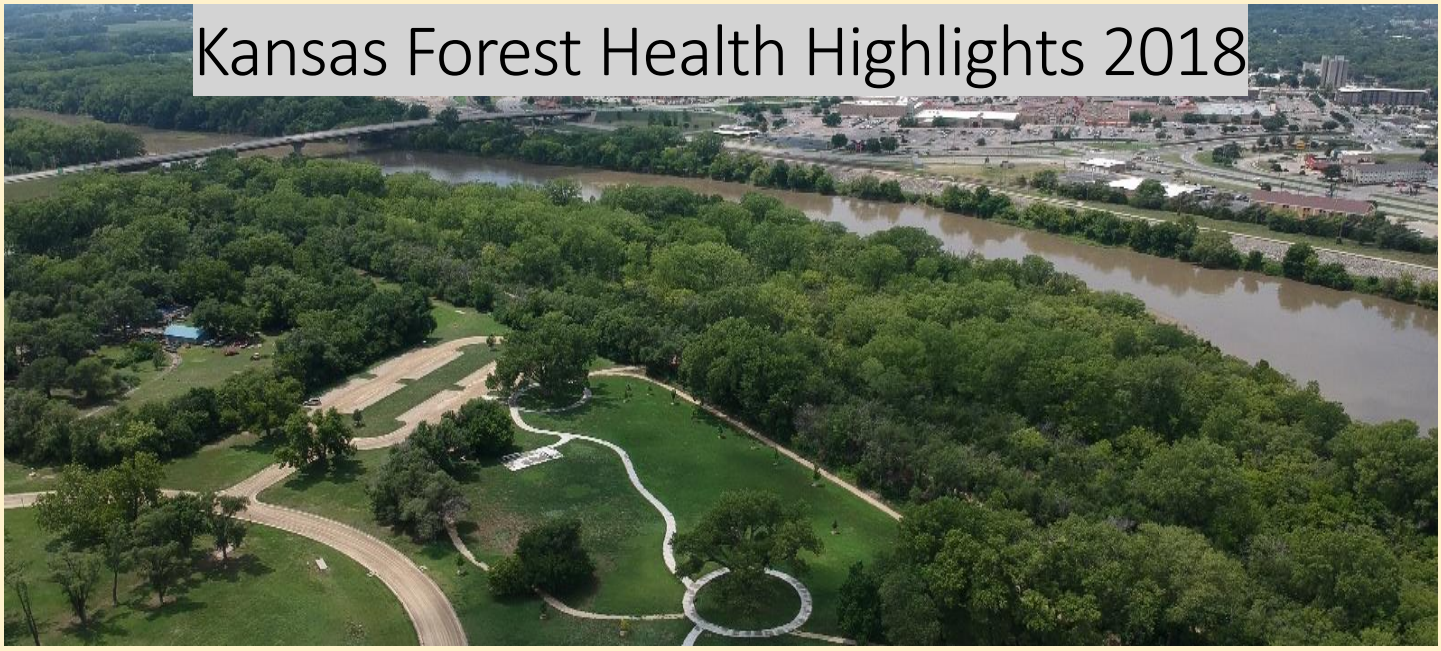
