NEW EXOTIC AND INVASIVES PESTS

VIBURNUM LEAF BEETLE, BROWN MARMORATED STINK BUG, WALNUT TWIG BEETLE, SPOTTED LANTERN FLY, ELM ZIGZAG SAWFLY, AND DRIPPY DISEASE OF OAKS

VIBURNUM LEAF BEETLE

- Native to Europe
- Considered a secondary pest species by APHIS for pest surveys
- First discovered in North America in 1947 in Ontario

DISTRIBUTION OF VIBURNUM LEAF BEETLE

- Currently found in Canada, New York (1996), Maine, Vermont, Pennsylvania (2001), Ohio (2002), Illinois (2009)
- Potential to cause heavy defoliation of shrubs, cause dieback, and kill plants
- Quarantines could limit nurseries

BIOLOGY OF VIRBURNUM LEAF BEETLE

- Adults and larvae feed on both native and ornamental plantings of *Viburnum* spp. resulting in complete plant defoliation

- European homeland has similar climate to northern United States and southern Canada

IDENTIFYING ADULTS

- Adults are ¼ to 3/8 inch long
- Golden-brown coloration with golden-grey pubscence

ADULT FEEDING AND EGG LAYING

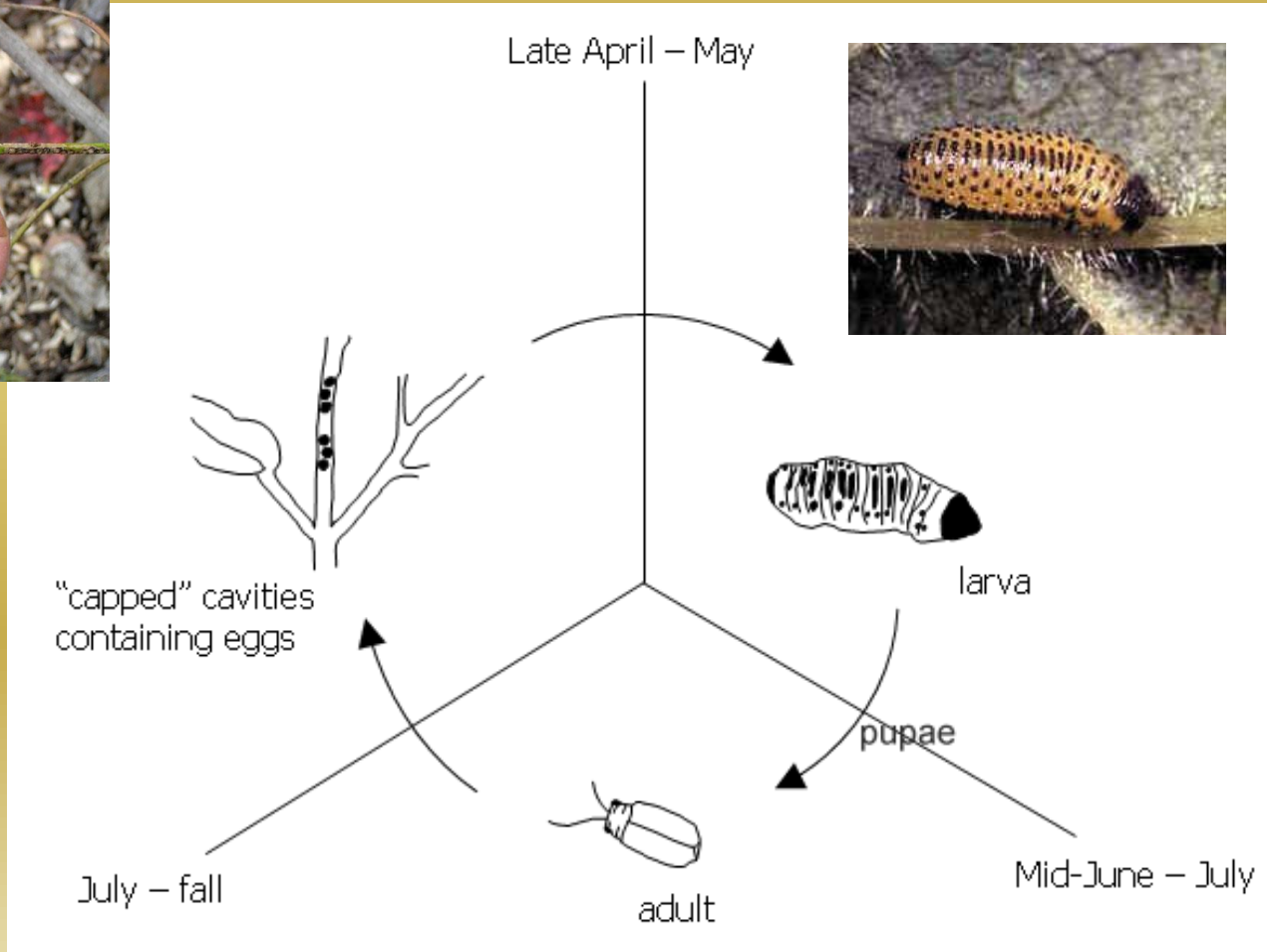
- Chew holes in leaves in summer

- Females produce **egg caps** arranged in straight rows visible in summer, fall, and winter

IDENTIFYING LARVAE

- Larvae are ½ long when mature
- Skeletonize leaves in spring (May-June)

LIFE CYCLE OF VIBURNUM LEAF BEETLE



