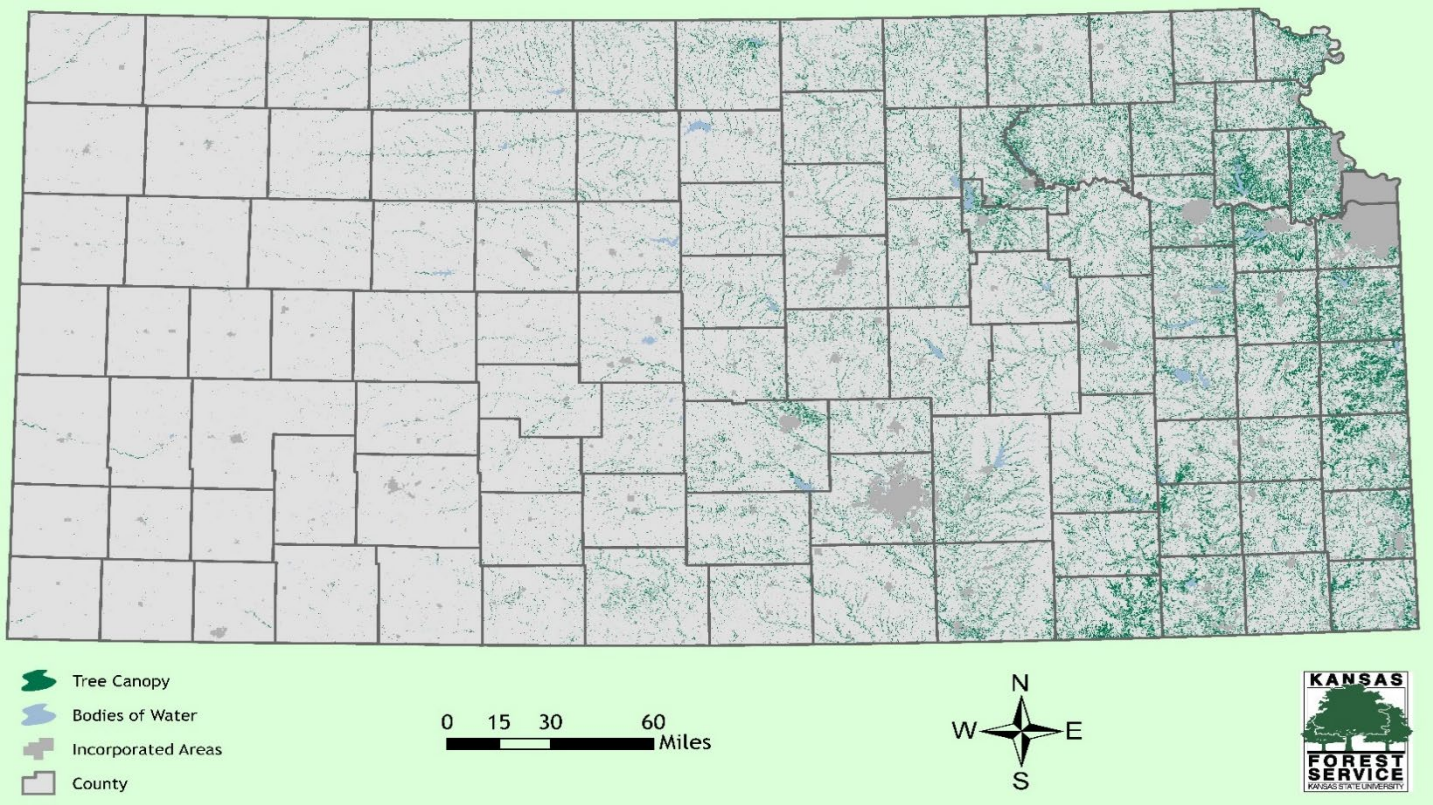
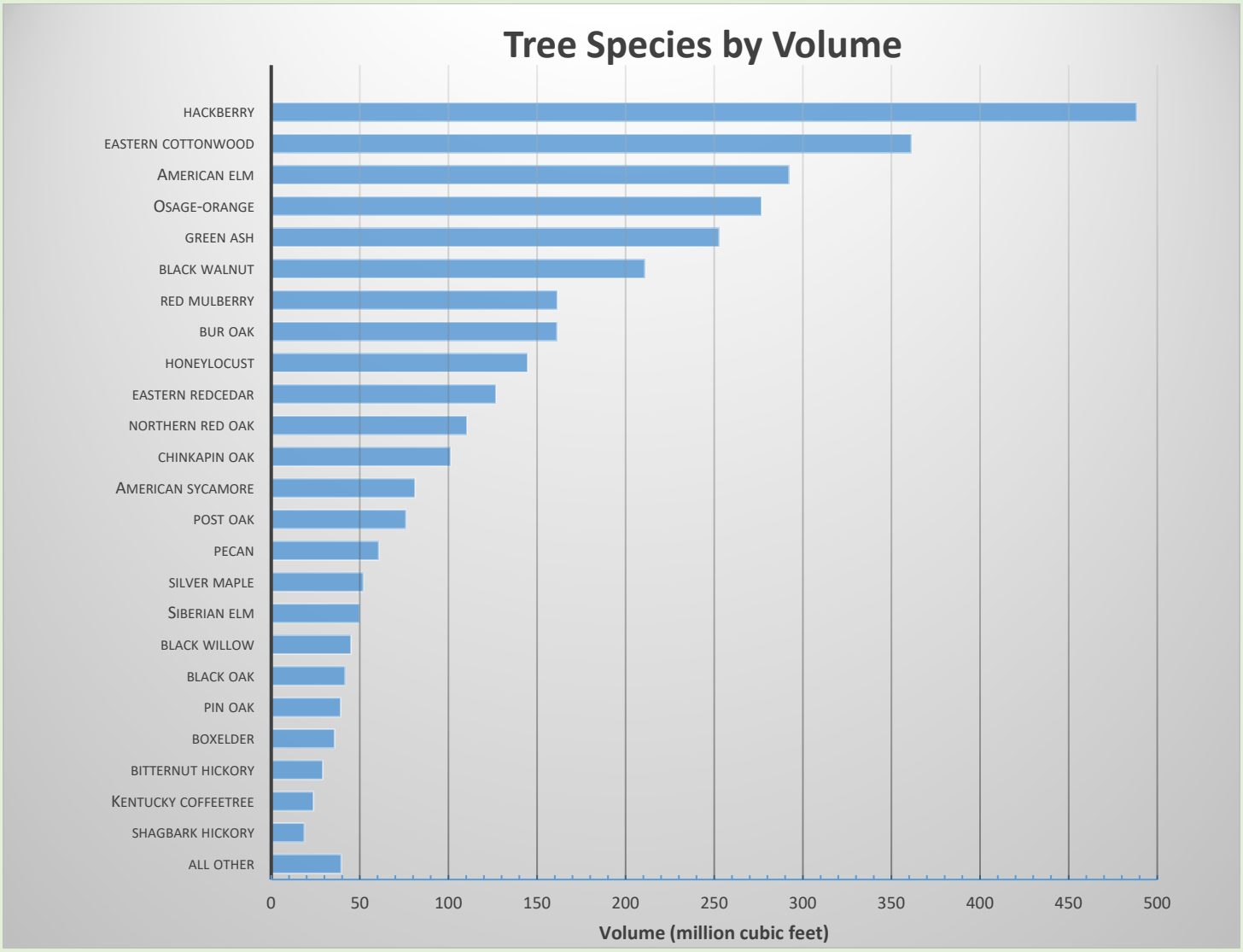
Kansas Forest Health Highlights 2020

The Baldwin Woods Forest Preserve in Douglas County contains nearly 80 species of woody plants, including bur oaks more than 250 years old.

