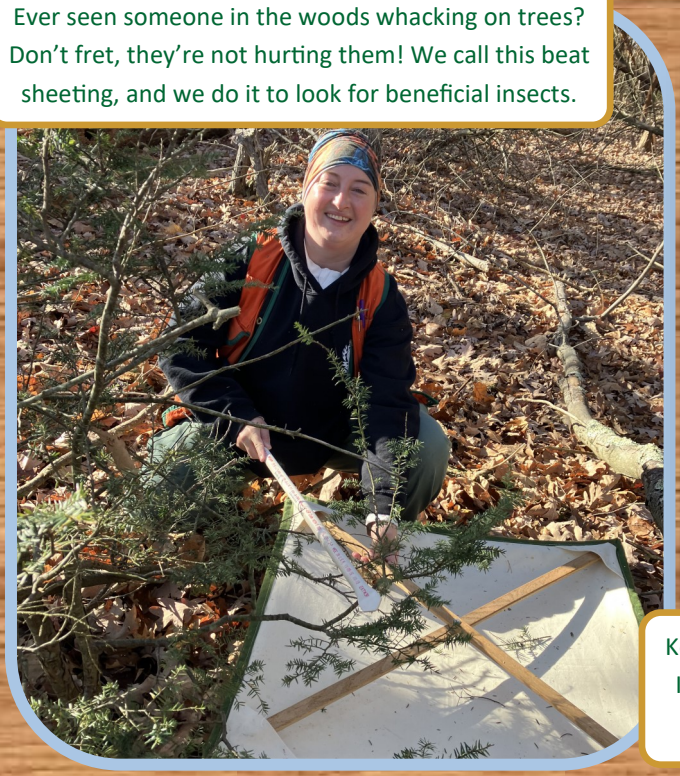
2024 Forest Health Highlights

from the Kentucky Division of Forestry

Our newest invasive pest threat, the Spotted Lanternfly, can be seen here emerging from it's concrete-like egg mass last spring. Be on the look out for these juvenile delinquents in April this year.

Kentucky is home to nearly 13 million acres of some of the nation's most diverse woodlands. Yet, this valuable resource is under attack. The most severe threats to our forests are insects, diseases, invasive plants, and bouts of extreme weather. This document touches on the most influential of these disturbances and provides an up-to-date review of their impacts within the Commonwealth over the past year.

Ever seen someone in the woods whacking on trees? Don't fret, they're not hurting them! We call this beat sheeting, and we do it to look for beneficial insects.

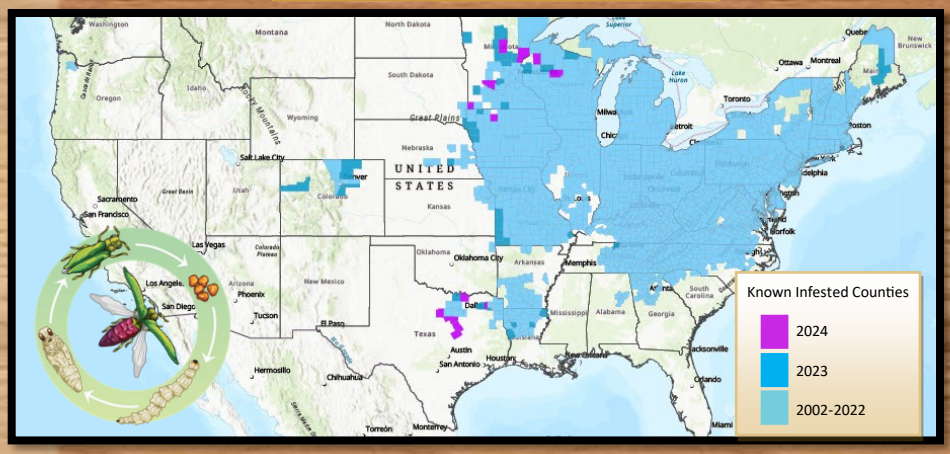


Kenna Smith, KDF Forest Health Specialist, and Casey Hoffman, EEC Summer Intern, are seen here changing out a yellow pan trap at Knobs State Forest this past summer in hopes of capturing the EAB parasitoid, *Oobius agrili*.

Exotic Insect Pests

Emerald Ash Borer

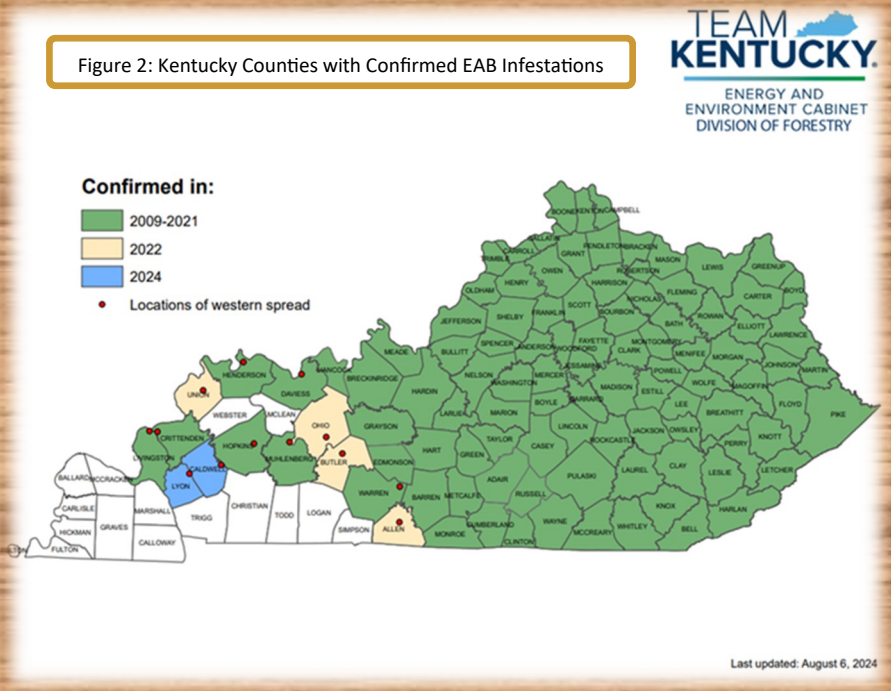
Figure 1: 2024 USDA APHIS National EAB Map



Since its initial discovery within US borders in 2002, this exotic pest has continued to cover new ground throughout the country and can now be detected in 36 states (Figure 1). Naturally, this small beetle can only disperse a few miles per year on its own. Therefore, these expansions are often caused by human assists such as the movement of firewood or other infested material. This pattern is mirrored within the Commonwealth as this pest continues to pop-up in new western counties.

