



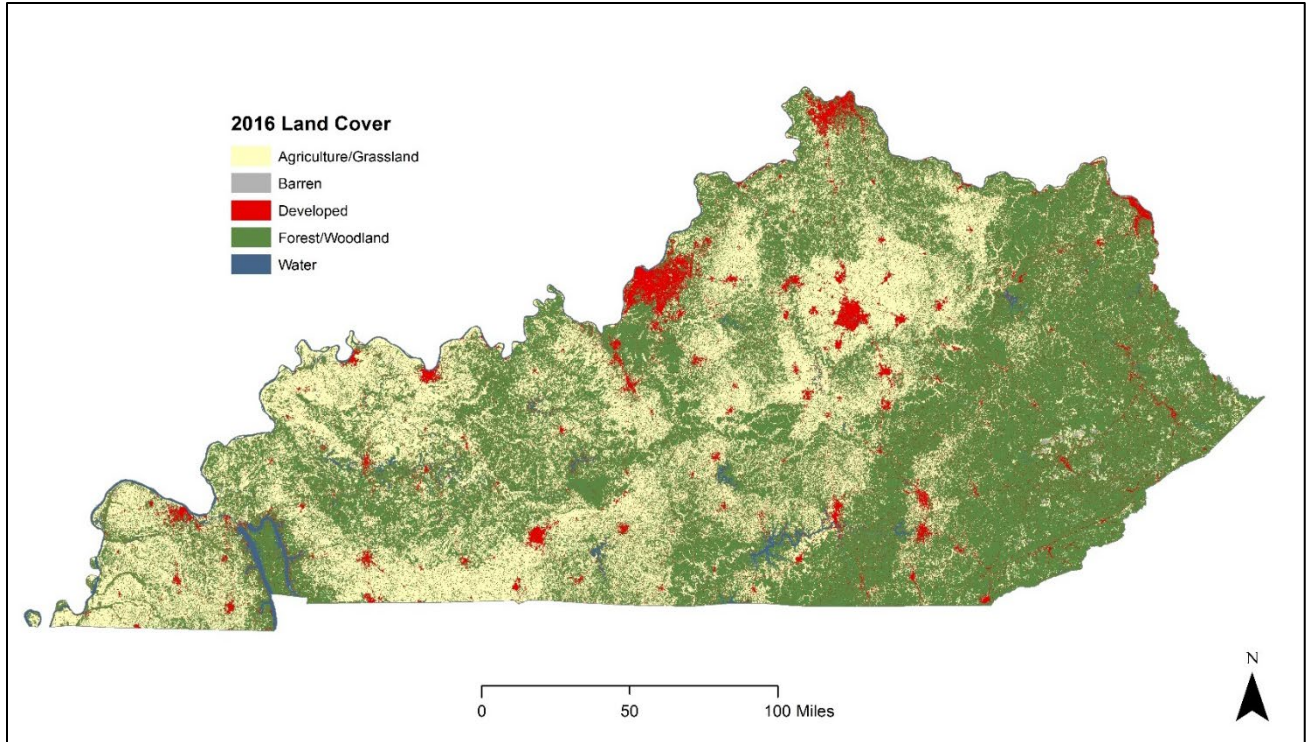
# Kentucky

## Forest Health Highlights 2022

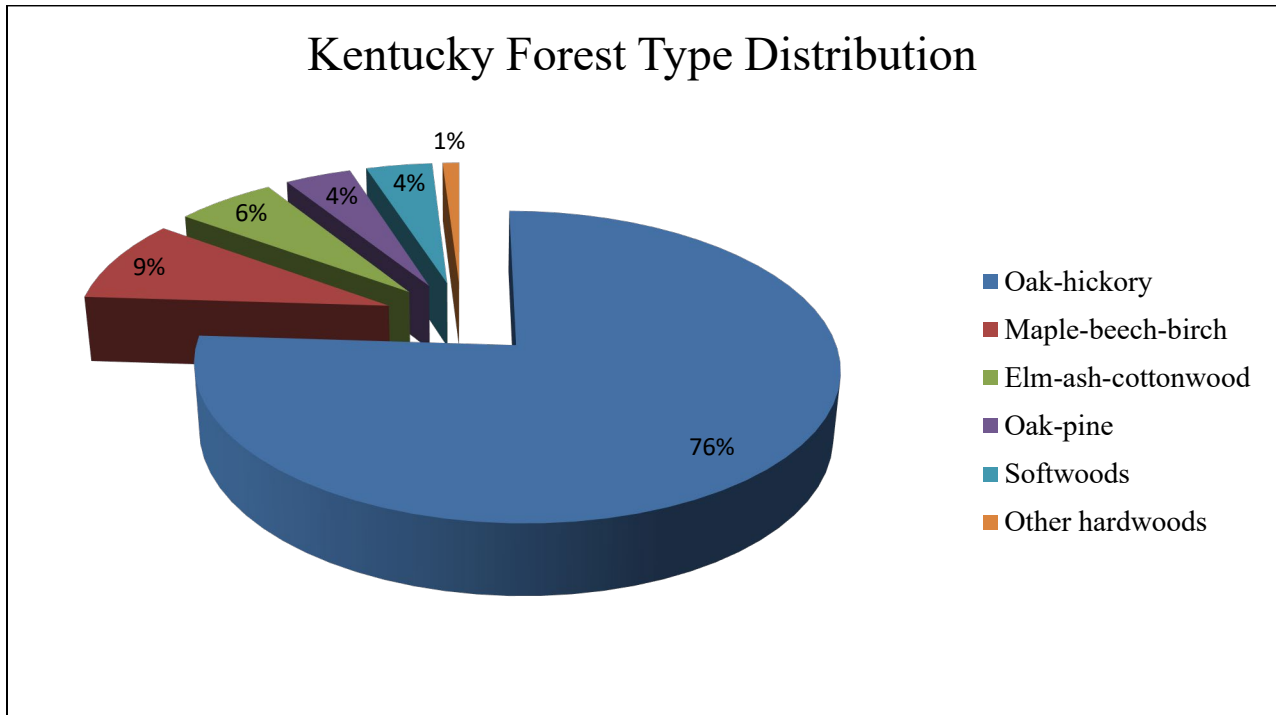


### The Resource

Kentucky is home to vast forestlands that are filled with approximately 7.44 billion live trees, which contain 26.69 billion cubic feet of wood. This makes Kentucky's forests a vital source of aesthetic, economic, and ecological value. They provide scenic beauty, support outdoor recreation and tourism, and provide critical wildlife habitat from the eastern Appalachian Mountains to the western Mississippi Valley. Woodlands cover an estimated 12.38 million acres within the state, which equates to 48% of Kentucky's land area. The eastern portion of the state, specifically counties within the Appalachians and the Cumberland Plateau, represent the most heavily forested areas. Many of these counties contain woodlands that cover more than 80% of the land area. The majority of the state's forestland, approximately 88%, is privately owned. While approximately 10% of forestland is federally owned and the remaining 2% owned by state and local entities. Kentucky has one of the most diverse hardwood mixes in the nation, yet the predominant forest type is oak-hickory, which covers nearly 9.5 million acres or 76% of the forested land. The most common species are red maple, sugar maple, and yellow poplar.



