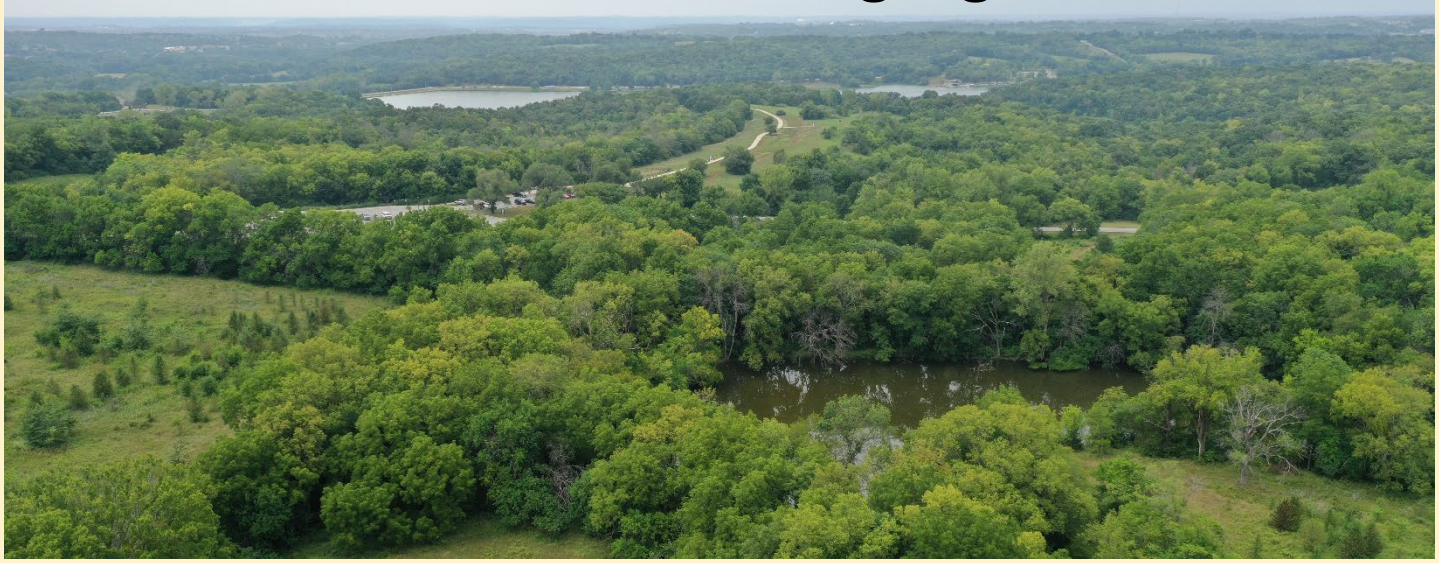
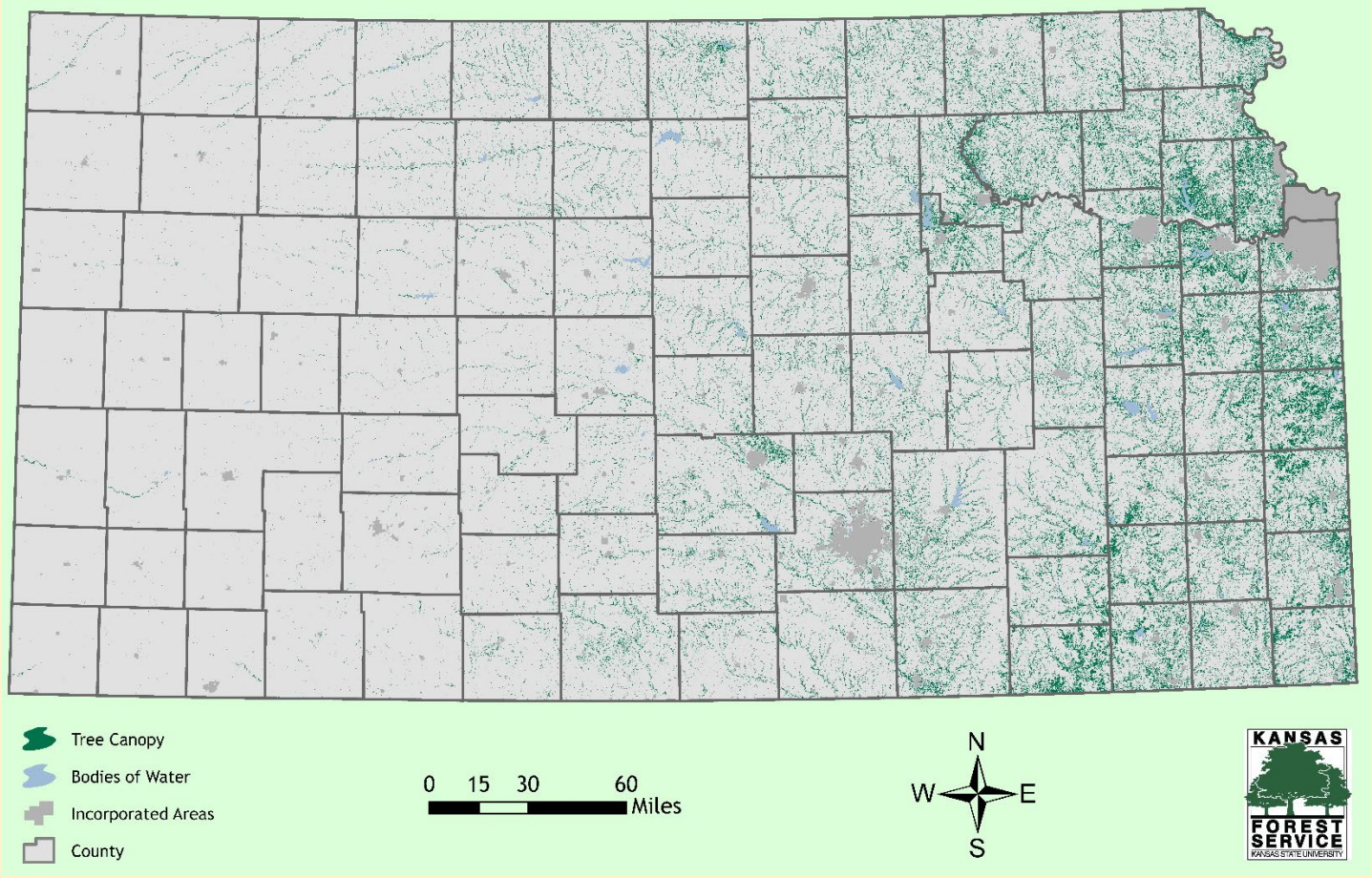
Kansas Forest Health Highlights 2021



Shawnee Mission Park (Johnson County, KS), with 1,655 acres of woodland and prairie, is visited by more than 2 million people each year.

Forest Resources of Kansas

In Kansas, the central hardwood forests transition into the Great Plains, with more than **4.5 million acres of trees**; 2.47 million acres of forest land and an additional 2.1 million acres of trees outside forest land. These forests, which are 92.9% privately owned, are productive; **8,576** local forest products jobs **($504 million** in wages) contribute approximately **$2.3 billion** to the Kansas economy and generate **$38 million** in state tax revenue each year. Much of the landscape is devoted to agriculture, but forests and trees are prominent components. The majority of these woodlands are linear in nature and follow water features along the terrain, although contiguous forestland can be found in far eastern Kansas.

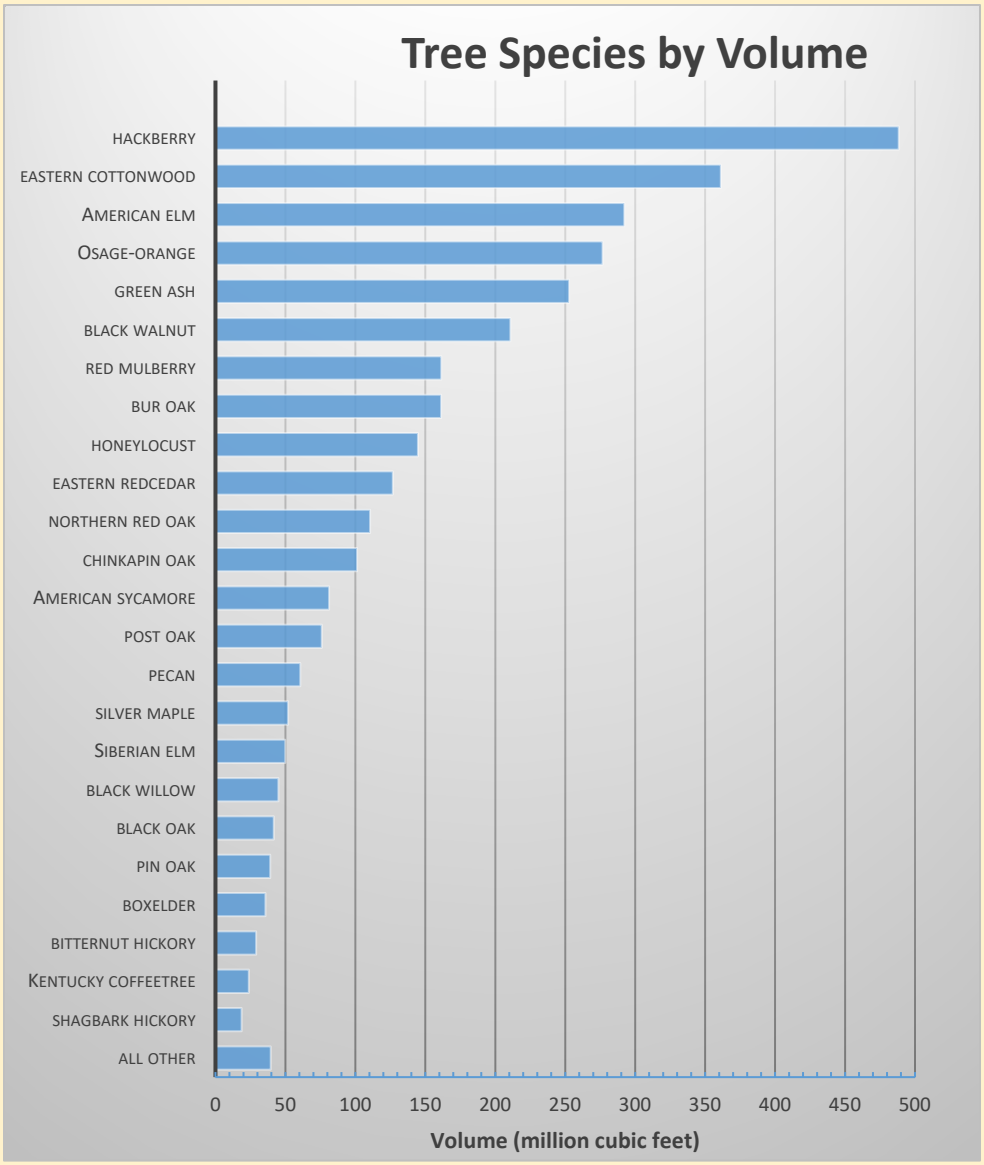


The top tree species, by statewide volume, are hackberry, eastern cottonwood, American elm, osage-orange, green ash, black walnut, red mulberry, bur oak, honeylocust, and eastern redcedar.