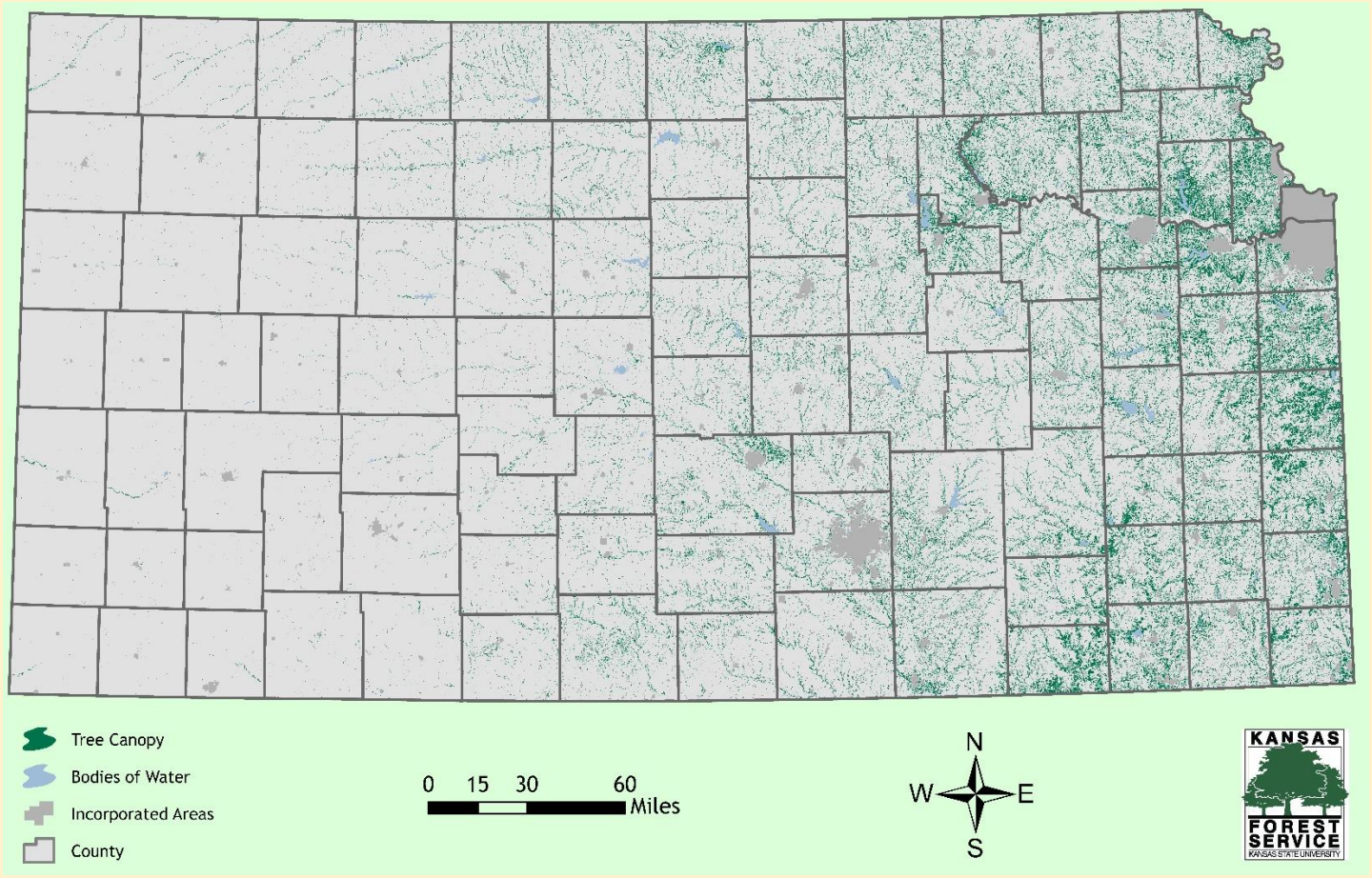
Kansas Forest Health Highlights 2018



