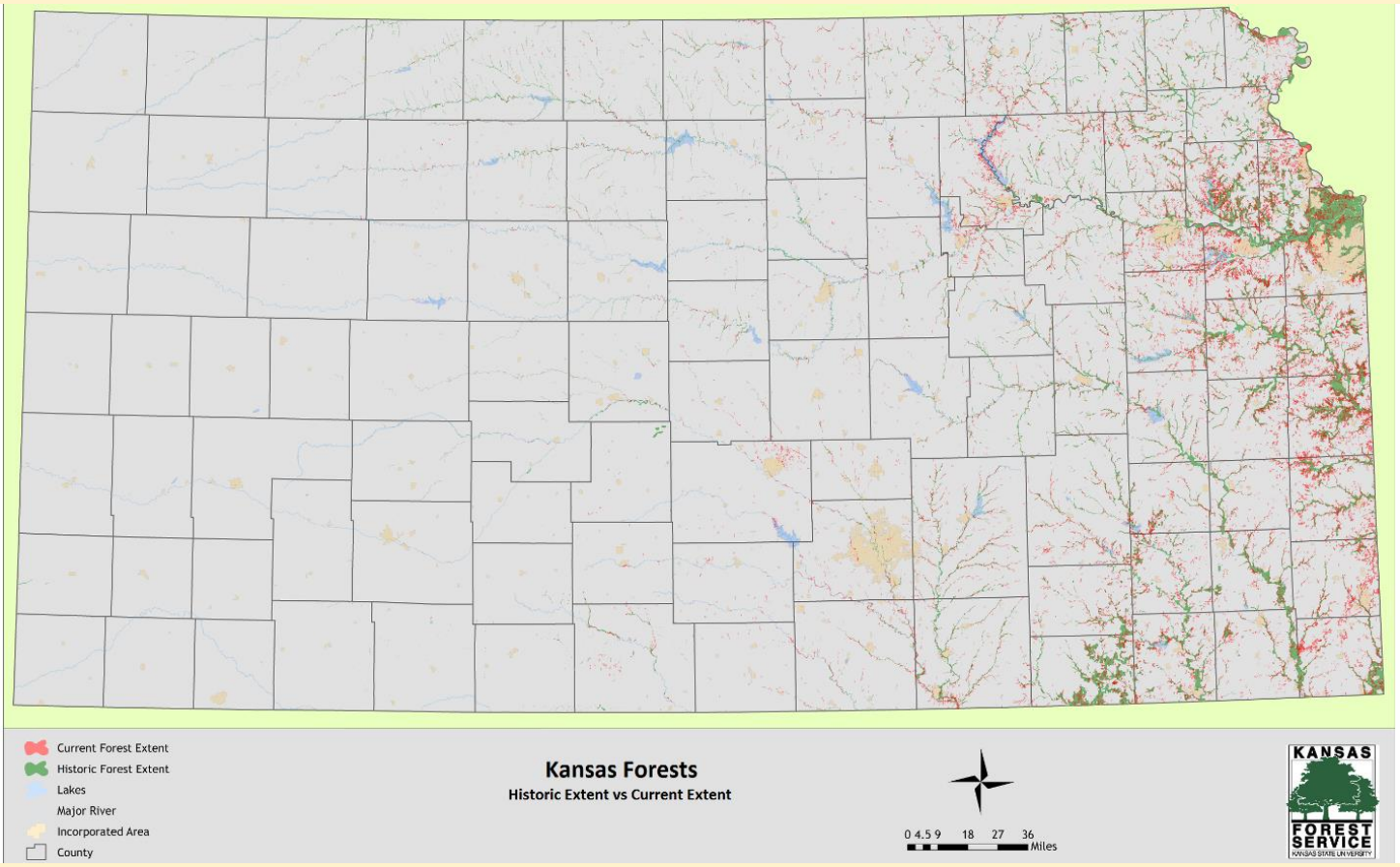
Kansas Forest Health Highlights 2016

A thriving native bur oak (Quercus macrocarpa) spreads its branches over a cemetery in rural Wabaunsee County.

Forest Resources of Kansas

In Kansas, the central 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.

