

'NEW' INVASIVE INSECTS AND DISEASES TOO!

WHAT IS NEXT FOR ALABAMA?



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WHAT IS NEXT FOR ALABAMA?

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Alabama Forestry Commission



Non-native Invasive Forest Pests – Insects and Diseases

- Some were intentionally introduced into the U.S. and escaped captivity
- Most were accidentally introduced into the country
- Many came into the U.S. through the ports from packing material or other products
- The U.S. received several billion tons of foreign imports a year
- Like non-native invasive plants, some of these pests are more invasive and destructive than others

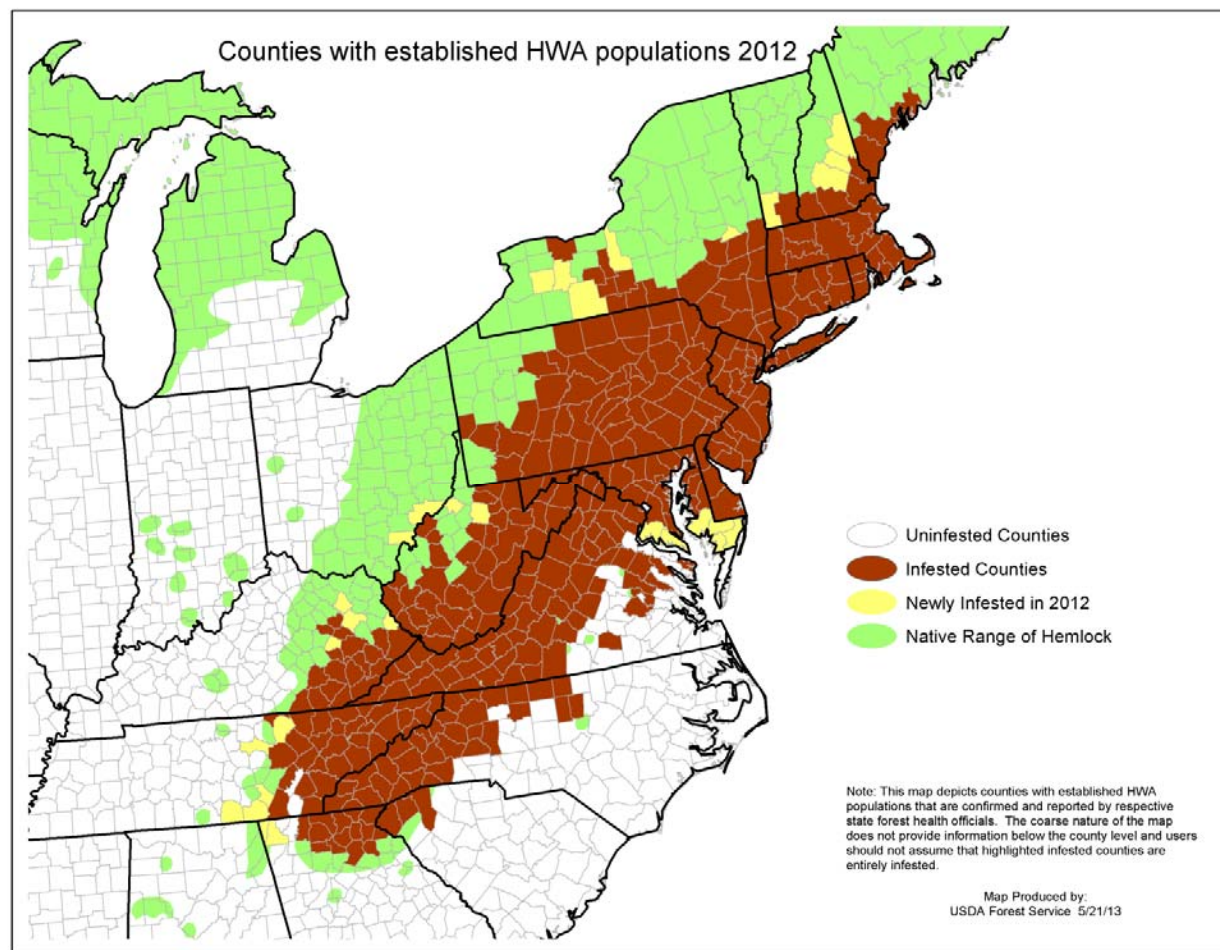


What is Next for Alabama? – These Four Non-native Pests

- Hemlock Woolly Adelgid – *Adelges tsugae*
- Thousand Cankers Disease: Walnut Twig Beetle – *Pityophthorus juglandis* and Primary Fungus – *Geosmithia morbida*
- Emerald Ash Borer – *Agrilus planipennis*
- Laurel Wilt Disease: Redbay Ambrosia Beetle – *Xyleborus glabratus* and Fungus – *Raffaelea lauricola*

Hemlock Woolly Adelgid – *Adelges tsugae*

- Hemlock woolly adelgid was first documented near Richmond, Virginia in 1951
- Originally from Southeast Asia (Southern Japan)
- It now exists in 18 states from Maine to Georgia
- It mainly spreads by wind, small animals, and birds (sometimes by people)
- Host trees are eastern hemlocks, Carolina hemlocks, and other ornamental hemlock cultivars



- Hemlock woolly adelgid has a complex life cycle with two generations a year
- Can reproduce asexually on its secondary host (hemlocks)
- Most are wingless individuals (or crawlers)
- A few are winged individuals but cannot reproduce sexually (no suitable spruce host)
- With its piercing-sucking mouth parts, it feeds at the base of the needles
- Feeding causes loss of needles, mortality of buds, and dieback



- Tree symptoms develop gradually with needles turning grayish-green
- Heavily infested branches will appear to have small pieces of white cotton at the base of needles (adult adelgids are covered with white woolly coating)
- Affected needles will desiccate and fall to the ground
- Thinning and stem dieback will occur starting from the bottom of the crown
- Hemlock will die within 3 to 7 years after infestation



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- Insecticidal soaps and horticultural oils can be used on small, high-valued trees at the start of decline – repeated treatment is needed
- Systemic insecticides like Tree-age and Imidacloprid can be injected into the tree or applied as a soil drench – can last up to 2 years
- Asian predatory lady beetles (*Scymnus sinuanodulus*, *Laricobius osakensis*, *Laricobius nigrinus*) – research still ongoing
- Hybrids with eastern hemlock are difficult – low genetic variation





OVIPOSITIONING
ADULTS

ALWAYS KEEP DOORS CLOSED

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ADULTS

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SCYMNUS OVIPOSITIONING ADULTS

PERCIVAL

Intellus environmental controller

HEAT
 COOL
 HUMIDITY
 DEHUMIDIFY

CO₂ HOLD/ALARM
 PROGRAM
 PREVIEW
 COMMAND KEYS

TIME
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 ALARM
 LIGHTS
 W/B
 CUL/ AUL
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 UP
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 HELP

