

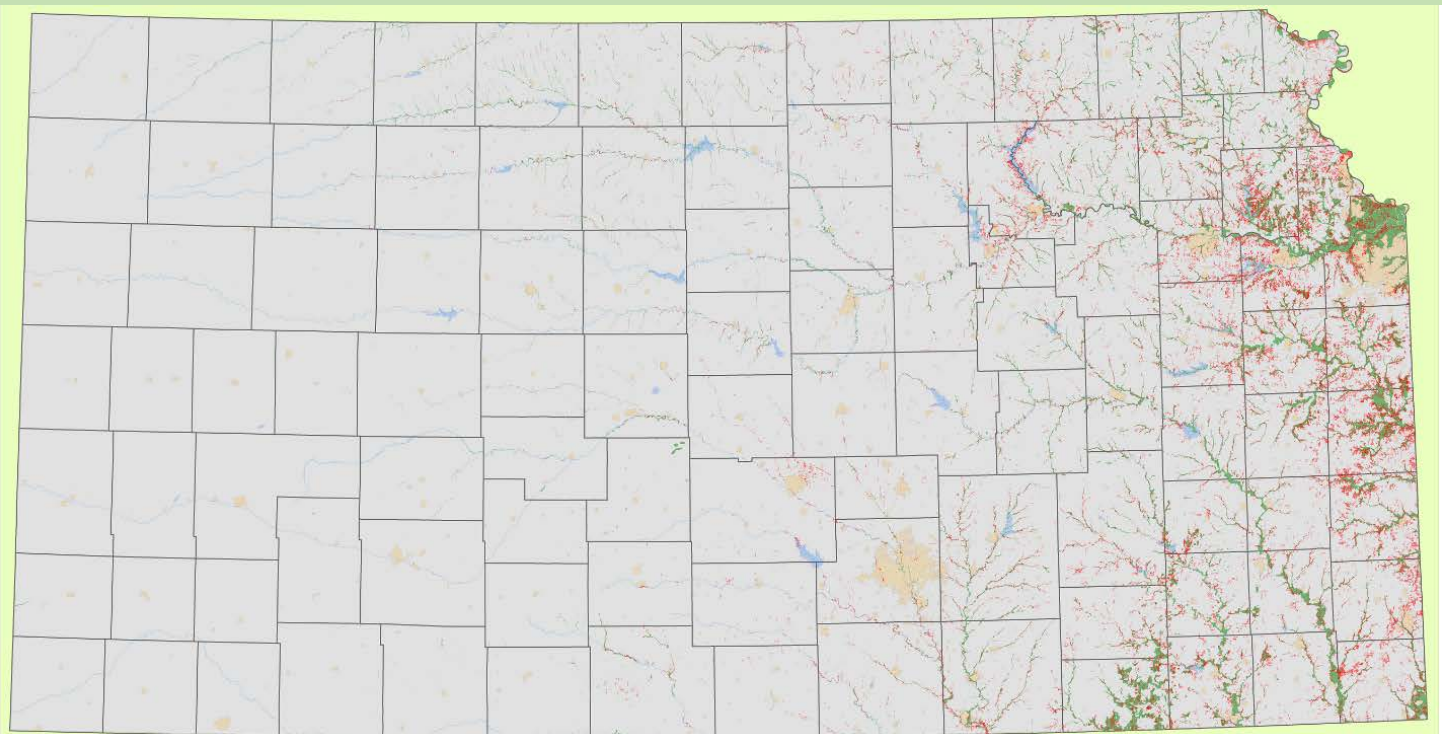
Kansas Forest Health Highlights 2015



A native stand of white oak (Quercus alba) in Atchison, KS.

Forest Resources of Kansas

In Kansas, the eastern hardwood forests transition into the prairie of the Great Plains. Across the state, forestland accounts for **5.2 million acres**, of which over 95% is privately owned. These forests are productive; local forest products contribute approximately **\$1.3 billion annually** to the Kansas economy. Most of the contiguous forestland is located in the eastern third of the state. Much of the landscape is devoted to agriculture, but forests and trees are prominent components. The majority of the state's woodlands are linear in nature and follow water features along the terrain.



- Current Forest Extent
- Historic Forest Extent
- Lakes
- Major River
- Incorporated Area
- County