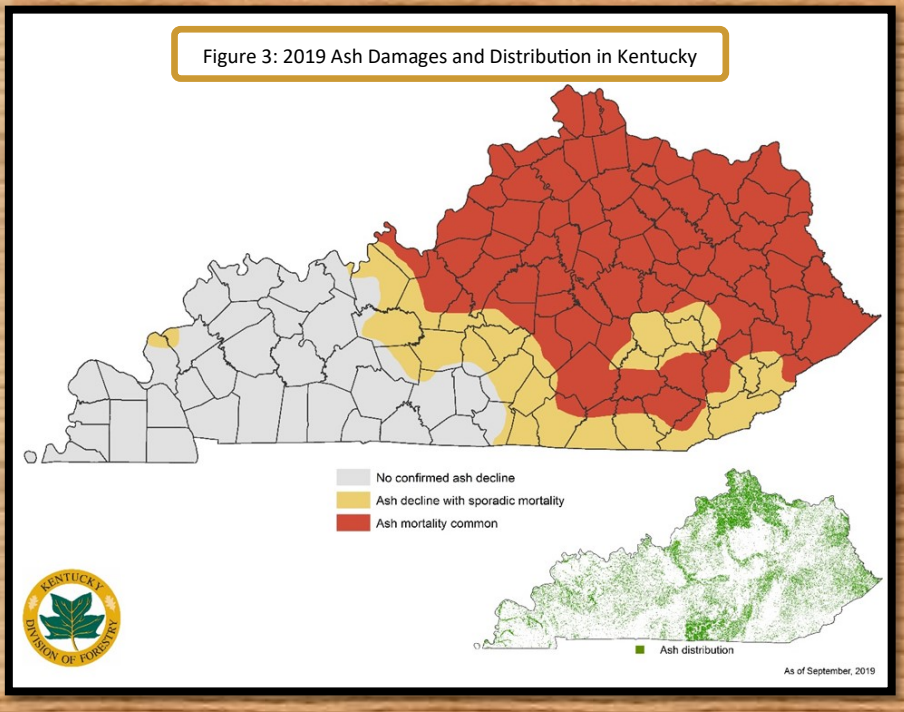
Infestations of the emerald ash borer (EAB) were first confirmed in Kentucky in 2009. A quarantine of 20 northern counties, located in the region between Louisville and Lexington, was initially established. In the following years, additional EAB infestations were found in nearby counties and the state quarantine was expanded. In April of 2014, the county quarantine system ended and the entire state was added to the USDA APHIS list of regulated areas. This regulated region is historically the largest area in the nation that has been under Plant Protection and Quarantine. As such, APHIS proposed to remove the domestic quarantine and refocus their efforts on biological control of this exotic pest. This proposal was approved and took effect in January of 2021.

Figure 2: Kentucky Counties with Confirmed EAB Infestations



EAB has been confirmed in 105 Kentucky counties to date (Figure 2). Ever since its arrival, EAB activity has led to mass mortality throughout our northeastern counties and decline continues to spread westward (Figure 3). In 2024, EAB was confirmed in two new counties: Caldwell and Lyon, and will eventually impact ash resources across the entire state as the infestation continues to spread into western Kentucky. Infestations in the neighboring states of Indiana, Illinois, Missouri, and Tennessee can only aid this expansion within the coming years.

Figure 3: 2019 Ash Damages and Distribution in Kentucky



The Kentucky Division of Forestry (KDF) will continue to monitor EAB's progress in 2025. In line with the USDA's regulatory changes, KDF's Forest Health Program applied for the National EAB Biological Control Program and was accepted in 2022. Please look to the following page for more details about this new endeavor.

Emerald Ash Borer Continued...

EAB Parasitoid Release and Recovery Program

During the 2022 and 2023 field seasons, approximately 2,600 *Oobius agrili* (Figure 4) wasps were released at Knobs State Forest in Bullitt County. These parasitoid wasps were produced and supplied by the USDA EAB Parasitoid Rearing Facility in Brighton, Michigan. They made the long journey to Kentucky as "sleeping" pupae, the insect life stage that's dormant, in the orange vials that you can see being deployed here (Figure 5). The parasitoids were released on several EAB-infested ash trees within the State Forest in the hopes that they will parasitize any freshly laid EAB eggs. During this process, the adult female wasp uses her needle-like ovipositor to lay a single egg inside of each EAB egg. Then the parasitoid larvae hatch inside the EAB egg and devour it from the inside out (Figure 6)!

Figure 5: Maddy Richmond, Forest Health Intern, deploying parasitoids on an infested white ash tree in Knobs State Forest.

KDF made their first recovery attempt for this parasitoid during the summer of 2024. 15 yellow pan traps (as seen on the cover) were deployed within Knobs State Forest and biweekly collections were made. While we are hopeful that these tiny helpers have become established within the State Forest, we must await expert identification of collected specimen to verify an established population. More to come in 2025!

Figure 4: Adult female *Oobius agrili* ovipositing into an EAB egg.

Figure 6: Parasitized EAB eggs at various stages of development.

Exotic Insect Pests

Hemlock woolly adelgid

The eastern hemlock is considered a foundation species within the riparian habitat in which it's found (Figure 7). However, this integral species is under attack from the hemlock woolly adelgid (HWA). This pest is an exotic species with origins from Japan and was first detected in the eastern United States during the 1950s. It wasn't until 2006 when this insect invader was first discovered in Kentucky. Approximately 98% of Kentucky's hemlocks are found in the eastern one-third of the state. In this region, infestations currently occur in 32 counties resulting in decline and mortality (Figure 8).

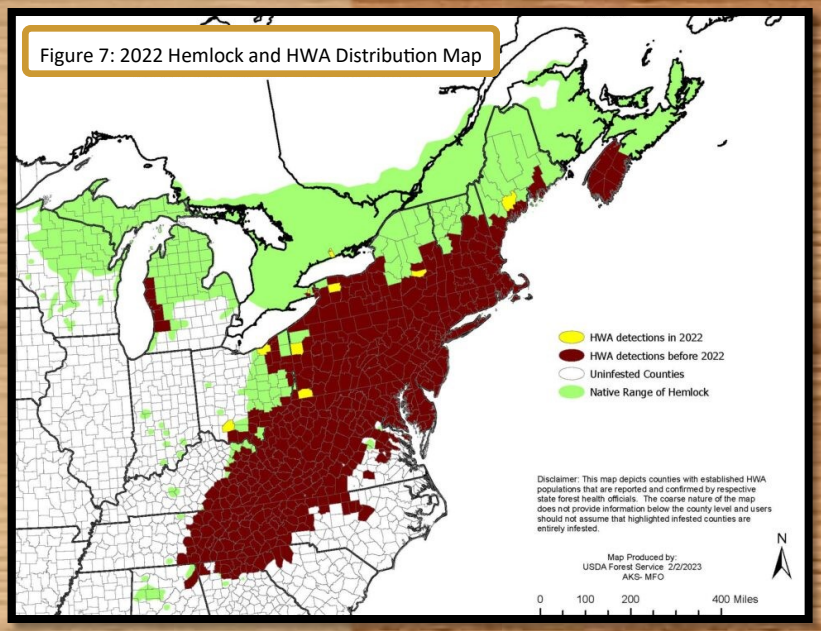


Figure 7: 2022 Hemlock and HWA Distribution Map

The KDF's Forest Health Program has a field crew responsible for treating hemlocks to prolong the survival of this ecologically significant tree. Chemical insecticide treatments are employed in order to suppress HWA populations (Figure 9). Treatments began in 2009 on Kentucky State Forests and has since expanded to include properties managed by Kentucky State Parks, Office of Kentucky Nature Preserves, Kentucky Department of Fish and Wildlife Resources, and the Daniel Boone National Forest (DBNF). Since 2009, KDF has treated nearly 250,000 hemlock trees!