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ADULT OVIPOSITION JARS

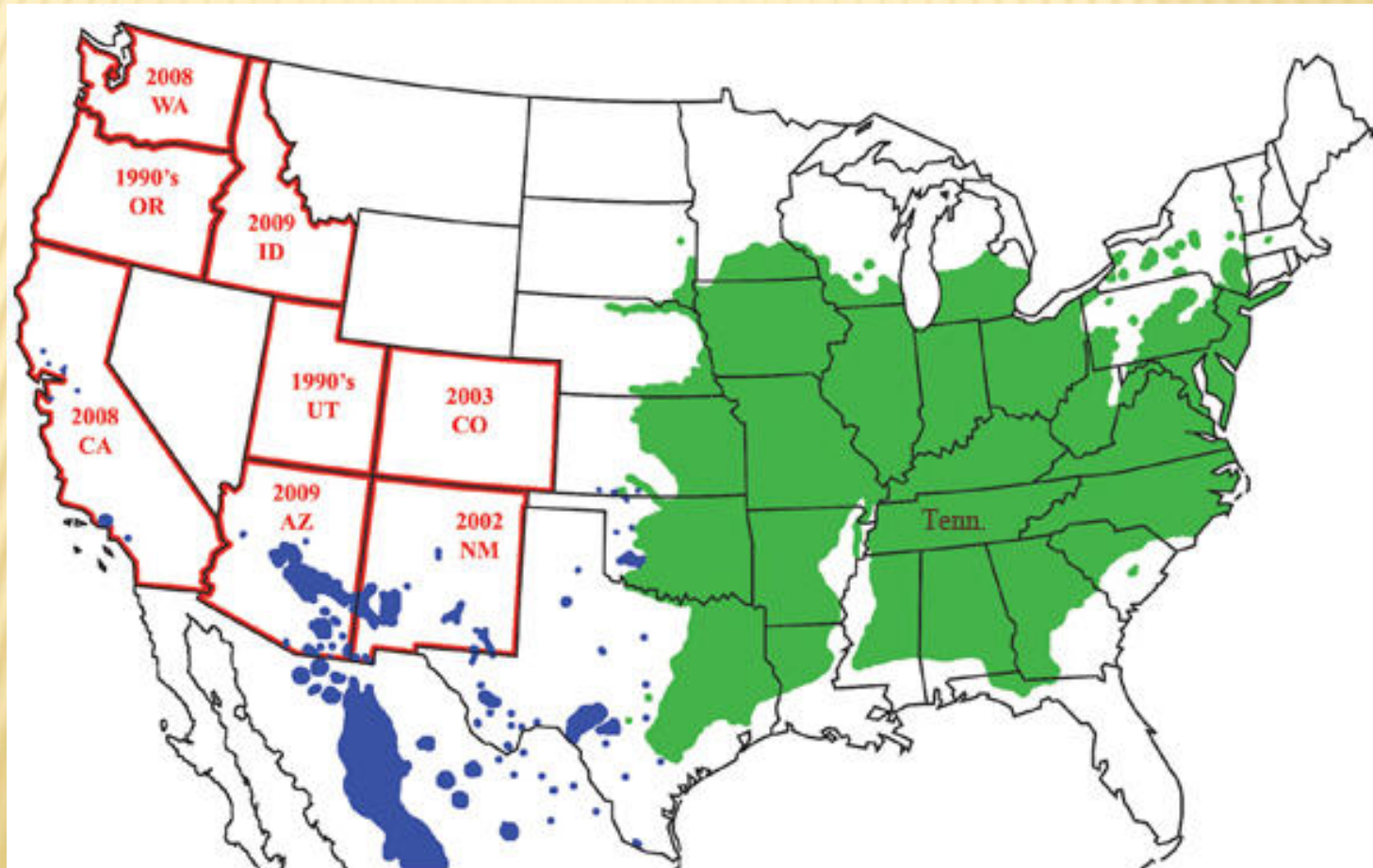
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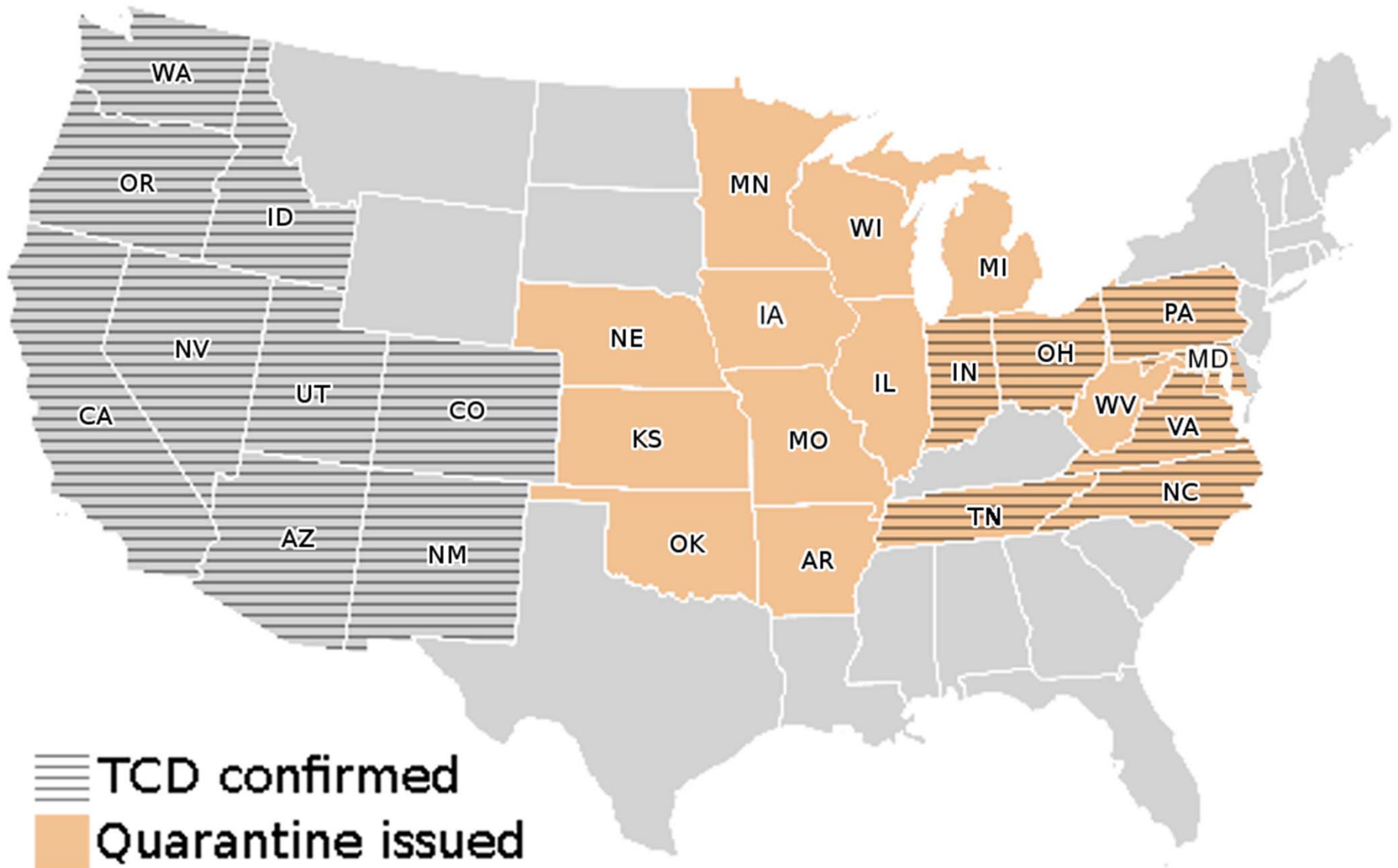