The two dominant forest type groups in Kansas are Elm/ash/cottonwood and Oak/Hickory.

Over the past 60 years or so, cottonwood regeneration levels have been low. Re-engineering of riparian environments due to the expansion of agriculture, construction of dams, and stream channelization have altered the landscape where cottonwood previously flourished. Unlike cottonwoods, eastern red-cedar trees have been very successful encroaching on grasslands, especially in the absence of fire.

Kansas's forests increased in acreage between 1939 and 2012, with a slight decrease since then. The oak component is decreasing in some areas as forest succession favors shade-tolerant species, such as hackberry and American elm.



According to Forest Inventory and Analysis (FIA) data, forest land in Kansas has increased since the earliest inventory and currently is showing signs of plateauing. In terms of stand-size class, sawtimber stands comprise half of all timberland area while poletimber and sapling/seedling stands occupy 28 and 18 percent of timberland area, respectively.

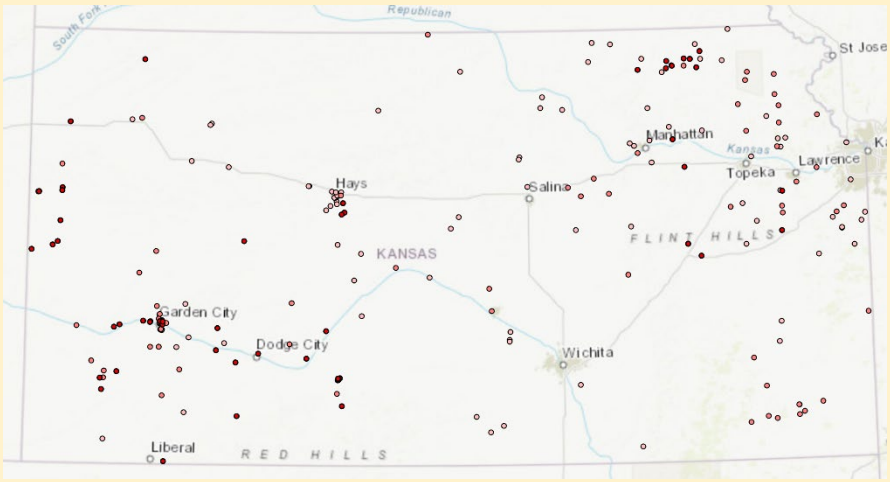
The forests of Kansas contain approximately **828 million live trees** (≥1-inch diameter) and **3.3 billion cubic feet of net volume** (live trees ≥5-inches diameter). The most numerous species are hackberry, American elm, eastern redcedar, Osage-orange, and green ash; they make up 56 percent of all trees. The five most voluminous species contain nearly half of total net volume, and of the five species previously listed, four are in the top five for volume as well: hackberry, green ash, American elm, and Osage-orange. Eastern cottonwood is the second-most voluminous species in the state but ranks 25th in terms of number of trees. While eastern redcedar is 3rd in terms of number of trees, it ranks 10th in volume.

There are about **90 million oven-dry tons of biomass** in Kansas forests; most of which is contained in non-growing stock trees (64%), followed by growing-stock trees (30%) and live trees 1- to 5-inches diameter (6%). Nearly one-third of all biomass is found in three species: hackberry, Osage-orange, and American elm. Osage-orange now ranks second in biomass, surpassing American elm, green ash, and eastern cottonwood.

Overall, hackberry, eastern cottonwood, and American elm have the highest growth rates, followed closely by black walnut and Osage-orange. However, mortality has increased while the area of forest land, number of live trees, and net growth of live trees has decreased significantly since 2014. This could be a concern if this trend continues.

Summary of Rural Forester Reporting

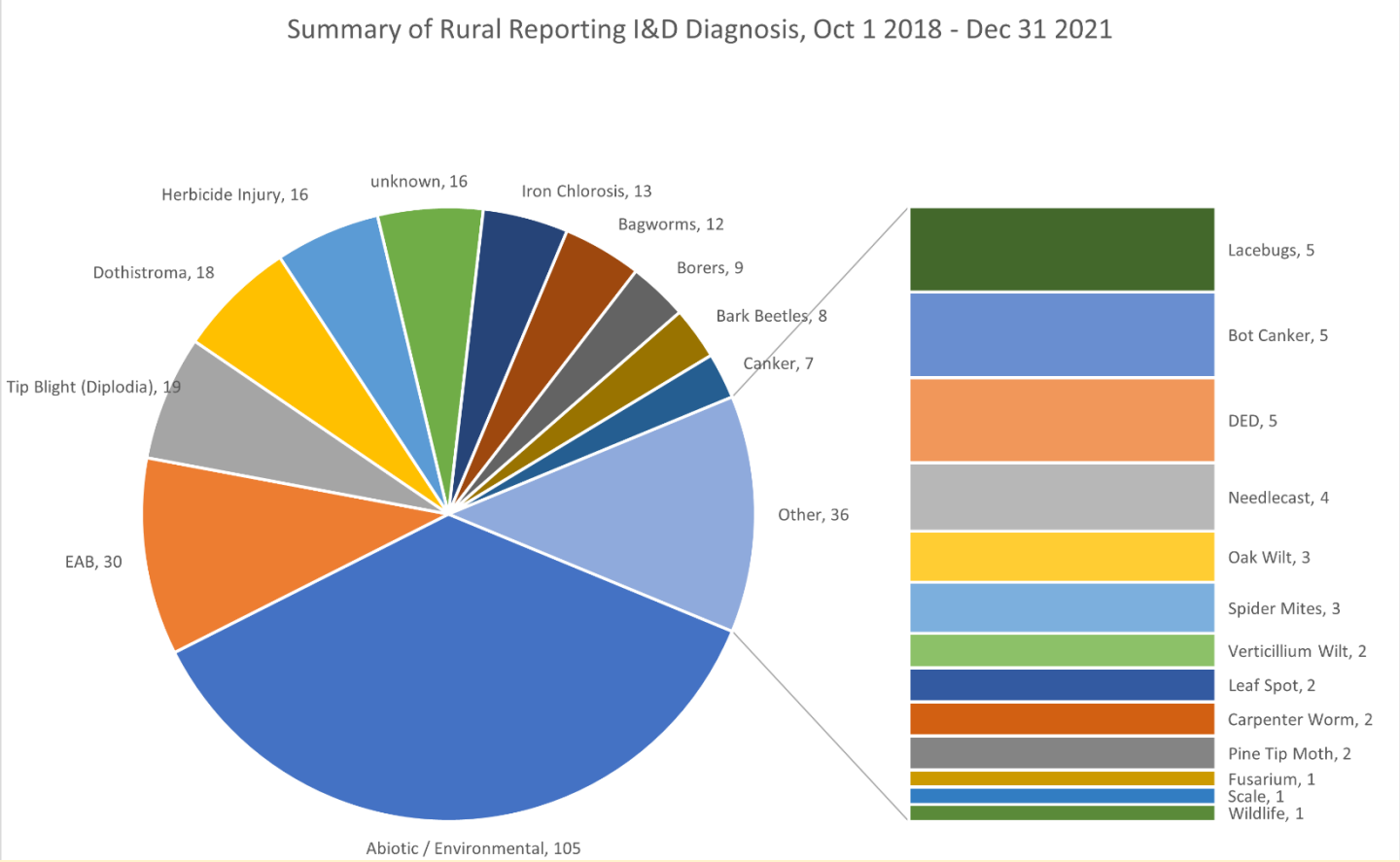
Kansas Forest Service receives funding from the USDA Forest Service that is used to support field foresters responding to and diagnosing insects and disease problems and other forest health issues. Historically, a major hurdle to accurate and complete reporting of these insect and disease issues has been that there isn't a simple, streamlined way for field foresters to report on those technical assistance visits with landowners.



Working with the KFS GIS Specialist and Rural Forestry staff, field foresters are now able to effectively use a Rural Reporting map and the ESRI Collector app, to have the option of reporting I&D diagnosis and/or comments as point data. This data is fairly well distributed across the districts, but it may be skewed slightly by the number of points (or landowner visits) that any particular district forester made.

In 2019, more than 110 points were entered into the Rural Reporting map on Collector with I&D data, representing a significant increase in objective forest health condition data over previous years. In 2020, 80 additional points were collected, and 105 were added in 2021, adding to the available data to assess the major forest health threats landowners deal with regularly.

