wait on harvesting oaks as they are receiving a lower price than they were in 2004. A landowner would need to consider harvesting hard maple since the price for that was at a two-year high and was the highest priced species group relative to the oaks and yellow-poplar. Further examination of long-term price trends could reveal even more information regarding the price cycle of certain species. Environmental factors such as rainfall amounts can also impact current prices. In especially wet periods, for example, landowners with "high and dry land" may receive a higher price because it is easier to operate logging equipment in dry areas.

The most important thing to note is that in many cases financial value can be enhanced by management and marketing decisions. On the biological side, timber stand improvement

(TSI) as a management tool can increase volume and/or value by concentrating growth on commercially desirable trees. Timber stand improvement could include (but is certainly not limited to) site preparation for natural regeneration, thinning, crop-tree release and other practices improving financial value. Economic factors can be handled through proper timing of the market. Knowing when to put your trees up for sale can be critical. A forester can be extremely helpful since they have knowledge of local markets. This knowledge can be critical for selling the right species or selling at the right time of year to avoid low prices due to economic and/or environmental factors. The forester can also help market the trees to ensure they are sent to the mill that will help maximize the landowner's revenue.

Trees are capable of increasing in financial value by themselves through biological growth. However, it is possible to increase their value through market timing and good forest management. Resources exist to help landowners maximize the revenue received for harvested trees.

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Assistant Professor of Forest Management and Economics at the University of Kentucky and is responsible for research and teaching related to economic and management issues of non-industrial private forest landowners. Her specialty is taxation including property, income and estate taxation related to forestland.

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Why We Should
Care About
Kentucky Forests.
By Billy Thomas

Kentucky is 47 percent forested. Whether or not we live in or near a forest, they impact our lives every day. Unfortunately, Kentucky's forests are currently facing a wide variety of unparalleled threats.

Without our forests, Kentucky would be a drastically changed place — and not for the better. Clean water and air, fish and wildlife habitat, recreational opportunities, wood products, solitude, biodiversity, income, and a sense of place are just some of the many unique contributions our forests provide us as individuals and as a society.

Our forests provide many ecosystem services.

Forests trap sediments and pollutants by filtering and absorbing them before they reach our waters. They help slow erosion and limit flooding. Trees store carbon, which is an important factor in the control of greenhouse gases. The biodiversity of Kentucky depends in large part on the habitat our forests provide either directly or indirectly. Threats to forest health can have a devastating impact on the ecosystem.

Our forests have a significant impact on the state's economy. During 2001, an estimated \$1.5 billion was spent on fishing, hunting, and wildlife watching in Kentucky. Also, more than 37,500 jobs are directly tied to the forest industry in Kentucky, and these jobs produce many wood products that we use every day. It is estimated that the Kentucky forest industry's impact on the state's economy was more than \$7 billion in 2003. These figures do not include the income paid to landowners when they harvest timber. It is easy to see why our forests are so important to the state's economy.

Recreational and tourism opportunities would be greatly reduced without our forests. Hiking, camping, boating, and many other outdoor activities would not be nearly as enjoyable without our forests. Our forests are an important part of what makes Kentucky the wonderful state it is.

Now consider that there are an estimated 423,000 private woodland owners in Kentucky controlling almost 80 percent of the forests. These private forests provide many benefits to their landowners and to society as a whole. Our forests are renewable, and with sustainable management, they can meet our needs today and in the future. In Kentucky, private woodland owners control the sustainable management and destiny of the forests, and they deserve our appreciation and support. The forest health challenges we are facing are significant and cannot be addressed by any individual or single organization. Working together to identify the challenges and developing solutions to meet them is our best hope for promoting healthy forests for today and for generations to come.

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Kentucky Forest Health Task Force

Since its establishment in early 2004, the Kentucky Forest Health Task Force has worked to establish itself as an information clearinghouse for issues impacting forest health in Kentucky. Informational meetings, newsletter articles, and a web site have helped further our goals. The task force is working with federal, state, and local officials, as well as stakeholders and universities, to facilitate coordination, cooperation, and education.

The mission of the Kentucky Forest Health Task Force is to identify and prioritize threats of insects, plant pathogens, invasive plant species, and environmental factors to the integrity of Kentucky's forest resources, and recommend sound and timely approaches to addressing them.

The wood and wood products industry in Kentucky generates approximately \$7.1 billion annually yet remains grossly underutilized. Our natural resources have tremendous potential for growth with respect to recreation, tourism, wildlife management, aesthetics, energy production, and timber production. The Kentucky Forest Health Task Force is seeking ways in which to develop this potential.

Declining forest health resulting from insects, plant pathogens, and invasive plant species is a serious threat to the sustainability of Kentucky's forests. For example, the southern pine beetle outbreak of 1999-2002 had a dramatic impact on the pine forests of Kentucky, including:

- stand altering mortality to nearly 100% of the pine type in Kentucky,
- economic losses exceeding \$120 million,
- elimination of habitat for the endangered red-cockaded woodpecker, and
- immeasurable aesthetic losses.

The Kentucky Forest Health Task Force hopes to facilitate coordination, raise awareness, and serve as an advocate

for matters related to forest health, including:

- exotic species detection and management,
- forest sustainability, and
- resource utilization.

Pending threats from invasive exotic species are a constant concern. Sudden oak death, the gypsy moth, hemlock woolly adelgid, and the emerald ash borer all have potential for dramatic impacts in Kentucky. The Kentucky Forest Health Task Force is working to facilitate coordination among state and federal agencies monitoring exotic introductions to minimize their impact.

The sustainability of Kentucky's forests is threatened by varying management philosophies, forest utilization practices, and invasive species introductions. Research on the ecology and management of regeneration and sustainability of oak-dominated deciduous forests and southern pine beetle-impacted conifer forests is ongoing. The Kentucky Forest Health Task Force is working to facilitate coordination among researchers and managers to focus efforts on furthering forest sustainability.

It is the Kentucky Forest Health Task Force's belief that we can work better together to address these forest health issues impacting Kentucky's natural resources. Coordination among state and federal agencies, private landowners, and interest groups along with our

universities can lead to more timely and effective measures to meet these challenges.
Please support this effort.

Members of the Kentucky Forest Health Task Force
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Grant Curry (Trus Joist)
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