Kansas Forests
Historic Extent vs Current Extent

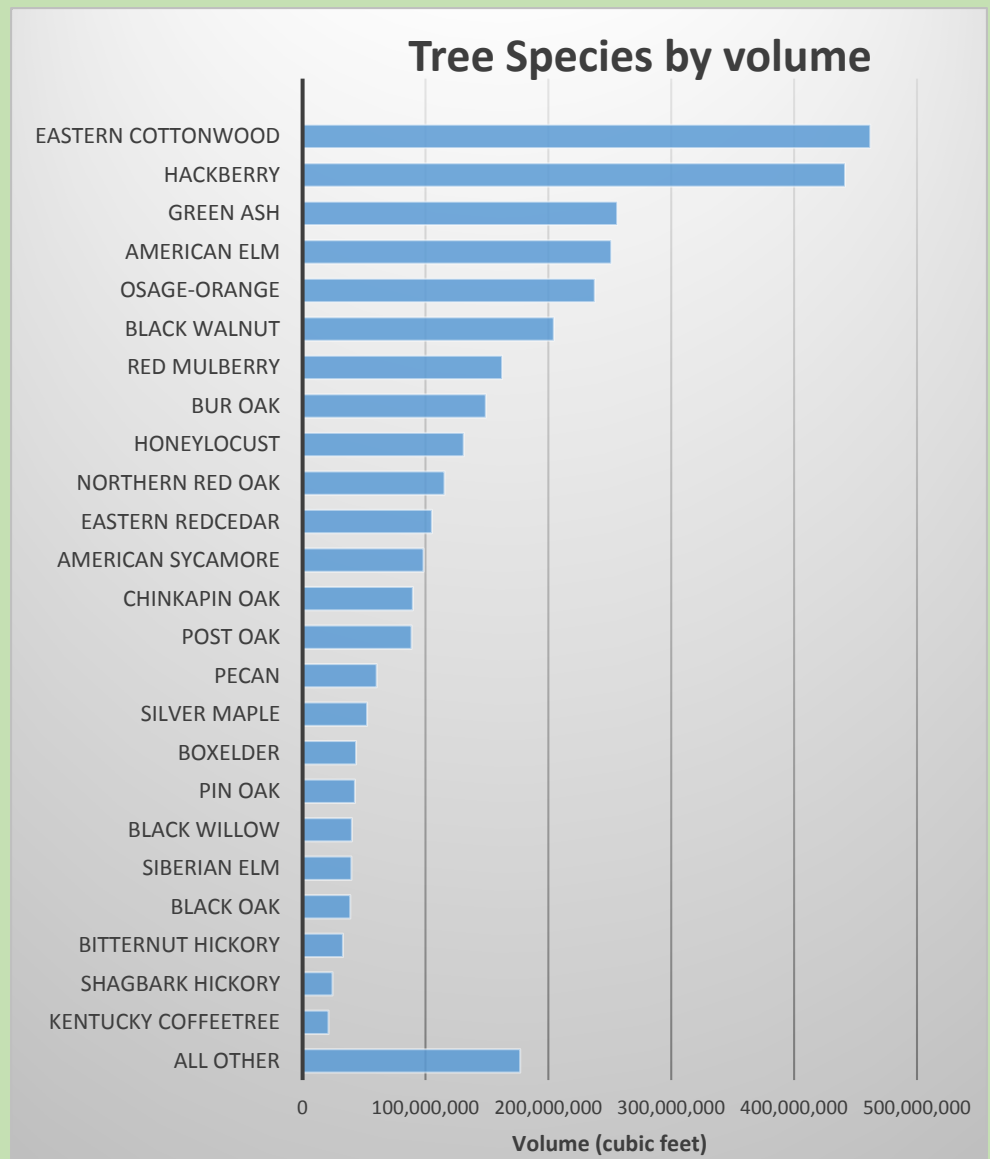


The top tree species, by statewide volume, are cottonwood, hackberry, green ash, American elm, osage-orange, black walnut, red mulberry, bur oak, honeylocust, and northern red oak.

Elm/ash/cottonwood and Oak/Hickory are the two dominant forest types.

Over the past 60 years or so, cottonwood regeneration levels have been low. Re-engineering of riparian environments due to 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 as early invaders on grasslands and abandoned range and farmlands.

Even though Kansas's forests are increasing in acreage, 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 29 and 19 percent of timberland area, respectively.

Kansas' forests contain approximately **846 million live trees** (≥ 1 -inch diameter) and nearly **3.4 billion cubic feet of net volume** (live trees ≥ 5 -inches diameter). The five most numerous species are hackberry, American elm, eastern redcedar, Osage-orange, and green ash; together, they make up 51 percent of all trees. The five most voluminous species contain nearly half (49%) 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 most voluminous species in the state but ranks 9th in terms of number of trees, and while eastern redcedar is 3rd in terms of number of trees, it ranks 11th in volume.

There are nearly **90 million oven-dry tons of biomass** in Kansas forests; most of which is contained in non-growingstock trees (56%), followed by growing-stock trees (38%) and live trees 1- to 5-inches diameter (6%). Nearly one-third of all biomass is found in three species: hackberry, Osage-orange, and cottonwood. Osage-orange now ranks second in biomass, surpassing eastern cottonwood.

Overall, the growth rate of Kansas' trees remains positive, with eastern cottonwood, hackberry, and American elm having the highest growth rates, followed closely by Osage-orange and black walnut.