This data is summarized in the chart below. As a general trend, this data supports the anecdotal evidence KFS has relied on for years to guide forest health priorities. As usual, **abiotic and environmental stress** represents a major share of the problems Kansas forests face. Following closely behind general abiotic stress are the "usual suspects" of **EAB, diplodia, dothistroma**, **herbicide injury, iron chlorosis, bagworms**, various **native borers**, **cankers**, and **bark beetles**.



Emerald Ash Borer

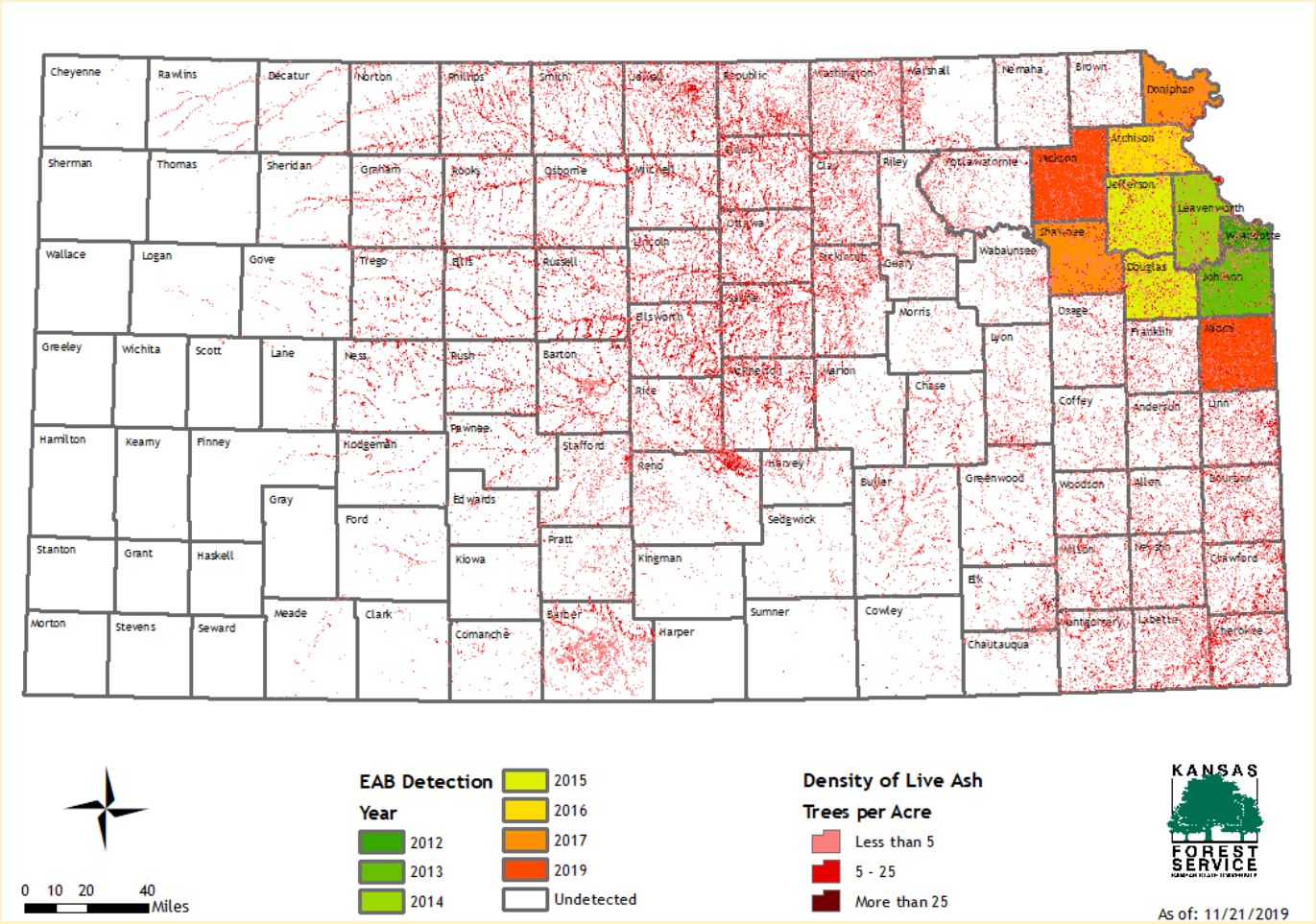
Emerald ash borer (EAB), an exotic wood-boring beetle, was first detected in 2012 in Wyandotte County, Kansas. Since that time, EAB has also been found in Johnson, Leavenworth, Douglas, Jefferson, Atchison, Doniphan, Shawnee, Miami, and Jackson counties.

EAB is a pest of all North American ash (*Fraxinus* spp.). Kansas' forest land contains **50.3 million ash trees**, or an average of about 20 trees per acre of forest land. Ash trees account for about **271 million ft^3** of volume, or **8 percent** of total net volume of live trees on forest land. Most of the ash resource (93%) is located on privately owned forest lands and is distributed primarily in the central and eastern parts of the state; the heaviest concentrations of ash are in the northeastern corner and along the eastern boundary.

In 2020, due to the impact of COVID-19 on trapping efforts, no traps were set by KDA or USDA APHIS, and few trap trees were able to be placed and peeled. However, in 2021, KFS was able to place 20 trap trees in 18 counties on lands managed by the Kansas Department of Wildlife and Parks (KDWP).

In 2021, **no new counties** were added to the existing Emerald Ash Borer Quarantine in Kansas, leaving the total number of counties with confirmed EAB presence to ten; all contiguous in the Kansas City-Topeka area. In previously quarantined counties, ash tree mortality continued to increase in both rural and urban settings.

Girdled ash tree at Milford State Park in Geary County, installed in cooperation with KDWP. No EAB were found at this location.

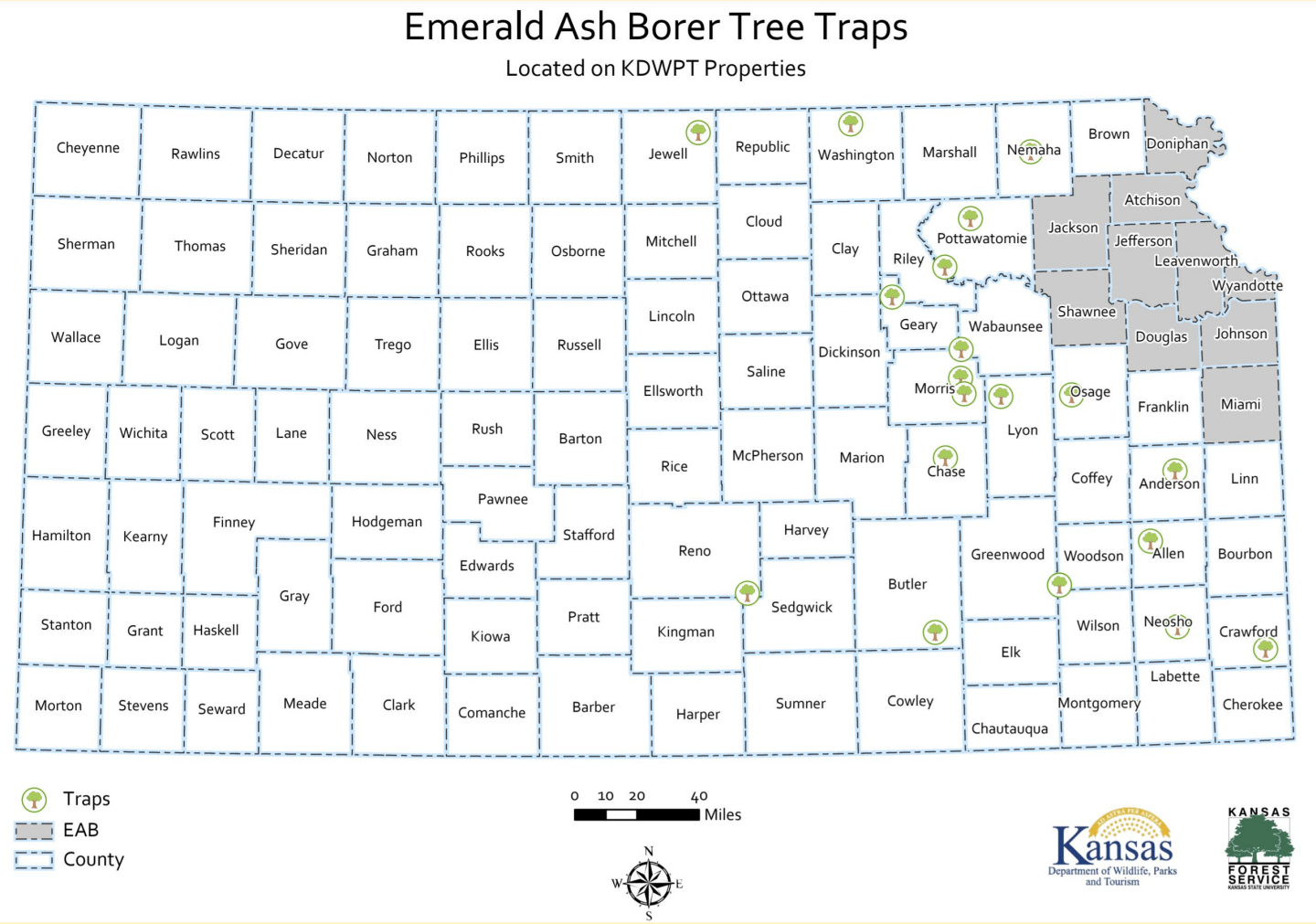


Releases of three biocontrol species (*Tetrastichus, Spathius, Oobius*) were done by the USDA APHIS contractors at two infested sites in northeast Kansas: Perry Lake and Clinton Lake. This is the sixth year for biocontrol releases in Kansas.

In response to EAB, a message of forest health resilience through diversity has been promoted statewide, in addition to the presentation of EAB and invasive pest information at forestry field days and workshops.