HIGHLY PREFERRED *VIBURNUM* spp.

- European cranberrybush (*V. opulus*)
- American cranberrybush viburnum (*V. trilobum*)
- Rafinesque viburnum (*V. rafinesquianum*)
- Arrowwood viburnums (*V. dentatum*)

LESS PREFERRED *VIBURNUM* spp.

- Sargent viburnum (*V. sargentii*)
- Wayfaringtree viburnum (*V. lantana*)
- Nannyberry viburnum (*V. lentago*)
- Blackhaw viburnum (*V. prunifolium*)

MANAGEMENT OF VIBURNUM LEAF BEETLE

- Prune out and destroy infested twigs after egg laying (October to April)
- Plant less susceptible *Viburnum* spp.
- Insecticide applications

BROWN MARMORATED STINK BUG (*Halyomorpha halys*)

- Native to Japan, Korea, and China
- Marmorated means "marble-like
- Also called yellow-brown stink bug or East Asian stink bug

BROWN MARMORATED STINK BUG (*Halyomorpha halys*)

- First reported in Pennsylvania in 2001
- Found in New Jersey, Maryland, Delaware, Virginia, West Virginia, New York, Ohio, Massachusetts, Michigan, Oregon, California and **Illinois (2009)**

PREFERRED HOSTS OF BROWN MARMORATED STINK BUG

- **Fruit crops:** pear, apple, cherry, currants
- **Agronomic crops:** corn, soybeans
- **Vegetable crops:** bean, asparagus, peppers

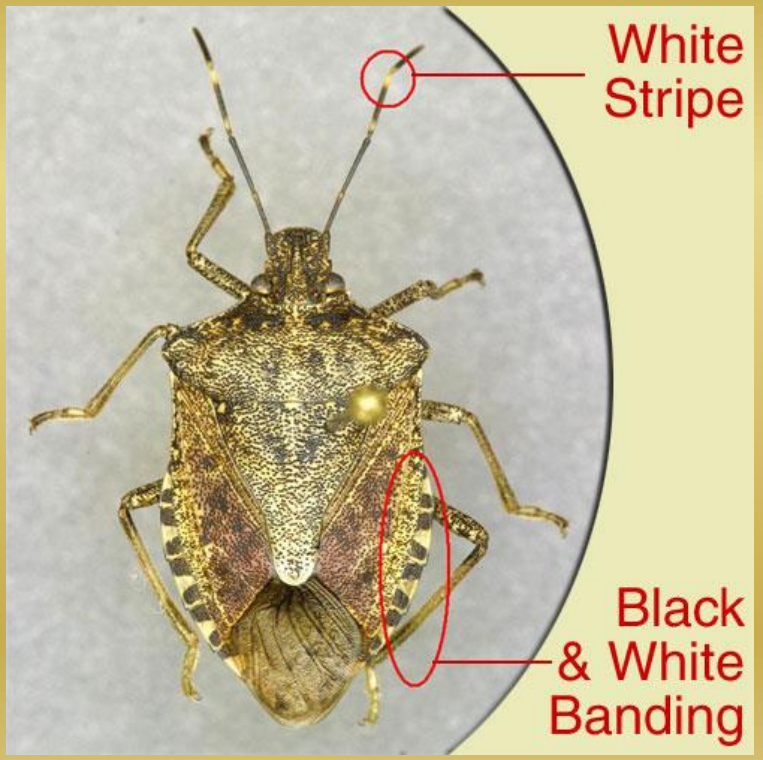
PREFERRED HOSTS OF BROWN MARMORATED STINK BUG