Emerald Ash Borer

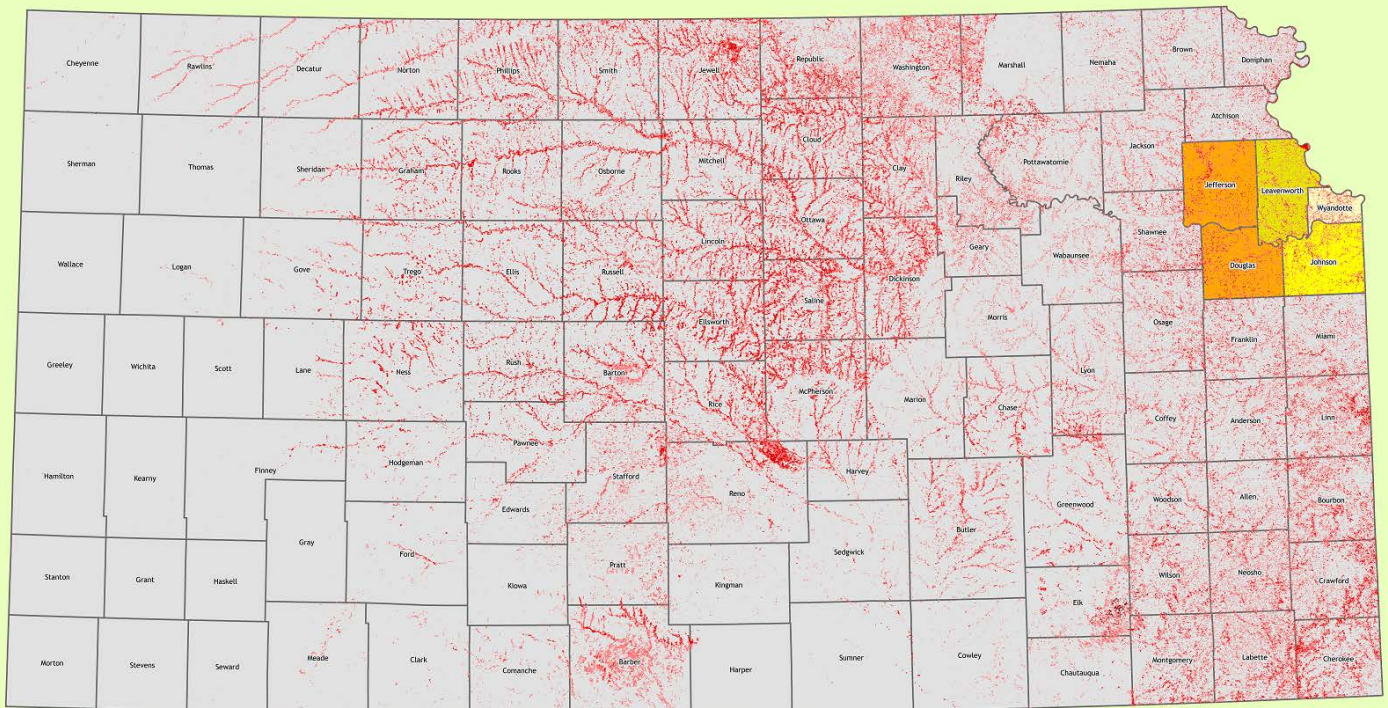
Emerald ash borer (EAB), an exotic wood-boring beetle, was first detected in 2012 in Wyandotte County, Kansas. Since that time, EAB has also been found in Johnson, Leavenworth, Douglas and Jefferson counties.

EAB is a pest of all North American ash (*Fraxinus* spp.). Kansas' forest land contains **52.5 million ash trees**, or an average of almost 21 trees per acre of forest land. Ash trees account for nearly **275 million ft³** 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.



A declining ash tree (left) in Lawrence, KS, potentially due to the presence of EAB.

In 2015, Kansas expanded the Emerald Ash Borer Quarantine to include **Douglas County** and **Jefferson County**, the fourth and fifth counties with confirmed EAB presence, all contiguous in the Kansas City area. In both counties, girdled trap trees were peeled in October, with live EAB larva extracted from beneath the bark. EAB was confirmed in the communities of Eudora and Lawrence, and at the US Army Corps of Engineers property at Lake Perry. In previously quarantined counties, ash tree mortality was observed to increase over previous years.