Thousand Cankers Disease – *Pityophthora juglandis* (Walnut Twig Beetle) and *Geosmithia morbida* (Primary Fungus)

- Thousand cankers disease was first documented in Eastern U.S. in 2010 (Knoxville, Tennessee)
- Originally from northern Mexico, Arizona, and New Mexico (the range of the Arizona walnut)
- Spread is by movement of infected wood and natural methods (can travel up to 2 miles to host tree)
- Host trees are walnuts, but the black walnut is the most susceptible

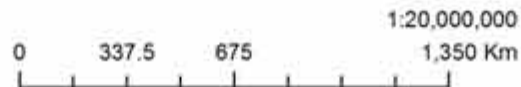
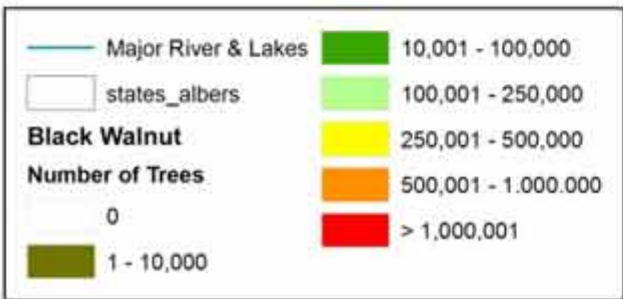
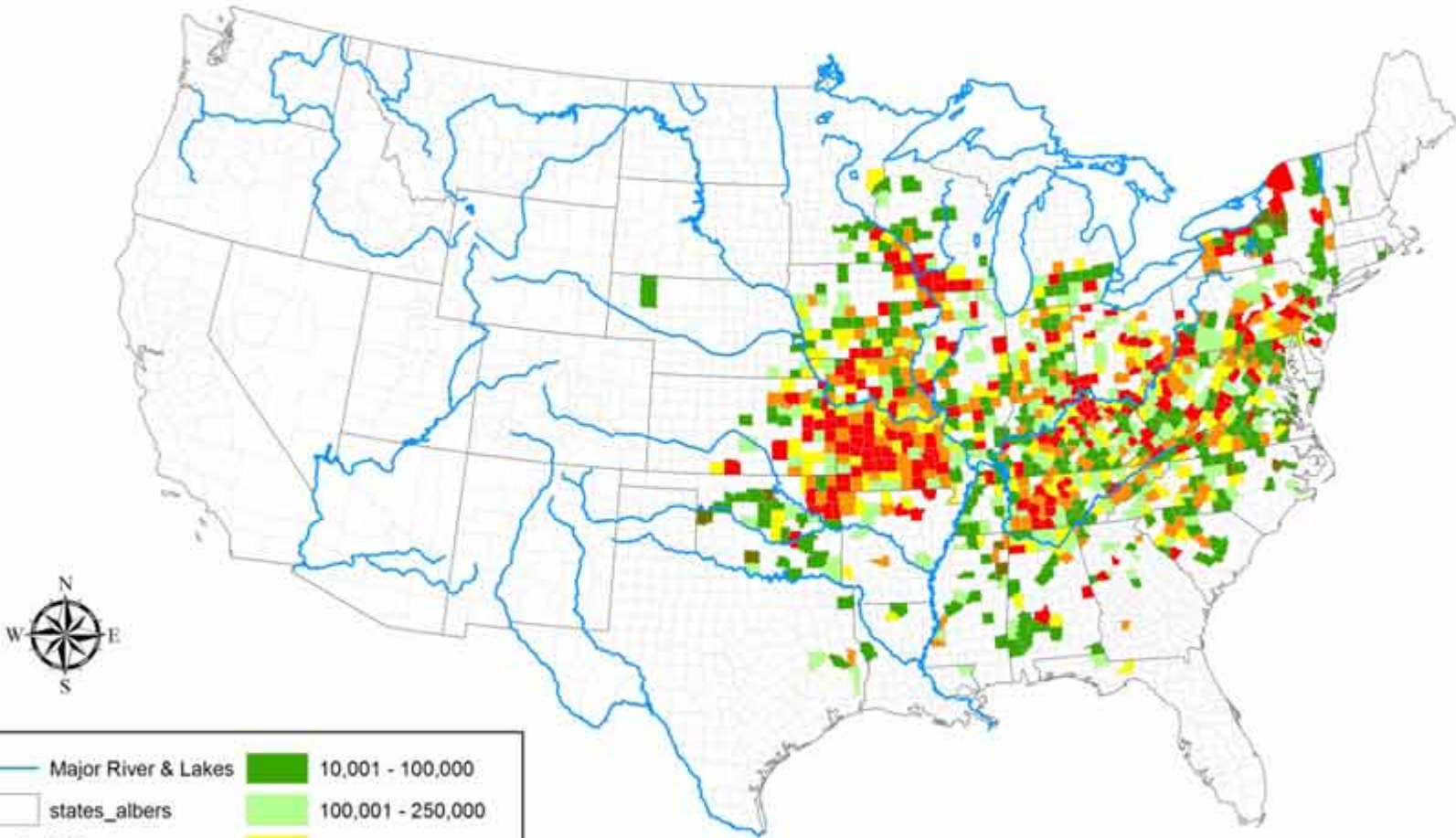


Distribution of Thousand Cankers Disease as of April 20, 2015



Source: www.thousandcankers.com

Number of Black Walnut (*Juglans nigra*) Trees in the Continental United States



Source: USDA FS FIA
Created By: Yu Takeuchi
USDA APHIS PPQ CPHST
Date: August 25, 2009
Projection: USA Contiguous Albers Equal Area