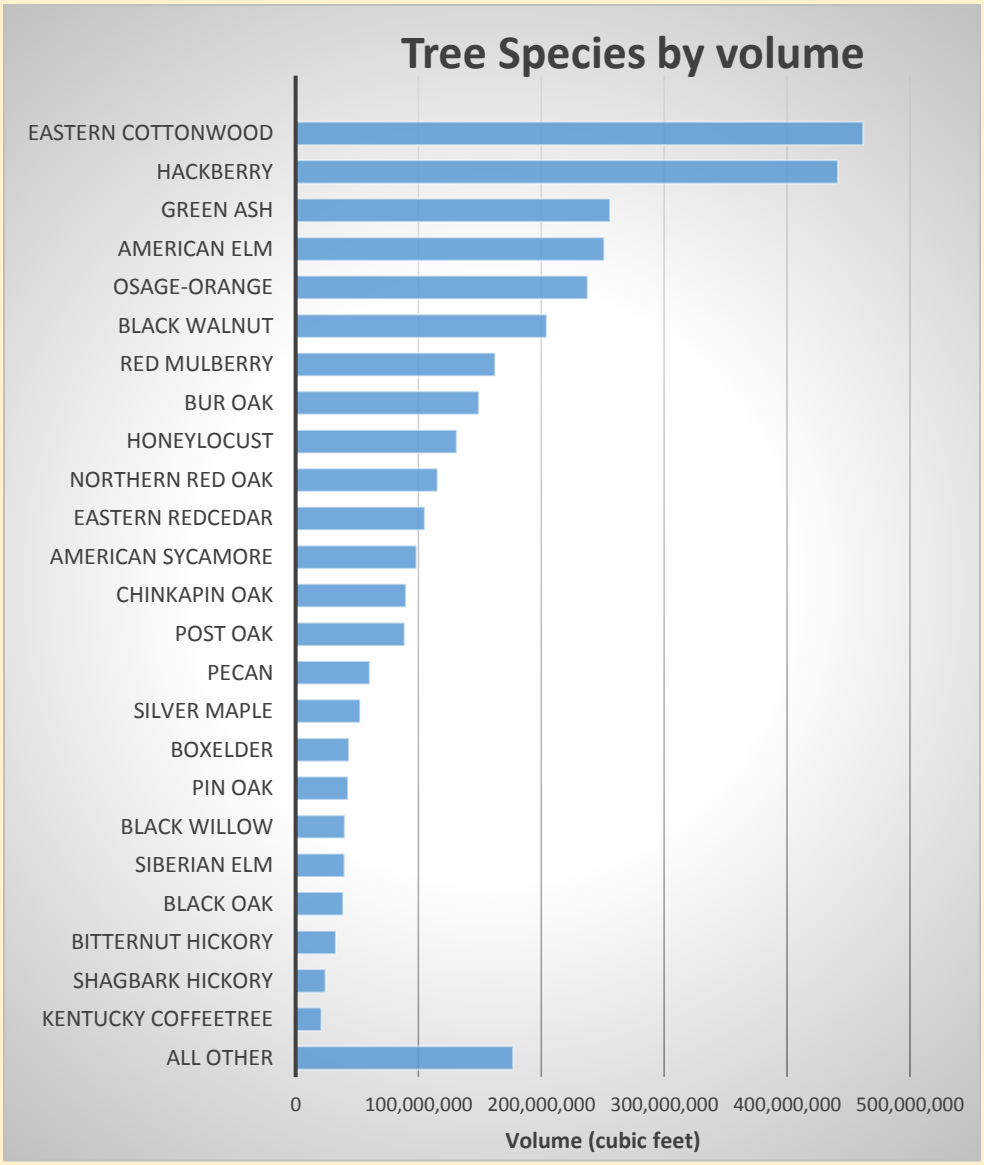


The top tree species, by statewide volume, are cottonwood, hackberry, green ash, American elm, osage-orange, black walnut, red mulberry, bur oak, honeylocust, and northern red oak.

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 **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.