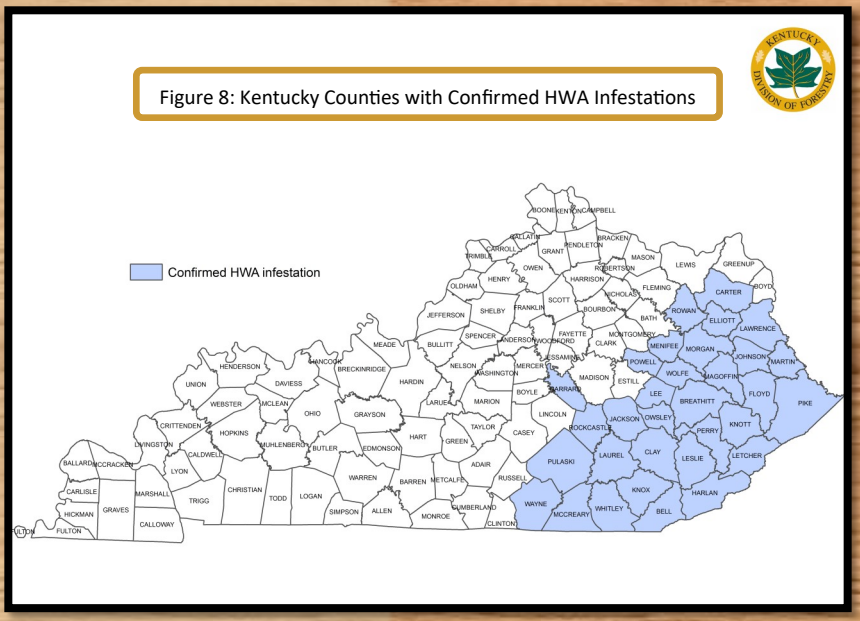


Figure 8: Kentucky Counties with Confirmed HWA Infestations

Recently, KDF has also released two species of predatory beetles that feed especially on HWA within the DBNF in hopes of creating a future field insectary site. In the past, Kentucky has struggled with predatory beetle establishment. However, in 2020 KDF made their first recovery of both the adult and larval forms of *Laricobius osakensis*, one of the species of predatory beetle (Figure 10). Identification was confirmed in 2021 by the Beneficial Insects Lab at Virginia Tech. Last year, KDF secured 1,566 *Laricobius nigrinus* adults from a field insectary located within Rocky Gap State Park in Maryland for release within the Commonwealth. KDF is hopeful that this will be the boost that we need to get this beneficial species established in the state as well. This is exciting news for the future of our precious hemlocks as we are well on our way to a robust predatory beetle population! We will continue to improve upon this integrated pest management approach in 2025 with further chemical and biological control of this invasive threat.

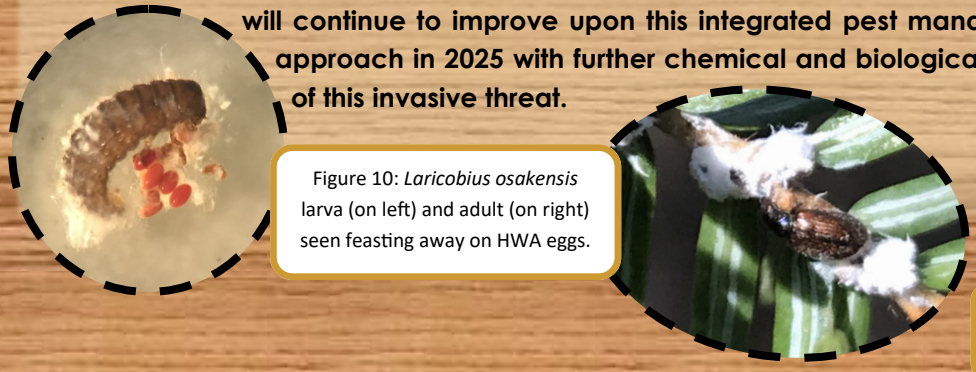


Figure 10: *Laricobius osakensis* larva (on left) and adult (on right) seen feasting away on HWA eggs.

Figure 9: Kenna Smith treating a hemlock using the soil drench technique.

Exotic Insect Pests

Spotted LanternFly

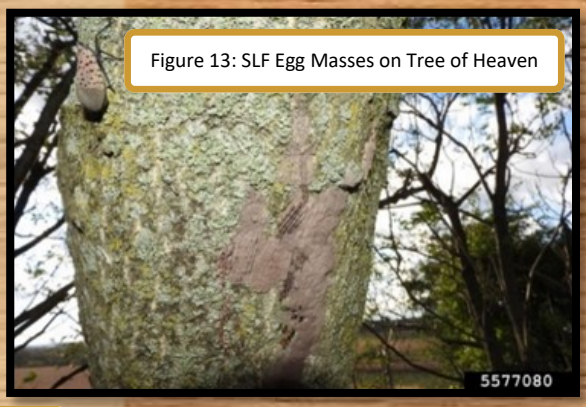
Figure 11: Adult Spotted Lanternfly

The spotted lanternfly (SLF) is a relatively new invasive insect to the US with origins from Asia. This pest was only first discovered in Pennsylvania in 2014. It can be described as beautiful, but it is also dangerous (Figure 11). Don't be fooled by its name, this insect isn't a fly at all. This insect is actually a hemipteran which uses its characteristic piercing and sucking mouthpart to steal sap and nutrients right out of its host plant. It is thought that the tree of heaven is their primary host species, but they also show strong preference towards red maple, black walnut, and various other fruit trees and grape vines. Damage from this insect's aggregate feeding behavior (Figure 12) can weaken the host, leaving it susceptible to other stress agents. These insects also produce ample amounts of honeydew, or liquid excrement, that attracts stinging insects and transforms into black sooty mold.

Figure 12: Juvenile SLF Aggregate Feeding Behavior

SLF has finally found its way into Kentucky. The initial discovery was made in Gallatin County in late October of 2023. This detection was only two miles south of the initial outbreak location in Indiana. SLF was also found within Cincinnati's city limits in October 2022; thus, Kentucky can only expect more cross-border detections to be made. One way that these pests can move around easily is through their egg masses. Gravid females will lay their eggs on just about anything! SLF egg masses have been found on tree bark (Figure 13), rusty metal, rocks, outdoor furniture, and vehicles! Look for these concrete -like splats on flat surfaces around your property if you live in an impacted county.

Figure 13: SLF Egg Masses on Tree of Heaven



As expected, SLF was unfortunately found in seven additional Kentucky counties in 2024 (Figure 14). Boone and Kenton counties have been officially confirmed by the USDA APHIS, while Owen, Campbell, Carroll, Grant, and Henry counties are still awaiting official confirmation. KDF is working with various agencies to educate the public on SLF identification and signs of infestation.

Currently, there is no federal quarantine in place for this pest. Yet, some states have taken it upon themselves to provide regulations for their own infested areas (Figure 15).