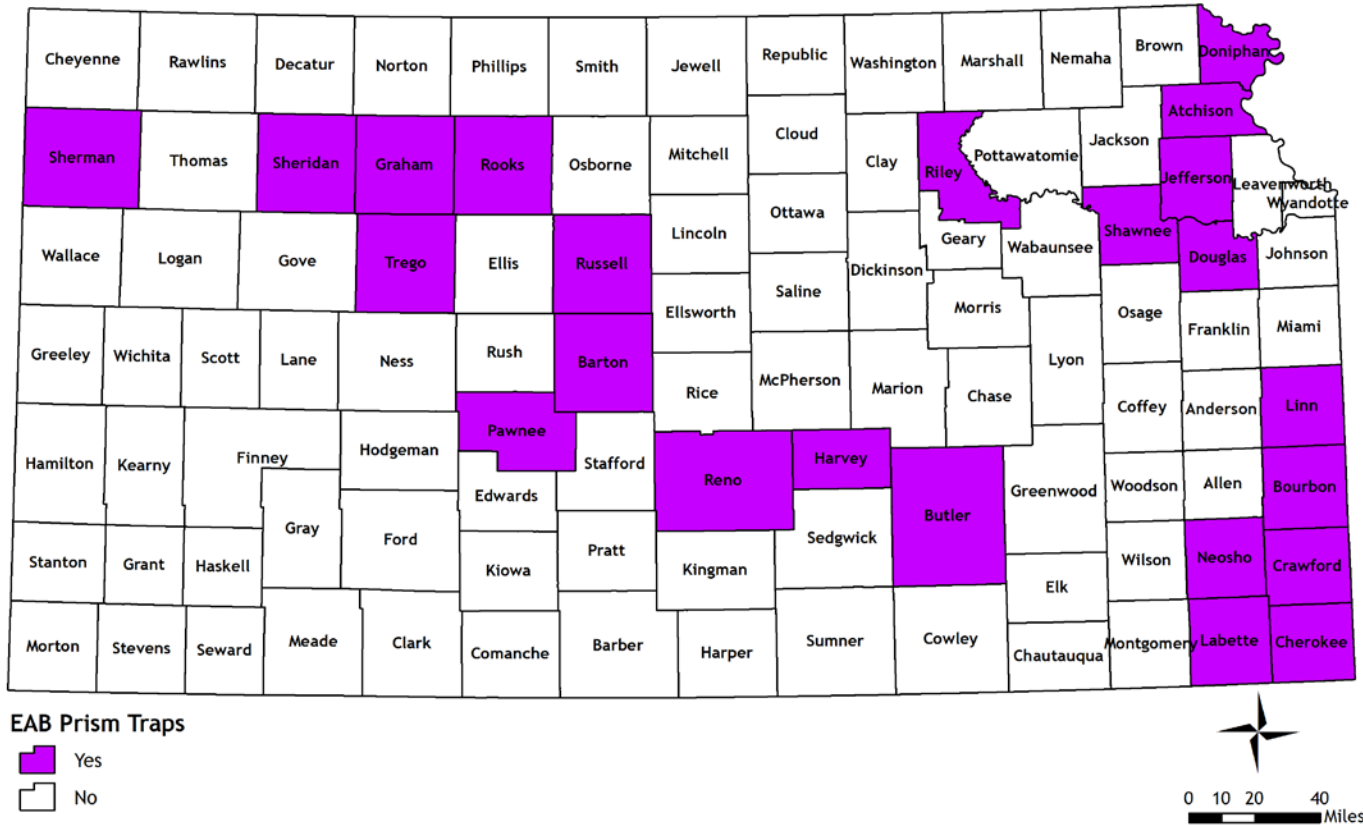


Density of Live Ash	EAB Detection
Trees per Acre	Year
Less than 5	2012
5 - 25	2013
More than 25	2014
	2015
	Undetected

Spread of Emerald Ash Borer

In 2015, the Kansas Department of Agriculture (KDA) placed EAB traps in 23 counties outside the established quarantine zone. The EAB survey began on March 10 and concluded on August 31, 2015. Sixty-four purple prism traps and 7 green Lindgren funnel traps were deployed by KDA staff. **No EAB were collected** in any KDA traps.

2015 EAB Prism Trap Locations



Working with the USDA, KFS, KSU Extension, and local cooperators, KDA set 7 trap trees in and around the EAB infested area in the Kansas City metro area and 9 trap trees around Wichita. Each trap tree was visited once a month. In September and October, trees were peeled and larva were found in **Douglas** and **Jefferson** County (new county detections).



EAB larva and feeding gallery visible just below the bark, from a trap tree at Perry Lake.



A girdled trap tree, in Eudora, KS.

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 *Pinus nigra* and *P. sylvestris*.

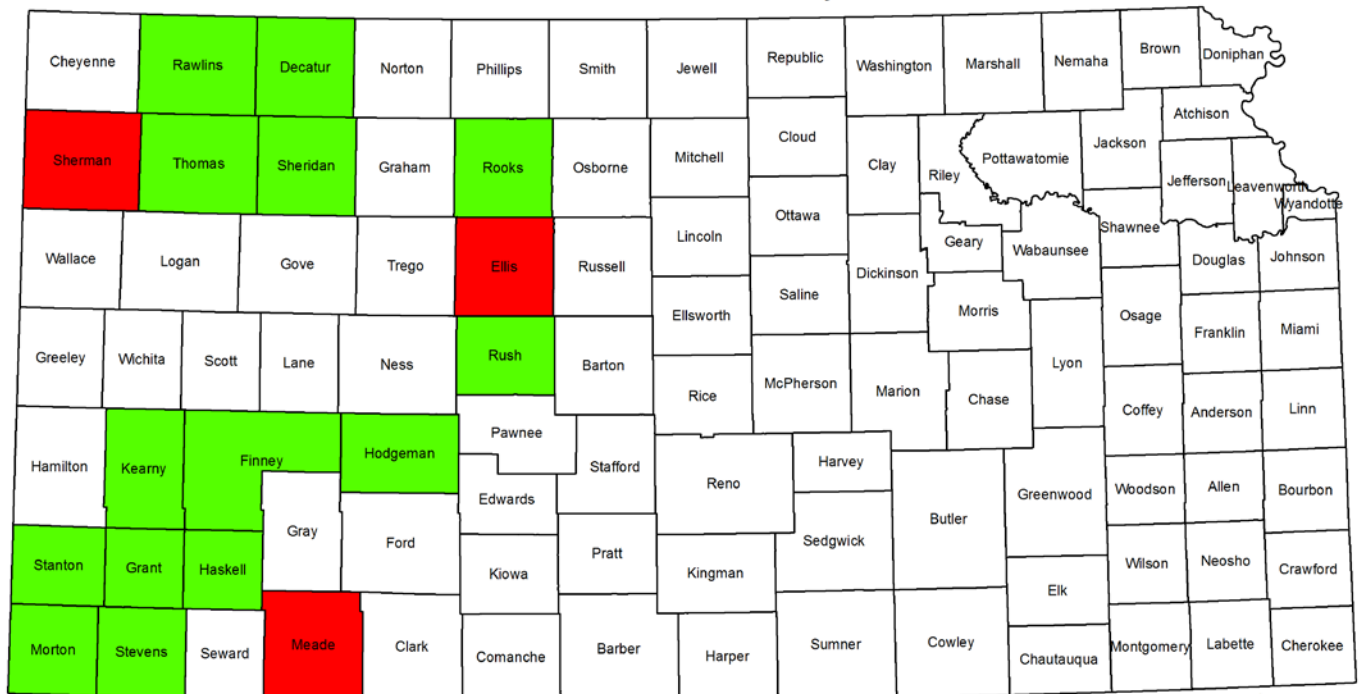
A previously known site in Meade, Meade County had a Scot's pine test positive for pinewood nematode. In late November several pine wilt positive trees were found in a Scots Pine windbreak, several miles north of Goodland, (Sherman). These trees will be removed and destroyed in early 2016. Delimiting survey of the surrounding area found no other suspect trees.