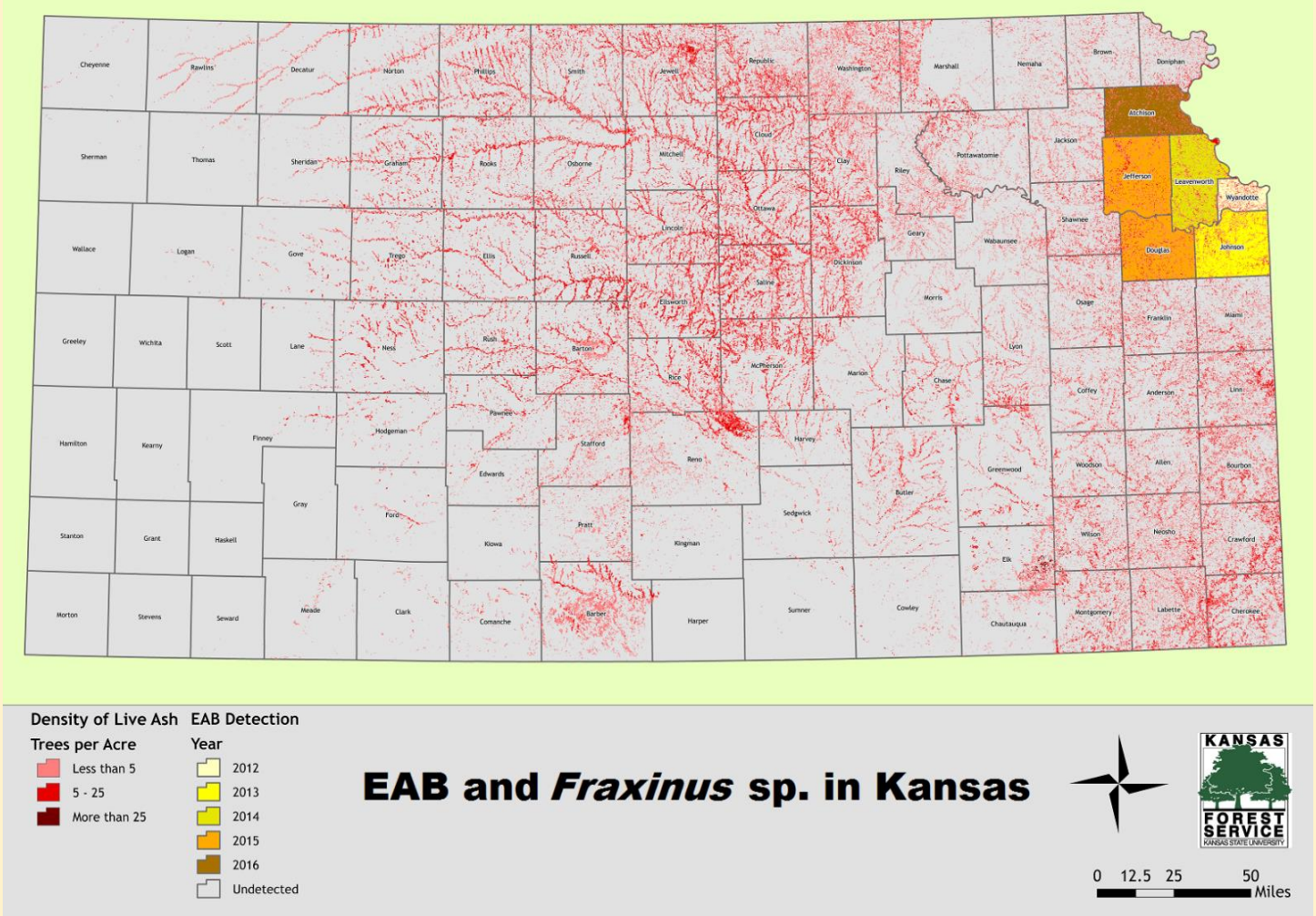
Emerald Ash Borer

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, Jefferson, and Atchison 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 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.

Ash trees in Roeland Park marked for removal due to the presence of EAB.

In 2016, Kansas expanded the Emerald Ash Borer Quarantine to include **Atchison County**, the sixth county with confirmed EAB presence, all contiguous in the Kansas City area. The Atchison County record was from an adult EAB caught on a purple prism trap in a rural area near Cummings. Subsequent trap tree peels in the city of Atchison produced 24 EAB larva, corroborating the presence of EAB in the county. In previously quarantined counties, ash tree mortality was observed to increase over previous years.



KFS and KDA staff and volunteers peel EAB trap trees in Topeka (left) and Ottawa (right) in October 2016. No EAB larvae were found at either site..

Additional trap trees placed in non-quarantined northeast Kansas counties (Doniphan, Shawnee, Franklin, 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.

Weekly releases of three biocontrol species (*Tetrastichus, Spathius, Oobius*) were done by the Kansas Department of Agriculture throughout the season at five sites around Wyandotte County Lake. This is the first year for biocontrol releases in Kansas. Additional releases of biocontrol agents are planned for 2017.

A rural woodland roughly 10 miles northeast of Lawrence, in Jefferson County, was confirmed to have a significant EAB population causing mortality consistent with a well-established EAB presence of several years, suggesting that EAB is more entrenched in the western portion of the quarantine zone than previously thought.

In response to EAB, a message of forest health resilience through diversity has been promoted statewide. As part of this diversity outreach, several tree plantings have been coordinated by KFS in public parks in the Kansas City metro area. 120 trees of more than 40 species were planted at six sites, with an additional 30+ species planted to enhance the diversity at the KFS office arboretum in Manhattan.

Educational kiosks were constructed by a timber-framing class at KU, with materials sourced from urban lumber in the City of Lawrence, further demonstrating the “full circle” benefits of managing urban forests.

A Kentucky Coffeetree is planted at Wyandotte County Park, with the help of many volunteers.

A timber-frame joint is prepared in a kiosk constructed of urban lumber (black walnut) at the University of Kansas.

Bark sloughing off a heavily infested ash in rural Jefferson County, part of a native forest stand with significant EAB damage and mortality.

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*).