Figure 14: SLF Detections in KY

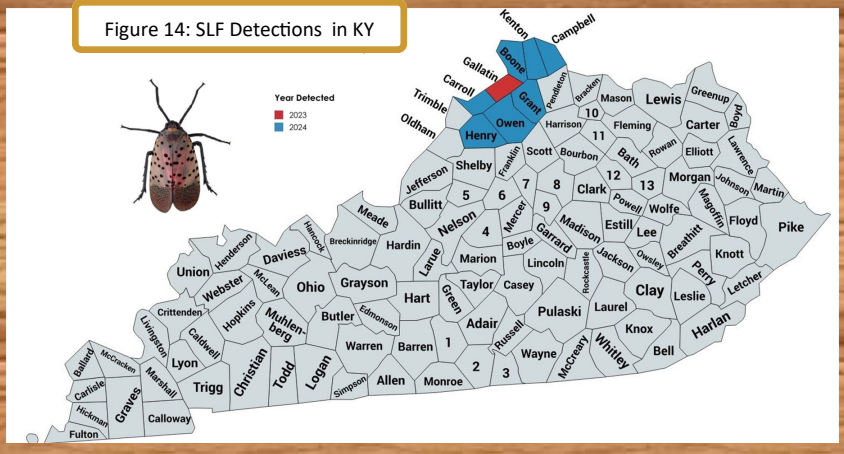
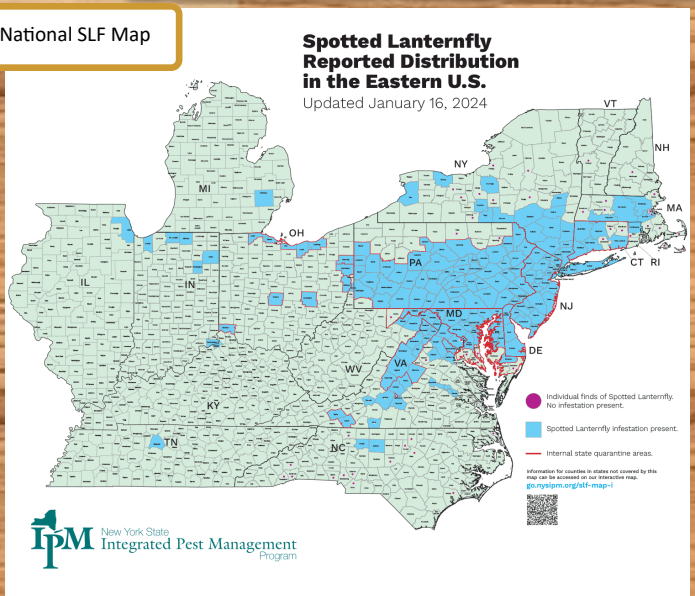


Figure 15: National SLF Map



Native Insect Pests

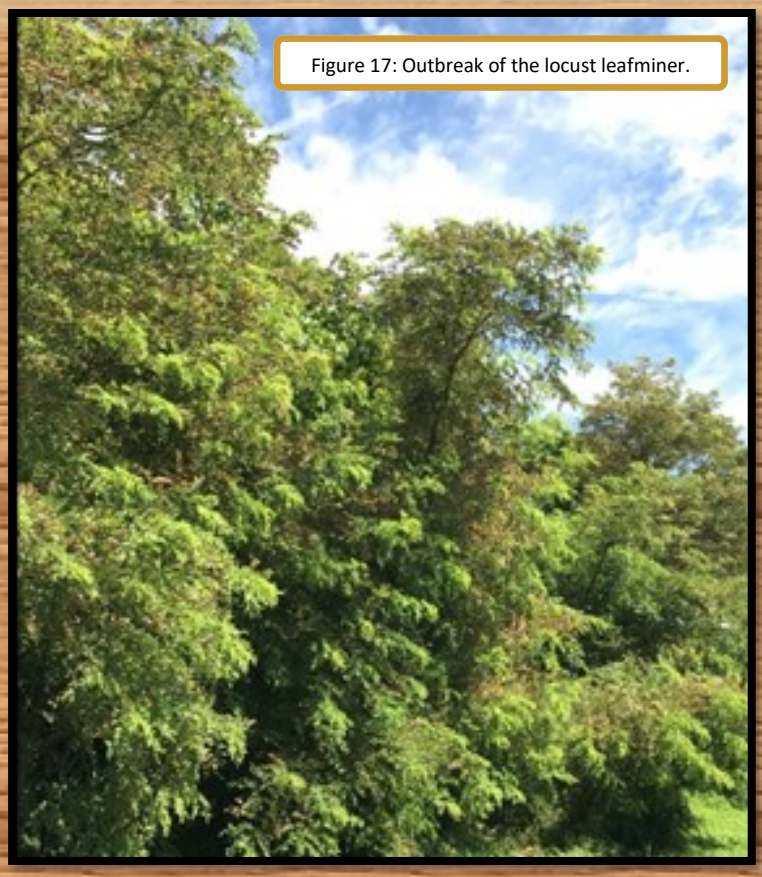
Exotic pests aren't the only insects damaging our woodlands. There are also a number of native insect pests that locally impact our forests every year. Yet, the significance of these native pests fluctuates over time. While these native insects typically don't cause the same level of damage as their non-native counterparts, they can become an issue when coupled with additional stressors such as drought. KDF is constantly on the look-out for damages from such native pests.

Locust Leafminer

Outbreaks of the locust leafminer (Figure 16) are very common in Kentucky. These outbreaks (Figure 17) vary in intensity and location from year to year. This year, damage was detected across much of the state's northern, eastern, and central counties. No formal surveys take place to record this pest annually due to the persistent damage year to year, but rather general observations are used to record hotspots that experience damage each year.

Figure 16: Locust Leafminer adults and their feeding damage.

Figure 17: Outbreak of the locust leafminer.



The Commonwealth is experiencing an uptick in oak lace bug outbreaks. Initial reports came into the Division during the late summer months of 2021. Again, this summer, browning oak trees were reported across the central portion of the state. Upon closer examination, feeding damage from the native oak lace bug was found to be responsible. No formalized surveys are employed to record outbreaks of this pest, but rather general observations are used to record hotspots that experience damage each year. This should only be a cosmetic problem with no impact to the tree's vigor. However, this damage paired with recent extreme weather events could potentially lead to future decline.

For more information, please see the pest alert on the following page.

Native Insect Pests

FOREST HEALTH PEST ALERT

OAK LACE BUG

The Issue:

Over the past several summers, we have noticed browning oak trees (Figure 1) across the landscape. After completing ground surveys and collecting samples, we have identified the culprit to be the **native forest pest**, the oak lace bug.

Identification and Biology:

The oak lace bug is a native forest pest. They are within the Hemipteran insect order and therefore are equipped with a piercing/sucking mouthpart. Adults (Figure 2) are 1/8" long and light brown with dark spotting along the wings. The juveniles or nymphs are smaller in size, darker in coloration, and are covered in spines. Each female lays 25-50 eggs on the lower leaf surface which will hatch into nymphs (Figure 3) that feed together with the adults as they grow. Several generations occur each year and they overwinter as adults.

Hosts:

All species of oaks, with preference for the white oak group, as well as other hardwood species. Damage during surveys was mainly seen on chinkapin oak.

Symptoms:

Symptoms begin as light stippling of the foliage (Figure 4), but can progress to complete bleaching (Figure 5) of leaves from the top down. Leaf drop can occur with heavy damage.

Distribution:

Many central Kentucky counties, primarily along ridgetops where mature oaks are common, saw at least some level of damage.

Recommendation:

No management is needed as trees can typically handle this type of feeding damage and should bounce back next year.