Forestland along the Kansas River at Fairmont Park, Manhattan, Kansas.

Forest Resources of Kansas

In Kansas, the central hardwood forests transition into the Great Plains, with more than **4.6 million acres of trees**; 2.5 million acres of forest land and an additional 2.1 million acres of trees outside forest land. These forests, which are 93% privately owned, are productive; local forest products contribute approximately **$2.1 billion annually** to the Kansas economy. 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.

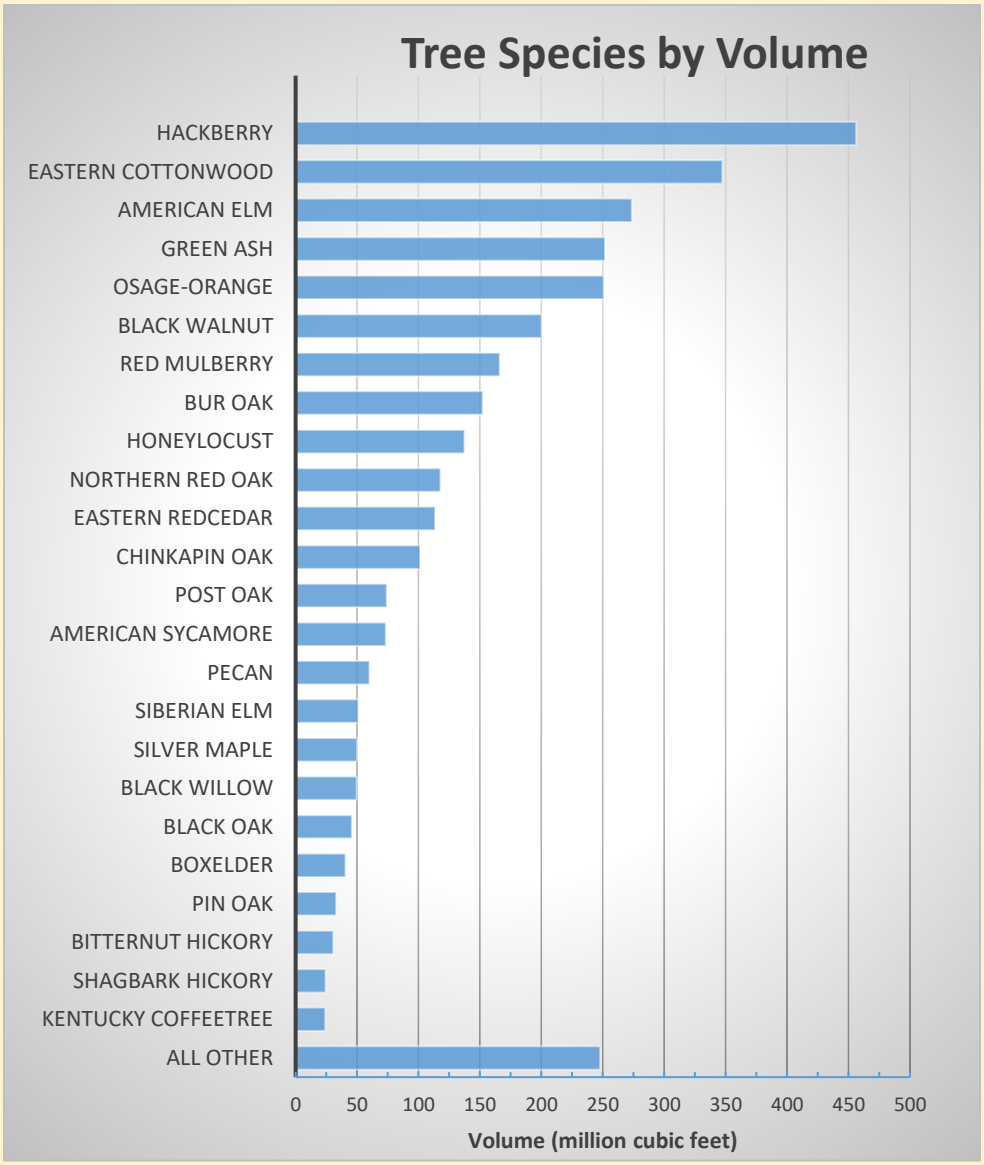


The top tree species, by statewide volume, are hackberry, eastern cottonwood, American elm, green ash, osage-orange, black walnut, red mulberry, bur oak, honeylocust, and northern red oak.

The two dominant forest types 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 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.

The forests of Kansas contain approximately **833 million live trees** (≥1-inch diameter) and nearly **3.3 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 52 percent of all trees. The five most voluminous species contain nearly half (48%) 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, and while eastern redcedar is 3rd in terms of number of trees, it ranks 11th in volume.

There are more than **89 million oven-dry tons of biomass** in Kansas forests; most of which is contained in non-growing stock trees (59%), followed by growing-stock trees (35%) 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 eastern cottonwood and American elm.

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 since 2012. This could be a concern if this trend continues.