Forest Resources of Kansas

In Kansas, the central hardwood forests transition into the Great Plains, with more than **4.5 million acres of trees**; 2.46 million acres of forest land and an additional 2.1 million acres of trees outside forest land. These forests, which are 92.4% 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 **811 million live trees** (≥1-inch diameter) and nearly **3.5 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

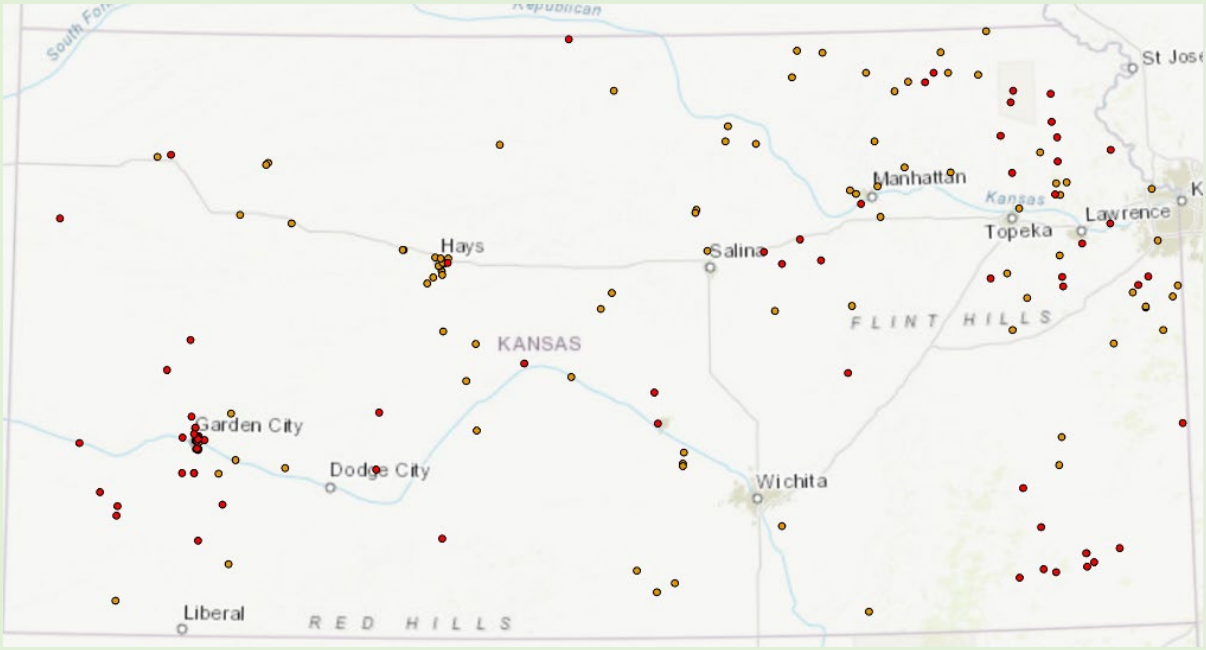
ash, American elm, and Osage-orange. Eastern cottonwood is the second-most voluminous species in the state but ranks 25th in terms of number of trees. While eastern redcedar is 3rd in terms of number of trees, it ranks 10th in volume.

There is about **88 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.

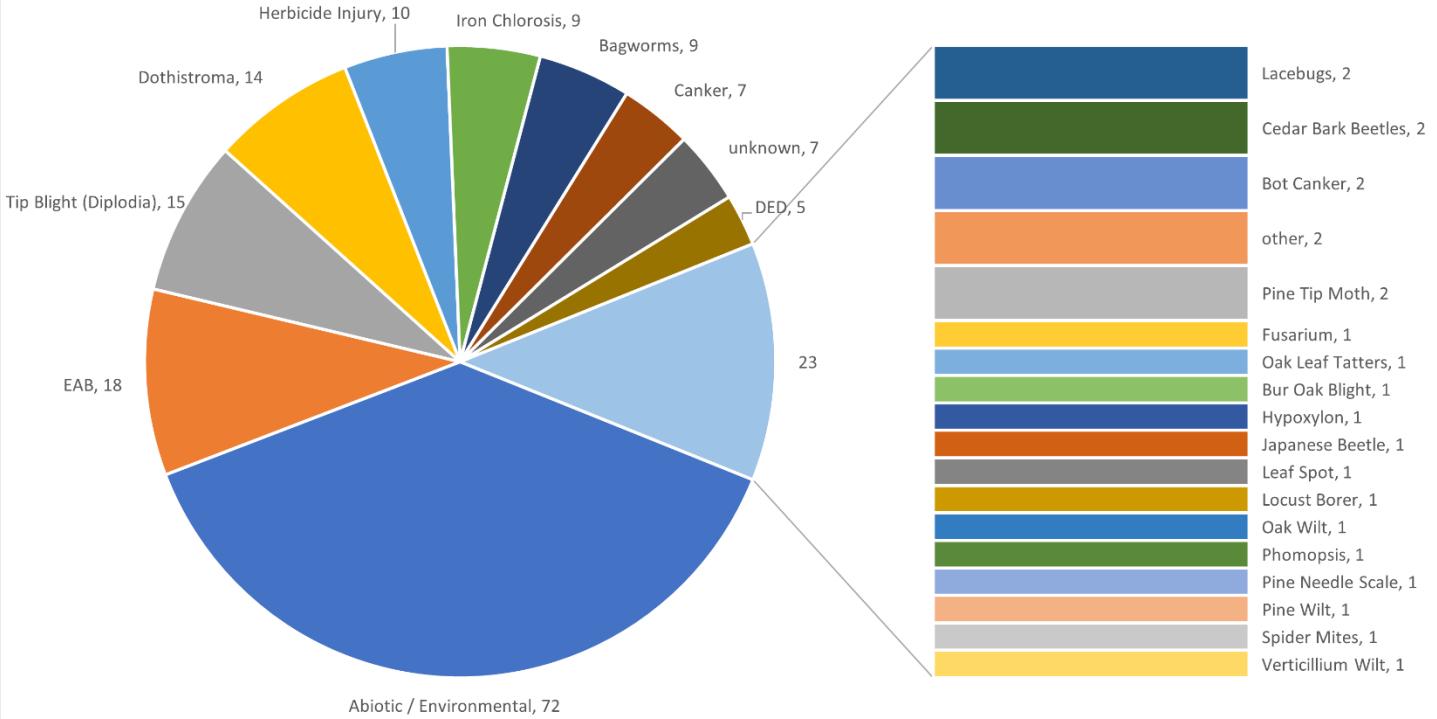


Working with the KFS GIS Specialist and Rural Forestry staff, field foresters are now able to effectively use a Rural Reporting map and the ESRI Collector app, to have the option of reporting I&D diagnosis and/or comments as point data. This data is fairly well distributed across the districts, but it 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, adding to the available data to assess the major forest health threats landowners deal with regularly.

Fewer insect and disease data points were recorded in 2020 then the previous year, likely due to the impact of COVID-19 on foresters' ability to meet with landowners and do diagnostic site visits.

This data is summarized in the chart below, but in general, 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 **cankers**, and **Dutch Elm Disease (DED)**.



Summary of Rural Reporting Insect & Disease Diagnosis between October 1, 2018 and September 30, 2020

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.

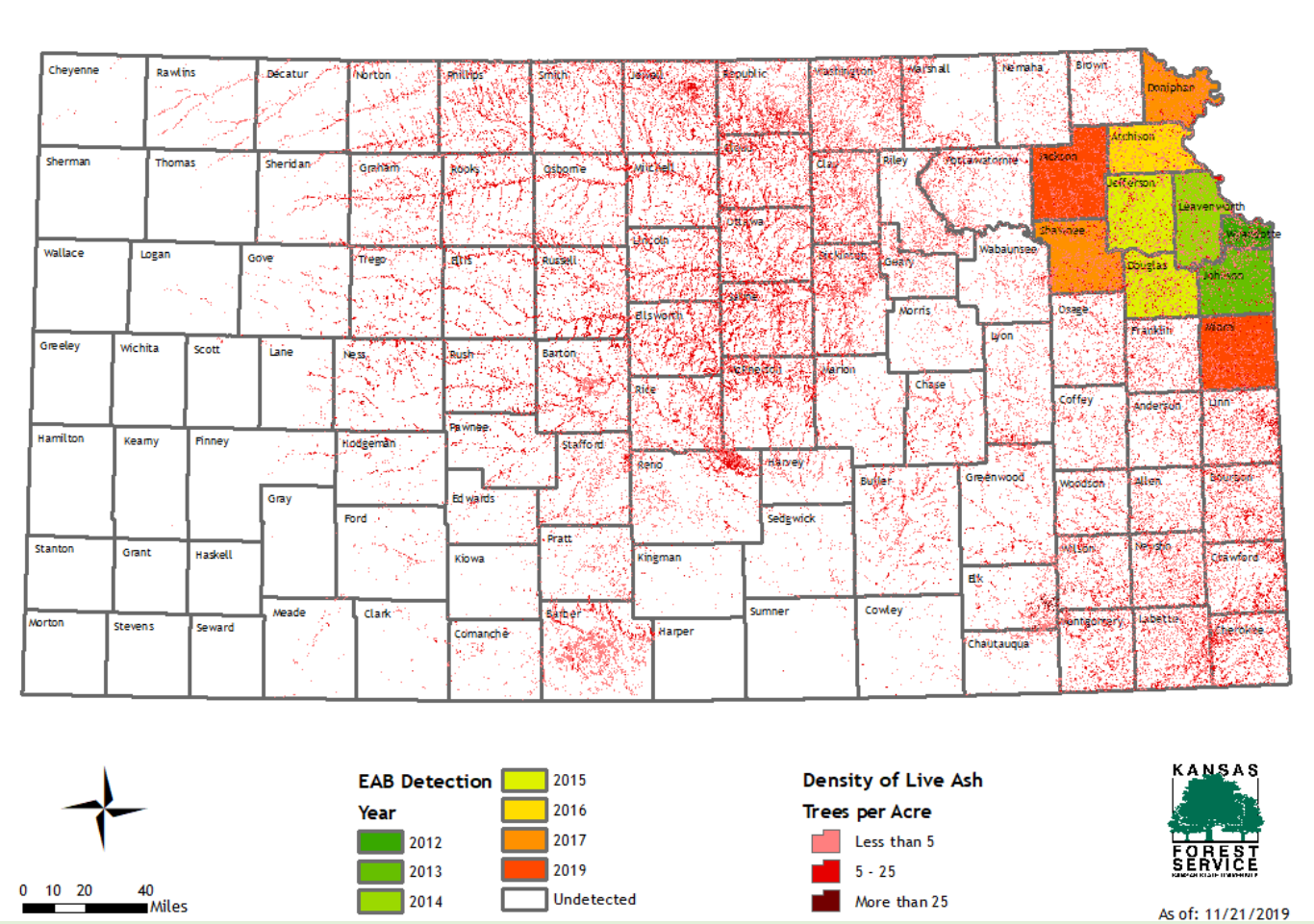
EAB is a pest of all North American ash (*Fraxinus* spp.). Kansas' forest land contains **50.3 million ash trees**, or an average of about 20 trees per acre of forest land. Ash trees account for about **271 million ft^3** of volume, or **8 percent** of total net volume of live trees on forest land. Most 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, **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 ontinued to increase in both rural and urban settings.