On March 1, 2021, KDA rescinded the state's EAB quarantine, following the federal quarantine removal. However, together with KFS, KDA will continue to monitor for EAB in counties peripheral to those detected and conduct outreach to educate local agencies as we continue to add to the list of detected counties.

Peeling EAB trap trees has proven to be an effective, although time-consuming, method for detection of EAB. Trees are girdled in spring, then felled and peeled each fall. This tree at Council Grove Wildlife Area (Morris Co.) was peeled by KFS staff, with no EAB found.



Working with the Kansas Department of Wildlife and Parks, KFS placed 20 trap trees in 18 counties across the uninfested area of eastern Kansas. No EAB larvae were found at any of these trap tree sites in 2021.

Bur Oak Problems Grant Awarded

In 2021, KFS and the Nebraska Forest Service received a multi-state Landscape Scale Restoration grant from USDA Forest Service to assess and respond to impacts on bur oaks in the Great Plains. This project is the initial phase of a broader program to improve bur oak resiliency by examining herbicide injury and damaging oak galls.

This first phase will focus on priority landscapes in Nebraska and Kansas, encompassing multiple forest resources including woodlands, rural community forests and conservation and shelterbelt plantings. A stakeholder survey and herbicide symptom documentation and tissue tests will provide information about the extent of bur oak damage by these threats. Seed sources that are potentially resistant to galls will be identified, with test plots established with a long-term outcome of improved bur oak lines.

Initial activities also include assessing impact from three different gall-forming insects (*Disholcaspis quercusmamma*, *Andricus quercusfrondosus*, *Callirhytis flavipes*).

In the photo to the right, bark stripping from woodpeckers seeking wasp larvae has caused signigicant damage to this young bur oak. In the photo below, distortion of bur oak growth is caused by a gall wasp.

Pine Wilt

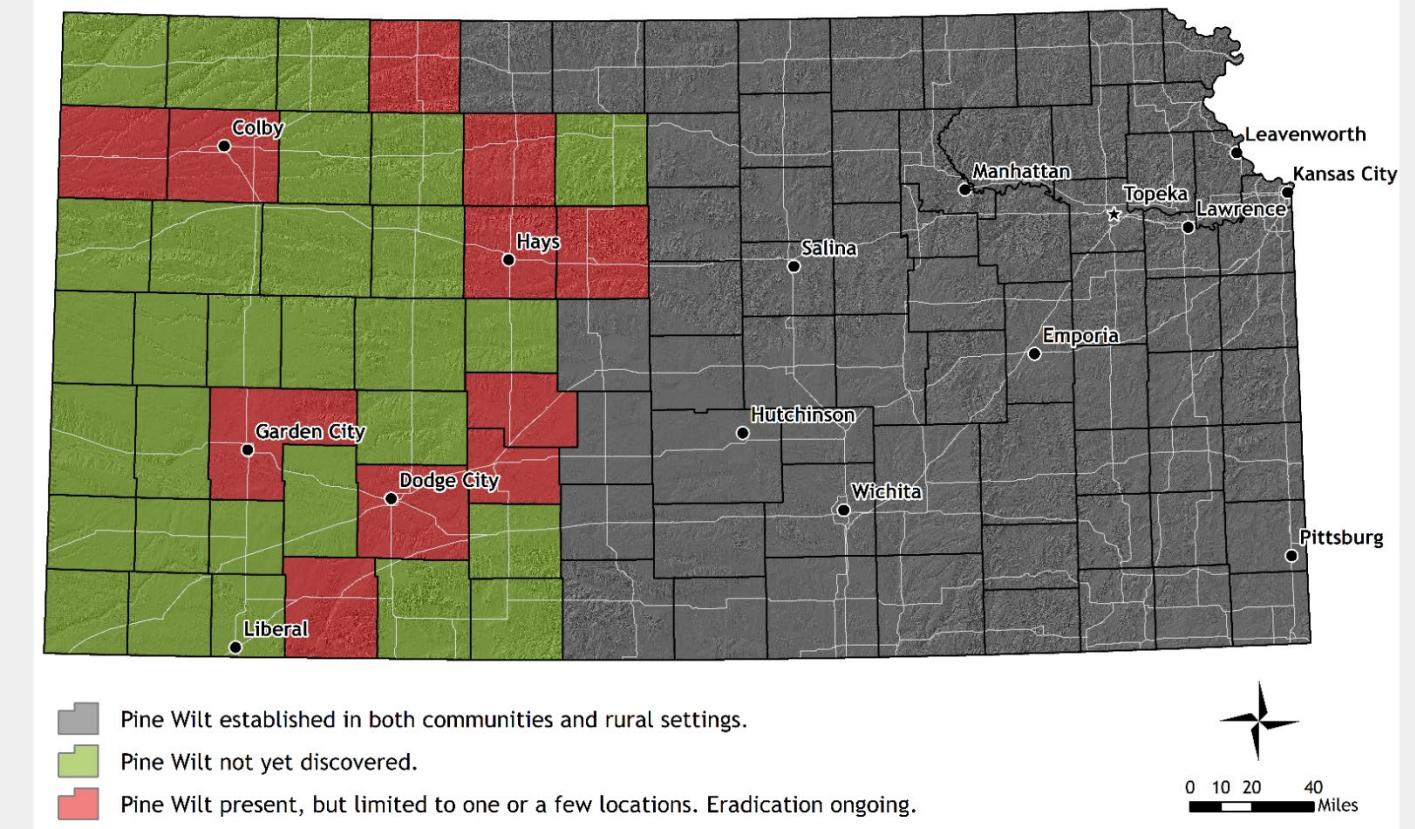
Pine wilt is caused by a plant parasitic nematode called the pine wood nematode, *Bursaphelenchus xylophilus*. The nematode is vectored by the pine-sawyer beetle, a long-horned borer in the genus *Monochamus*. They kill pine trees by feeding and reproducing in the resin canals of the branch and trunk.

This disease is continuing to spread westward, frequently damaging and causing high mortality in windbreaks and conservation plantings containing Austrian pine (*Pinus nigra*) and Scotch pine (*P. sylvestris*).

Eradication efforts continue in Goodland (**Sherman County**), Almena (**Norton County**) and Hays (**Ellis County**) among others.

Scotch pines showing typical pine wilt symptoms, in Hutchinson (Reno County). Nearby healthy pines can remain in the landscape longer with timely removal of symptomatic dead trees.

In February 2020, a survey partnership between the Kansas Department of Agriculture (KDA) and Kansas Forest Service did not find any pine wilt positive trees in a comprehensive survey of more than 27,000 pines in Decatur, Ellis, Ford, Gove, Graham, Gray, Hodgeman, Norton, Osborne, Rooks, Sheridan, and Trego counties.



Diplodia Tip Blight and Dothistroma Needle Blight

Often mistaken for pine wilt symptoms, two common foliar diseases of pines saw sustained impact in Kansas in 2021. Recent environmental conditions, especially wet weather in early 2021, meant both of these blights continued to impact susceptible pines.

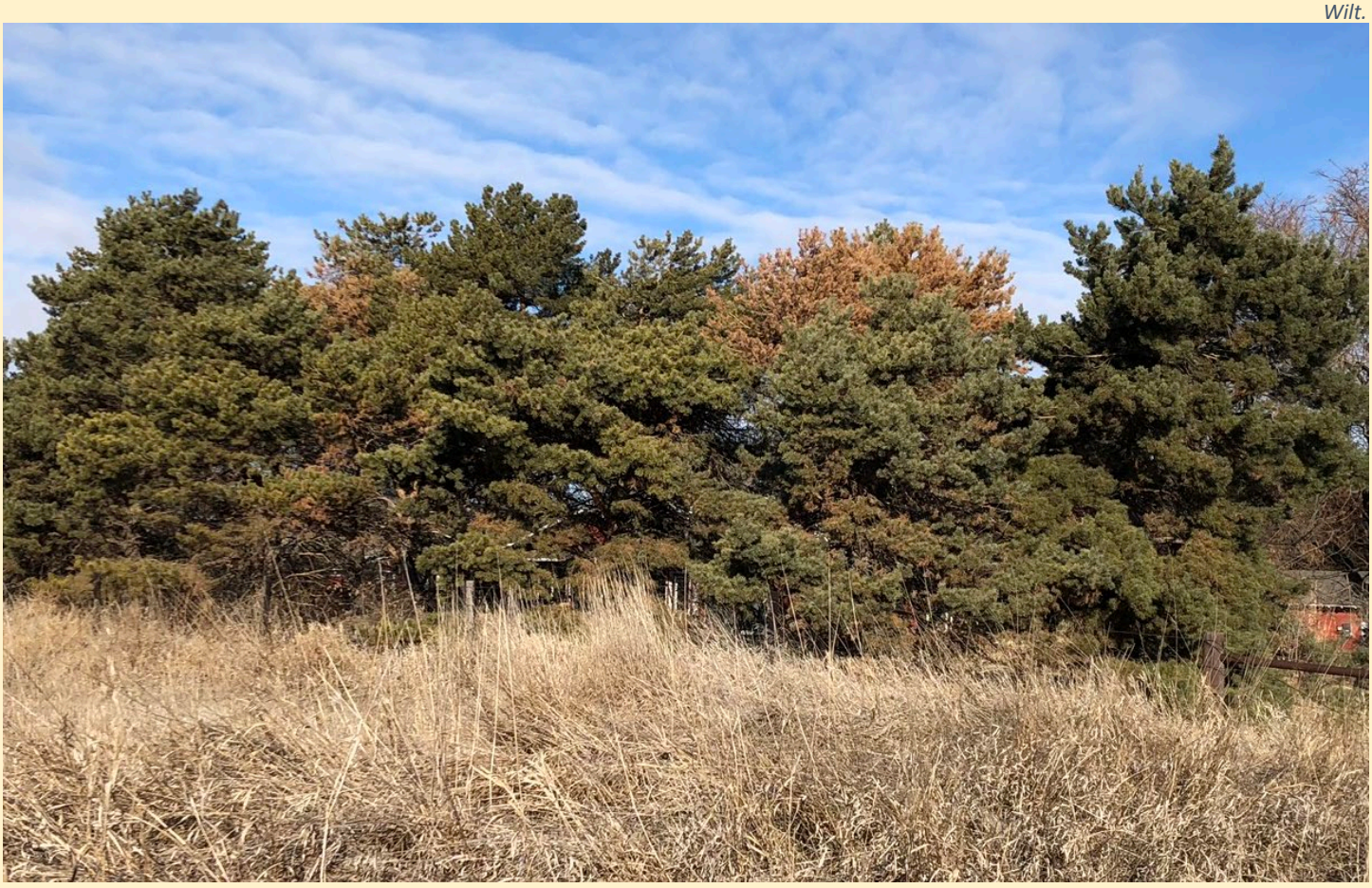
Diplodia Tip Blight, caused by the fungus *Diplodia pini*, is a disease that affects Austrian, ponderosa, Scotch, and mugo pines. This disease is most severe on mature trees, often 20 years or older. While a single infection will not cause mortality, the stress of repeated annual infection over several years can cause decline and death on susceptible trees. Wet spring weather creates an environment conducive to severe infection, and 2021 saw ideal conditions for this disease across much of the state.