Kentucky Land Cover

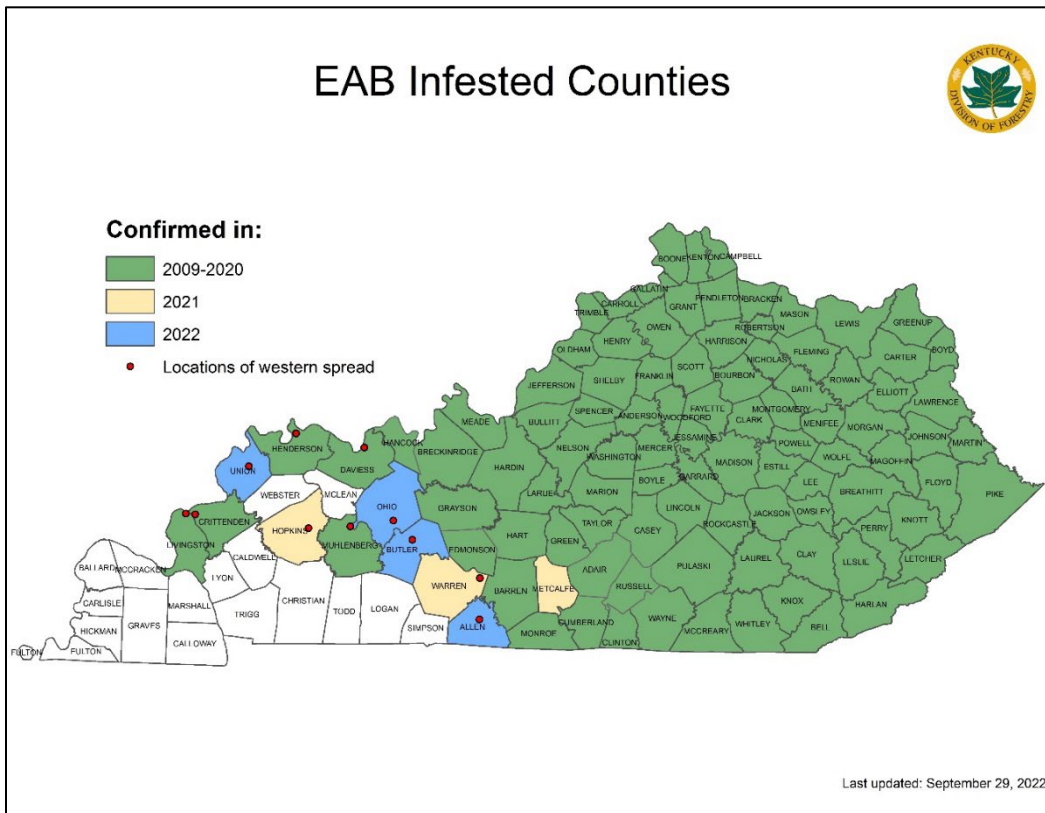


# Insects

## Emerald Ash Borer

Infestations of the emerald ash borer (EAB) were first confirmed in Kentucky in 2009. A quarantine of 20 northern Kentucky 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 In April of 2014, the county quarantine system was rescinded and the entire state was added to the USDA APHIS list of regulated areas. In September of 2018, APHIS published a proposal to remove domestic quarantine regulations for EAB. This proposal was approved after a public comment period and the ruling officially took effect on January 14, 2021. Currently, EAB has been confirmed in 103 Kentucky counties. In 2022, EAB was detected in four new counties: Allen, Butler, Ohio and Union. EAB will eventually impact ash resources across the entire state as the infestation continues to spread into western Kentucky. Infestations in neighboring states of Indiana, Illinois, Missouri, and Tennessee can only aid this expansion within the coming years.

Once the deregulation of this exotic pest took effect, the USDA APHIS channeled all funding into the EAB Parasitoid Release and Recovery Program. KDF applied for this program in 2021 and was accepted for the release of *Oobius agrili*, the specialist EAB egg parasitoid. During the 2022 field season, 1200 *O. agrili* pupae were released at Knobs State Forest in Bullitt County. KDF will continue releases next season, followed by a recovery attempt in year three.