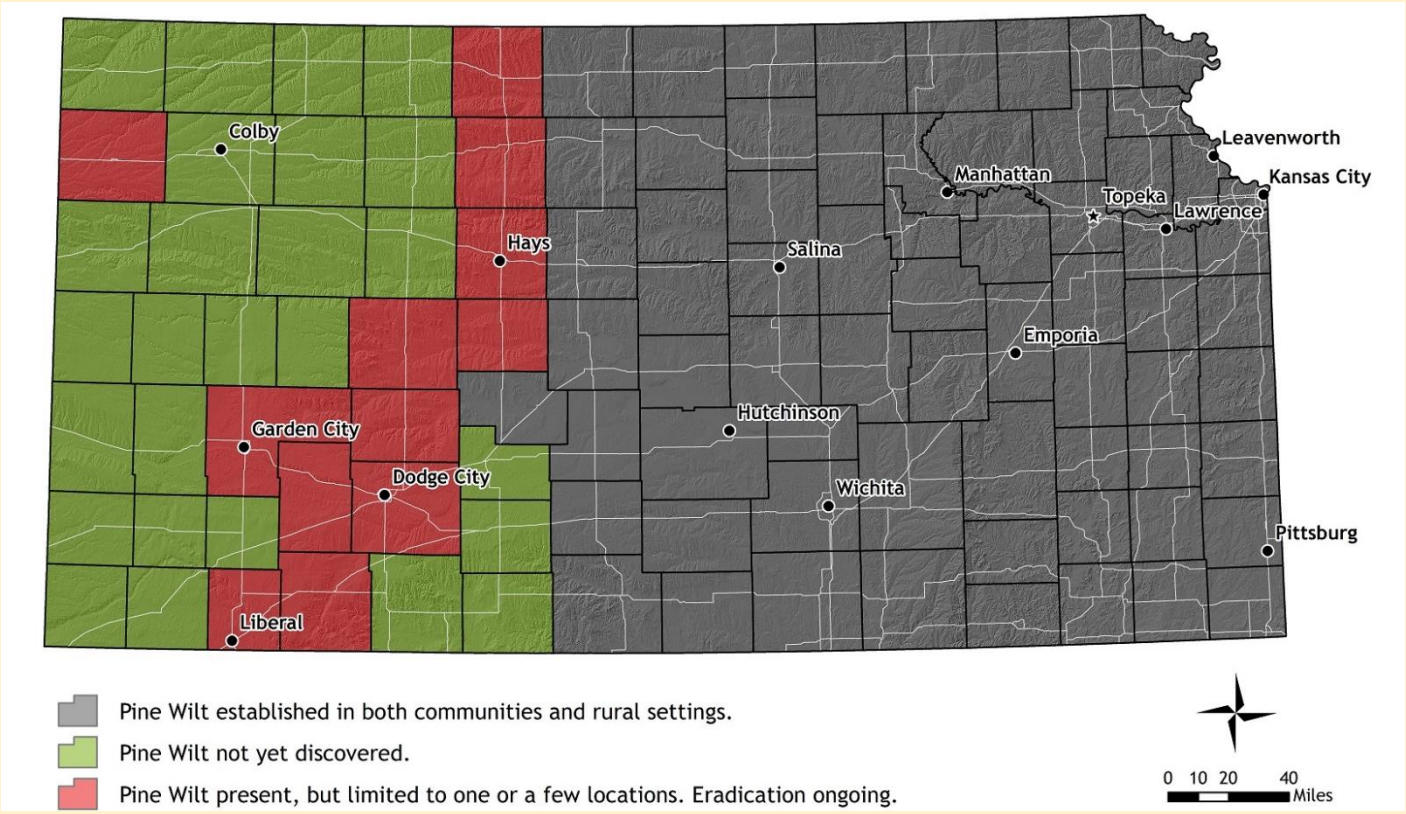
In 2015 several pine wilt positive trees were found in a Scotch pine windbreak, several miles north of **Goodland**. These trees were removed and destroyed. In 2016, the Sherman County extension agent confirmed a new infestation west of Goodland. The homeowners destroyed the infested trees. This infestation is located 1 mile east of the golf course where thousands of Austrian and Scotch pines reside. A survey of the surrounding area found no other suspect trees.

A third infestation was found on the northwest side of Goodland. A Scotch pine died this summer and was confirmed positive for the disease. The tree may be in a state of Kansas right-of-way and jurisdiction is being determined before it is removed. Delimiting survey did not find any more infected trees. All three infestations are isolated from each other by several miles and all occur along state highways.

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

Follow up survey of past positive sites in Colby (Thomas), and Stockton (Rooks) were negative in 2016.

The city of Hays (Ellis County) has thousands of susceptible pines. 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.