Follow up survey of past positive sites in Jetmore (Hodgeman County), Colby (Thomas), and Stockton (Rooks) were negative in 2015. Additional surveys were conducted in Decatur, Morton, Stanton, Grant, Finney, Kearny, Haskell, Sheridan, Rush, Stevens and Rawlins counties and negative for the disease complex. The city of Hays in Ellis County has thousands of pines with many Scotch and Mugo besides Austrian pines. The disease has been eliminated at several sites throughout the community and outlying housing developments. Two trees found positive for pine wilt disease have been removed and destroyed. That site continues to be monitored and controlled with City of Hays and county extension help.

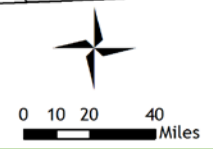


An Austrian pine showing signs of decline due to pine wilt in late summer, in Manhattan, KS. Resistant ponderosa pine is nearby.

2015 Pine Wilt Survey Results



Pine Wilt
■ Negative
■ Positive



Abiotic Stress



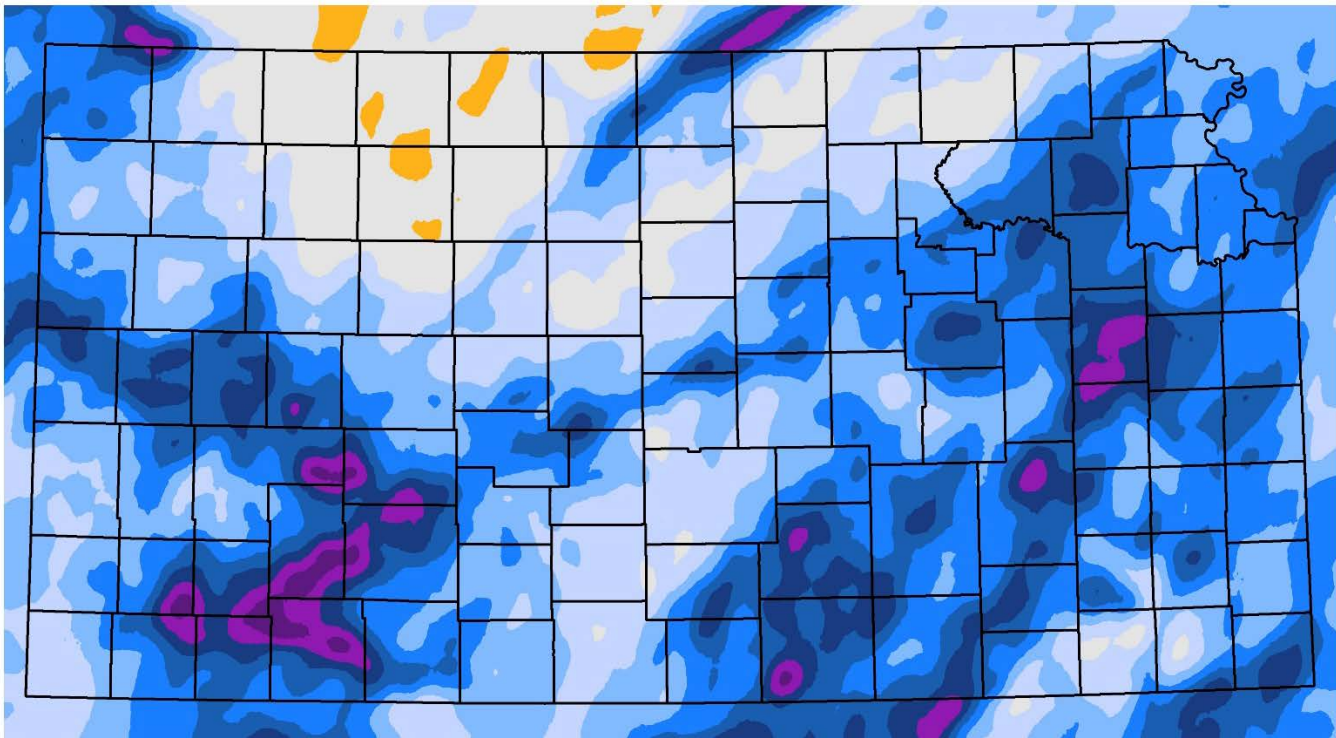
Trees temporarily flooded by high waters at Clinton Lake near Lawrence.

Unusually heavy precipitation in late April and throughout May led to increased stress on forests. Trees in riparian areas suffering from flooding, while trees throughout the state saw an increase in foliar diseases such as anthracnose due to the sustained humidity and wet weather.