Urban green ash showing significant canopy thinning, a common symptom of EAB infestation, in Miami County

Peeling EAB trap trees has proven to be an effective, although time-consuming, method for detection of EAB at sites across eastern Kansas.Trap trees are girdled in spring, then felled and peeled each fall by a partnership of KFS, KDA, and local personnel

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 in 2020. Increased trapping outside previously-infested counties will take place in 2021.



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 fifth 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.

As of March 1, 2021, KDA will be rescinding 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.

A dead green ash with signs of EAB fell across this hiking trail in Johnson County. Mortality of ash has increased in long-infested areas. EAB-killed trees standing along trails, in woodlands, and along parks may pose a hazard to recreational users.

Yellow-bellied Sapsuckers & COVID-19

Early in the 2020 growing season, an unusually large number of landowners contacted Kansas Forest Service personnel with concerns about the appearance of rows of holes on various tree species. These reports were commonly from homeowners, not from rural landowners, and occurred on a variety of tree species. Pines were the most commonly reported tree species with these holes, but reports also include pecans, maples, and more. The diagnosis in the majority of cases was damage typical of feeding by yellow-bellied sapsuckers, a migratory woodpecker present in Kansas from October through April.

Instead of attributing this influx of reports to a significant increase in sapsucker feeding, it may be the case that this is one of the results of many people staying at home more than usual in due to COVID-19. More time at home, in some cases, meant more time taking notice of backyard trees and the usual (but previously unobserved) wildlife on those trees.

In the photo above, a Kansas pecan exhibits horizontal rows of small holes, typical of feeding by yellow-bellied sapsuckers (pictured below, photo credit Johnny N. Dell, Bugwood.org).

Pine Wilt

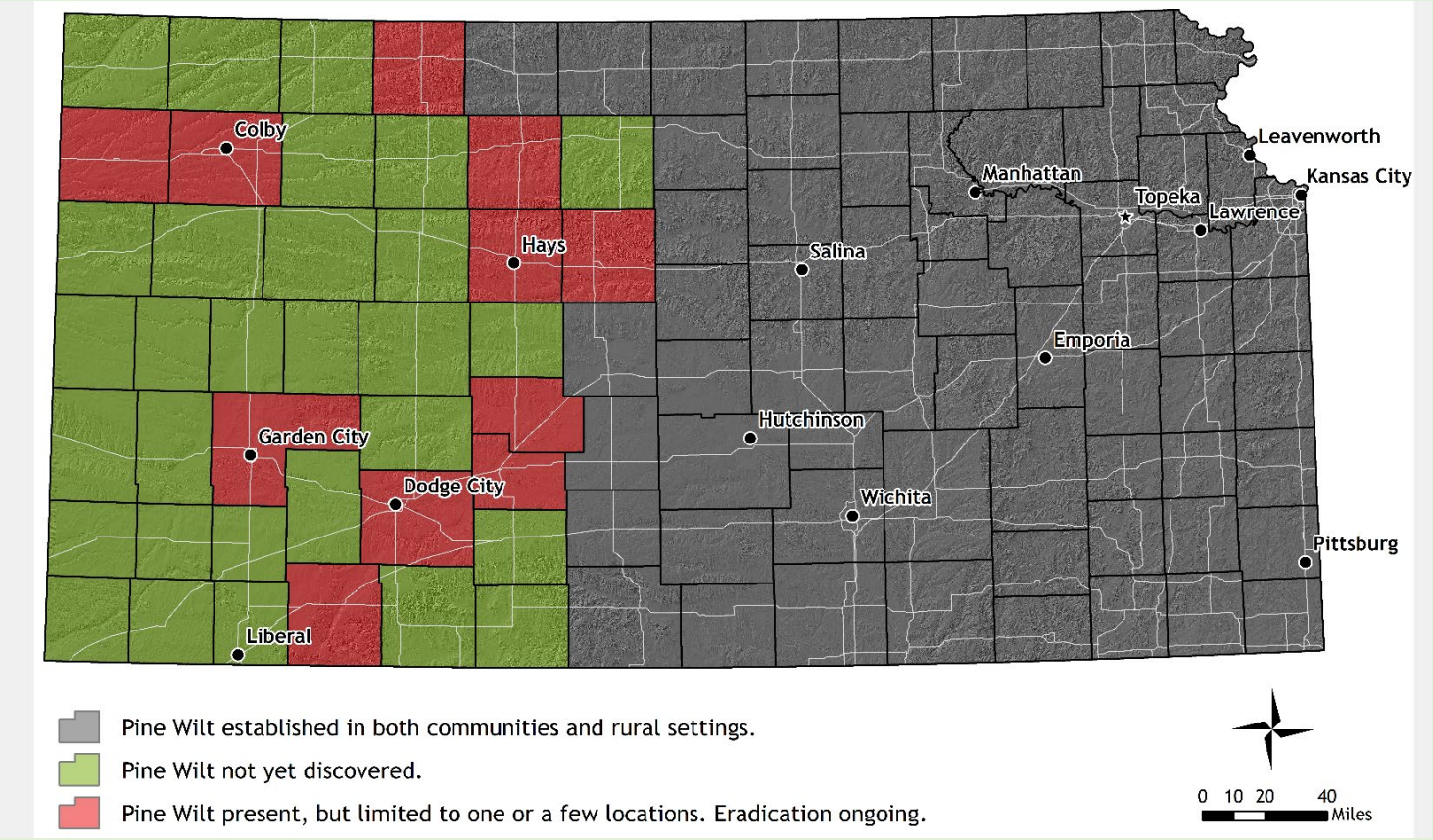
Pine wilt is caused by a plant parasitic nematode called the pine wood nematode, *Bursaphelenchus xylophilus*. The nematode is vectored by the pine-sawyer beetle, a long-horned borer in the genus *Monochamus*. They kill pine trees by feeding and reproducing in the resin canals of the branch and trunk.

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.

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.

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



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 2020. Recent environmental conditions, especially wet weather in 2019 and summer of 2020, 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 2019 saw ideal conditions for this disease across 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.