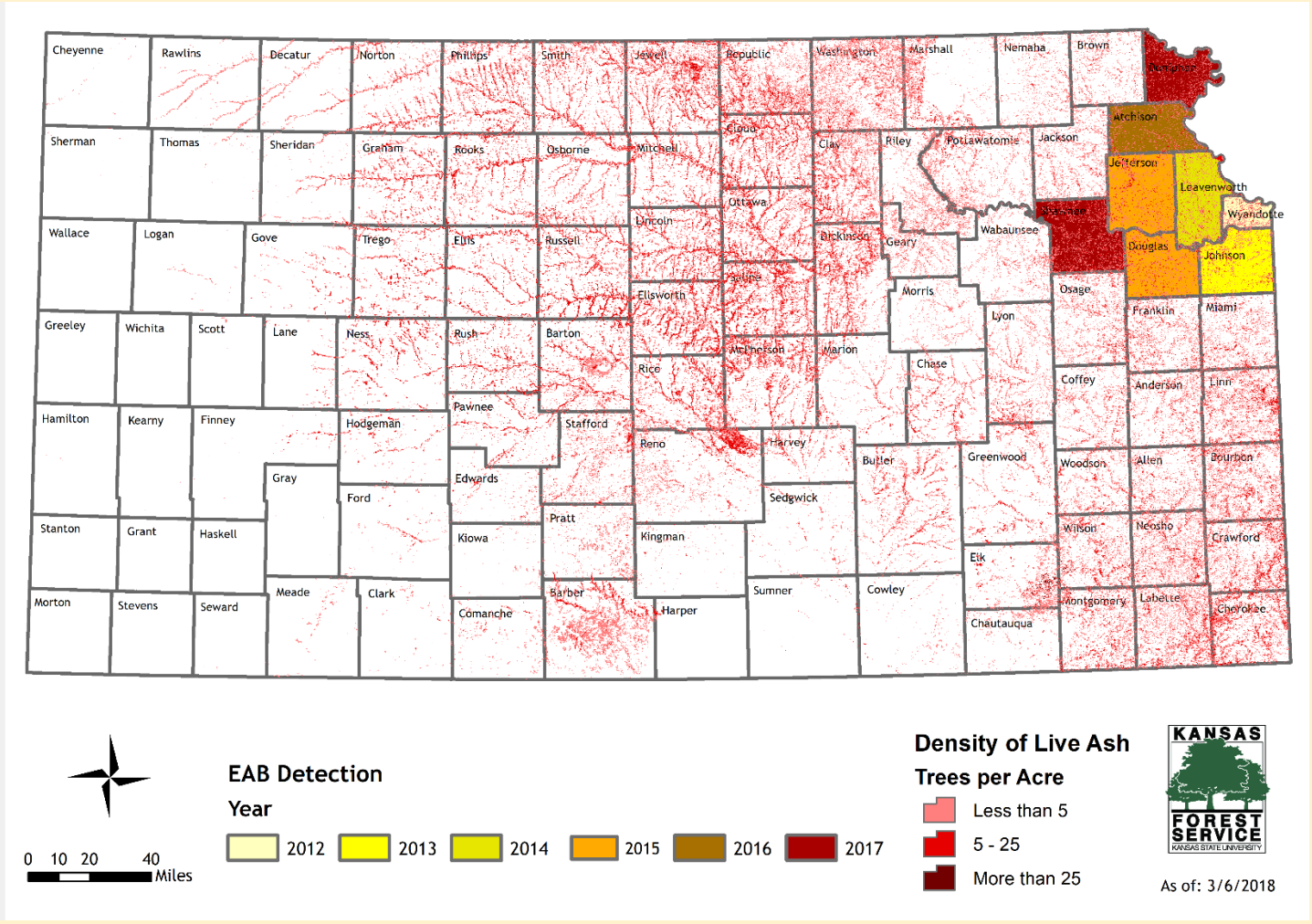
Emerald Ash Borer

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, and Shawnee counties.

EAB is a pest of all North American ash (*Fraxinus* spp.). Kansas' forest land contains **51.1 million ash trees**, or an average of about 20 trees per acre of forest land. Ash trees account for nearly **275 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.

Green and white ash in a parking lot in Manhattan, Kansas.

In 2018, **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 eight; all contiguous in the Kansas City area. In previously quarantined counties, ash tree mortality was observed to increase over previous years.



All trap trees placed in non-quarantined northeast Kansas counties (Brown, Riley, Osage, Miami) and southeast Kansas counties (Labette, Crawford, Cherokee) were negative for EAB presence. Emphasis on trapping in southeast Kansas was justified by the detection of EAB in northeast Oklahoma (Delaware County) in late 2016, less than 25 miles from the Kansas-Oklahoma border.

KFS and KDA staff peel EAB trap trees in Osage (left) and Miami (right) counties in October 2018. No EAB larvae were found at either site.

Releases of three biocontrol species (*Tetrastichus, Spathius, Oobius*) were done by the Kansas Department of Agriculture throughout the season at sites around Wyandotte County Lake. This is the third year for biocontrol releases in Kansas. Additional releases of biocontrol agents are planned for 2019, along with follow-up survey to assess if the biocontrol species are established.

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.

Outreach materials and "bug box" samples of EAB and other invasive pests were displayed on site at forestry field days and workshops.

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*).