A large hail storm in southeast Kansas in April caused damage to urban and rural forests from Wichita east to Missouri, potentially causing wounds that can serve as entry points for pathogens such as oak wilt.

An ice storm in late November caused significant damage to trees in north-central Kansas, from Junction City to Topeka, along the I-70 corridor. This has the potential to hasten canopy decline in communities that may not be well-positioned to respond aggressively with corrective pruning and replanting efforts.

Departure from Normal Precipitation - May 2015



0 10 20 40
Miles

Departure from Normal Precipitation in Inches



As of: 2/23/2016

Invasive Bush Honeysuckle



Invasive bush honeysuckle that has been treated (on the left) next to untreated plants, in Hutchinson, KS.

The non-native bush honeysuckles (*Lonicera maackii*, *L. tatarica*, and *L. x bella*) and their vine counterpart, Japanese honeysuckle (*Lonicera 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.

Additionally, a spectral remote-sensing protocol has been developed to detect and delimit infestations, and will eventually aid in strategic decision-making to treat populations and limit the spread of this invasive plant.



Leaves and fruit of bush honeysuckle in late fall, still green well after leaf drop of native woodland trees and shrubs.

Black Walnut Shoot Moth



Webbing is visible on the trunk of this black walnut in Ottawa County in late summer. Defoliation earlier in the summer has been replaced by a second leaf flush, depleting the tree's energy reserves.

In late summer, severe defoliation and webbing was observed on several stands of black walnut in rural Ottawa County. It was determined that the black walnut shoot moth (*Gretchena concitaticana*) was the damage-causing agent.

This pest has been observed in north-central Kansas periodically (1968, 1974, 1993, 2004) causing damage to thousands of acres of walnut, then disappears for a length of time. Anecdotal reports indicate that presence has been observed in Shawnee and Geary counties, as well.

Further monitoring will be needed to assess the potential for a large outbreak of this defoliator and stress agent in 2016.

Periodic Cicadas



Twig breakage due to damage from cicadas.

Brood IV of the 17-year cicadas emerged in spring 2015, causing stress to native woodlands and parks where high numbers caused branch tip breakage, especially on isolated trees in open grassy areas and edges.

Long-term damage is not expected on mature trees, but deformation of structure and stress is expected on smaller trees and newly-planted specimens.



Cicadas on a callery pear branch.



Cicadas on the trunk of an ash tree in north-central Kansas.

Forest Health Threats

Thousand Cankers Disease



A 20-year-old black walnut plantation in northeast Kansas, which is threatened by the potential for TCD to enter Kansas.

This disease 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.

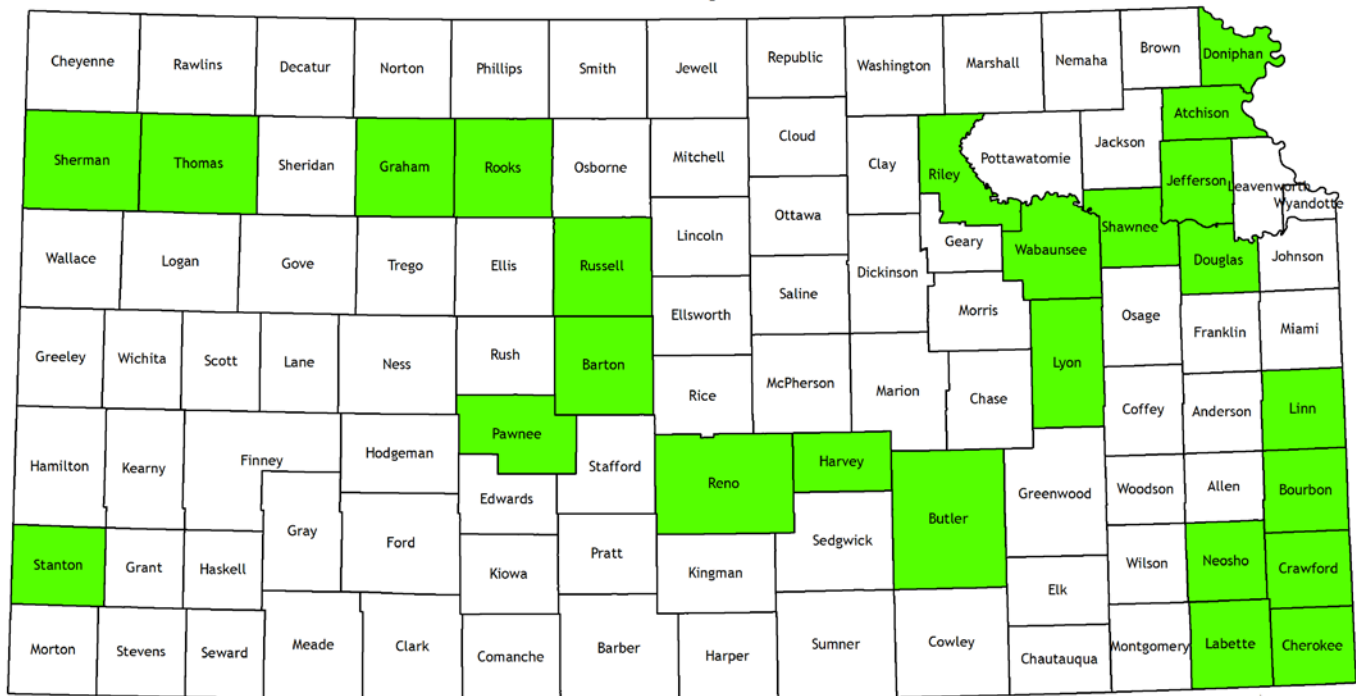
A recent estimate of economic loss over a 20-year period associated with the introduction of thousand cankers disease to Kansas suggests **\$160 million** in 2010 dollars.