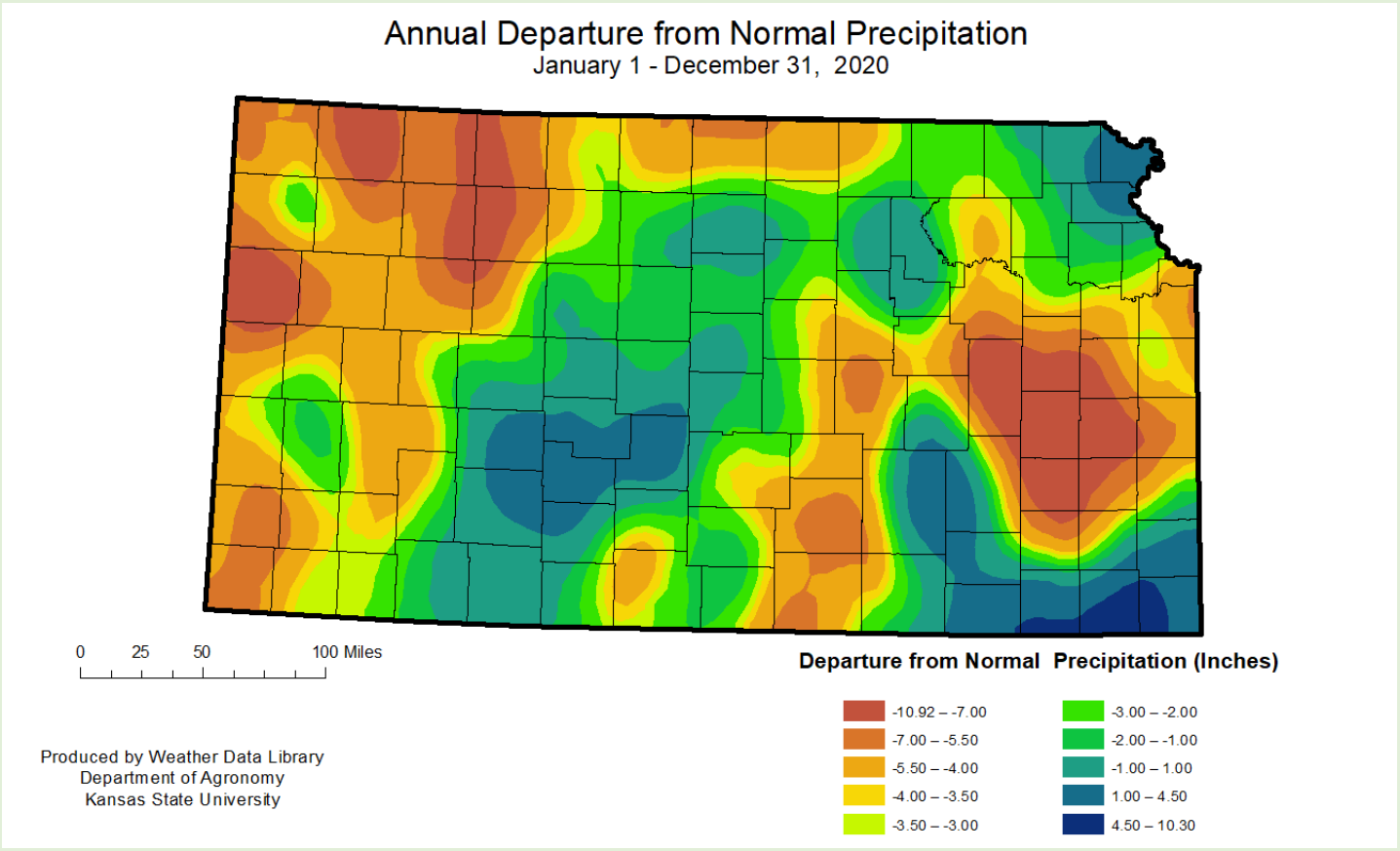
Needle Blight tends to be fairly common in eastern Kansas where sustained wet weather is more common, which facilitates this disease persisting in the landscape, but wet weather in late spring in western Kansas led to widespread impact from Needle Blight.

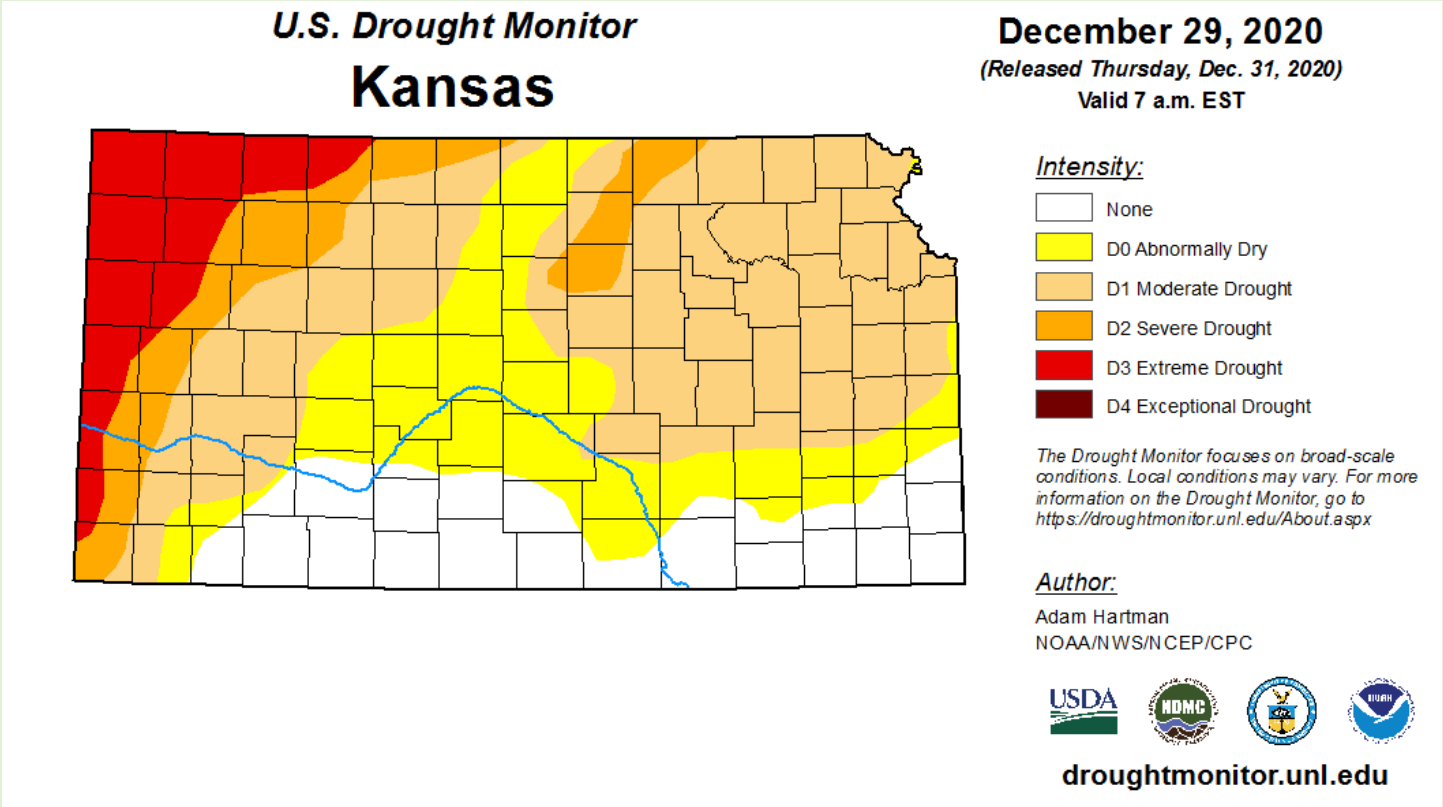
Typical symptoms of Diplodia Needle Blight on these Austrian pines in Quinter, pictured above.