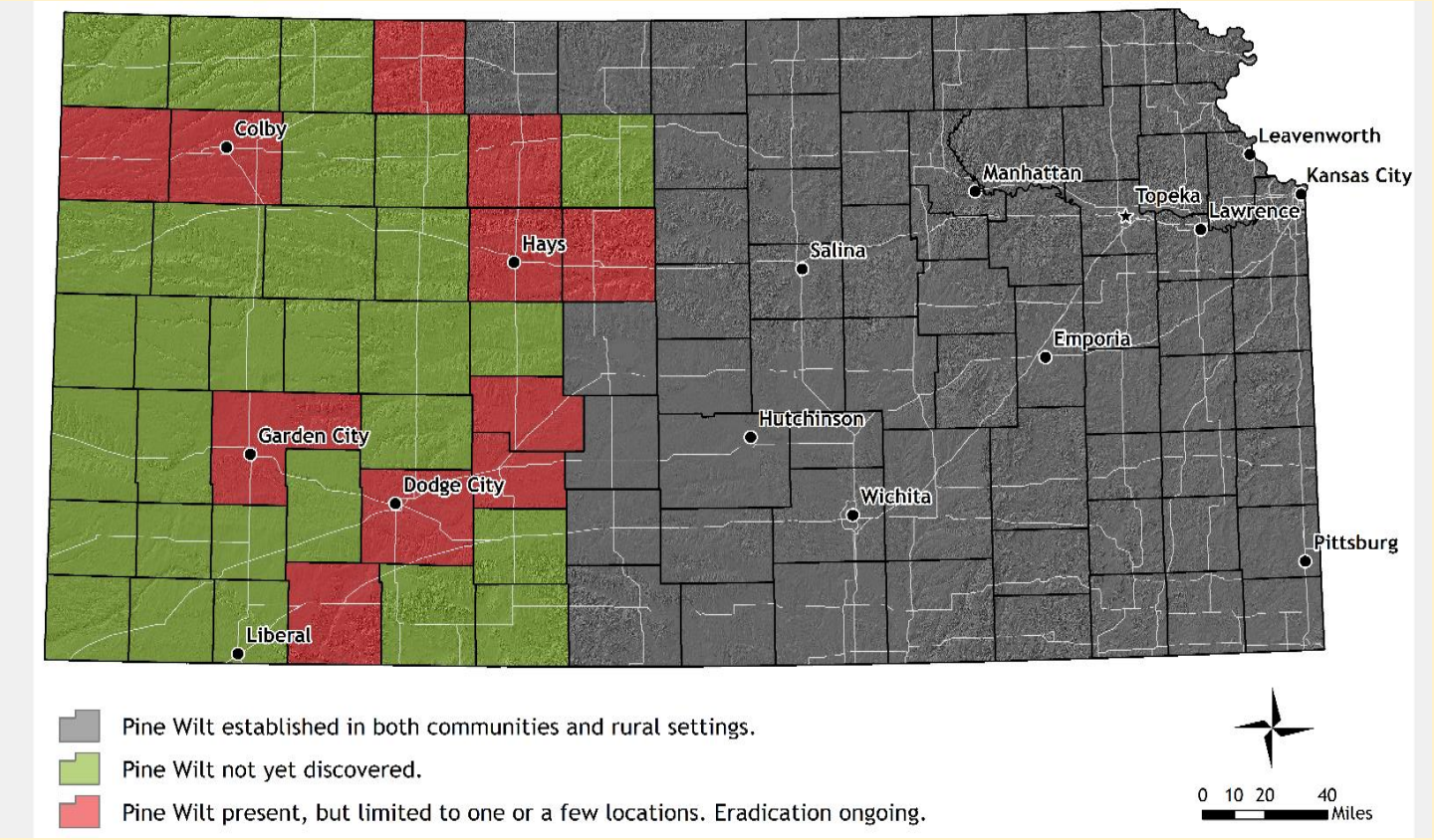
In 2015, several pine wilt positive trees were found in a Scotch pine windbreak, several miles north of Goodland (**Sherman County**). These trees were removed and destroyed. In October 2016, four pine wilt positive Scotch pine trees were found in Goodland. In March 2018, eight Scotch pine trees were removed after two positives. This site will continue to be monitored for additional dead trees.

Five pine wilt positive Scotch pine trees were found and destroyed in the town of Almena (**Norton County**) in March and April 2017. A delimiting survey was performed and no additional suspicious trees were found.

A Kansas Department of Agriculture (KDA) survey of the previously non-infested Finney, Greeley, Hamilton, Wichita, Rush, Scott, and Lane counties was negative for pine wilt.

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

The city of Hays (**Ellis County**) has thousands of susceptible pines, and is surveyed annually as part of the pine wilt initiative project by KDA, Kansas Forest Service, and Ellis county extension. The disease has been eliminated at several sites throughout the community and outlying developments. Trees found positive for pine wilt disease have been removed and destroyed, and the site continues to be monitored and controlled with City of Hays and county extension help. The City of Hays offers rebates for removal of infested pines, incentivizing removal for private landowners.