Dothistroma Needle Blight, caused by the fungus *Dothistroma septospora*, is a serious foliar disease of Austrian and ponderosa pines, especially in high-density plantings like windbreaks. This disease causes premature needle drop the year after infection, leading to thin, sparse canopies on impacted trees. These sparse branches are less able to maintain tree vigor, and can lead to tree death over several years.

Needle Blight tends to be fairly common in eastern Kansas where sustained wet weather is more common, which facilitates this disease persisting in the landscape, but wet weather in late spring in western Kansas led to widespread impact from Needle Blight.

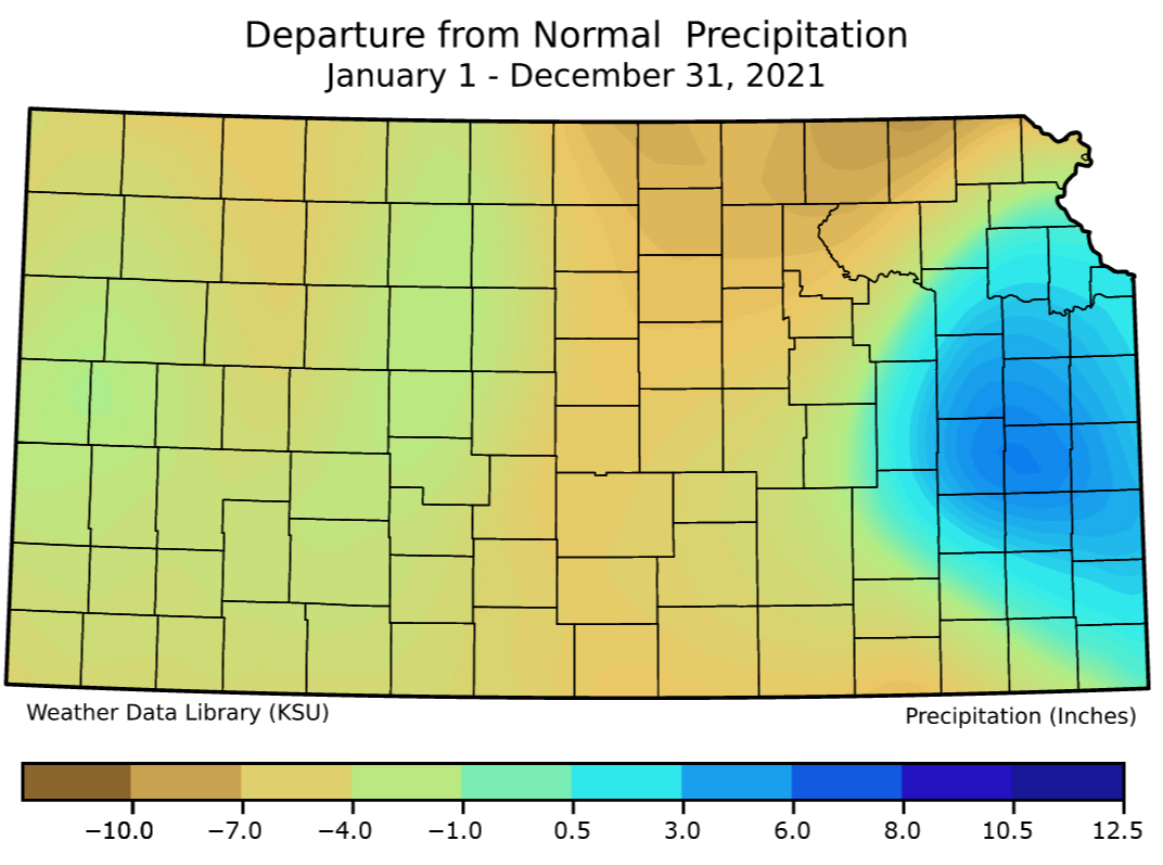
Typical symptoms of Diplodia Needle Blight on these Austrian pines in Quinter, pictured above.

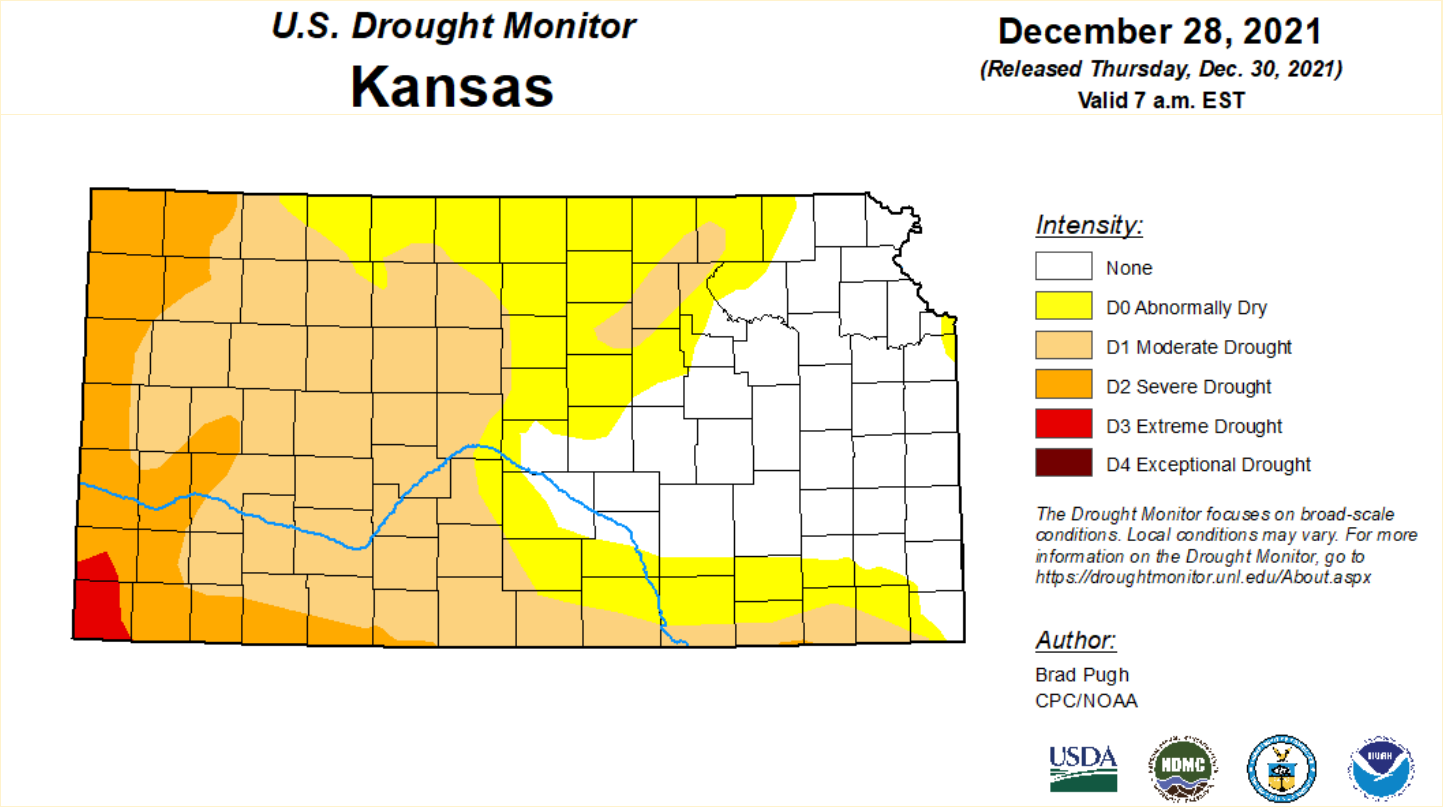
These pines in Norton, pictured below, are typical of mature windbreaks with poor air circulation, creating an environment conducive for decline associated with Dothistroma Needle Blight and Diplodia Tip Blight. Samples were negative for Pine Wilt.



Abiotic and Environmental Stress

While 2021 started with persistent dry conditions across the state, heavy rains resulted in the fourth wettest March on record, with more than twice the normal rainfall for that month, a pattern which continued with a wet May and June. July and August were cooler than usual. Dry conditions began to set in through the end of the year, and most of Kansas ended 2021 in drought status, according to data from the United States Drought Monitor.