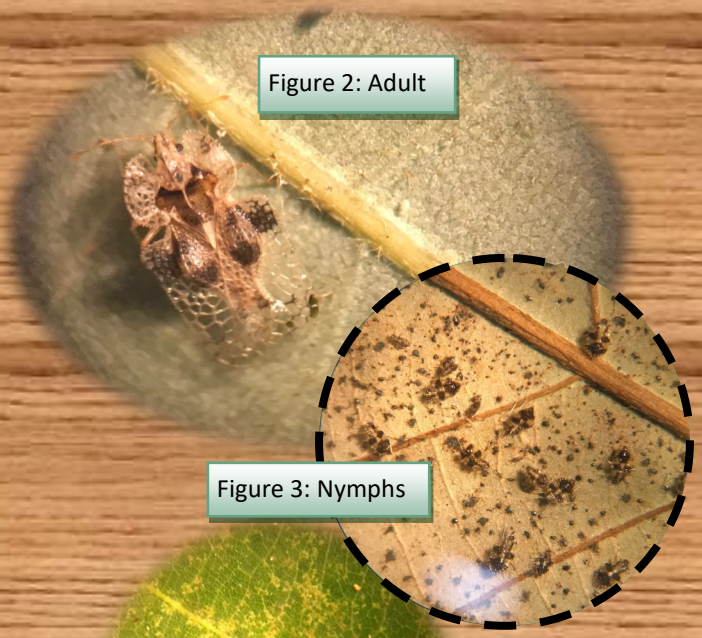


Figure 2: Adult

Figure 3: Nymphs

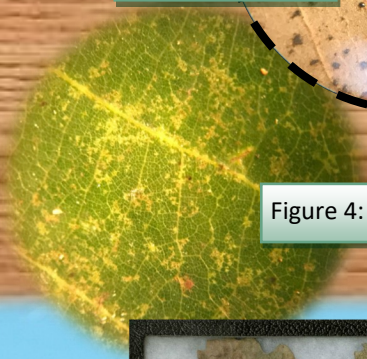


Figure 4: Stippling

Figure 5: Bleaching

Figure 1: Browning Oaks

Invaders on the Horizon

There are also a myriad of pests that have yet to make their way into Kentucky. These looming threats would cause extensive damage to our forests, which is why they demand our attention and awareness. These pests may never make it to Kentucky. It all depends on the quarantines put in place by the federal government and additional regulatory efforts by various state and private stakeholders. Even under these strict guidelines, we each must do our part to ensure that we aren't moving infested material.

Spongy Moth

Lymantria dispar, now known as the spongy moth (Figure 18), surveys have been conducted since 2005 through various agencies and programs. This pest is not yet established in Kentucky, although it has been detected every year since the surveys began. The USFS and Kentucky's Office of the State Entomologist (OSE) annually trap (Figure 19) for this invasive species using detection surveys through the USDA APHIS and Slow the Spread programs. In 2024, the OSE set traps in 70 counties across the state. Four of these counties had positive trap catches; these include: Boone, Elliott, Jefferson, and Lee. A total of four moths were captured in this detection survey with each positive county having one moth captured respectively. Furthermore, in an effort to bring awareness to this forest pest, the OSE continued to implement the Citizen Scientist trapping program in 2024. 425 additional traps were deployed under this new initiative within 51 counties. Thankfully, no additional moths were captured through this Citizen trapping program.

Nine additional counties were monitored with Slow the Spread (Figure 20) funding. Two out of the nine counties had positive detections with a total of 11 moths captured. These counties include Floyd, and Pike. Pike county had the most positive detections with 10 moths captured across six traps. The USFS also monitors for this forest pest within the Daniel Boone National Forest and found no moths during their detection surveys this year.

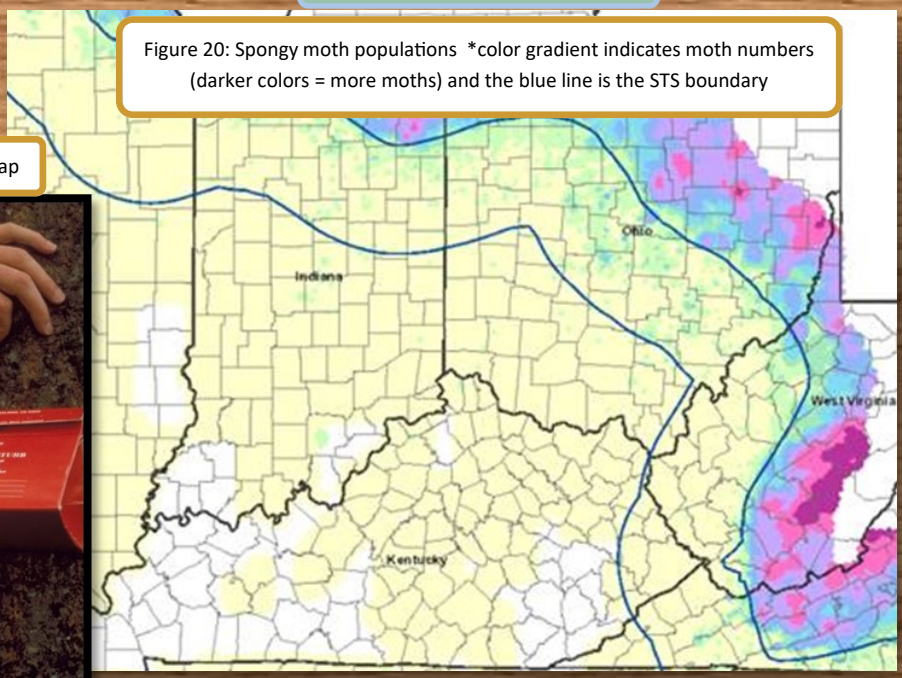
Kentucky saw a drop in spongy moth populations in 2024 with a total of 15 moths captured throughout all state and federal programs. This is a significant decrease from the 160 moths captured last season and the 299 moths captured in 2022.

Figure 18: Spongy Moth Caterpillar

Figure 19: Spongy Moth Trap

Slow the Spread Program

Figure 20: Spongy moth populations *color gradient indicates moth numbers (darker colors = more moths) and the blue line is the STS boundary



Invaders on the Horizon

Asian Longhorned Beetle

The Asian longhorned beetle (ALB) continues to be a potential pest of concern for Kentucky (Figure 21). Although ALB has not been found within the Commonwealth, in 2011 it was discovered in Clermont County, Ohio, a mere 10 miles from our northern border. More recently, ALB was confirmed in Charleston County, South Carolina in June 2020. To date, eradication efforts are still underway at both the established OH infestation as well as the novel SC infestation. Here are the common signs of ALB activity. The females chew oviposition pits on host trees, most commonly maple, and lay a single egg beneath the bark. Then the larvae hatch and feed on the sapwood for a short period of time before moving into the heartwood. When adults emerge, they create noticeably round exit holes that can be as large as a dime (Figure 22). KDF continues to work with various agencies to educate the public on ALB identification and signs of infestation.