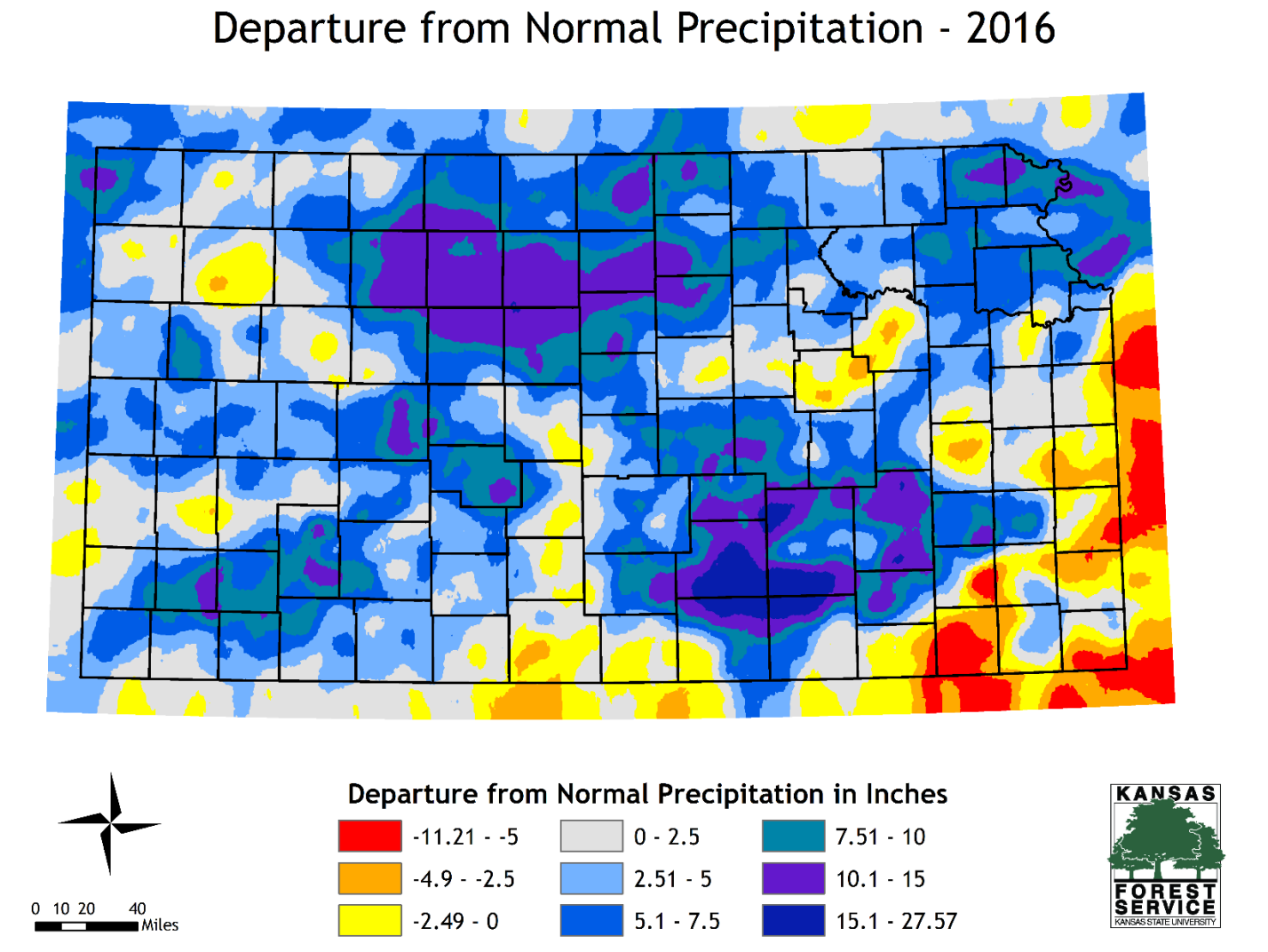
Abiotic Stress

Unusually heavy precipitation in parts of central Kansas 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.

The city of Wichita, which normally averages about 34 inches of rainfall per year, recorded 50.6 inches of rain in 2016, the **second-most on record dating back to 1888**. Widespread flooding occurred in the region due to deluges in July, August and September. Inundated soils were likely to cause stress and root dieback on trees in low-lying areas.

Floodwaters inundate trees in Mulvane after a heavy rain. (Image courtesy of KAKE)

A large hail storm in western Kansas in May caused damage to urban and rural forests around Dodge City and Garden City, stressing trees and causing wounds. A heavy ice storm at the very beginning of 2017 caused limbs to fail on thousands of trees across the western half of Kansas, with significant damage in Pratt, Garden City, Hays and Dodge City. 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.



Invasive Bush Honeysuckle

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

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.

Additionally, a spectral remote-sensing protocol has been developed to detect and delimit infestations, and mapping of this newly-acquired data will aid in strategically treating populations and limiting 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.

Oak Itch Mite

The oak leaf itch mite, *Pyemotes herfsi*, is a tiny mite that causes itching and painful bites on humans.

This mite was responsible for widespread outbreaks of itching bites in 2004 and 2007, and has seen persistent presence since 2014 in communities with presence of red oaks – specifically pin oaks.

In addition to almost daily walk-in visits or calls to the state forestry office in Manhattan from local people afflicted with bites from this pest, extension agents in counties with high red and pin oak populations reported many complaints in the summer of 2015 and 2016 from homeowners affected by intense itching.

Oak leaf itch mites emerge in late July and continue throughout late summer. Activities that take place near or under trees, such as gardening, backyard leisure activities, and especially raking of leaves in fall, cause increases in complaints of itch mite activity.

Female itch mites search for the larvae of the midge that causes oak leaf margin gall, a food source for the mites. These mites can be carried on the wind for hundreds of yards, occasionally landing on humans and pets. Attempts to feed lead to intense itching as a reaction to the neurotoxin (purported to be TxP-I) contained in the mite's saliva.

Although the common name for this mite suggests a close association with oaks, the mite appears to be a generalist feeder. The mite has also been observed to feed on larvae of furniture beetles, rice and granary weevils, oriental fruit moths, pine tip moths and hackberry nipple gall psyllids. Therefore, removal of red oak and pin oaks in an attempt to mitigate the irritation from these mites is likely an ineffective strategy and would lead to unnecessary removal of valuable community tree assets.

Insect repellents such as DEET have no apparent effect on these mites, although some anecdotal evidence suggests that feeding may be somewhat dissuaded by certain kinds of sunscreen applied to exposed skin.

Some individuals seem to be much more sensitive than others, and experience significant irritation and itching. Cortisone cream or other antihistamines have provided some level of relief for these individuals, although the most effective strategy seems to be avoiding exposure in the first place.