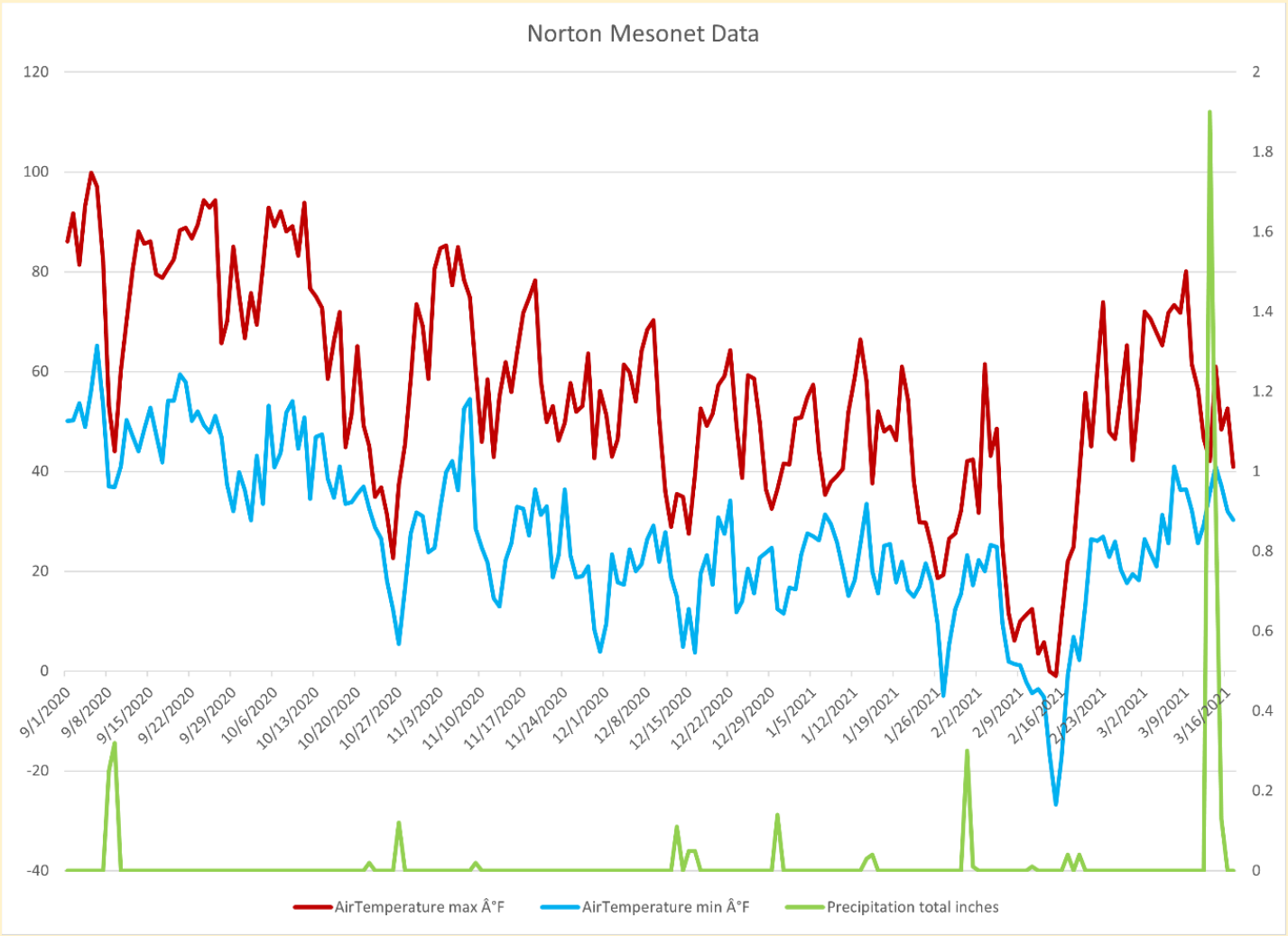


Severe Weather

Eastern redcedar mortality, such as this windbreak in Norton County, was associated with the severe temperature swings in February 2021.

The deep freeze that impacted much of the country in mid-February had a wide impact on trees throughout Kansas. Many trees were slow to leaf out or suffered top dieback, including Shumard oaks in south-central Kansas.

Mesonet data from Norton County shows that it was as warm as 62 degrees F on Feb 3, then it dropped to -27 F on the 15th, then back to 74 degrees on the 24th. That large swing, coupled with nearly zero measurable precipitation in Norton County between mid-September and mid-March, likely contributed to dieback becoming visible early in the summer.



Windstorm and Fires

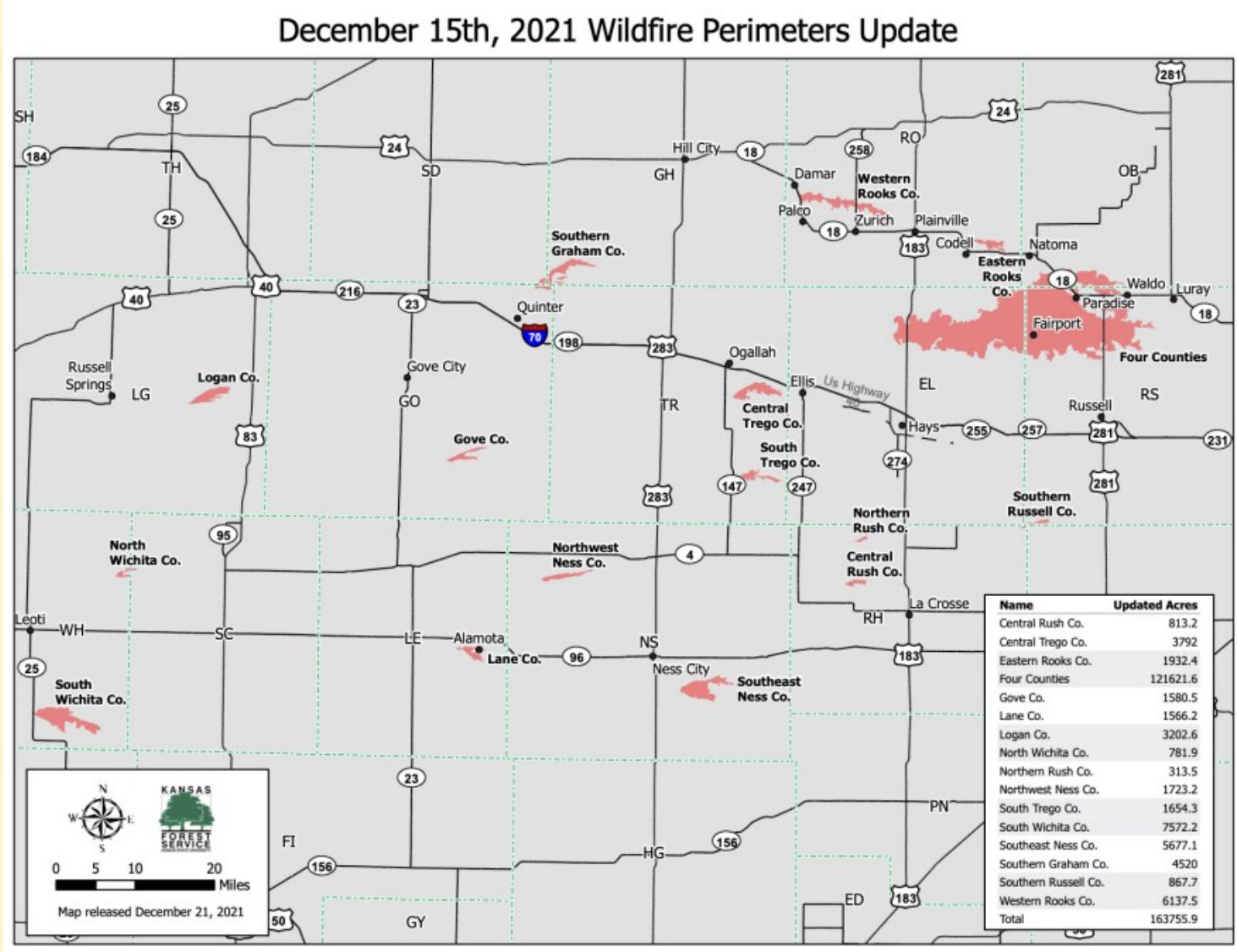
On December 15, Kansas experienced a state-level emergency event when winds gusted from 80 to 100 mph across the region, causing significant damage to structures and trees – and driving intense fire activity, especially in northwest Kansas.

The widespread wind event impacted community forests throughout the state, and also led to widespread power outages caused both by wind action on transmission lines and numerous trees failing and contacting lines.

While information is still being gathered at time of publication, it's clear that in addition to the significant losses of structures, fences, infrastructure, livestock, and more suffered by Kansans, there were many miles of mature windbreaks that were destroyed.

Pictured at right: a large tree toppled in Garden City by the high wind.

Map below: some of the many fires driven by extreme weather on December 15, 2021.



A windbreak completely destroyed by wind-driven fires of December 15. Foresters are assisting landowners with planning for windbreak recovery.

Kansas Forest Service District Foresters are working to assist landowners impacted by fires with planning for renovation or replanting of windbreaks damaged or destroyed by the fires of December 15.

Invasive Bush Honeysuckle

Bush honeysuckle has created a solid monoculture in the understory of this riparian forest along the South Fork of the Ninnescah River in Pratt. Local efforts to control this invasive plant have been supplemented by a backpack mistblower KFS placed with the Pratt Co. Noxious Weed Dept.