- **Ornamentals:** crabapple, catalpa, walnut, maple, basswood, sweet gum, redbud

- **Shrubs:** butterfly bush, rose serviceberry, viburnum

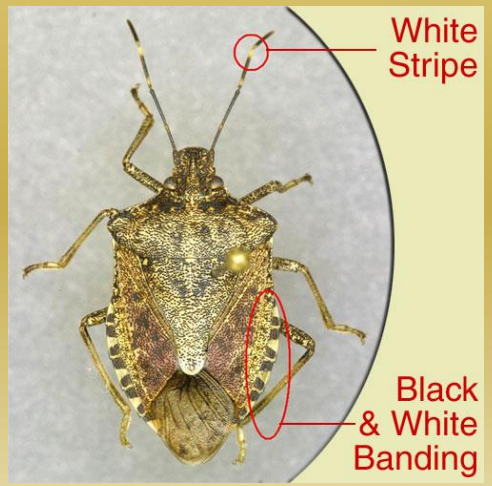
DESCRIPTION OF THE ADULT STINK BUG

- **Adults** are 5/8 inch long and 3/8 inch wide
- Typical shield-shape with dark red eyes
- **Upper body** is mottled brown and gray
- **Underside** is white and brown legs



BROWN MARMORATED STINK BUG LOOK ALIKES

- Squash bug
- Green stink bug
- **Brown marmorated stink bug**



IMMATURE STAGES OF THE STINK BUG

- **Eggs:** light green, barrel-shaped and in clusters
- **Nymphs:** oval shape and tick-like
  - **Young nymphs:** yellow-brown with mottled black and red
  - **Older nymphs:** darker with light bands on legs and antenna

LIFE HISTORY OF THE STINK BUG

- **Overwinters** as an adult then active in early May
- **Eggs** laid from June to August
- **New adults** late July to August

ECONOMIC IMPORTANCE OF THE STINK BUG

- **Highly mobile** and **very broad host range**
- **Fruit damage:** necrotic spots and cat-facing