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.



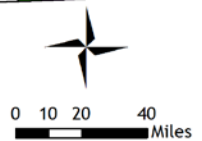
Small exit holes and galleries from the walnut twig beetle are visible on this TCD-infested tree in Colorado. Pocket knife is for scale.

2015 WTB Trap Locations



WTB Traps

Yes

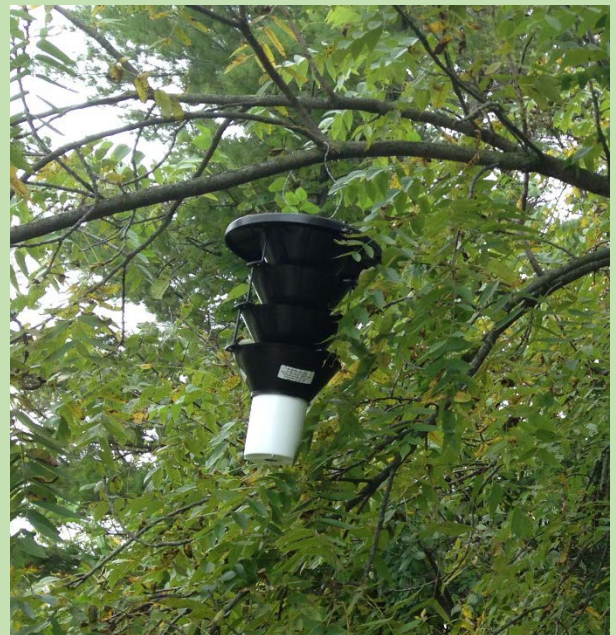


Street-side and on-the-ground visual surveys of black walnut have been conducted across the state. Lindgren traps, with lure, were set and monitored by Kansas Department of Agriculture (KDA) at key locations statewide. **No walnut twig beetle (WTB) specimens were found.**

The WTB survey began on April 28 and concluded on October 26, 2015. Thirty two Lindgren funnel traps were deployed in Atchison, Barton, Bourbon, Butler, Cherokee, Crawford, Doniphan, Douglas, Graham, Harvey, Jefferson, Labette, Linn, Lyon, Neosho, Pawnee, Reno, Rooks, Riley, Russell, Shawnee, Sherman, Stanton, Thomas, and Wabaunsee counties.

The walnut twig beetle survey had two objectives in 2015. The first was monitoring of high risk areas of central and eastern Kansas where walnut is common and pathways are of concern. The second objective was a dedicated sentinel site trap program in western Kansas of known walnut locations. The second objective was motivated by the discovery of walnut twig beetle in Eads, Colorado which geographically lies about 40 miles directly west of the Colorado-Kansas border near Tribune, Kansas (58 miles).

A monitoring-trapping program for WTB was conducted in each of the KDA Plant Protection area staff areas except for western Kansas. A minimum of five sites were monitored for a 60 day cycle dependent on staff work load for each area. Staff chose either spring or fall trap deployment dates. In western Kansas, a sentinel site program was set up in 2015 and traps tended from May through October by the KDA western Kansas Area Specialist, Bob Buhler, KDA entomologist Greg Chrislip and now-retired KDA plant pathologist Jon Appel.



A Lindgren funnel trap, used to monitor for WTB.

Gypsy Moth

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.**

The trap was located at a distribution location located in Johnson County. The moth was sent to an Aphis PPQ, where it was identified as the European gypsy moth *Lymantria dispar dispar*.

The finding of a single moth now triggers a delimiting survey in 2016.

The nearest established population of gypsy moth to Kansas is in southern Wisconsin and northeastern Illinois, more than 400 miles. 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.