- Thousand cankers disease is an interaction between the walnut twig beetle and a fungus
- The walnut twig beetle vectors the fungus *Geosmithia morbida*, both likely native to southwestern U.S.
- Research is ongoing to understand the biology of the insect and the fungus - Number of generations a year? Active during the winter months?
- Thousands of twig beetles create small cankers in branches and the main bole that eventually coalesce



- Walnut twig beetle bores into branches in the upper crown first creating galleries underneath the bark
- The vectored fungus spreads in these galleries causing small circular dark brown cankers
- Cankers coalesce to girdle the branches
- Foliage on infected branches turn yellow, then wilt and turn brown
- Crown dieback occurs with numerous pin-sized exit holes on infected branches
- Black walnut tree will die within 3 to 10 years after initial infestation





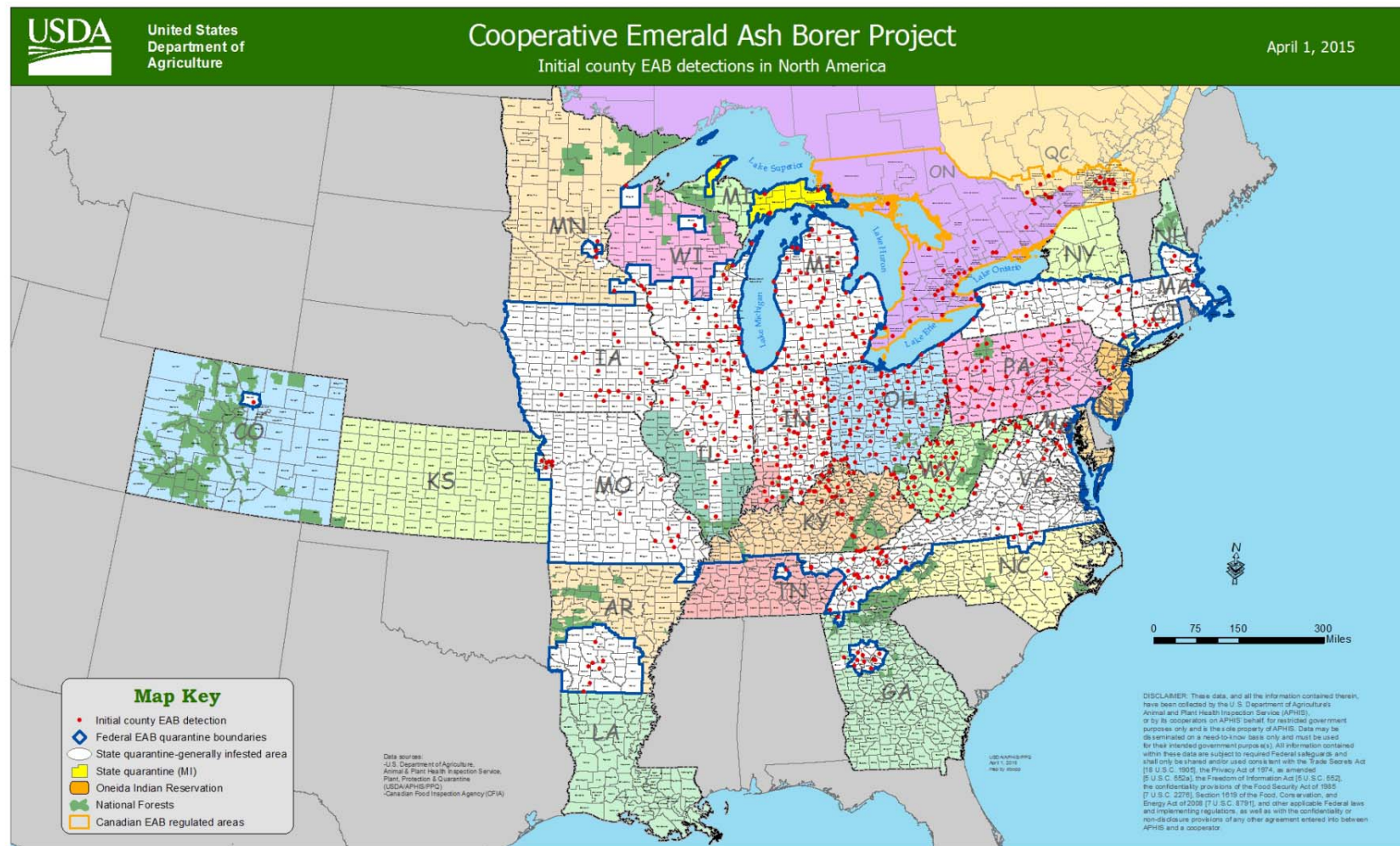


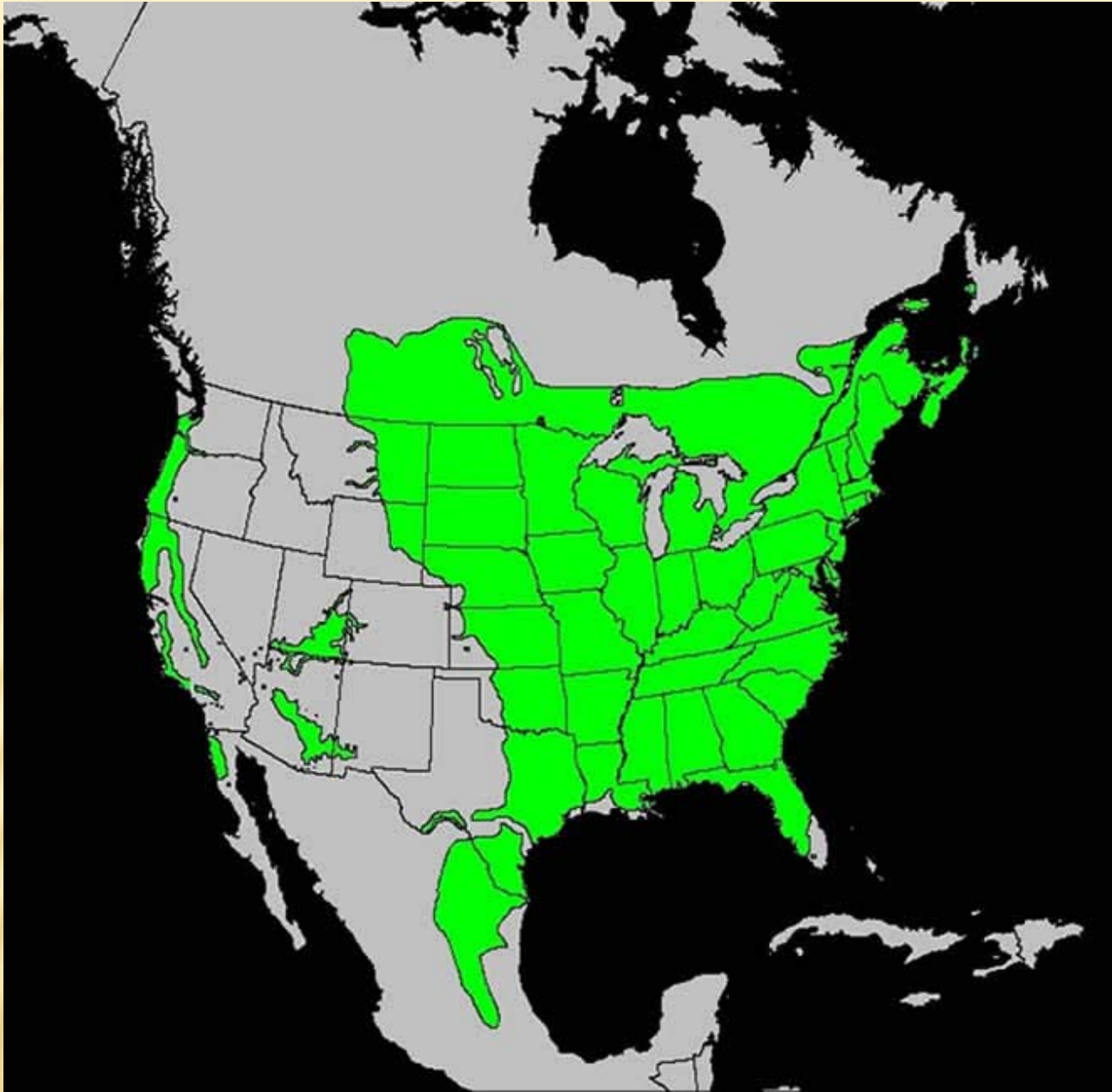
- Tree symptoms are most noticeable during the summer months when the twig beetle is most active
- Currently, no known successful control or preventative methods - limit the movement of infested wood
- Early detection and destruction of infested trees may reduce the rate of spread