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

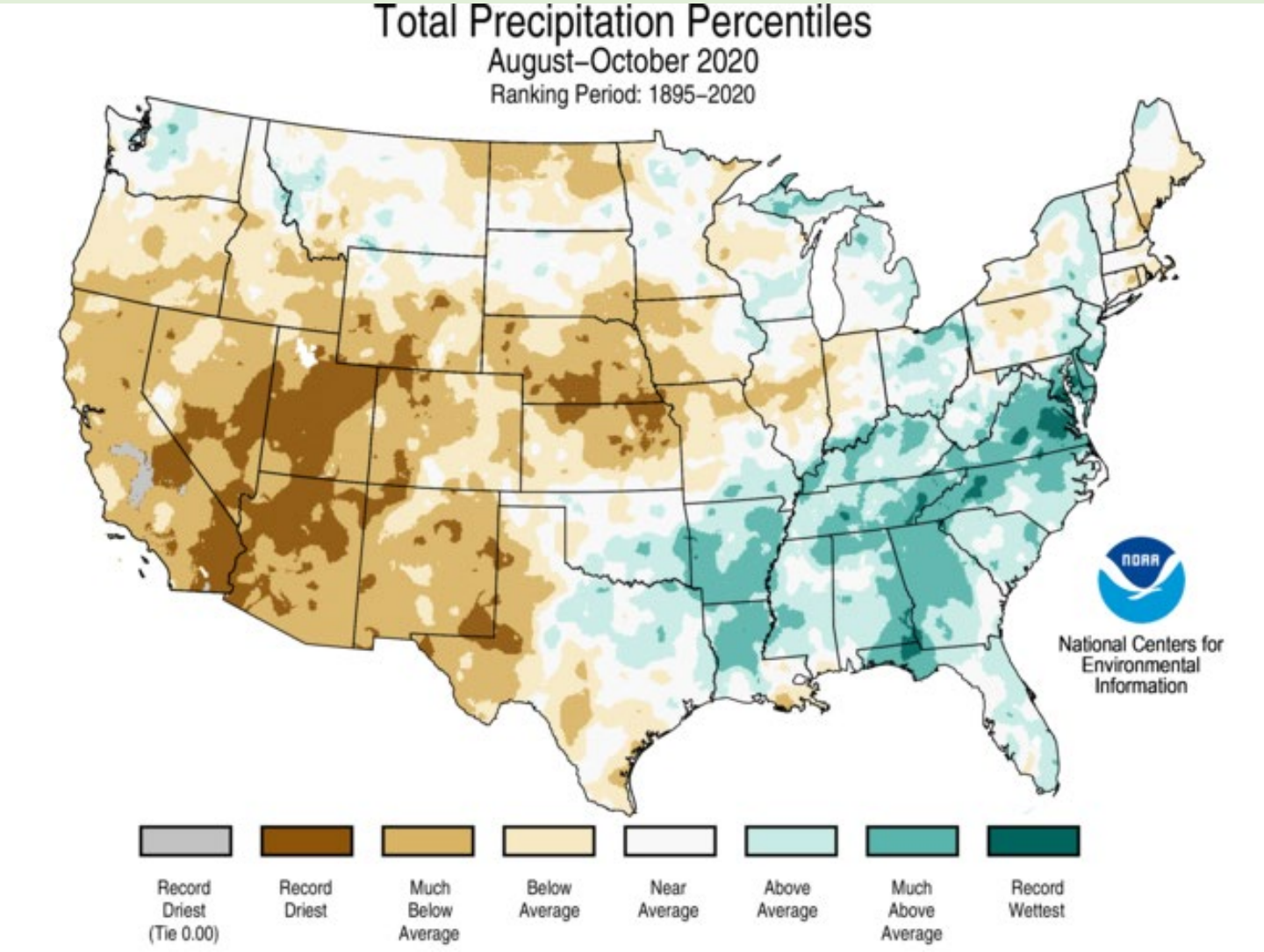
In a change from previous years' weather patterns, the year started with roughly average precipitation in much of the state. April and May were drier than usual in western Kansas, but a wetter June and July brought the state back to an average total of precipitation on the year. Much of Kansas ended 2020 in drought status, according to data from the United States Drought Monitor, driven by a severe lack of precipitation near the end of the summer growing season.





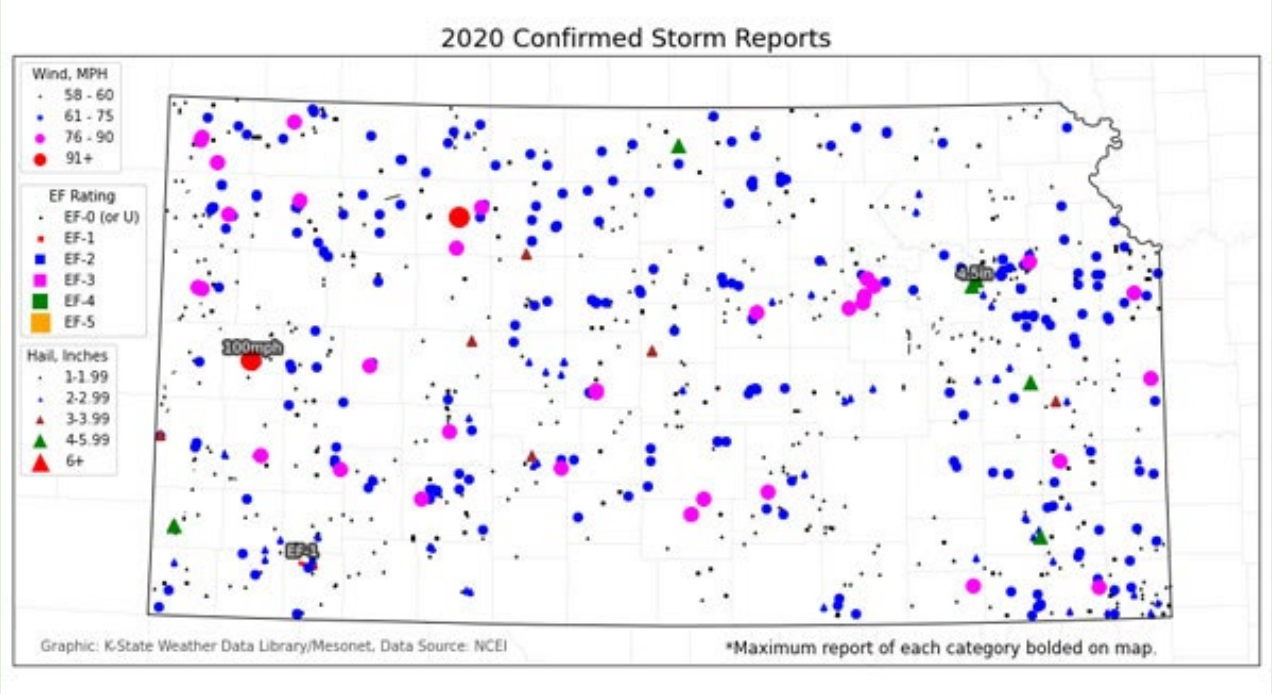
Drought

The three-month period from August through October was one of the driest on record for north-central and northeastern Kansas, with very little moisture available for trees at the end of the growing season. Whether the drought heading into dormancy will have an impact on woody plants for the 2021 growing season is yet to be seen.



Severe Weather

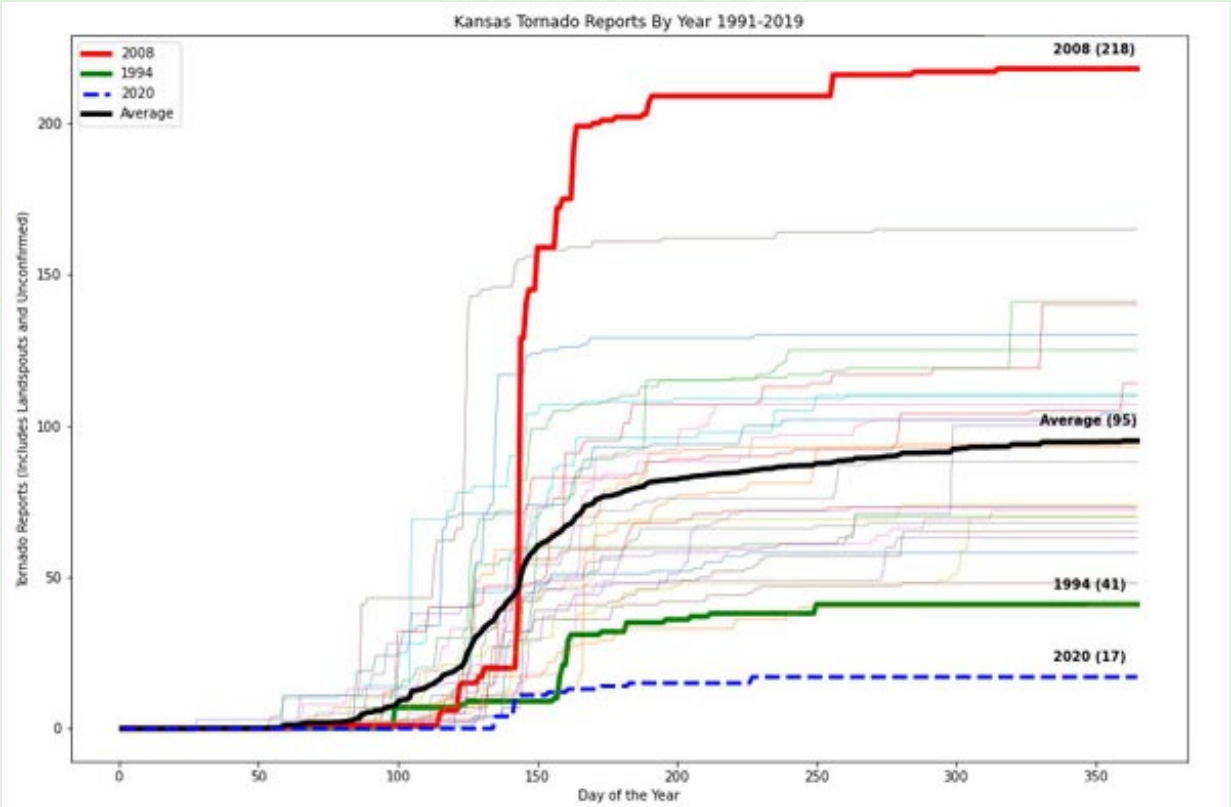
According to FIA data, more than 3,000 acres of Kansas forestland is disturbed annually by weather events. This would include hail, tornadoes, high winds, ice storms, and other typical Kansas storm occurrences. An additional 15,000 acres are disturbed by fire on an annual basis, which does not include beneficial prescribed fire such as oak woodland burning.