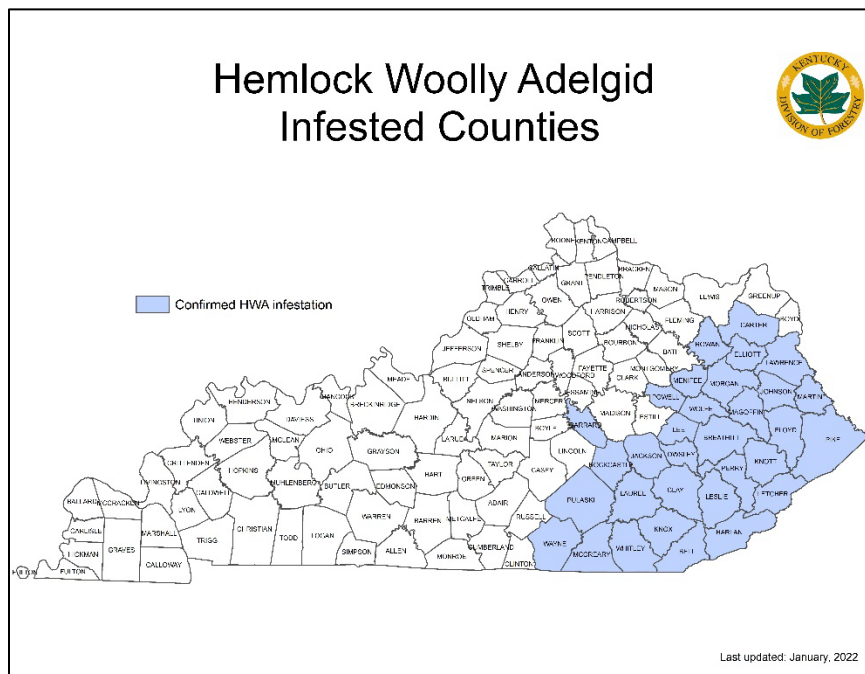


## Hemlock Woolly Adelgid

The hemlock woolly adelgid (HWA) was first discovered in Kentucky in 2006. 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. The counties include Bell, Breathitt, Carter, Clay, Elliott, Floyd, Harlan, Jackson, Johnson, Knott, Knox, Laurel, Lawrence, Lee, Leslie, Letcher, Magoffin, Martin, McCreary, Menifee, Morgan, Owsley, Perry, Pike, Powell, Pulaski, Rockcastle, Rowan, Wayne, Whitley, and Wolfe. Garrard County was added to the state's distribution map in February of 2022.

The Kentucky Division of Forestry (KDF) 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 hemlock woolly adelgid populations. Treatments began in 2009 on Kentucky State Forests and has since expanded to include properties managed by the Kentucky State Parks, Office of Kentucky Nature Preserves, KDFWR Wildlife Management Areas, and USFS Daniel Boone National Forest (DBNF). Since 2009, KDF has chemically treated over 200,000 hemlock trees.

KDF has also continued the release of two species of predatory beetles that feed exclusively on HWA within the DBNF in hopes of establishing field insectary sites. In the past, Kentucky has struggled with predatory beetle establishment. However, in 2020 KDF made the first-ever recovery of both the adult and larval forms of the *Laricobius osakensis* species. Identification was confirmed in 2021 by the Beneficial Insects Lab at Virginia Tech. In 2022, additional recoveries of both *L. osakensis* adults and larvae were made. However, identification results from the lab are still pending. Future releases will take place adjacent to previous release sites to augment the formerly established population.



## Yellow Poplar Weevil

Much of eastern and central Kentucky experience periodical outbreaks of the yellow poplar weevil. Generally, this native insect is considered a minor pest, but the weevil was reported at higher than normal levels again this year. In 2021, no evidence of this insect was reported. However, this was only a short break from this forest pest as it had reoccurring outbreaks for four consecutive years (2016-2020). Feeding damage has been observed in locations across eastern Kentucky. This year's damage seems to be less severe and not as widespread as in previous years. No major decline has been documented from the recent infestations, though periods of drought that occurred this year could lead to future localized decline.



## Locust Leafminer

Outbreaks of the locust leafminer are very common in Kentucky. These outbreaks 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.



## Spongy moth

*Lymantria dispar*, now known as the spongy moth, 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 for this invasive species using detection surveys through USDA APHIS and Slow the Spread programs. In 2022, the OSE set traps in 82 counties across the state. 45 of these counties had positive trap catches; these include: Bath, Boone, Bourbon, Boyd, Bracken, Breathitt, Carter, Clark, Clay, Elliott, Estill, Fayette, Fleming, Franklin, Garrard, Greenup, Harrison, Jackson, Jessamine, Knott, Lawrence, Lee, Leslie, Letcher, Lewis, Lincoln, Madison, McCreary, Menifee, Mercer, Montgomery, Morgan, Owsley, Perry, Powell, Pulaski, Robertson, Rowan, Scott, Shelby, Spencer, Trimble, Washington, Wolfe, and Woodford. A total of 188 moths were captured in this detection survey with Greenup, Lee, and Perry counties having the most positive detections with 21, 10, and 9 moths captured respectively. Furthermore, in an effort to bring awareness to this forest pest, the OSE implemented the first-ever Citizen Scientist trapping program in 2022. 44 additional counties were monitored under this new initiative with 8 counties having positive detections. These counties include: Bath, Boyd, Harlan, Johnson, Lewis, Madison, Rowan, Taylor. 13 additional moths were captured in these traps.

Eight additional counties were monitored with Slow the Spread funding. Six out of the eight counties had positive detections with a total of 97 moths captured. These counties include: Floyd, Johnson, Lawrence, Letcher, Martin, and Pike. Lawrence, Martin and Pike counties had the most positive detections with 16, 18, and 56 moths captured respectively. The USFS also monitored for the spongy moth within the Daniel Boone National Forest and found one moth during their detection surveys.



Kentucky saw a surge in spongy moth populations in 2022 with a total of 299 moths captured throughout all state and federal programs. This is a significant increase from the 30 moths captured last season and the 4 moths captured in 2020.