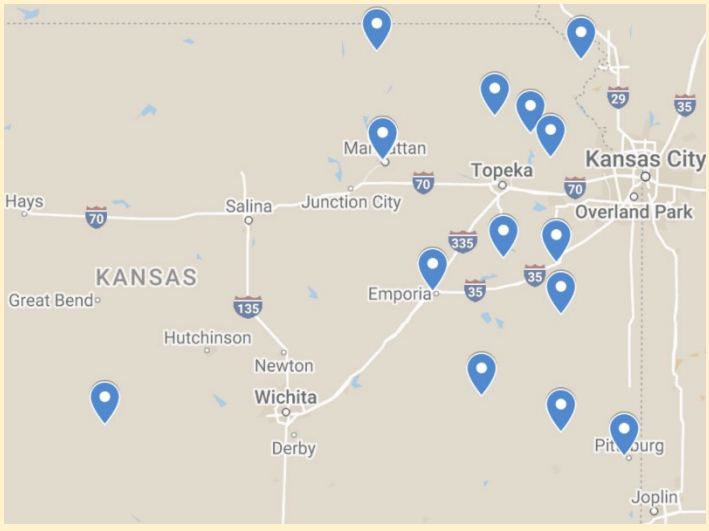
The non-native bush honeysuckles (*Lonicera maackii*, *L. tatarica*, and *L.* x *bella*) and their vine counterpart, Japanese honeysuckle (*L. japonica*) have invaded many woodlands, forests, and nature preserves causing declines in species diversity and richness of native ground cover and mid-story vegetation.

Honeysuckle infestation can be ascribed, in part, to their adaptability to a wide variety of habitats and spread as a result of being a prolific producer of seeds (bush honeysuckles primarily) that are easily dispersed by birds.

Asian bush honeysuckle possesses rapid aboveground and belowground growth, is adapted to low-light environments, begins growth earlier and can continue growing later in the growing season than most other woodland species.

Urban woodlands around **Wichita**, **Topeka**, and the **Kansas City** metro area continue to implement management efforts to combat these invasive shrubs and vine. Some land managers have been utilizing backpack mistblowers for control, which show promise in economical, effective control of this forestland invader.

The Kansas Forest Service provides mistblowers on loan to landowners for no charge, in order to facilitate treatment of infestations in late fall, when off-target impact is minimized and control of bush honeysuckle has been shown to be highly effective.



There are now 15 mistblowers across eastern Kansas, hosted by local partners, making these valuable tools available to landowners for use in treating Bush Honeysuckle.

Invasive Callery Pear

Invasive callery pear seedlings are visible (white flowers) in this photo from near Ottawa (Franklin County). Unlike the eastern redcedar also pictured, the callery pear seedlings are not easily controlled with prescribed fire, and present a significant management challenge.

Callery pear (*Pyrus calleryana*) was introduced to the United States from China in 1917 as an ornamental tree. Starting in the 1950s with the introduction of the popular cultivar 'Bradford', these small trees have been widely planted in landscapes across the country. New cultivars brought cross-pollination of previously sterile 'Bradford' flowers, and birds widely distributed the now-viable seeds where they became established in undermanaged margins and interfaces between forestland, urban areas, grasslands and "waste" areas. Callery pear's prolific ability to resprout, tolerance of a wide range of environmental conditions, and dense shade cast by its canopy, has led to a rapid infestation and conversion of previously diverse ecosystems into a virtually impenetrable monoculture of callery pear seedlings and trees in a short time.

A thorny callery pear seedling, one of many throughout natural areas in this park in Shawnee County, has been marked for herbicide

Evidence shows that callery pear seedlings are becoming established in important ecosystems such as the tallgrass prairies and gallery forests of the Flint Hills and the remnant post oak savannah forestland of the Cross Timbers. Unlike states to the east of Kansas, from Missouri to Indiana, where infestations are widespread and well-established, Kansas is early in the callery pear infestation stage.

Supported by USDA Forest Service competitive grant funding, a survey was conducted in 19 Kansas counties with almost 80 positive sightings before being postponed due to the emerging COVID-19 pandemic in March 2020. The survey was finished in early 2021 to cover additional eastern Kansas counties.

Current mapping shows that callery pear infestations have been recorded in at least 50 Kansas counties, essentially every county in the eastern half of the state, and as far west as Greensburg. However, many of these populations may be small enough that early treatment of these seedlings may avoid dense, mature infestations in the future.

This pasture in rural Geary County has been completely overtaken by callery pear seedlings, and serves as a seed source threatening adjacent tallgrass prairie in the Flint Hills. Efforts to control these seedlings with mechanical/chemical means have been challenging.

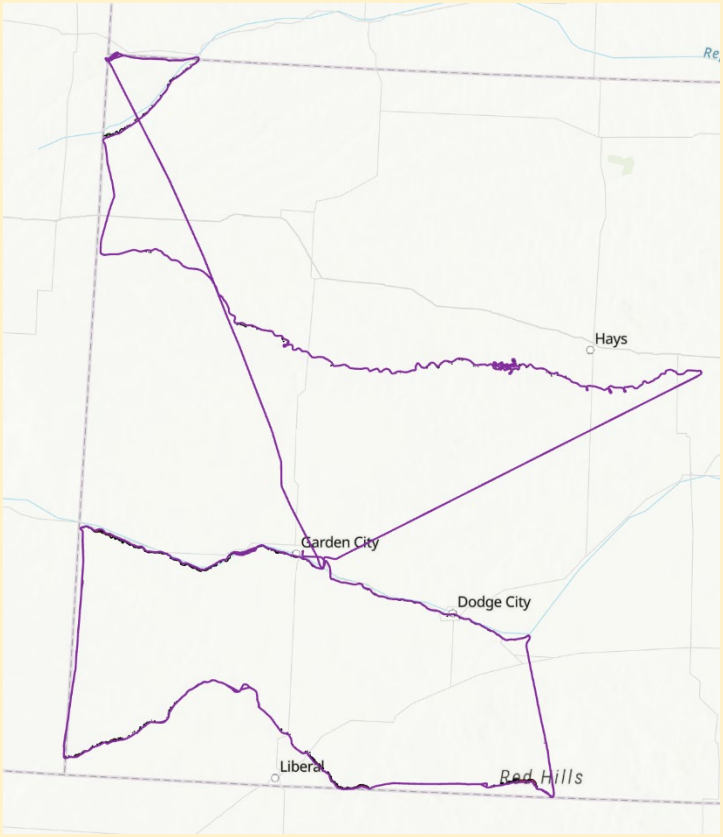
Aerial Survey for Tamarisk & Russian-Olive

A significant stand of russian-olive is visible along the central portion of the dry channel of the Arikaree River in northwestern Cheyenne County.

In 2021, for the first time, aerial survey was flown in Kansas for forest health purposes, to help assess and map infestations of tamarisk and Russian-olive in western Kansas. The Arikaree, Smoky Hill, South Fork of the Republican, Arkansas, and Cimarron Rivers were surveyed as they crossed 15 counties in western Kansas. This was the first update to tamarisk location data since 2004, and the first time Russian-olive has been mapped on a landscape scale.

On July 7-8, a US Fish and Wildlife survey plane (Quest Kodiak) was flown at approximately 500-700' AGL (above ground level) over the river courses of interest at approximately 80-100 knots. One USDA Forest Service employee mapped Russian-olive, and one Kansas Forest Service employee mapped tamarisk. Areas with the plant of interest were recorded by drawing either a polygon (of at least 1 acre) or recording an individual point, using tablets equipped with the Digital Mobile Sketch Mapping (DMSM) software.

Results of this survey were summarized in a document available on the KFS website, and were provided to partners to help prioritize local projects on the ground.



Above, tamarisk in flower along the Arkansas River in southwest Kansas.
Right, a map of the flightlines covered in the aerial survey.
Below, a chart with a summary of acres with tamarisk or Russian-olive.

County Summaries (Acres WITH)

County	River	Russian-olive	Tamarisk
Cheyenne	Arikaree	97	14
Cheyenne	SFRR	1720	0*
Logan	Smoky Hill	426	0*
Gove	Smoky Hill	102	41
Trego	Smoky Hill	518	538
Ellis	Smoky Hill	124	5
Hamilton	Arkansas	203	5270
Kearny	Arkansas	34	2845
Finney	Arkansas	0*	1700
Ford	Arkansas	7	320
Morton	Cimarron	0*	2576
Stevens	Cimarron	0*	249
Seward	Cimarron	632	1236
Meade	Cimarron	254	2496
Clark	Cimarron	0*	3413
Comanche	Cimarron	0*	292

**zero acres does not necessarily indicate absence of this species*

Forest Health Threats

Thousand Cankers Disease

A 25-year-old black walnut plantation in northeast Kansas, which is threatened by the potential for TCD to enter Kansas.

This disease complex has **not yet been detected** in Kansas. However, Kansas shares a 200-mile border with Colorado, an infested state, increasing the risk of TCD introduction. With TCD existing as close as Colorado, Kansas is a potential "doorway" to the entry of thousand cankers disease into the native range of black walnut, which would have disastrous consequences both economically and environmentally.

Doniphan, Bourbon, Franklin, Osage, Linn, Leavenworth and Pottawatomie counties contain the largest number of black walnut trees in Kansas.

A recent estimate of economic loss associated with the introduction of thousand cankers disease to Kansas suggests at least **$160 million** over the next 20 years.

TCD trainings occurred throughout the year to arborists, municipalities, and landowners, greatly increasing the detection network and providing further outreach efforts. Walnut Twig Beetle pocket ID cards were distributed to interested parties, including arborists and extension agents.

Walnut twig beetles are visible on this black walnut twig in Loveland, Colorado. Walnut twig beetles have not yet been detected in Kansas

Street-side and on-the-ground visual surveys of black walnut have been conducted across the state. High risk areas of central and eastern Kansas were visually surveyed, where walnut is common and pathways are of concern.