ECONOMIC IMPORTANCE OF THE STINK BUG

- **Leaf feeding:** light-colored stippling or crows-foot lesions

- **"Home invader"**

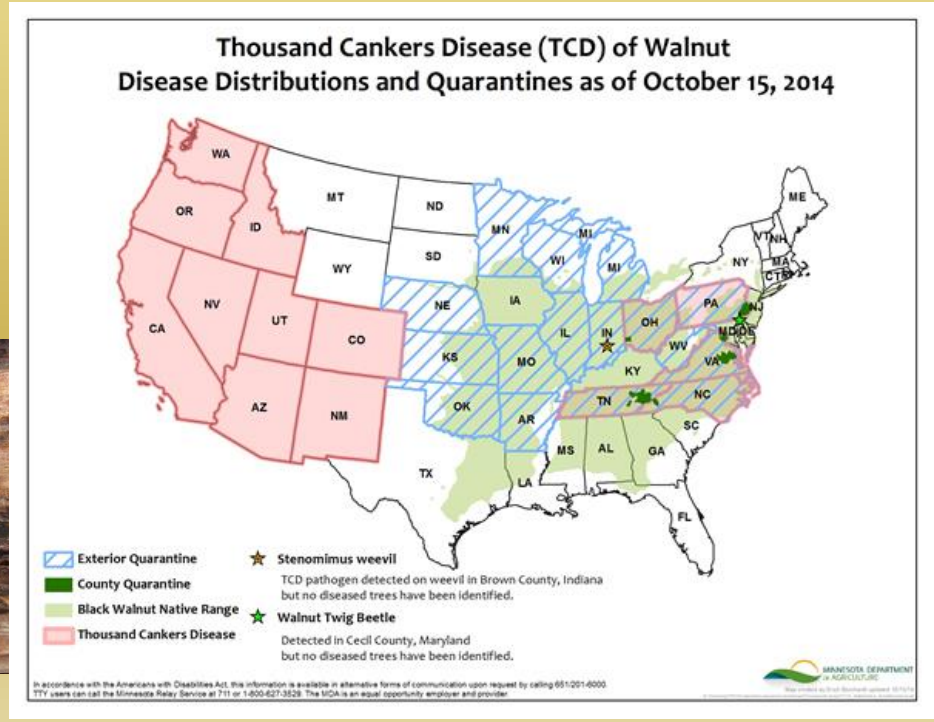
MANAGEMENT OF THE STINK BUG

- **Outdoors:** Still in progress
- **Indoors:** Exclusion and hand removal, **insecticides not recommended**

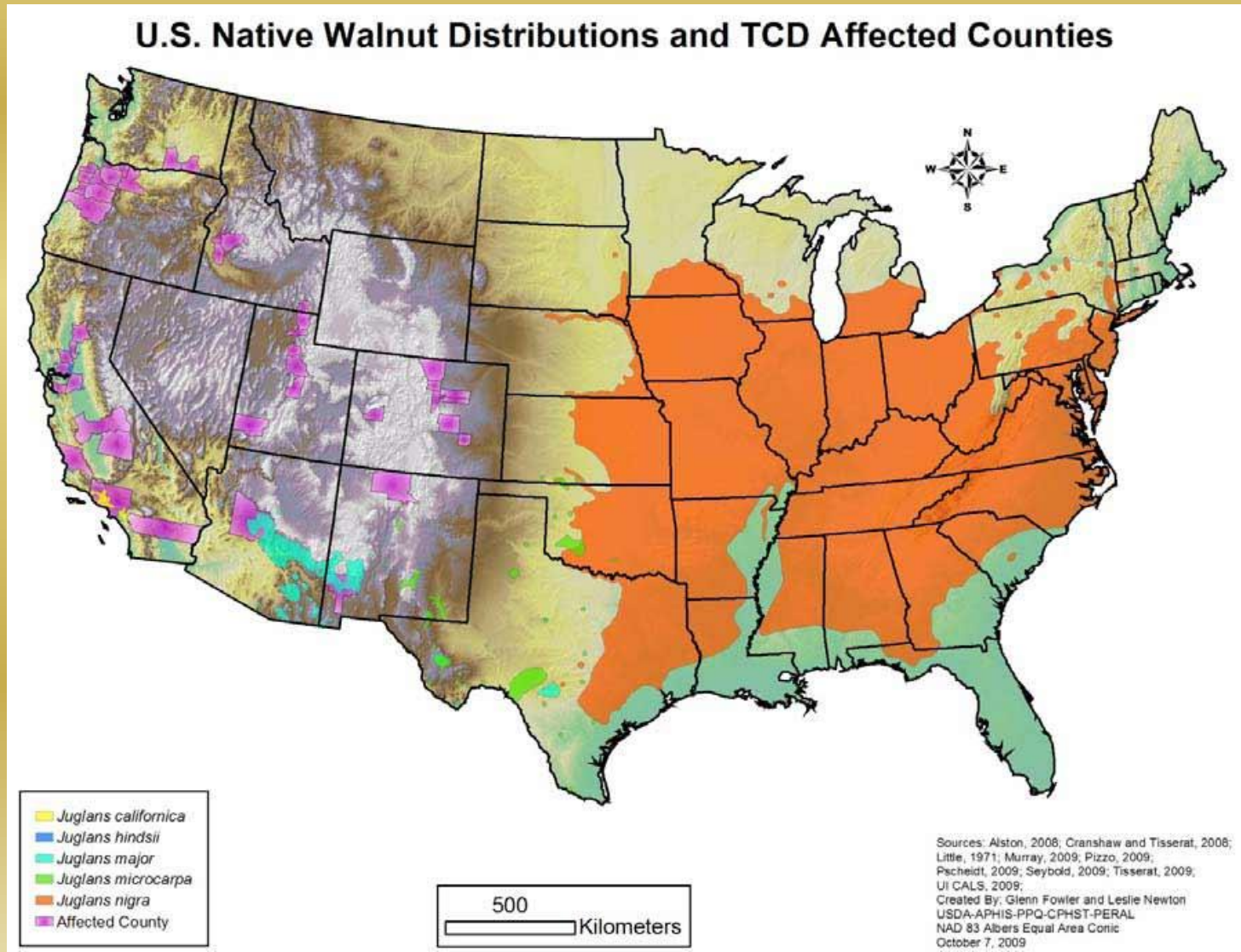
THOUSAND CANKERS DISEASE OF BLACK WALNUT (TCD)