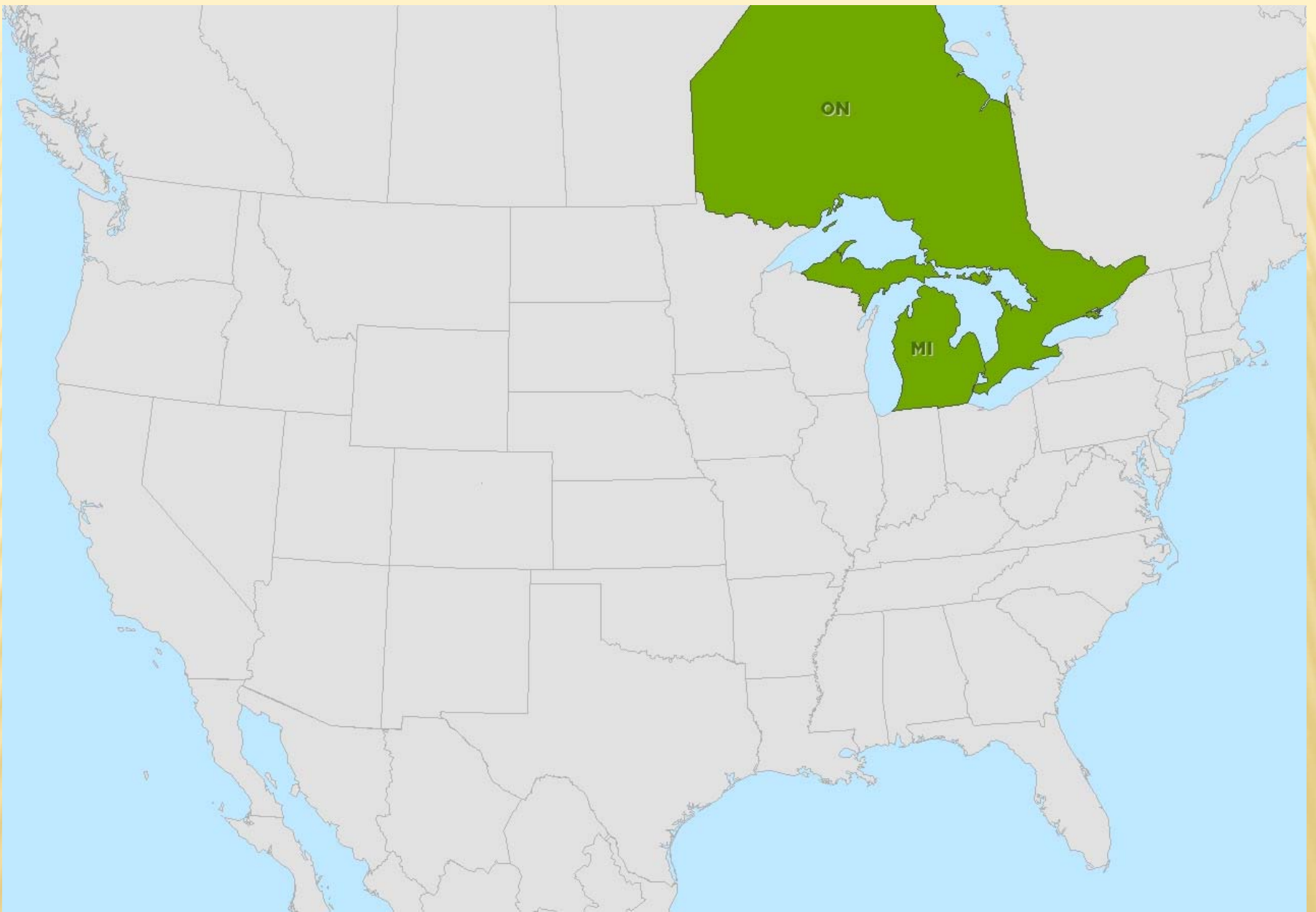
Emerald Ash Borer – *Agrilus planipennis*

- Emerald ash borer was first documented near Detroit, Michigan in 2002
- Originally from Asia, it came into the U.S. on wood packing material from China
- It can spread naturally (a few miles per year) or by movement of infested wood
- Host trees are all species of ash