A pin oak in an urban backyard, typical of the setting where oak itch mites have been most problematic in recent years. (Photo by David Stephens, Bugwood.org)

Oak leaf itch mites are known to feed on the larvae of the oak leaf margin gall midge, which causes the leaf margin distortion seen in this pin oak leaf. (Photo by Megan Kennelly, Kansas State University Plant Pathology)

Invasive Plants

Invasive callery pear seedlings mingled with bush honeysuckle on a vacant lot bordering woodlands near Lenexa, KS.

Invasive plants threaten several Kansas ecosystems, from saltcedar along the Arkansas River watershed, to sericea lespedeza in native prairies, to callery pear and bush honeysuckle in urban wildland interfaces, and many more such as Russian-olive, tree-of-heaven, old world bluestem, Japanese honeysuckle, and more.

These invasive plants suppress native plant and forest regeneration, deplete available water resources, fail to support native wildlife and pollinators, and generally disrupt ecosystem function wherever they become entrenched.

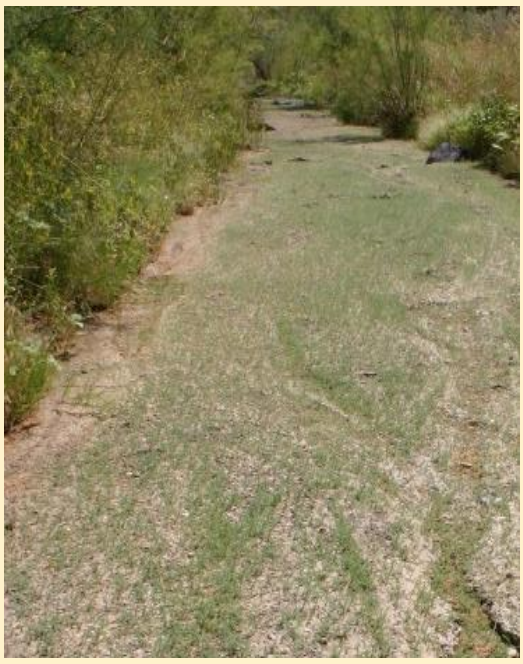
The Kansas Forest Service has secured grant funding to address these issues in a broad, cooperative, and sustainable manner. A series of Plant Pest Detector trainings are planned, and a comprehensive Invasive Plant Management and Restoration Guide for the region is being developed with a diverse array of partners and stakeholders.

Bumper magnets were developed and distributed throughout the state to help raise awareness of the impact of invasive species on our resources.

While it's important to note that eastern redcedar is not considered an invasive species, the aggressive expansion of this native tree into rangelands over recent years is an issue that must be addressed.

This management problem is being met with an emphasis on land management practices, such as prescribed burning, that keep this native species within its historic niches, while preserving the highly important redcedars that are critical conservation tools in windbreaks and shelterbelts throughout the state.

Prescribed fires can be a valuable management tool for preserving high-quality ecosystems.



A dry streambed, typical of saltcedar infestation in western Kansas along the Arkansas River. (Photo by Eric Coombs, Bugwood.org)

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.