Figure 21: Asian Longhorned Beetle Adult

Figure 22: ALB Feeding Damage

Elm Zigzag Sawfly

The elm zigzag sawfly (EZS) is an invasive forest pest from eastern Asia. Adults are small, black, winged insects. Hatched larvae are small, approximately 2 millimeters in length, and start off as a grayish-white color. As the larvae mature, they change to a green coloration with a distinctive black band across their head capsule (Figure 23). Females produce parthenogenetically and can lay up to 60 eggs along the margins of elm leaves. This sawfly will produce a loosely spun cocoon in the summer, and in the winter, a tighter walled cocoon is formed. Several generations can occur every year with the addition of a winter generation. The juvenile form of this insect is the culprit of tree defoliation due to its unique feeding habit of creating zigzag patterns in elm leaves (Figure 24). In heavy infestations, whole trees can become defoliated. 13 US states have detected this pest thus far. Virginia in 2021; Maryland, Pennsylvania, New York, and North Carolina in 2022; Vermont, Massachusetts, and Ohio in 2023; and most recently, Wisconsin, Minnesota, Connecticut, New Hampshire, and Illinois in 2024. Kentucky hasn't made any detections to date but will continue to monitor for this new pest in 2025.

Figure 23: Juvenile EZS

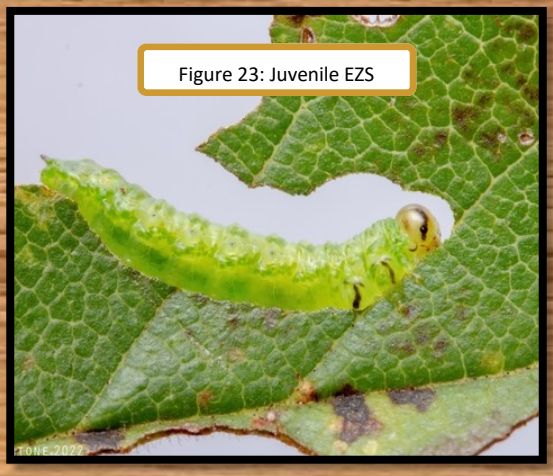


Figure 24: Unique feeding behavior of EZS.

Tree Diseases

Thousand Cankers Disease

Thousand cankers disease (TCD) of eastern black walnut is caused by the fungal pathogen, *Geosmithia morbida* and its insect vector, the walnut twig beetle (WTB) (Figure 25). It was first recorded in the eastern United States in 2010. Yet, neither the pathogen nor the vector of TCD have been confirmed in Kentucky even though there have been confirmed cases in the neighboring states of Indiana, Ohio, and Tennessee (Figure 26). KDF's TCD monitoring and trapping program conducts general walnut decline/TCD surveys and an annual trapping effort in areas where symptomatic walnut occur or areas at high risk for WTB introductions. This monitoring program has been conducted within the Commonwealth for many years, and thus far, no vectors have been found.

During the 2024 field season, trapping (Figure 27) for the WTB resumed after a break in 2023 due to capacity transfers within the KDF Forest Health Program. Survey work also picked up in 2024 as the new Forest Health Specialist was trained in on-the-ground monitoring techniques and completed several TCD surveys in new counties.

Potential WTB specimens captured during this season's trapping effort will be sent off for expert identification. Results to come in 2025, as well as, new ground surveys and trapping efforts will continue in the 2025 field season.

Figure 25: The beetle vector and the lethal fungal pathogen that make up TCD.

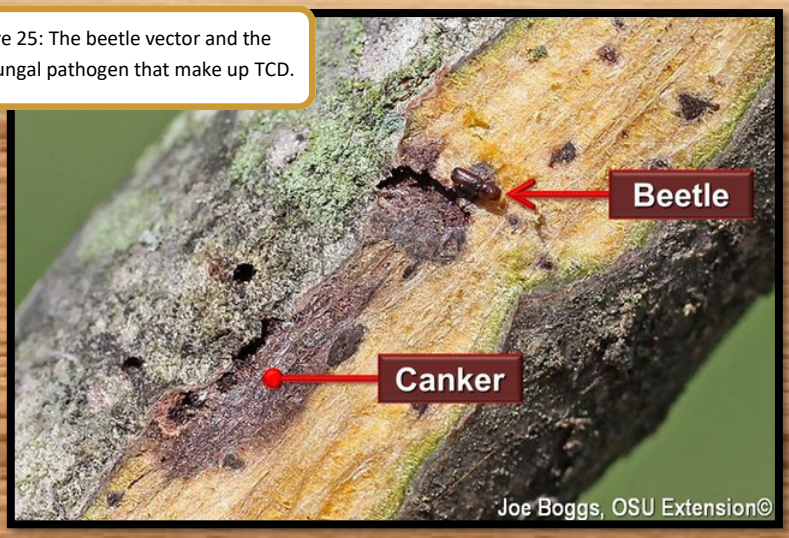
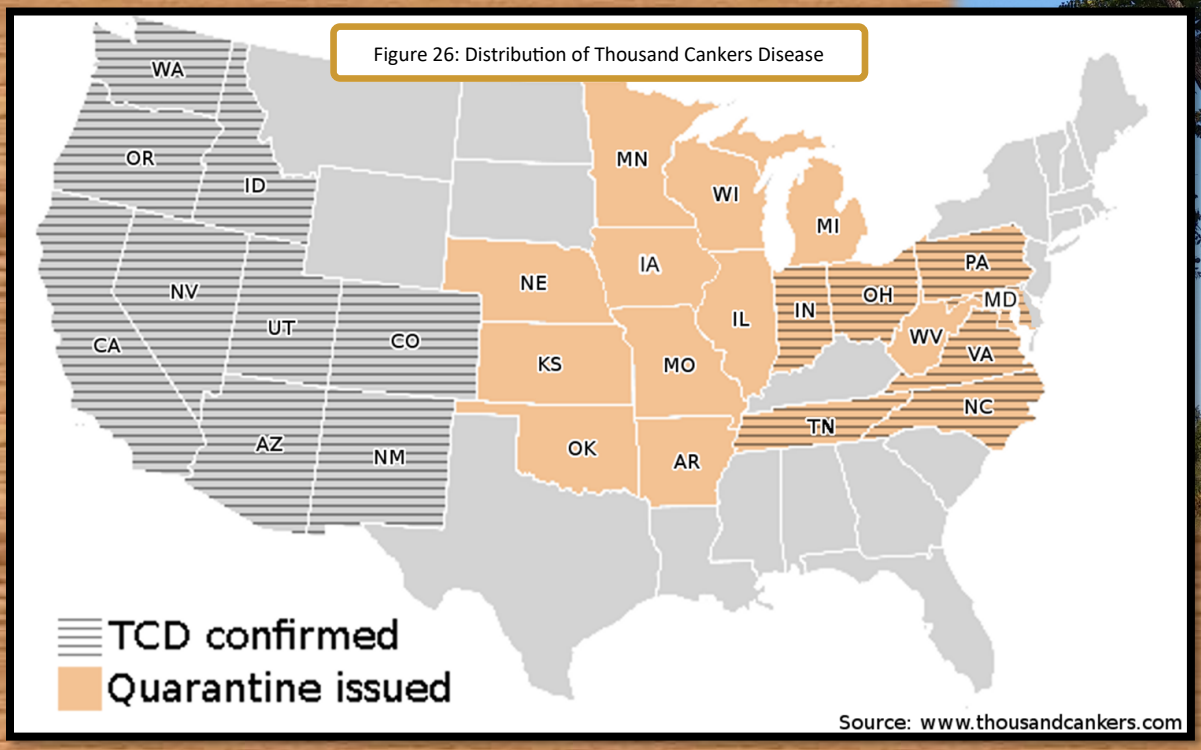


Figure 27: Funnel Trap in a Black Walnut

Figure 26: Distribution of Thousand Cankers Disease



Tree Diseases

Laurel Wilt Disease

In 2019, Laurel Wilt Disease (LWD) was first documented in Kentucky in Christian, Todd, and Logan Counties. LWD was initially confirmed inside the Fort Campbell Army Base after large sassafras trees were reported dead. After this primary detection, ground surveys were used to learn the extent of the outbreak. In 2024, five additional counties were added to the map. Those counties include: Fulton, Graves, Hickman, Ballard, and Lyon (Figure 28). LWD has now been confirmed in counties ranging from the extreme southern and northern borders of Kentucky as well as much of the land west of Land Between the Lakes. It appears that the positive detections are following major interstate corridors, such as I-65 which travels from southwestern Kentucky into the city of Louisville. Investigation of these potential vector pathways will continue to be a top priority into the next field season.