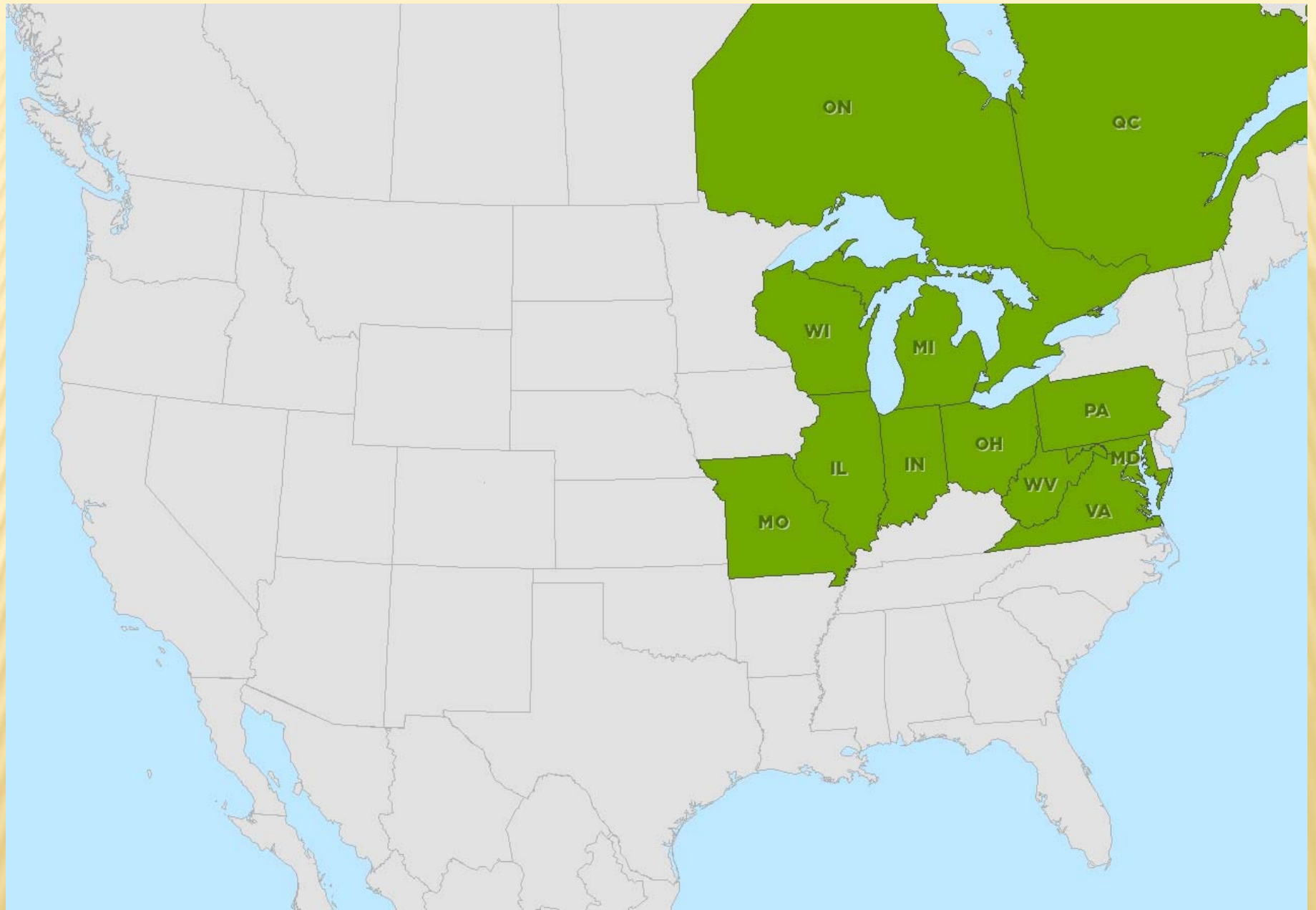




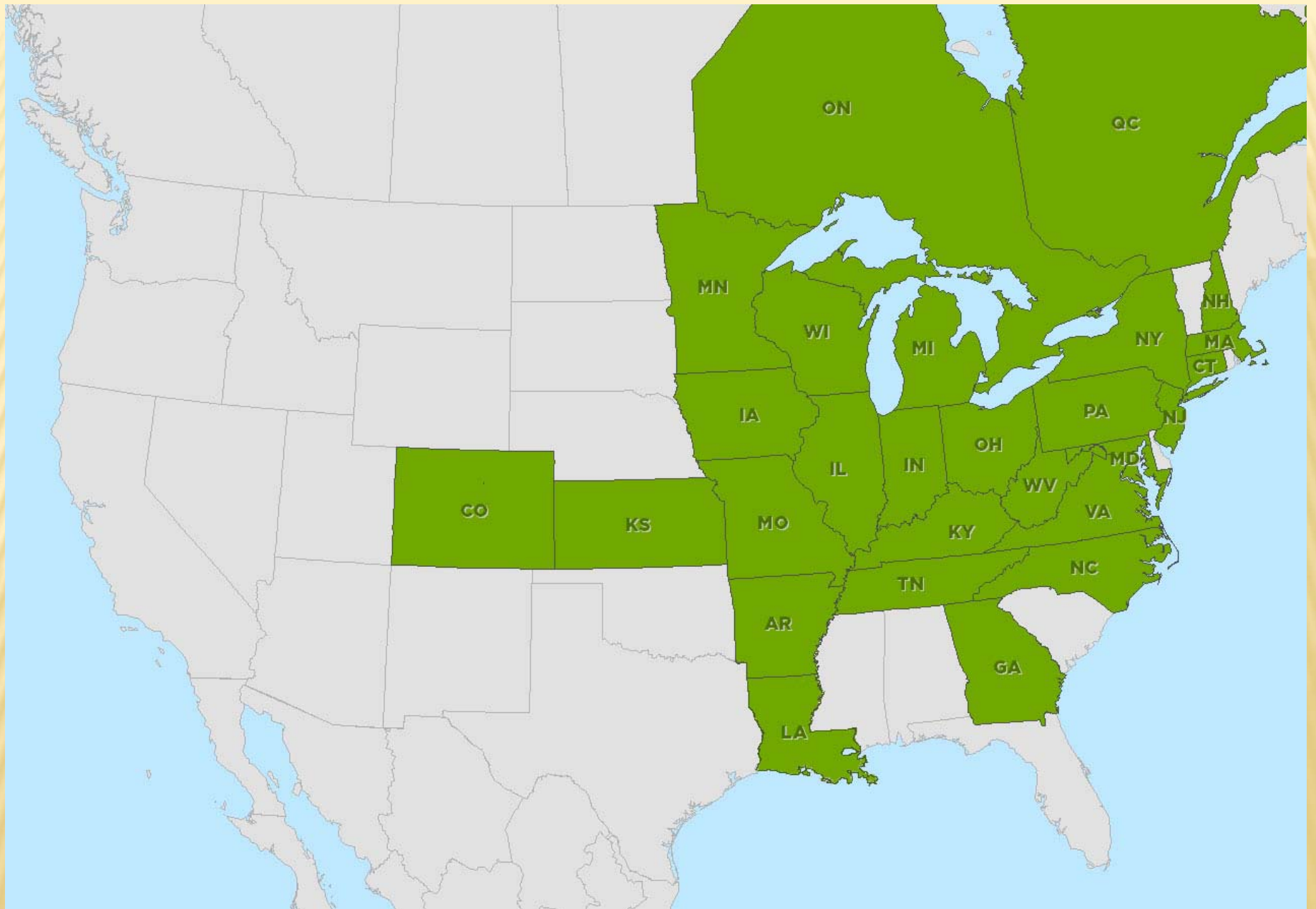
Range of white, green and black ash



Spread of Emerald Ash Borer in 2022



Spread of Emerald Ash Borer in 2008



Spread of Emerald Ash Borer in 2015

- The adult insect of the emerald ash borer is bronze, golden, and reddish green with metallic green wings
- Adult insect emerges from the infested tree in spring creating a D-shaped exit hole
- Cream-colored larvae do the damage by creating galleries underneath the bark (sapwood) during feeding
- Larvae feed from summer through the fall preventing the transportation of water and nutrients
- There is generally one generation a year