## Asian Longhorned Beetle

The Asian longhorned beetle (ALB) continues to be a potential pest of concern for Kentucky. Although ALB has not been found in Kentucky, it was discovered in 2011 in Clermont County, Ohio, which is only 10 miles from the northern Kentucky border. More recently, ALB was confirmed in Charleston County, South Carolina in 2020. To date, eradication efforts are still underway at both the established OH infestation as well as the novel SC infestation. KDF works with various agencies to educate the public on ALB identification and signs of infestation.



## Spotted Lanternfly

The spotted lanternfly (SLF) is a relatively new invasive insect to the US with origins from Asia. It was only first discovered in Pennsylvania in 2014. This insect is actually a hemipteran which uses its characteristic piercing and sucking mouthpart to steal sap from its host plant. It is thought that tree of heaven is their primary host species, but they also show preference towards red maple, black walnut, and various other fruit trees and grape vines. Damage from this insect's aggregate feeding behavior can weaken the host, leaving it susceptible to other stress agents. These insects also produce ample amounts of honeydew, or liquid excrement, that transforms into black sooty mold. Although SLF hasn't been found in Kentucky, it was discovered just two miles north of the border in Vevay, Indiana in July 2021. More recently, this pest was found within Cincinnati's city limits in October 2022. KDF is working with various agencies to educate the public on SLF identification and signs of infestation.



# Diseases

## Thousand Cankers Disease and the Walnut Twig Beetle

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 walnut twig beetle (WTB) introductions. During the 2022 field season, trapping for the WTB resumed after a break in 2021 due to a capacity transfer that was made to meet the needs of the EDRR trapping effort. Survey work also picked up in 2022 as a new Forest Health Intern was trained in on-the-ground monitoring techniques and completed several TCD surveys in new counties. In addition, educational outreach about this disease and its vector was pushed through social media to bring awareness to the public.

Potential WTB specimens captured during this season's trapping effort were sent off for expert identification. All specimens came back as different species resulting in negative confirmation of the vector. Thus, neither the fungus nor the insect vector have been confirmed in Kentucky to date even though the disease has been confirmed in the neighboring states of Indiana, Ohio, and Tennessee for a number of years. New ground surveys and trapping efforts will continue in the 2023 field season.



## Laurel Wilt Disease and the Redbay Ambrosia Beetle

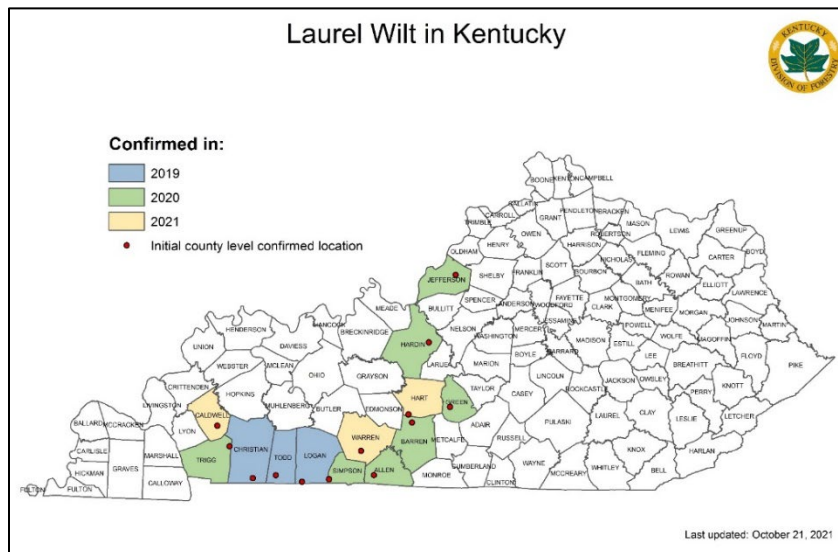
In 2019, Laurel Wilt Disease (LWD) was first documented in Kentucky in Christian, Todd, and Logan counties. After this initial detection, ground surveys were used to learn the extent of the outbreak. LWD has now been confirmed in counties ranging from the extreme southern and northern borders of Kentucky. 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 be a top priority next season.