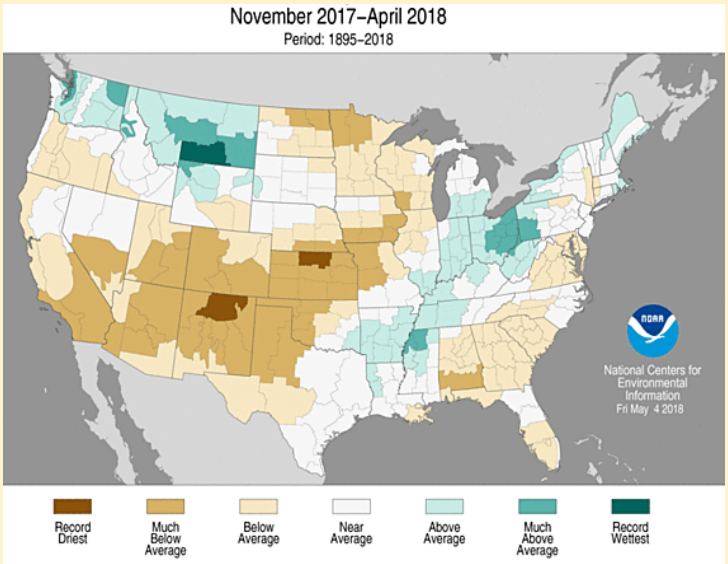


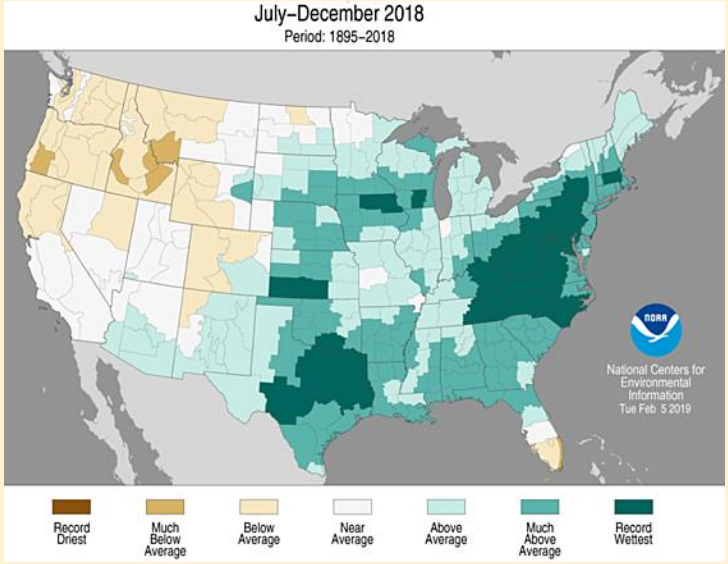
Abiotic Stress

After one of the wettest springs on record in 2017, the winter of 2017-2018 was one of the driest on record for Kansas, leaving little soil moisture for trees to draw on as the growing season approached. Statewide, it was the second-driest November-to-April period since records began in 1895, and the driest on record for the north-central region of the state.

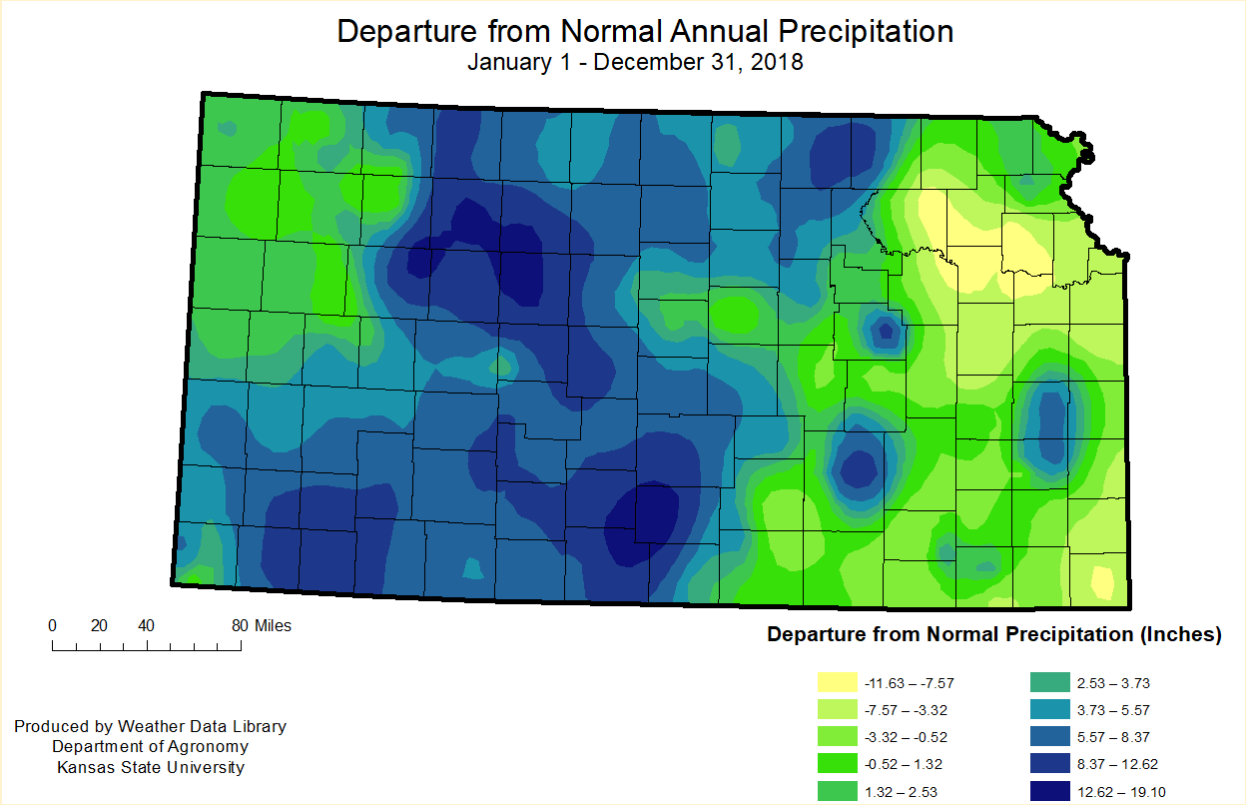
Especially in April, May and June, northwest Kansas continued to receive heavy rains while northeast Kansas was significantly below average for rainfall well into the growing season and heat of summer.