- As larvae activity increases, wilting foliage and premature defoliation will occur
- Dead and dying branches in the upper crown are evident
- There will be D-shaped exit holes caused by emerging adult borers on branches and trunk
- Woodpecker activity will increase
- Vertical splits on the bark may occur adjacent to larval feeding galleries
- Epicormic sprouts may form on the trunk or large branches
- After the initial infestation, the ash tree can succumb to the attack within 3 to 4 years





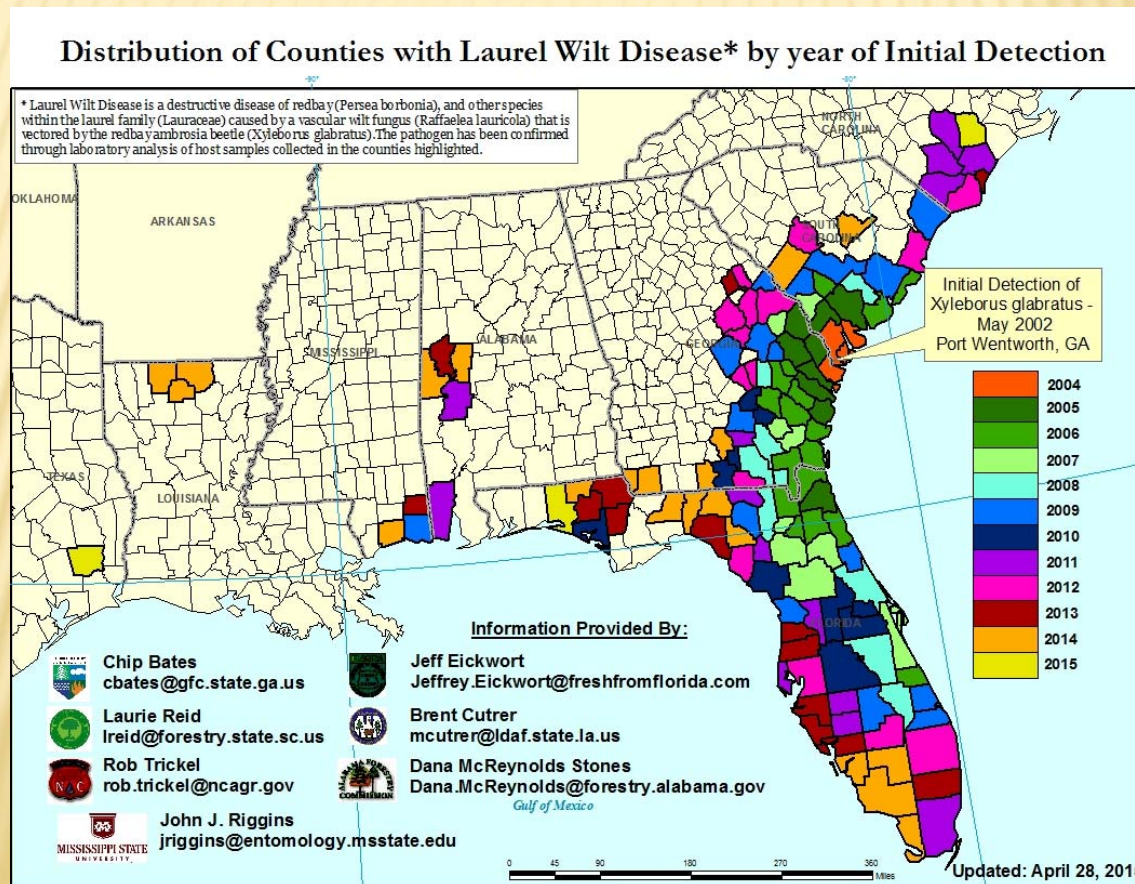


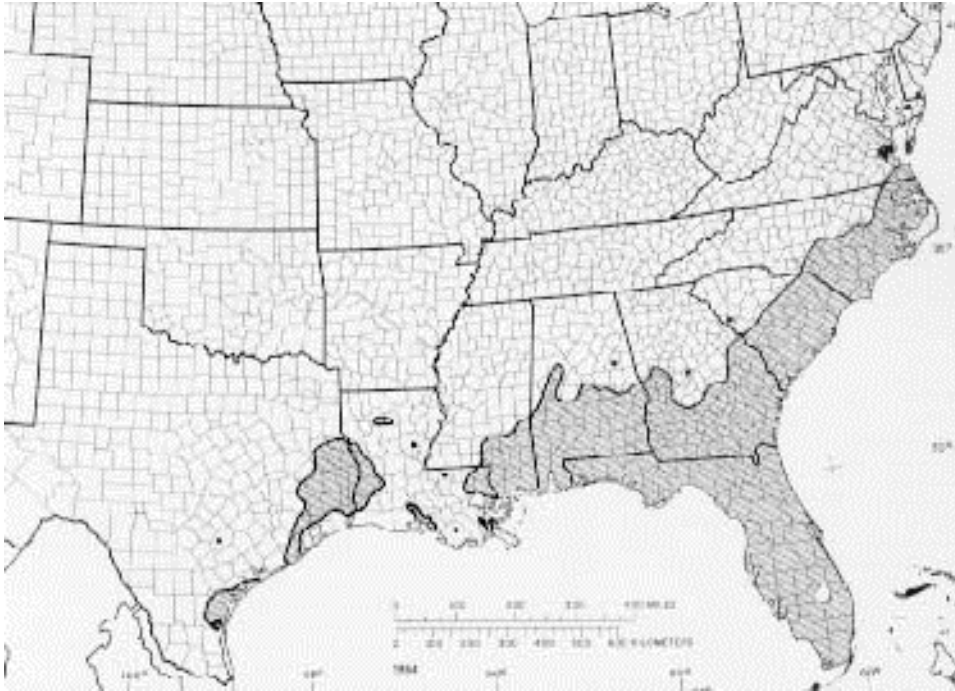
- There is currently no known successful eradication method for the emerald ash borer
- For high-valued ash trees, systemic insecticides like Tree-age can be used as preventative method or to retard lightly infested trees – must reapply every 1 to 2 years
- To slow the spread, remove dead or dying infested ash trees and destroy the wood
- Limit the long distance movement of infested wood