Redbay ambrosia beetles vector LWD by boring into species of the Laurel family, such as sassafras and spicebush. A single female can transmit enough spores of the lethal fungus,



*Haringtonia lauricola*, to kill a tree. The fungus infects the xylem which blocks off the vascular system causing rapid wilt and mortality. Mortality can occur within weeks to months after being infected. Signs of beetle activity include very small circular holes in the bark, occasionally accompanied by thin sawdust toothpicks of waste. Other symptoms caused by the fungal pathogen include early fall coloration or wilting of leaves on suspect trees that may remain attached for months. In most infected trees and shrubs, the fungus causes distinctive dark staining within the sapwood.

Initial LWD detections within the state of Kentucky were all in sassafras, however more recently we have confirmed infection occurring in spicebush. This season a pilot study in cooperation the University of Kentucky and Bartlett Tree Experts began to examine the efficacy of fungicide treatments as a method to combat this disease in municipal trees. Trials will continue in spring of 2023.



# Other Damages

## Tornado Outbreak

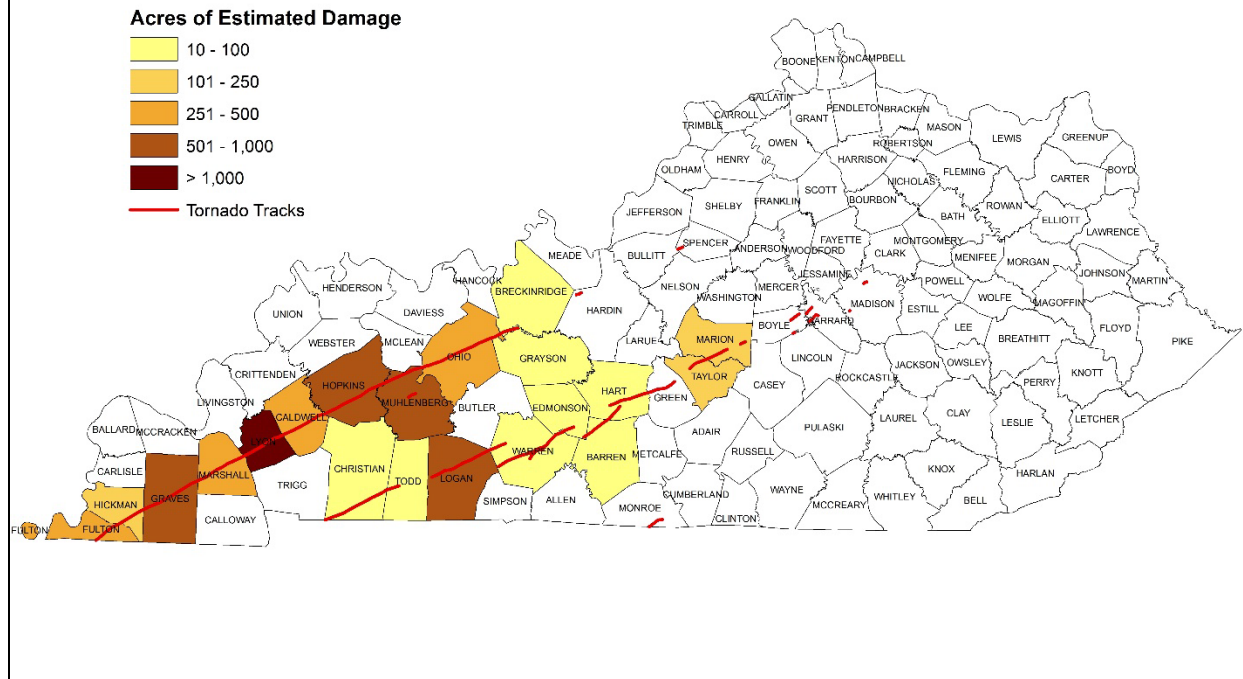
2021 was a devastating year for severe weather in Kentucky with multiple extreme events causing noticeable damage throughout the Commonwealth. The year ended in the worst way imaginable with the most catastrophic tornado outbreak in US history. Lives, homes, and whole communities were lost. The impact of these tornados is still present on the landscape in 2022 and will be for quite some time.

On the night of December 10th into the early morning hours of December 11th, a massive storm system moved through the state. During this time, Kentucky was hit by 7 tornados. The National Weather Service (NWS) confirmed a total of 21 touchdowns by radar as well as on-the-ground surveys. These supercells left behind a path of massive destruction in their wake. Widespread and significant damage was recorded. The final report from the NWS classified these damages, using the Enhanced Fujita scale, as ranging from an EF0 to an EF4. An EF4 tornado has enough power to turn large vehicles into projectile missiles! And this is what Kentuckians witnessed in the aftermath of this outbreak.