This trend reversed for the second half of the year, as July-to-December was the second-wettest on record statewide, including the wettest second half recorded for south-central and southwest Kansas.





While the acute stress from the short-term drought in eastern Kansas will certainly be reflected in the loss of vigor for those forest lands, the significant rainfall in the fall and winter of 2018 meant that Kansas ended 2018 with no level of drought anywhere in the state, according the United States Drought Monitor.



Invasive Bush Honeysuckle

Bush honeysuckle creating a dense monoculture in the understory of native forestland along a walking trail at Anneberg Park in Manhattan.

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 backpack 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.

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

Herbicide Injury

While woody plants in Kansas have experienced varying levels of impact from herbicides for decades, a noticeable increase has taken place in recent years.

The application of herbicides that readily volatilize, such as ester formulation of 2,4-D, has long been known to cause leaf deformation in sensitive species such as oak, redbud, sycamore, and others.

Symptoms consistent with 2,4-D exposure have been documented on woody species across the state. While a one-time exposure to low levels of herbicide may cause deformation of new growth without having a significant impact on long-term tree health and vigor, repeated exposure and injury will contribute to decline, especially when complexed with the existing abiotic and biotic stressors that already impact trees in Kansas.

In 2017, the controversial topic of dicamba injury came to a national forefront, focusing mainly on injury to non-tolerant crops adjacent to dicamba-tolerant fields.

However, Kansas (like many other states in the region) also witnessed injury to many trees within forested land both adjacent to, and some distance from, agricultural land where dicamba may have been applied.

These symptoms manifested especially strongly on black walnut adjacent to agricultural fields where dicamba was applied as an early spring "burn down" herbicide to control glyphosate-resistant weeds before planting soybeans or corn. Even if the applicator has taken steps to limit risk for wind-aided drift, dicamba could move off-target due to volatilization or movement through the soil water.

A clear causal relationship between herbicide application and tree injury has not yet been established, but based on the widespread symptoms observed in 2017 and 2018, further study will be undertaken in 2019 to document and investigate the source of these symptoms. A focus will be on testing of symptomatic trees to determine herbicide residues, if any.

Deformation and cupping of new growth and chlorosis, symptoms consistent with herbicide injury on redbud (top photo), sycamore (middle photo), and northern red oak

Invasive Callery Pear

Invasive callery pear seedlings proliferate in grasslands in rural Geary County. Untreated seedlings on the left, treated seedlings on the right.

A seedling of callery pear in forestland in rural Montgomery County.

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. Efforts to address poor branching structure and subsequent storm damage led to the introduction of improved cultivars, but these new trees with better branch angles were also genetically distinct from the clonally propagated and identical 'Bradford' that existed in the landscape. With these new cultivars came 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. In many cases, this invasion and conversion happens without land managers being aware of the process, and it is only noticed when it's too late and management has become a challenge.

A large callery pear exhibits strong pyramidal form, in a waste area in rural Crawford County.

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. There are a few well-established populations of callery pear near urban areas of Wichita and Kansas City, but many smaller infestations are still becoming established in other areas such as Hutchinson, Manhattan, Topeka, and towns in southeast Kansas.

A callery pear seedling produces a proliferation of fruit, with seeds that are likely viable, at an infestation in Riley County.

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.