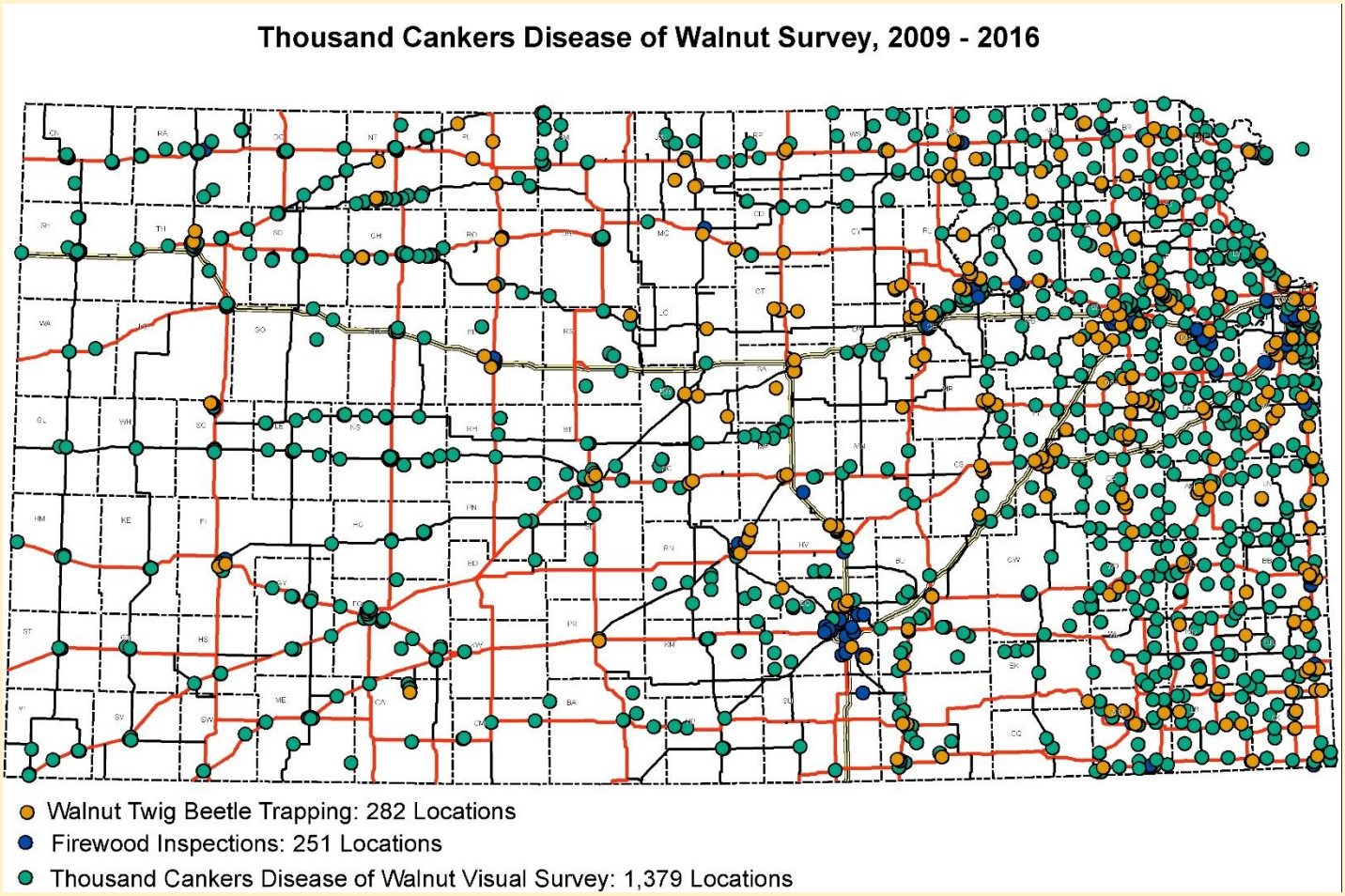
This disease complex has **not yet been detected** in Kansas. However, Kansas shares a 200-mile border with Colorado, an infested state, increasing the risk of TCD introduction. With TCD existing as close as Colorado, Kansas is a potential "doorway" to the entry of thousand cankers disease into the native 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. 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 WTB survey began in April and ran through October 2016. Thirty five Lindgren funnel traps were deployed in Bourbon, Cherokee, Clay, Crawford, Doniphan, Douglas, Graham, Osage, Osbourne, Riley, Rooks, Shawnee, Sheridan, and Wyandotte counties.

High risk areas of central and eastern Kansas were surveyed, where walnut is common and pathways are of concern. Also, a dedicated sentinel site trap program was maintained in western Kansas of known walnut locations. This was motivated by the discovery of walnut twig beetle in Eads, Colorado, which lies about 40 miles directly west of the Colorado-Kansas border near Tribune, Kansas.

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 repeated in different counties in 2016 by the KDA western Kansas Area Specialist, Bob Buhler.

Preliminary sorting of samples has started and is ongoing. Kansas State Plant Pathology lab tested some samples for *Geosmithia* fungus, but the **samples were negative**.

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 in 2015**. 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 *Lymantra dispar dispar*.

This find triggered a delimiting survey in 2016. **No gypsy moths were detected 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.