The worst of these tornados, the long-track EF4, covered approximately 165 miles within Kentucky alone! It wreaked havoc in counties all the way from Fulton to Breckinridge, reaching top wind speeds of 190 MPH. A state of emergency was immediately declared and KDF foresters were called into action. A total of 36 foresters were deployed to aid in rescue and recovery missions in western and central regions of the state. They removed debris, down trees, and broken limbs from power lines and roadways to clear access for emergency responders. Over 11,000 disaster claims were made following these violent storms and we are still working to clean up the residual chaos.

Once it was possible, our Forest Health Program got a drone in the air to inspect the severity of damage to our forestlands. Damage was widespread and indiscriminate. The straight-line winds caused trees to completely uproot, tops to be broken, trunks snapped in half, and branches became a mangled mess. After the drone survey, an aerial detection survey took place in January of 2022 to track the worst damages within each tornado's path. The damages seen from the drone survey were mirrored during this broad-scale detection flight. In addition, it was observed that all species, hardwoods as well as pines, and all age classes experienced some level of damage from these brutal winds. Over 7,300 acres of timber damage were documented. Using the data collected during the aerial survey, KDF was able to provide a map of the county level damages to timber in western and central Kentucky. All KDF Programs continuing to work together in 2022 to provide further assistance to our fellow Kentuckians affected by this tornado outbreak. Once landowners are ready to reforest their lands, we will be ready and waiting to serve.

## Acres of Estimated Timber Damage December 10 & 11 Tornadoes



## Flooding

In July of 2022, Kentucky was hit with yet another devastating natural disaster. From July 25<sup>th</sup> to July 30<sup>th</sup>, the Commonwealth received multiple storm complexes that brought substantial precipitation, flash floods, and severe river flooding to eastern Kentucky. During this five-day period, rainfall was upwards of 4 inches per hour at its heaviest. Radar recorded estimates of 14 to 16 inches of rain in the worst hit areas. All other impacted areas received approximately 6 to 10 inches of rainfall. This excessive amount of precipitation caused catastrophic damage in the Appalachian region of the state. 39 lives were lost, countless homes were destroyed, and entire communities were swept away due to this extreme weather event. The damage to infrastructure in this region was comparable to the December 2021 tornado outbreak, and as such, will take years to restore.

The peak of this event happened over July 27<sup>th</sup> and 28<sup>th</sup>. The majority of the rain fell over the course of these two days. During this timeframe, 10 flash flood warnings were issued and 3 flash flood emergencies were declared. The most heavily impacted areas were between northern Clay

and southern Owsley counties and east to southern Breathitt and northern Leslie counties, including Perry, Knott, and Letcher counties. The highest rainfall report came out of Knott County, where 14 inches fell in total. This bout of severe weather is yet another historic event for Kentucky's record books. Just as with the tornado outbreak, KDF was immediately brought into the emergency response efforts on July 28<sup>th</sup> for Mobilization. 90 employees were deployed for on-the-ground assistance with debris removal as saw crews, while 10 personnel coordinated response efforts at Kentucky's Emergency Operations Center (EOC). KDF personnel were staffed at EOC until the mobilization was terminated on September 9<sup>th</sup>.