Laurel Wilt Disease – *Xyleborus glabratus* (Redbay Ambrosia Beetle) and *Raffaelea lauricola* (Fungus)

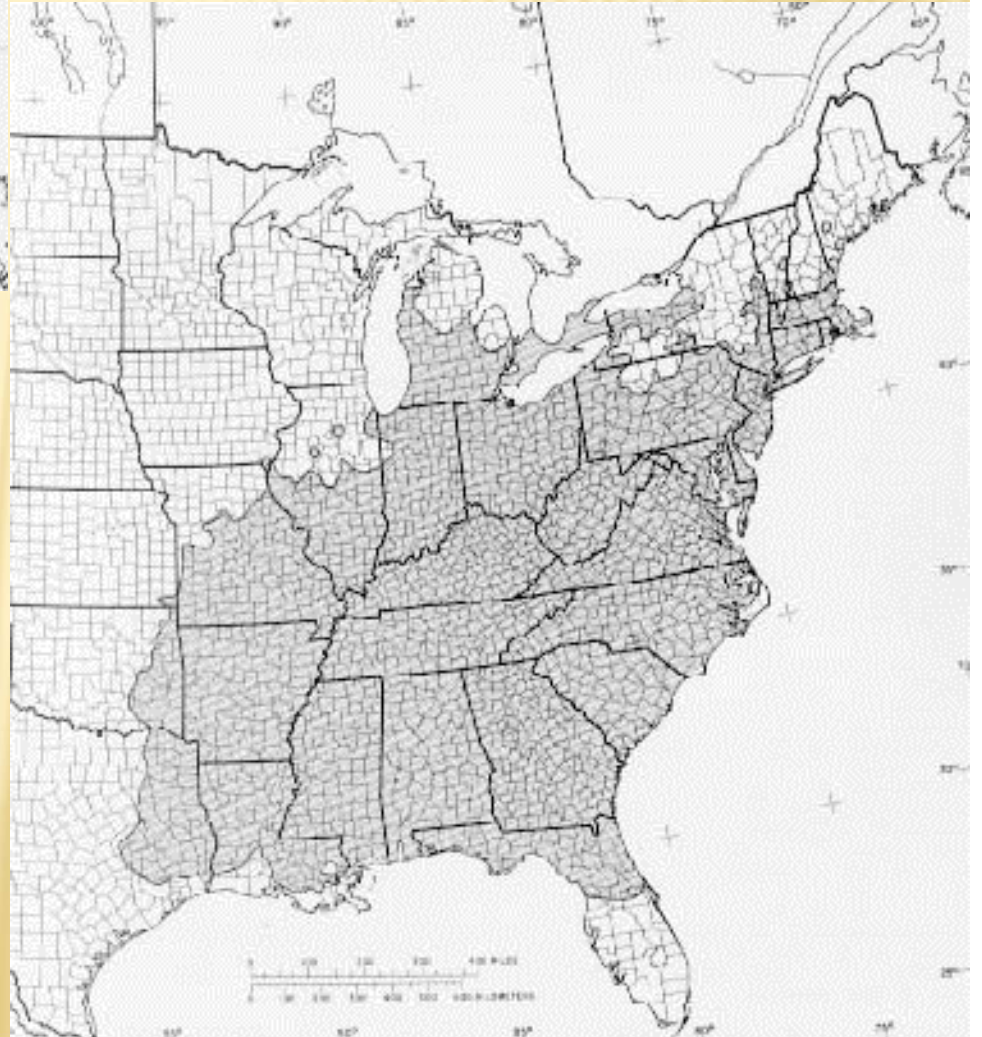
- The redbay ambrosia beetle was first identified in a survey trap in Port Wentworth, Georgia
- Originally from Asia, believed to have been introduced into the U.S. on infested wood packing material
- The disease-complex can spread naturally and by the long distance movement of infested wood
- Native trees in the laurel family are susceptible, especially redbay, swampbay, sassafras, and avocado
- Other laurel species are also susceptible – pondberry, pondspice, and spicebush





Range of sassafras trees in the U.S.

Range of redbay trees in the U.S.



- Laurel wilt disease is the interaction between the redbay ambrosia beetle and a fungus
- This extremely small insect bores into the host tree, creating galleries in the wood
- The redbay ambrosia beetle vectors a deadly fungus – one beetle can kill a host tree
- The fungus causes the host tree to halt the function of the vascular system
- The flow of water and nutrients is eventually disrupted
- Research is ongoing to understand the biology of the insect and the fungus - Number of generations a year? Active during the winter months?



- Leaves on an isolated branch in the crown will turn olive-grey, then reddish-brown
- These leaves will droop then wilt, turning completely brown
- Eventually, these symptoms will rapidly spread throughout the entire crown
- Dark purple to black streaks exist in the sapwood of dead or dying trees
- Small round entrance holes may be visible on stems and branches on infested and dead trees
- Toothpick-like tubes of sawdust may protrude from the entrance holes
- The tree will succumb to the disease within 4 to 12 weeks after the initial infestation











- There is currently no known successful eradication method for laurel wilt disease
- Research is still ongoing to find adequate systemic insecticides and fungicides
- Some systemic fungicides like Alamo can be used on high-valued trees that were recently infected
- These systemic fungicides can also be used as a preventative method – only last for 1 to 2 years
- Research is currently being conducted to find native laurel species that are resistant to the fungus



What Can We Do?

- Start with the natural resource professionals (foresters, arborists, landscape architects, etc.) – inform them of the latest invasive pests and they will inform the public
- Park supervisors and campground managers can also get involved in minimizing the risk and spread of invasive pests
- Let citizens be a part of the solution by informing them about invasive pests
- Public education has been the best solution in early detection and rapid response
- Contact local natural resource entities – Alabama Forestry Commission, Alabama Cooperative Extension System, Alabama Department of Agriculture and Industries, Universities (Auburn University and Alabama A & M University), USDA Animal and Plant Health Inspection Service, USDA Forest Service, etc.
- Be mindful of transporting untreated wood long distances (over 60 miles)

References

Pictures:

- <http://www.invasive.org/>
- <http://www.forestryimages.org/>
- <http://www.thousandcankers.com/tcd-locations.php>
- <http://www.emeraldashborer.info/surveyinfo.cfm#sthash.UdMgOcXA.RRLb3670.dpbs>
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- <http://edis.ifas.ufl.edu/hs391>
- <http://www.doacs.state.fl.us/pi/enpp/enpp/ento/x.glabratus.html>

Any Questions?

Thank You



Burn It Where You Buy It