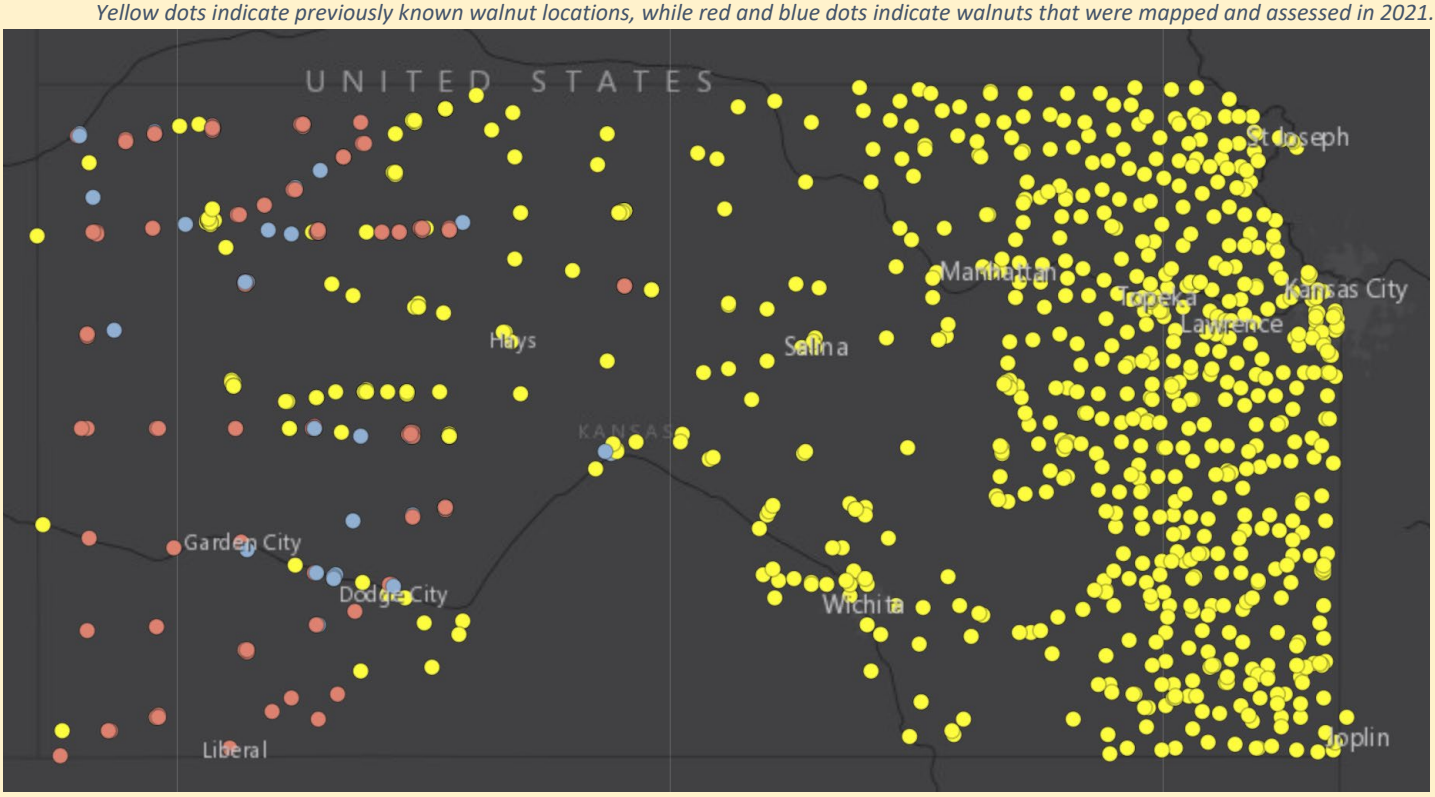
No walnut twig beetle (WTB) specimens have been found in Kansas to date.

In 2020, plans to survey for *Geosmithia morbida* in Kansas were thwarted due to COVID-19, but due to multiple states coordinating a move to deregulate thousand cankers disease associated taxa without a *G*. *morbida* survey, KDA and KFS decided to revisit the subject and coordinate survey objectives prior to the 2021 field season.

A dedicated sentinel site trap program was revived in western Kansas, but was delayed to 2021 due to COVID-19 complications for travel. KFS is currently working on updating and expanding this dataset, originally from 2009/10, that was created to survey for early detection of TCD in Kansas. These "sentinel walnuts" are being located, assessed for condition, and photographed to better track any future canopy decline. So far, 227 trees have had information updated, using ArcGIS Field Maps to collect the information.

The nearest known walnut twig beetle population is in Eads, Colorado, about 40 miles directly west of the Colorado-Kansas border.

So far, 227 walnut trees in western Kansas have been mapped and assessed for canopy condition in an effort to provide early detection of possible TCD related decline, and to enhance and prioritize future trap placement for walnut twig beetle detection. Yellow dots indicate previously known walnut locations, while red and blue dots indicate walnuts that were mapped and assessed in 2021.



Spotted Lanternfly

Spotted lanternfly (SLF) is an invasive pest of a wide range of forest, landscape, and horticultural plants, with the potential to cause significant harm if introduced.

In September 2021, a single dead spotted lanternfly was found in an entomology exhibit at the Kansas State Fair.

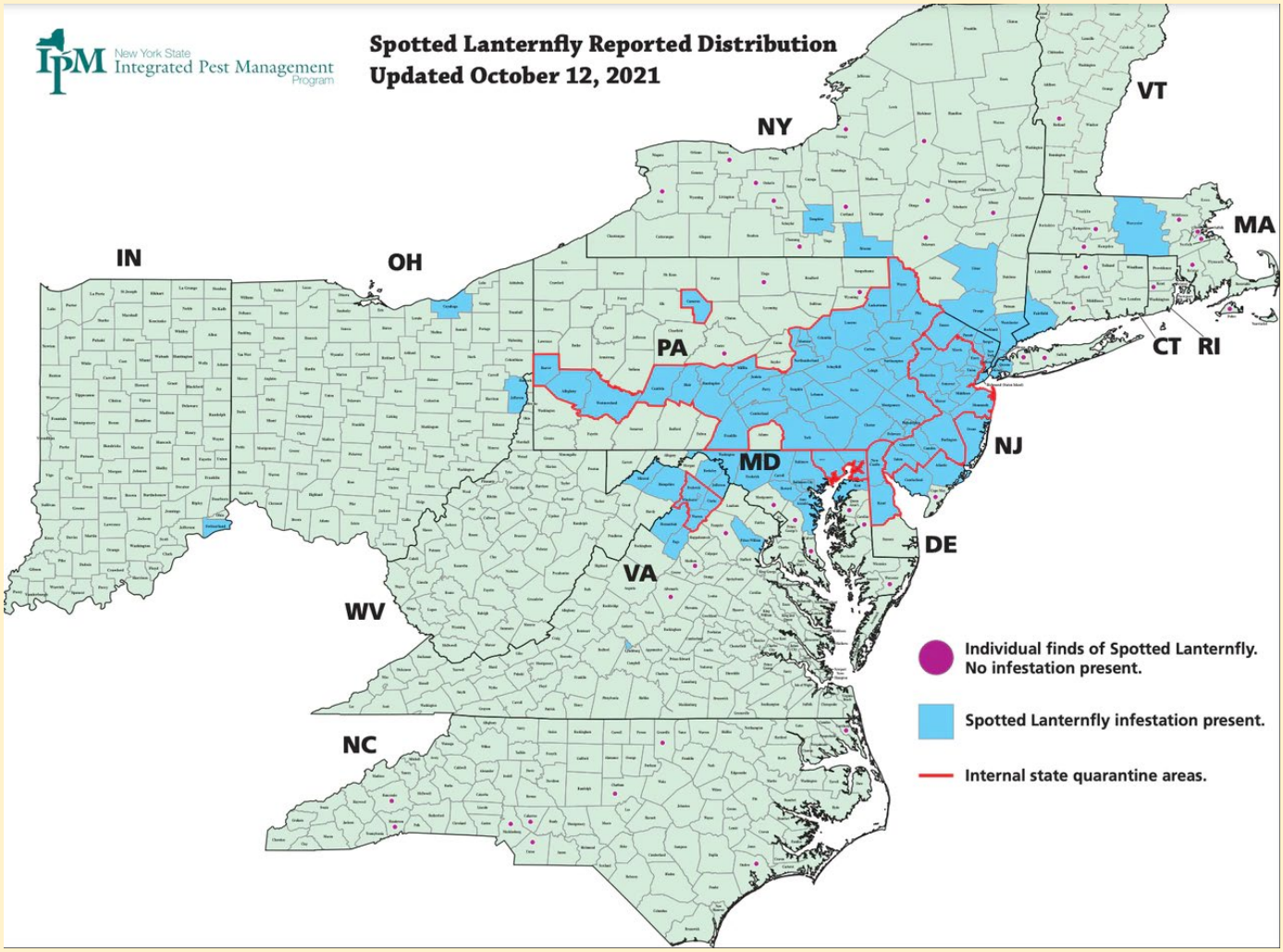
This finding understandably attracted heavy news attention around the country (and even overseas) due to the nature of the circumstances involved.

The individual who made the collection reported finding the somewhat desiccated specimen on the ground in Colby, in northwestern Kansas.

An extensive survey was done by KFS and KDA personnel, with **no SLF found** anywhere in Colby. Large numbers of tree-of-heaven (*Ailanthus altissima*), the preferred host of SLF, were located, however.

Follow-up surveys are planned for Colby and other areas of northwest Kansas in 2022 to ensure no infestation is established there.

Above, several spotted lanternfly adults gather on the trunk of a tree-of-heaven in Pittsburgh, PA. To date, no living spotted lanternfly (of any life stage) have been found in Kansas. The nearest known infestation to Kansas is in southeastern Indiana, as depicted on the map below.



Cottonwoods, the state tree of Kansas, create a tunnel-like canopy over this rural road in Stafford County in the south-central part of the state.

For Forest Health assistance and further information on Forest Health in Kansas, please refer to the following.

Kansas Forest Service

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http://www.kansasforests.org

USDA Forest Service – Rocky Mountain Region

Forest Health Protection (FHP) – Forest Health Monitoring (FHM)

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