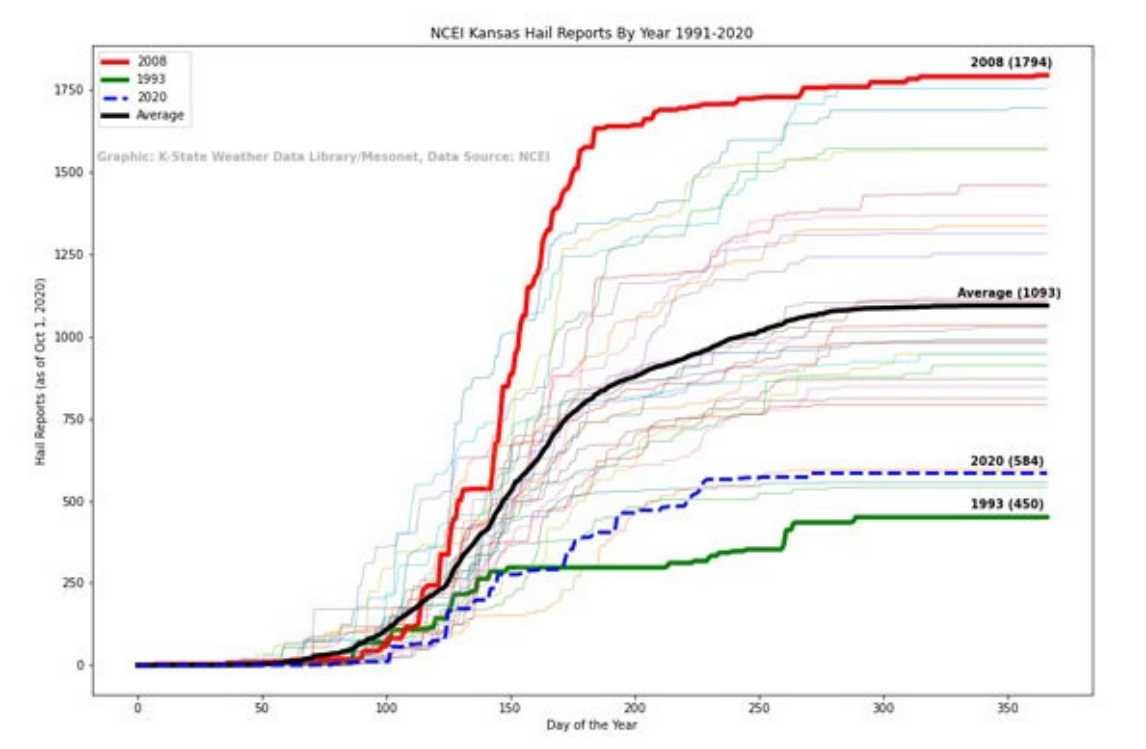
Kansas experienced far below its usual share of severe weather in 2020, although multiple events of winds in excess of 75 mph did damage. One such event occurred on June 21 in Great Bend, where winds in excess of 80 mph caused significant damage to trees and some structures. Communities with high percentages of tree species prone to storm damage, such as silver maple, callery pear, and hackberry are at a higher risk of long-term negative impact to community forest canopy loss than communities with a more diverse and resilient species composition.

Severe tree damage can be seen in these photos from the June 21, 2020 wind event in Great Bend. The 80 mph winds caused widespread damage to the community forest canopy of Great Bend, which has awarded Tree City USA status for 37 years as of 2020.(Photos courtesy KWCH)

Exceptions to the “usual” pattern of severe weather included the phenomenon of very limited tornado activity in 2020. According to a report from the Kansas State Weather Data Library, there are an average of 95 reported tornadoes annually in Kansas. There were only 17 reported in 2020, less than half the number of the previous minimum.



In addition to limited tornado activity, hail activity was sharply reduced from previous years. Some isolated incidents produced very large hail, but overall impact on forest resources appears to be limited in 2020.



Invasive Bush Honeysuckle

Supported by grant funding from the USDA Forest Service and KFS, more than 125 acres of bush honeysuckle was removed from Shawnee Mission Park in Johnson County, Kansas. The photo above shows the significant reduction in honeysuckle density, and increased visibility along a highly used trail in the park. Native species have begun to recover in areas cleared of honeysuckle, although the invasive species may never be eradicated.

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.

A large mistblower was acquired in 2019, available to landowners and agency partners for treating bush honeysuckle infestations

Invasive Callery Pear

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

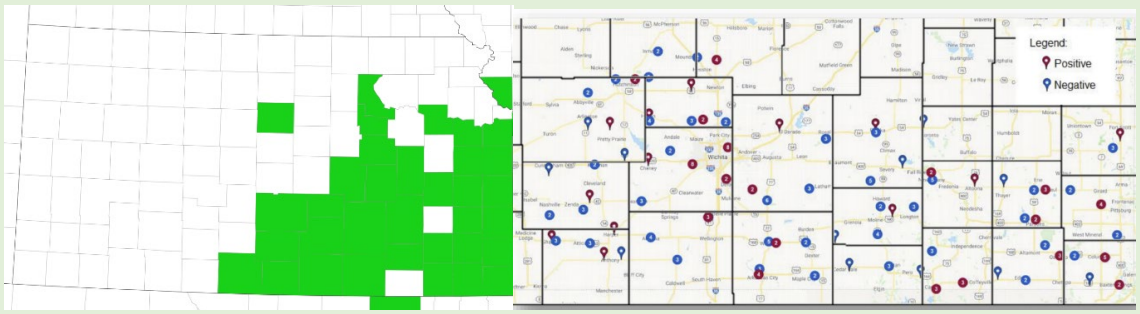
Callery pear (*Pyrus calleryana*) was introduced to the United States from China in 1917 as an ornamental tree. Starting in the 1950s with the introduction of the popular cultivar 'Bradford', these small trees have been widely planted in landscapes across the country. New cultivars brought cross-pollination 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 treatment

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 (map below) before being postponed due to the emerging COVID-19 pandemic in March 2020. The survey will continue in early 2021 to cover additional eastern Kansas counties.

While current mapping (from EDDMapS, map below) shows that callery pear infestations have been recorded in at least 35 Kansas counties, many of these populations may be small enough that early treatment of these seedlings may avoid dense, mature infestations in the future.



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.

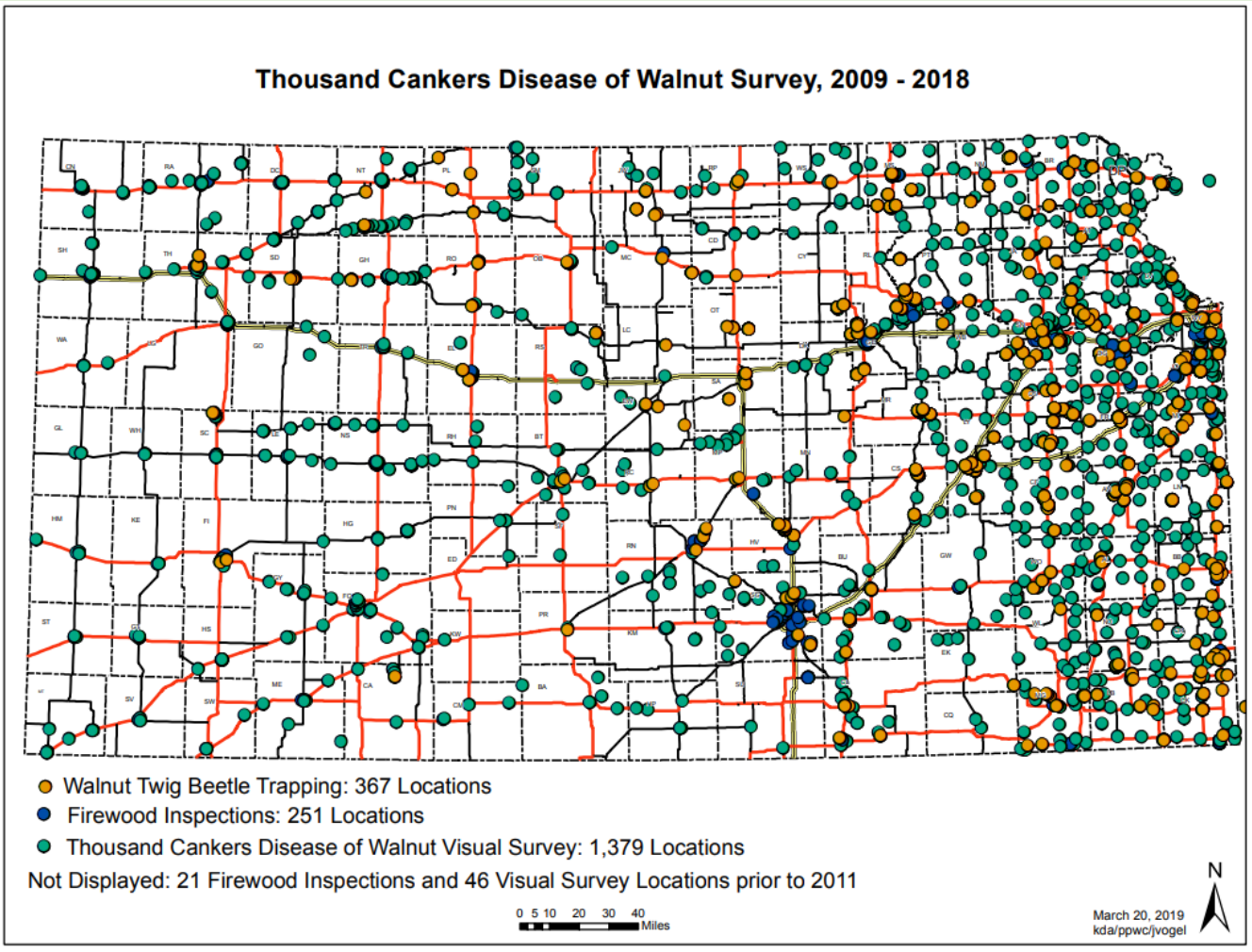
In 2020, pheromone-baited Lindgren funnel traps were placed by KDA at 50 sites across north-central counties: Clay, Cloud, Dickinson, Ellsworth, Geary, Jewell, Lincoln, Marshall, Mitchell, Ottawa, Pottawatomie, Republic, Riley, Saline, Wabaunsee, Washington.