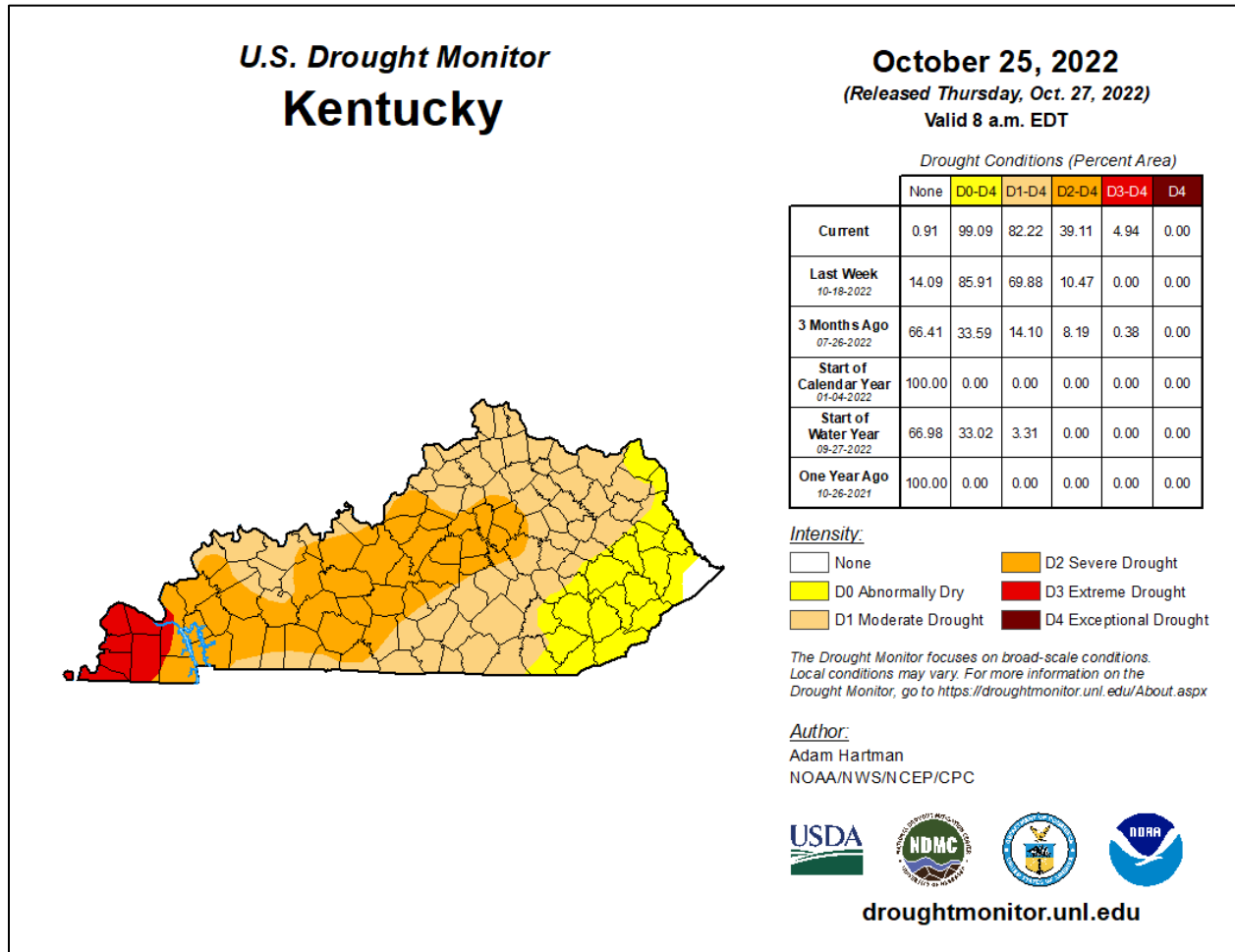


## Drought and Fire

As unfathomable as it seems, Kentucky began to experience drought conditions soon after the severe flooding event of July 2022. By October of 2022, much of the state's landscape became very dry. As you can see in the Drought Monitor Map below, by October 25<sup>th</sup> approximately 90% of the Commonwealth was facing some level of drought. The far western counties being the hardest-hit region were suffering from extreme drought conditions. The other western counties and some of central Kentucky were dealing with severe drought conditions, while the remainder of central Kentucky into the eastern portion of the state were experiencing moderate drought to abnormally dry conditions respectively. All in all, this was not a good place to be in during the fall fire season which occurs during October 1<sup>st</sup> – December 15<sup>th</sup>. This became very evident as fires quickly broke out across the entire state.

In November, the situation became so overwhelming that KDF entered into Phase 1 Mobilization and had to call upon five other states for additional resources. All KDF resources, including staff from the central and western branches, were utilized on three different dozer crews out of the Morehead, Hazard, and Pineville Branch Offices. Once all of our in-state resources were exhausted, crews from Virginia, Mississippi, Arkansas, Pennsylvania, and Texas were requested.

This was quite the unprecedented wildland fire event for our state with the last mobilization occurring in 2016 and out-of-state resources rarely being requested.



## References:

- [Kentucky’s Office of the State Entomologist](#) provided data from their Spongy Moth survey.
- 2016 Land Cover data was obtained through NRCS from the [National Land Cover Database](#).
- 2017 FIA One-Click Factsheet for Kentucky from the [USDA USFS](#)
- Photos with image numbers taken from Bugwood.org

# **Forest Health Assistance in Kentucky**

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