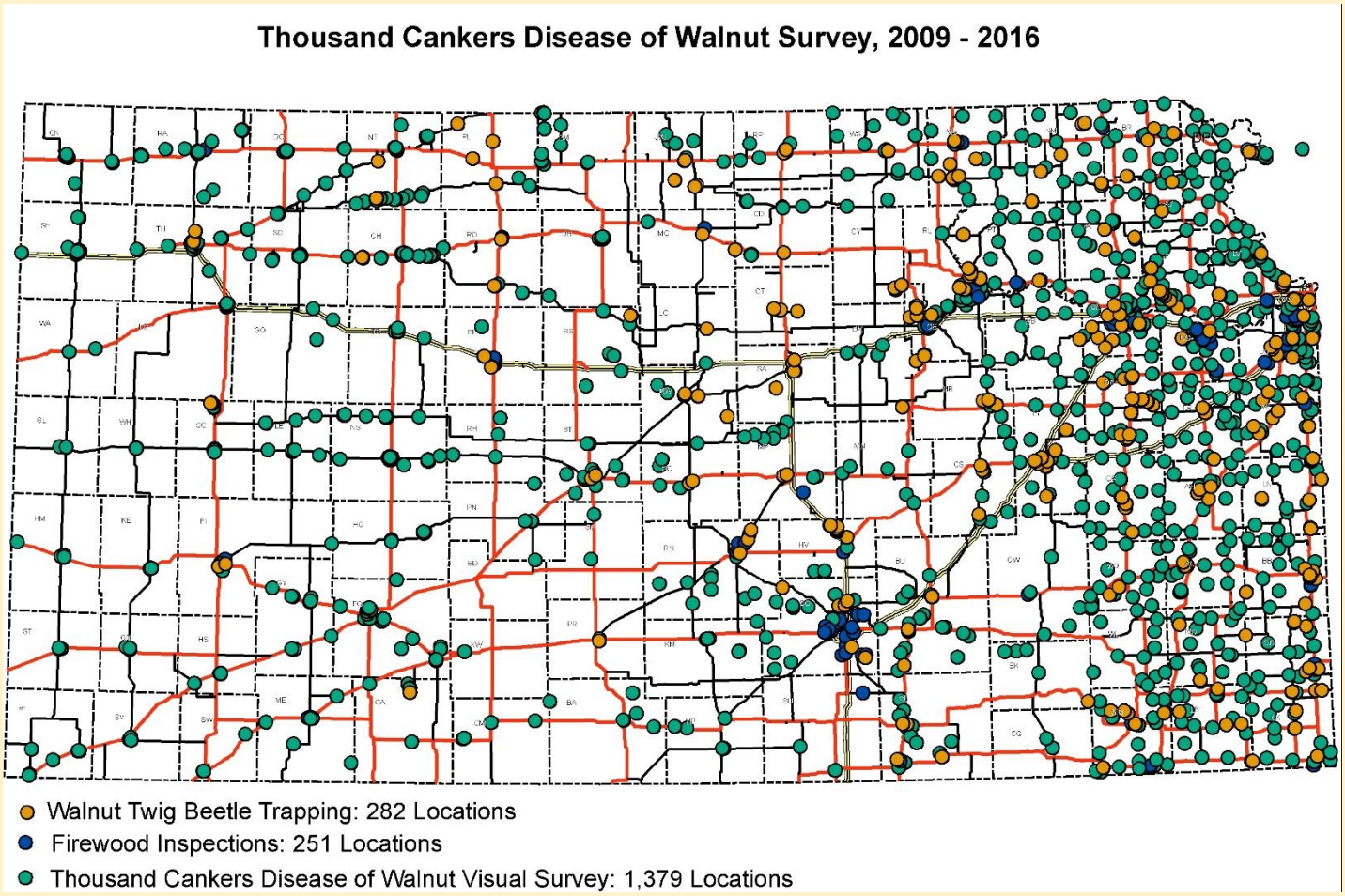
This disease complex has **not yet been detected** in Kansas. However, Kansas shares a 200-mile border with Colorado, an infested state, increasing the risk of TCD introduction. With TCD existing as close as Colorado, Kansas is a potential "doorway" to the entry of thousand cankers disease into the native 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.

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



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. Lindgren traps, with lure, were set and monitored by Kansas Department of Agriculture (KDA) personnel at key locations statewide. **No walnut twig beetle (WTB) specimens have been found to date**.

The 2018 WTB survey began on May 30 and concluded on August 3. Forty-four Lindgren funnel traps were deployed in 14 southeast Kansas counties, with one trap at each site, in Franklin, Miami, Coffey, Anderson, Linn, Woodson, Allan, Bourbon, Wilson, Neosho, Crawford, Cherokee, Labette, and Montgomery counties.

This was the first year we tried dry cup trapping. Overall it was positive with easier collection and sorting, but some predation was observed. All samples were completed and no suspect specimens were detected.

A dedicated sentinel site trap program was maintained in western Kansas of known walnut locations. This was prompted by the discovery of walnut twig beetle in Eads, Colorado, about 40 miles directly west of the Colorado-Kansas border. The Eads infestation remains the nearest known TCD positive, although a new infestation in along Interstate 76 in Brush, Colorado was found in 2017, 85 miles from northwestern Kansas.

The Interstate 70 corridor from Denver to Kansas City remains the most likely pathway for TCD, linking the TCD-positive Denver metro area with the major black walnut production area of eastern Kansas and Missouri.

A Lindgren funnel trap, used to monitor for WTB.

The onset of autumn on native forestland at Pomona Lake in Osage County, Kansas.

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

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