2020 was the third year of using a dry-trapping method, but unlike 2019, there were no issues with excessive water retention in collecting cups or issues with necrophilous Coleoptera. Three bark beetles were collected (all non-target): hackberry engraver (*Scolytus muticus*), banded elm bark beetle (*S. schevyrewi*), and fruit-tree pinhole borer (*Xyleborinus saxesenii*). Of the three species trapped, the latter two are "legacy invasive", or species that have had a long history as an invasive in the US.

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

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 will revisit subject and coordinate survey objectives prior to the 2021 field season.

A dedicated sentinel site trap program was planned to be revived in western Kansas, but was delayed to 2021 due to COVID-19 complications for travel. The nearest known walnut twig beetle population is in Eads, Colorado, about 40 miles directly west of the Colorado-Kansas border.

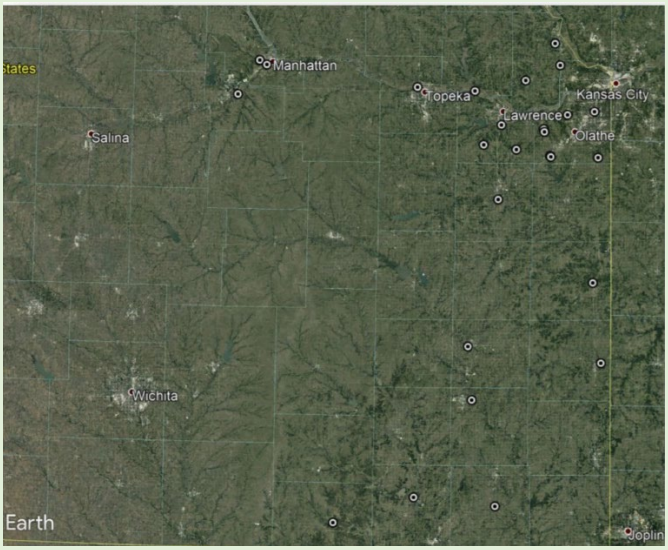


Gypsy Moth

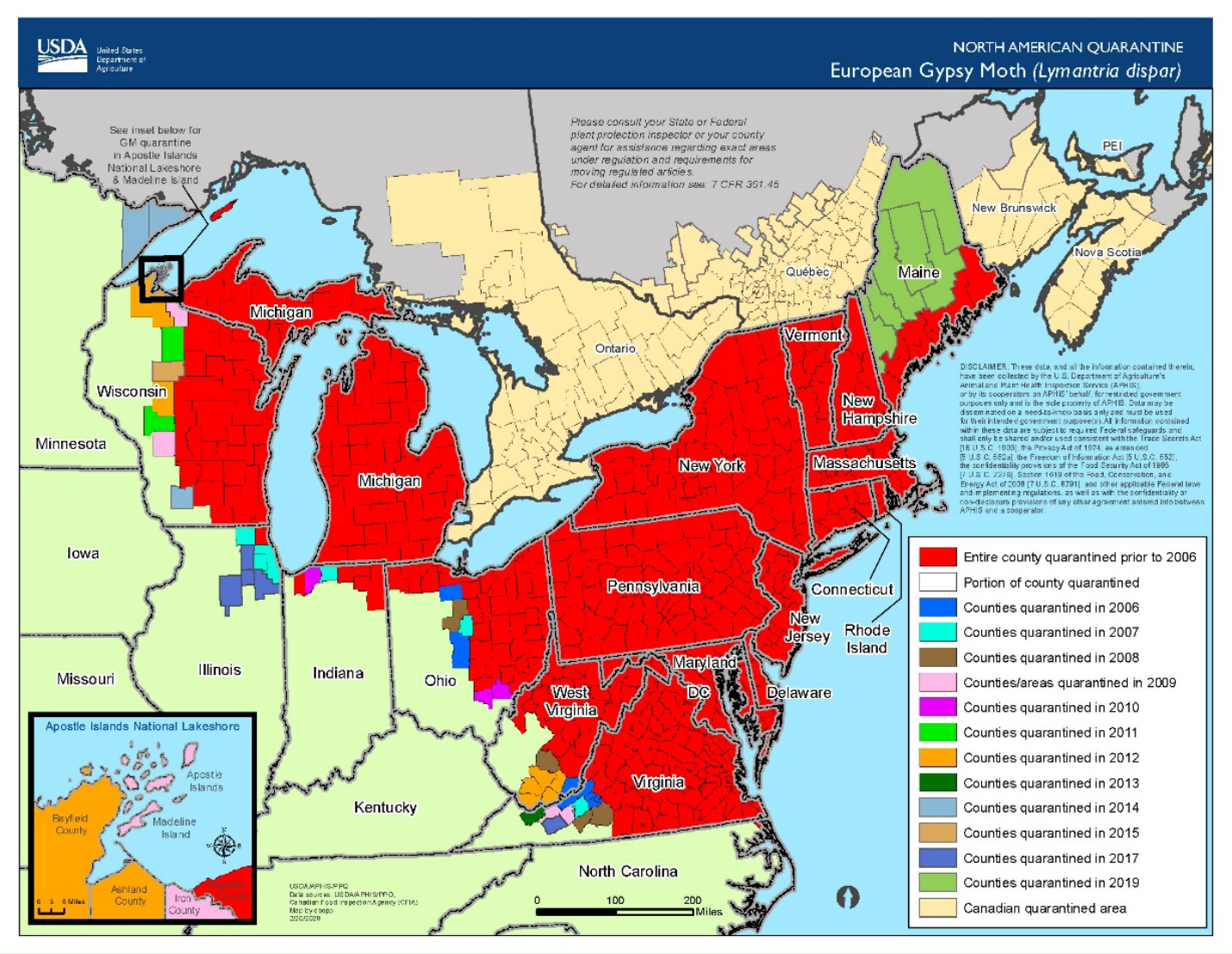
In 2020, KDA set 27 traps across eastern Kansas, and no gypsy moths were found.

According to a report by the Kansas Dept. of Agriculture, during checks of the gypsy moth traps deployed as a part of the pathway survey, one male gypsy moth was collected in 2015, in Johnson County. It was identified as the European gypsy moth *Lymantra dispar dispar*. Kansas has had **no positive finds** in traps set every year since 2015.

The nearest established population of gypsy moth to Kansas is in southern Wisconsin and northeastern Illinois, more than 400 miles from Kansas. Based on the current annual spread of gypsy moth, abated by the "Slow the Spread" program, gypsy moth is not expected to become established in Kansas for at least 30 years.



Pheromone traps were set across eastern Kansas in 2020, but no gypsy moths were detected.