Redbay ambrosia beetles vector this disease by boring into the host and transmitting the pathogen within the wood. A single beetle can transmit enough spores of the lethal fungal pathogen, *Harringtonia lauricola*, to kill a tree. The fungus infects the xylem, blocking off the vascular system, causing rapid wilt and eventual mortality. Death can occur within weeks to months after being infected. Yet, there is evidence to suggest that sassafras can surpass the initial infection and survive for an extra year or two before succumbing to the disease. Signs of beetle activity include very small circular holes in the bark, occasionally accompanied by thin sawdust toothpicks of waste. Other symptoms to look for include early fall coloration or wilting of leaves on suspect trees that may remain attached for months (Figure 29). In most infected trees and shrubs the fungus causes distinctive, dark staining within the sapwood (Figure 30).

It is important to note that this disease complex is specific to plants within the Laurel Family. Sassafras and spicebush are the only two species found in Kentucky that LWD is known to attack. As of now, we only know of severe impacts to sassafras. However, the first observations of infection in wild spicebush were documented and confirmed within the Fort Campbell Army Base in 2020. There will be more to come with work surrounding this alternative host plant.

In 2022, a pilot study in cooperation with the University of Kentucky and Bartlett Tree Experts will examine the efficacy of fungicide treatment as a method to combat this disease in municipal trees. Trials concluded in the summer of 2024 and a publication will soon be on the way in 2025. The Commonwealth could need this more than we know as the national champion, and possibly, the world's largest sassafras tree is located in Owensboro, Kentucky.

Figure 28: Laurel Wilt Distribution Map

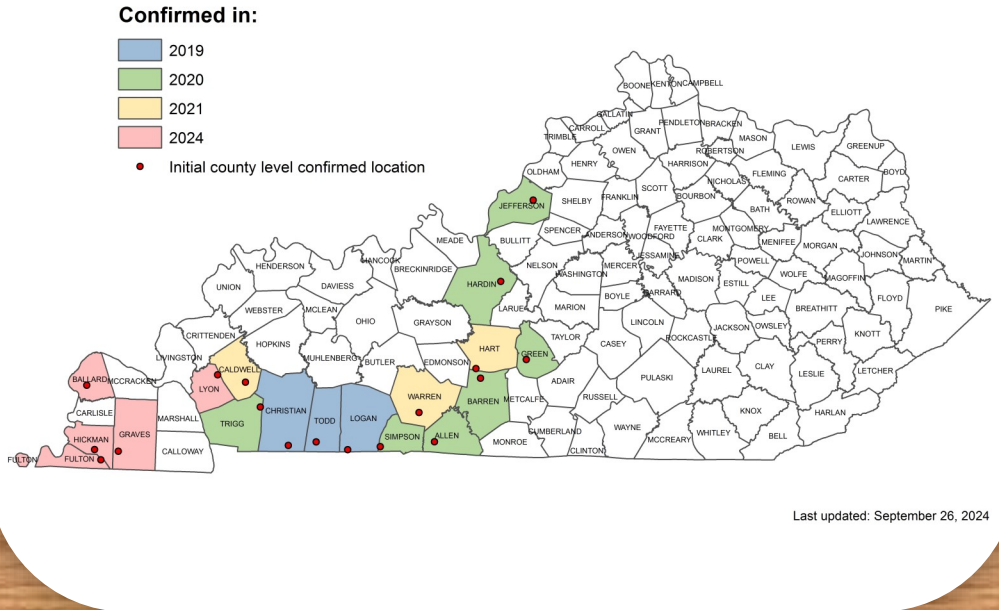


Figure 29: Foliar Symptoms of LWD

Figure 30: Sapwood Staining

Laurel Wilt Disease Continued…

Laurel Wilt Disease Confirmed in Spicebush

As previously mentioned, the first-ever infected spicebush has been found in the wild. This is terrible, yet exciting, news since past research had suggested that the redbay ambrosia beetle didn't show a strong preference for spicebush in the laboratory setting. We now have evidence from the field to suggest otherwise. Please make yourself aware of the following tell-tale signs as we need all the help we can get to find new locations of infection across the region. As you can see, spicebush displays the same symptoms as sassafras when affected by LWD. Early fall coloration in the form of golden-hued foliage can be seen in the summer months (Figure 31). Frass toothpicks left behind by the beetle vector litter the boles of infected spicebush (Figure 32). The iconic staining of the sapwood can be seen in the cross-section of this freshly cut sample (Figure 33). And the final stages of wilt that dry out not only the leaves, but also the fruit, which marks the lethal blow (Figure 34).

Figure 32: Frass Toothpicks Hanging from Spicebush Bole

Figure 33: Spicebush Sapwood Staining

Figure 34: Wilted Leaves and Fruit of Spicebush

Figure 31: Early Fall Coloration in Spicebush

Potential Herbicide Damage

This summer, Division Forest Health Program staff joined forces with the USFS Southern Research Station and several other state agencies to investigate the ever-growing concern of potential herbicide damage to native Kentucky hardwood species. This team included representatives from the Kentucky Department of Agriculture, local Universities, as well as the National Park Service. In May 2024, interested stakeholders met for a field day that consisted of multiple site visits in and around Central Kentucky to locations that are known to have symptomatic trees (Abraham Lincoln Birthplace National Historical Park and Pearman Forest Nature Preserve in LaRue County and Freeman Lake Park in Hardin County).

Trees were assessed for signs of drought, early frost, oak lace bug, and two-spotted spider mite, but the symptoms were not consistent with drought or early frost, and neither pest was found in numbers sufficient to cause the widespread damage. Several native tree species, as well as shrubs and other understory vegetation, were observed to have the following foliar symptoms: leaf curling/deformity, leaf elongation, epicormic shoot development, and crown thinning. A complete list of species impacted can be found in Table 1. It is important to note that these observations were made 500 meters or more into the forest-interior, demonstrating that symptoms are being exhibited without any apparent point-source event from adjacent agricultural fields.

The symptoms of damage observed on foliage of trees and shrubs were consistent with damage from phenoxy herbicides. Currently, there is no empirical data to confirm the presence of herbicide residues in plant tissues and observations of leaf symptoms consistent with phenoxy herbicide damage are circumstantial. Phenoxy herbicides and other growth regulators cause distortion and curling of foliar plant parts. Stems and leaf petioles are often twisted or bent, and leaves may be cupped. Abnormal growth is accompanied or followed by leaf yellowing and/or browning. Herbicides in this group typically injure the youngest tissues first and they can affect most broadleaf plants.