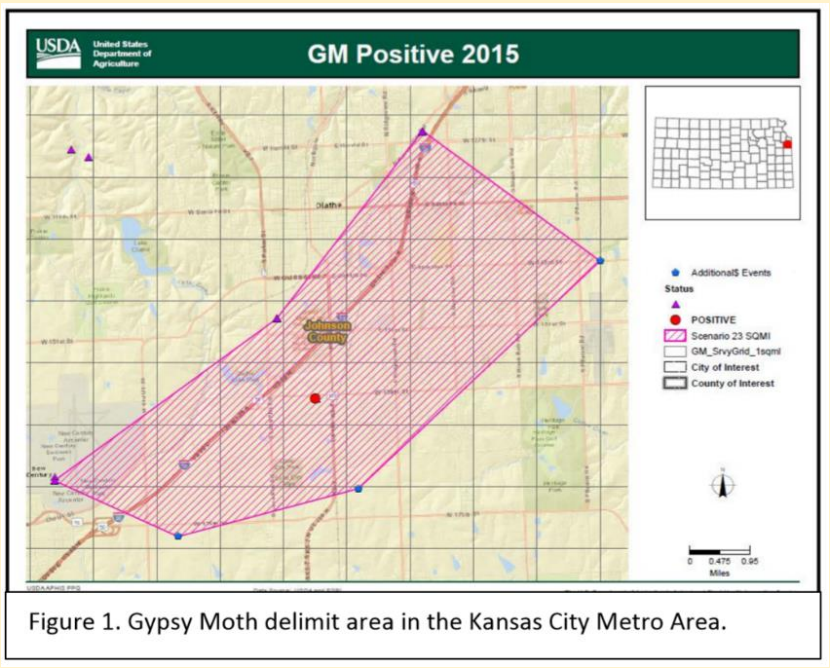
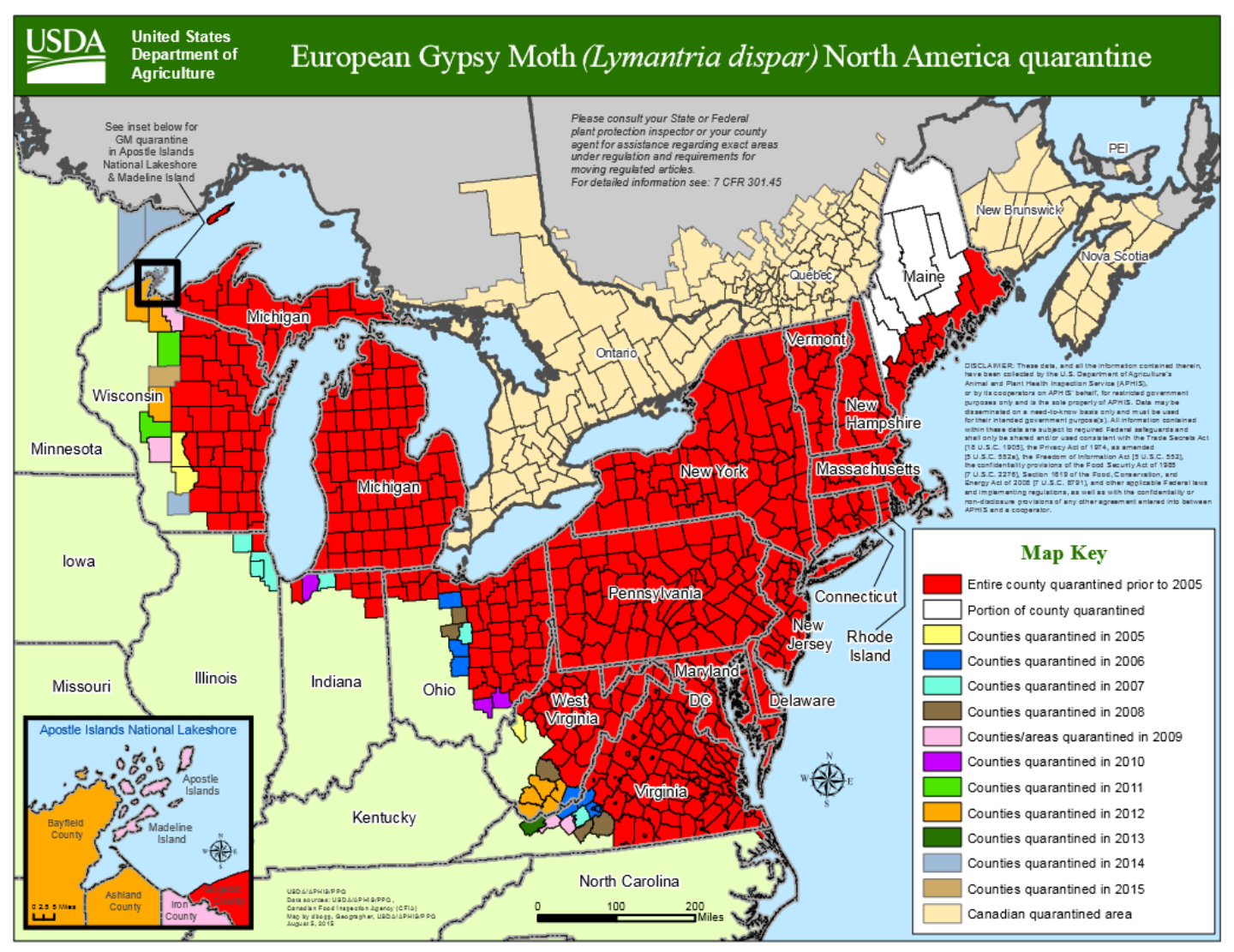


Figure 1. Gypsy Moth delimit area in the Kansas City Metro Area.



Forest Health Outreach

Don't Move Firewood

Continuing a long-standing outreach effort, educational material was distributed to high-risk sites that outlines the risks involved with moving firewood, and therefore potentially moving Emerald Ash Borer, Thousand Cankers Disease, and other forest pests.

The Kansas Department of Agriculture inspected firewood retail locations throughout the state to ensure compliance with applicable Emerald Ash Borer and Thousand Cankers Disease quarantine law.

Several radio features were also produced to explain why moving firewood or other untreated wood can threaten our forest resources in both rural and urban settings.

Moving firewood is a significant risk for spreading forest pests and diseases, especially when unused wood is left behind at camp sites.

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.

Giant "Tree Tags" were placed on trees in several cities in the Kansas City metro area, and also in Manhattan. These tags focused on bringing the benefits of a diverse urban forest into focus for people who may otherwise have passed by these trees without a second glance.

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.

To this end, recommended tree lists were updated by district and community foresters for several regions, native seed sources were explored for better-adapted Kansas trees, and trials were conducted for alternatives to various conifers that are disappearing from the landscape due to pine wilt or abiotic weather stresses.

Large "Tree Tags" were placed on trees in several cities, highlighting the value in a diverse urban forest made up of many species, in many age classes, on many sites.

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.

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