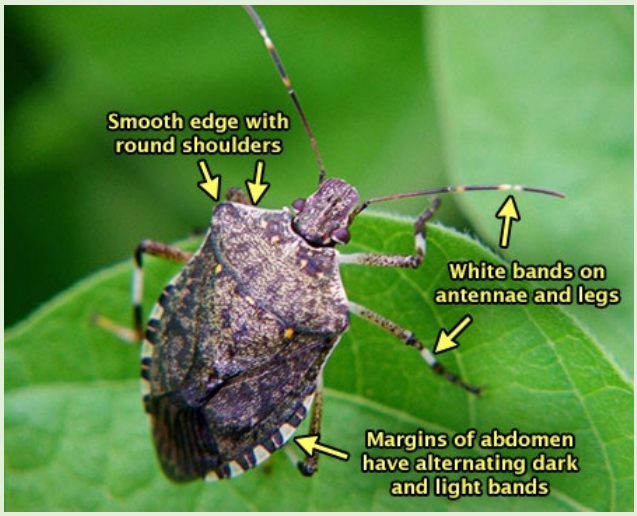


Brown Marmorated Stink Bug

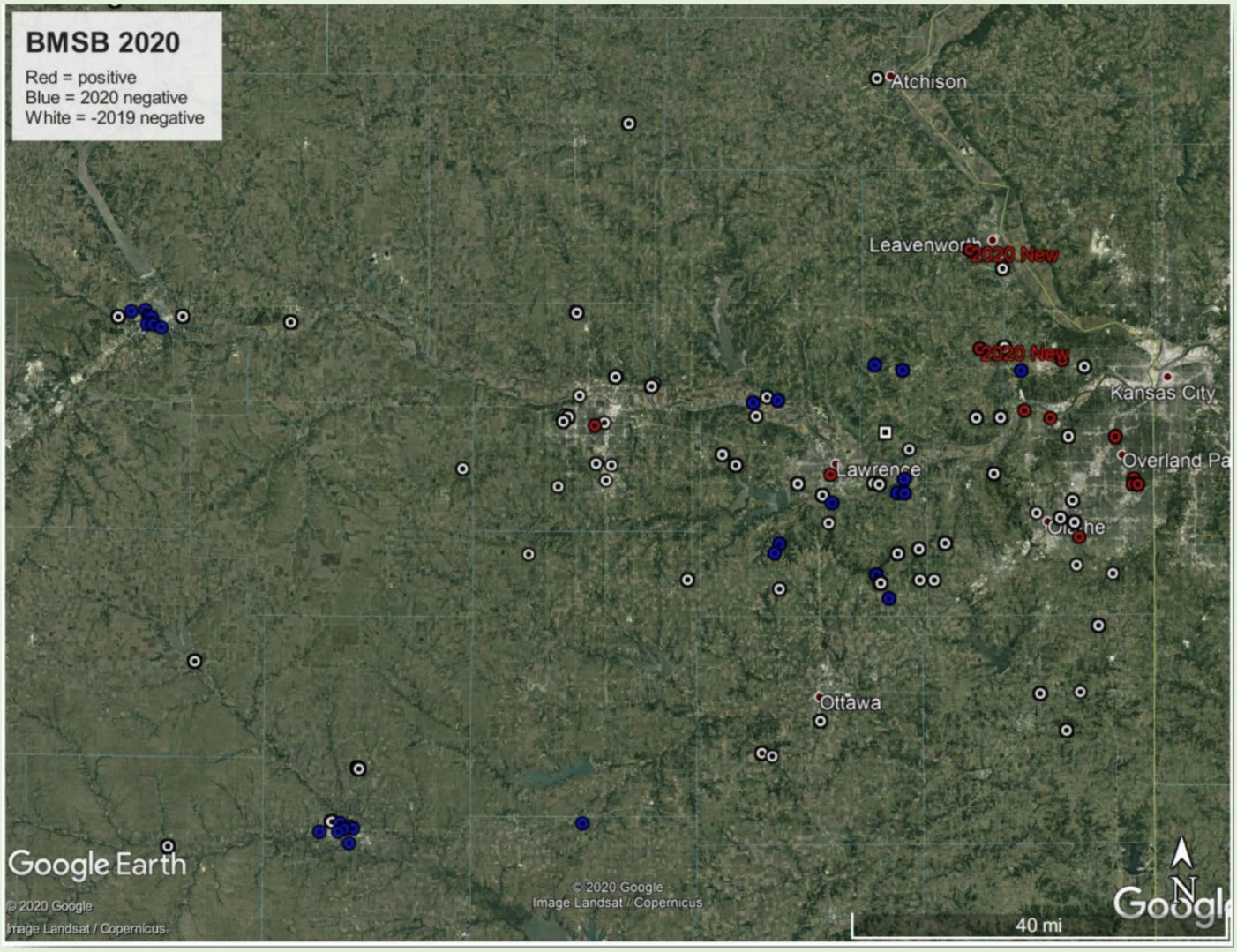
Brown marmorated stink bug (BMSB) is a non-native invasive pest that damages a wide variety of fruit, vegetable, and ornamental crops. In Kansas, trees potentially impacted would include apple, pear, hazelnut, nectarine, peach, apricot, cherry, serviceberry, redbud, Japanese pagoda tree, Korean evodia, Peking tree lilac, dogwood, and linden.

According to a report from the Kansas Department of Agriculture, BMSB was first detected in Douglas Co. in 2011 and later reported in the Journal of the Kansas Entomological Society. Subsequently, BMSB came to the attention of KDA through reported sightings in Johnson Co., follow-up trapping efforts by KDA and a sighting in Douglas Co.

In 2020, KDA surveys for BMSB included two positive detections in Leavenworth County, for the first time. According to KDA reports, eastern counties are beginning to see signs of damage and nuisance. An organic fruit farmer in Douglas Co. has reported significant damage and a business in Kansas City has reported nuisance from overwintering BMSB aggregation. Due to their highly polyphagous nature and economic importance, KDA will continue to monitor and survey for BMSB in 2021.



Brown marmorated stink bug (Halyomorpha halys).Photo by Steve Schoof.



Sudden Oak Death / *Phytopthora ramorum*

Sudden Oak Death (SOD) is caused by *Phytophthora ramorum*, a water mold pathogen. The pathogen is also the cause of the Ramorum Leaf Blight, Ramorum Dieback and Phytophthora Canker Diseases.

SOD was first detected in the San Francisco Bay Area in the mid-1990s. It was first recognized as killing trees in Oregon forests in in 2001. The SOD pathogen is considered especially dangerous because it affects a wide variety of trees, shrubs and plants and there is no known cure. The pathogen has killed millions of tanoak and coast live oak trees along the central CA coast into Southern OR and is a concern because it also infects rhododendron, camellia and other common horticultural nursery plants.

Coast live oak dying from P. ramorum infection, China Camp State Park, CA.Sudden Oak Death has NOT yet been associated with any tree mortality in Kansas

The oak forests of Kansas are predominately in the eastern third of the state, and while most native oaks like bur oak are of the potentially less-susceptible white oak group, there are millions of red, black, pin, shumard, blackjack, shingle, and other oaks that could be impacted should this disease gain a foothold in the state.

Unfortunately, few details are certain about how this pathogen might affect the species that are native to the central hardwood forests present in Kansas, so KFS encourages the public to be proactive in taking steps to ensure this disease does not spread from rhododendrons or other infested plant material into our community forests and rural woodlands.

2019 Kansas Exposure to Phytopthora ramorum

In May 2019, the Kansas Department of Agriculture (KDA) received a list of 60 Walmarts and one Home Depot in the state which had received rhododendron stock from a nursery in Oklahoma infected with *Phytophthora ramorum*, the causal agent of Sudden Oak Death.

In total, **34 Kansas counties** received shipments that included the seven confirmed positive varieties of rhododendron. Of these 34 counties, KDA intercepted and ordered destruction of plants at stores in 17 counties. There were 1220 rhododendrons shipped to stores in Kansas from the Oklahoma nursery, and KDA ordered destruction of 222 (18.2%). The remainder of those 1220 plants had already been sold by the time KDA was notified of the trace forward so were unable to be inspected prior to their sale.

In spring 2020, KDA conducted an additional survey, between May 12 and July 14. Host plant samples were collected from 10 selected wholesale and retail plant dealers, and water samples were collected from selected retention ponds and from public waterways in 10 counties. All counties were selected due to proximity to box stores that received infested material in 2019. There were 89 plant samples and 26 water baits collected for a total of 115 samples.

All but three water bait samples were positive for *Phytophthora* spp. Of the 89 plant samples, 25 were positive for *Phytophthora* spp. Of all samples collected, 41.7% of samples were positive for *Phytophthora* spp. **but all were negative for *P. ramorum***. KDA will perform the survey again in 2021 and will target box stores instead of nurseries/retails.

At this time, there are no reports of *Phytophthora ramorum* becoming established in the landscape in Kansas, causing symptoms on oaks, or causing mortality on oaks. Therefore, **Sudden Oak Death is not known to be present in Kansas**, although the pathogen that causes it has been introduced through infected nursery stock.

While Scotch pine (Pinus sylvestris) is no longer recommended for windbreaks or ornamental planting in any part of Kansas due to Pine Wilt, this species is still a reliable and attractive performer for Christmas tree growers. This tree farm in Douglas County, one of more than three dozen across Kansas, has successfully managed brown spot, bagworms, and pine tip moth as it produced quality live Christmas trees for many families in 2020.

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

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