To demonstrate causation would require experimental data to correlate herbicide volatilization to leaf symptoms. Some potential methods for measuring volatilized and metabolized chemical could include collecting air samples at time intervals during “burndown” and collecting foliar samples during suspected exposure for residue analysis. Collecting temporal records of tree budbreak and leaf expansion could assist in understanding when damage is occurring and on which species. Monitoring past tree condition using satellite imagery for comparison to present conditions in tandem with long-term monitoring plot installation at areas around the county could help with delineating the timeline of symptom occurrence and recognizing changes in tree condition. However, our most hopeful solution is to keep lines of communication open between private and state agricultural entities in that it could help resolve unknowns regarding herbicide product usage and elevate awareness of the issues in search of cooperative solutions.

Herbicide Damage Continued…

Table 1: Species impacted and not impacted by potential herbicide damage.

Tree Species Impacted
white oak (*Quercus albo)*
American holly (*Ilex opaca*)
black locust (*Robinia pseudoacacia*)
black oak (*Quercus velutina*)
black walnut (*Juglans nigra*)
blackjack oak (*Quercus marilandica*)
shingle oak (*Quercus imbricaria*)
red oak (*Quercus rubra*)
chestnut oak (*Quercus montana*)
chinquapin oak (*Quercus muehlenbergiiI)*
tulip poplar (*Liriodendron tulipifera)*
redbud (*Cercis canadensis)*
sassafras (*Sassafras albidum)*
box elder (*Acer negundo*)
sugar maple (*Acer saccharum*)
Norway maple (*Acer platanoides*)
American sweetgum (*Liquidambar styraciflua*)
flowering dogwood (*Cornus florida*)
blackgum (*Nyssa sylvatica*)
elm spp. (*Ulmus* spp.)
hackberry (*Celtis occidentalis*)
Kentucky coffeetree (*Gymnocladus dioicus*)
princess tree (*Paulownia tomentosa*)
Eastern redcedar *(Juniperus virginiana)*
American sycamore (*Platanus occidentalis)*
white ash (*Fraxinus americana*)
Shrub/Herbaceous Species Impacted
poison ivy (*Toxicodendron radicans*)
coralberry (*Symphoricarpos orbiculatus*)
Christmas fern (*Polystichum acrostichoides*)

Extreme leaf curling indicative of herbicide damage.

Tree Species Appearing Unaffected
American beech (*Fagus grandifolia*)
American pawpaw (*Asimina triloba*)
pignut hickory (*Carya glabra*)
American persimmon (*Diospyros virginiana*)
Shrub/Herbaceous Species Appearing Unaffected
mayapple (*Podophyllum peltatum*)
Virginia creeper (*Parthenocissus quinquefolia*)
jewelweed (*Impatiens capensis*)
spicebush (*Lindera benzoin*)
winterberry (*Ilex verticillate*)
poison hemlock (*Conium maculatum*)
poison hemlock (*Conium maculatum*)

Forest Health Assistance in Kentucky

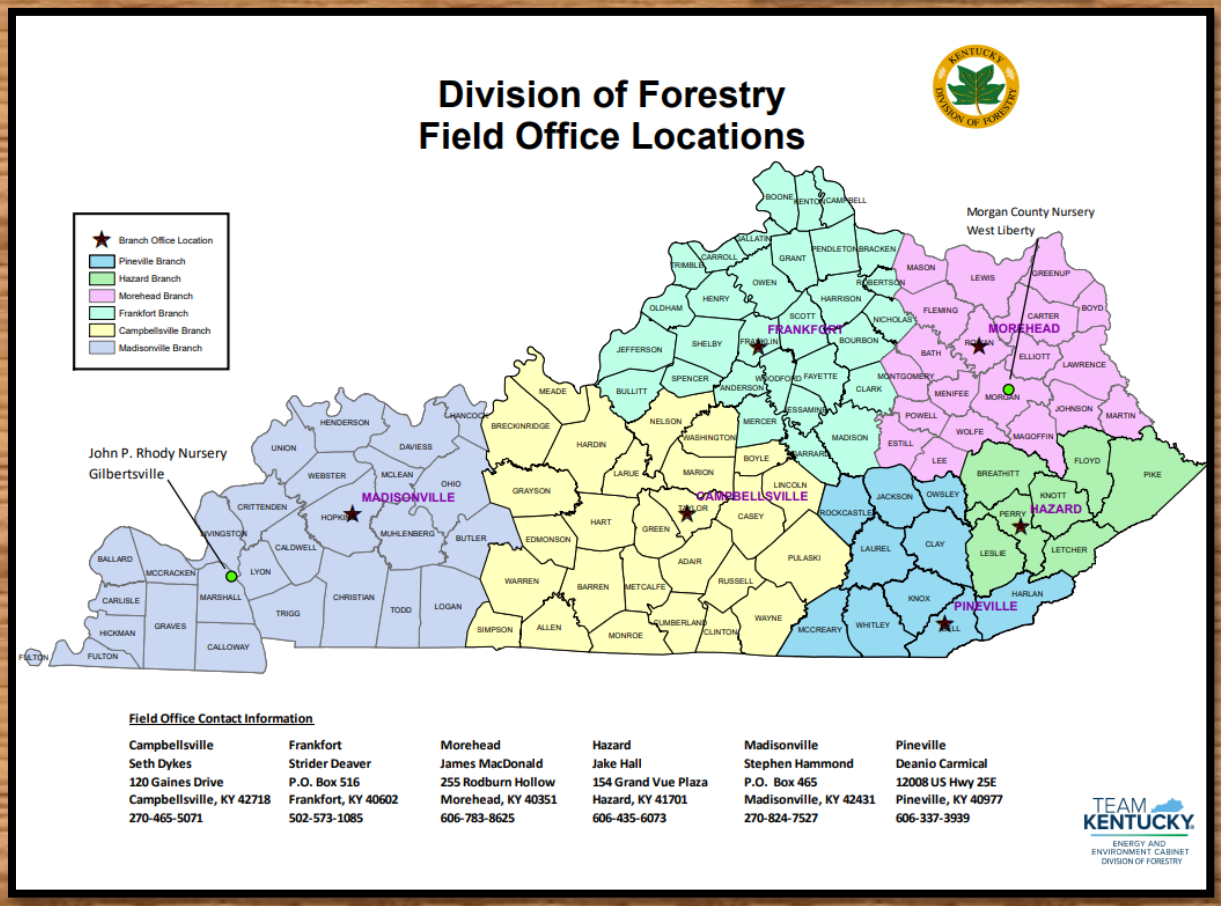
Kentucky Division of Forestry
Sower Complex
300 Sower Boulevard – 4th Floor SE
Frankfort, KY 40601
http://forestry.ky.gov
(502) 564-4496

TEAM KENTUCKY
ENERGY AND ENVIRONMENT CABINET

KENTUCKY DIVISION OF FORESTRY

University of Kentucky Forestry Extension
Thomas Poe Cooper Building
730 Rose Street
Lexington, KY 40546
forestry.extension@uky.edu
(859) 257-7597

COOPERATIVE EXTENSION SERVICE
UK UNIVERSITY OF KENTUCKY
College of Agriculture, Food and Environment



References:

- USDA APHIS provided the Federal Quarantine Maps
- Photos with image numbers are courtesy of Bugwood.org

Brought to you by:
Alexandra Blevins
KDF Forest Health Program Coordinator
Alexandra.Blevins@ky.gov