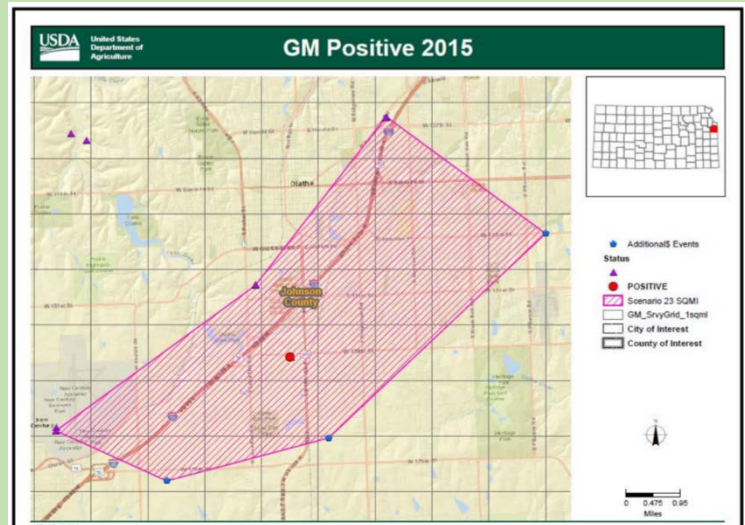
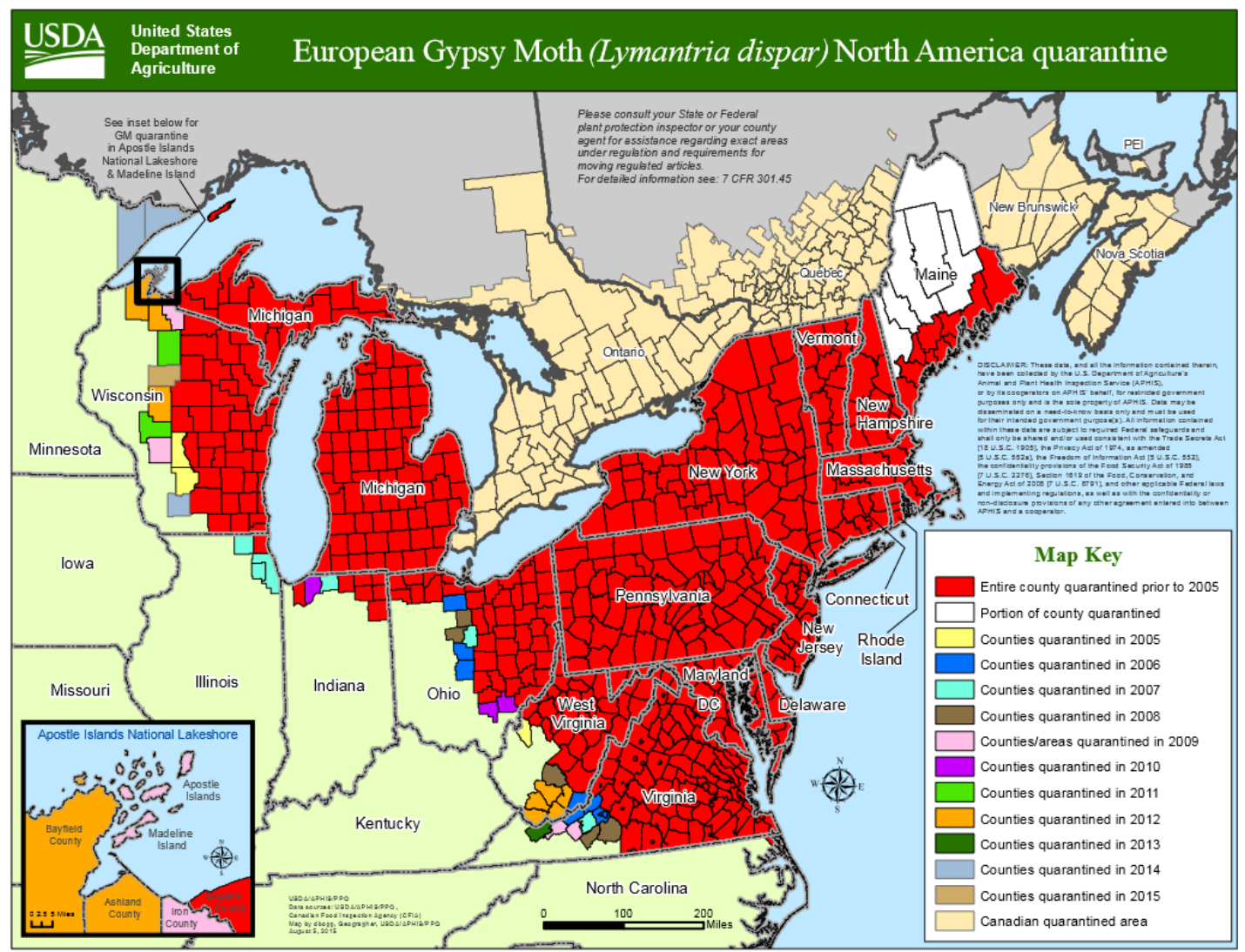


Figure 1. Gypsy Moth delimit area in the Kansas City Metro Area.



Forest Health Outreach

Don't Move Firewood

A partnership was initiated with the US Army Corps of Engineers at Clinton Lake to exchange firewood. The Kansas Forest Service provided nearly 300 bundles of locally-sourced “clean” firewood that USACE personnel offered in exchange for wood brought in by incoming campers utilizing the facilities at the lake.

In addition, at Clinton Lake and nearby Perry Lake, educational material was distributed that outlines the risks involved with moving firewood, and therefore potentially moving Emerald Ash Borer, Thousand Cankers Disease, and other forest pests.



Clean, local firewood ready to be exchanged at Clinton Lake.



A firewood exchange box at Clinton Lake.

Diversity



A guiding principle of the Kansas Forest Service Forest Health program is that a diverse urban and rural forest is the best way to ensure a resilient, healthy forest for future generations.

A billboard was placed on I-670, visible to west-bound traffic leaving Kansas City, MO entering Kansas, with more than one million “impressions” over the 6-7 weeks it was displayed. This messaging is repeated on signage at three locations in the Kansas City metro area where public plantings of a diverse mix of tree species were planted in fall 2015.

Continued emphasis on diversity of species, age, growth form, and niche will allow the Kansas Forest Service to be proactive in mitigating threats to the many kinds of forests throughout Kansas.



A panorama of Kansas forest land below Tuttle Creek Dam, near Manhattan, KS.

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



[Kansas Forest Service](#)

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[USDA Forest Service – Rocky Mountain Region](#)

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

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