- First noticed in western states of Oregon, Idaho, Utah, Arizona, Colorado, and New Mexico

- **Found in Tennessee in 2010**

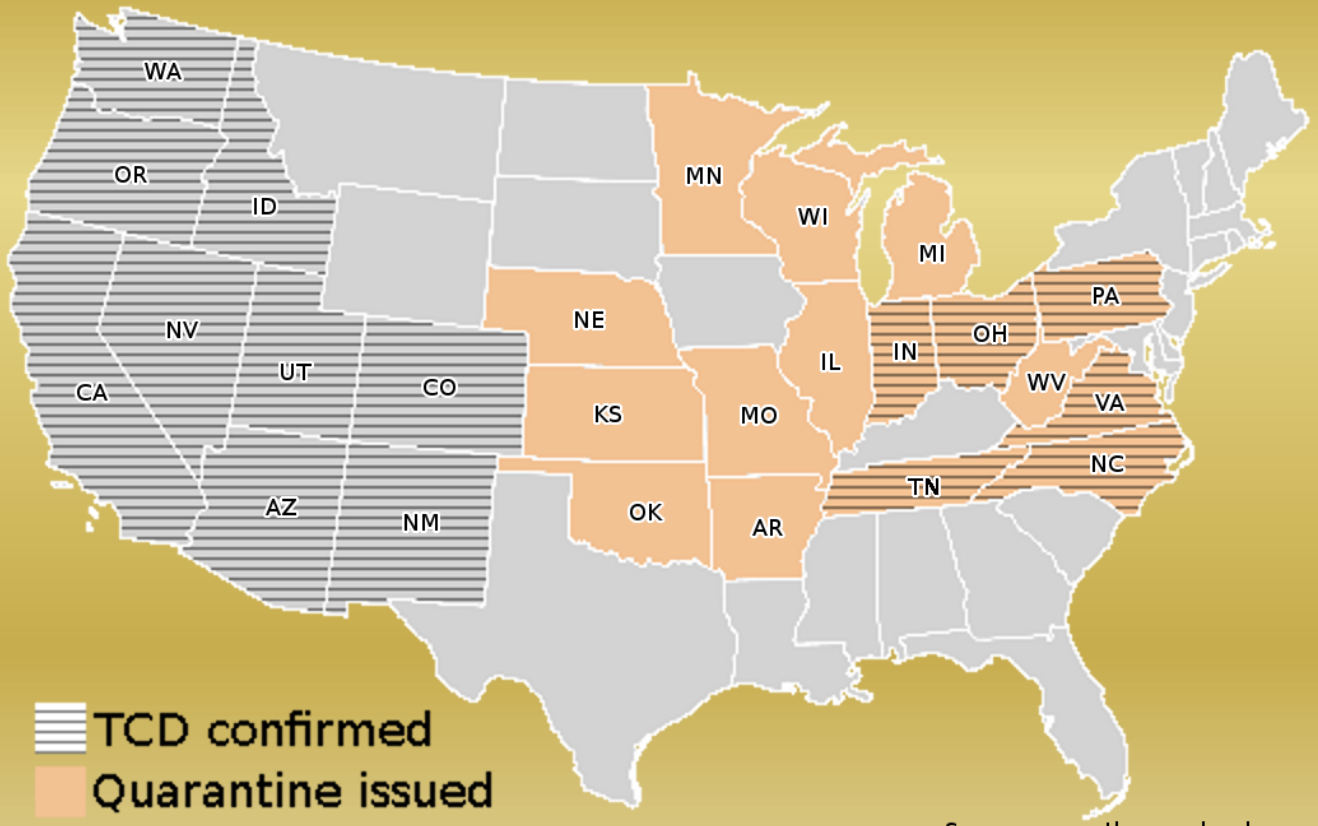


DISTRIBUTION OF BLACK WALNUT AND TCD



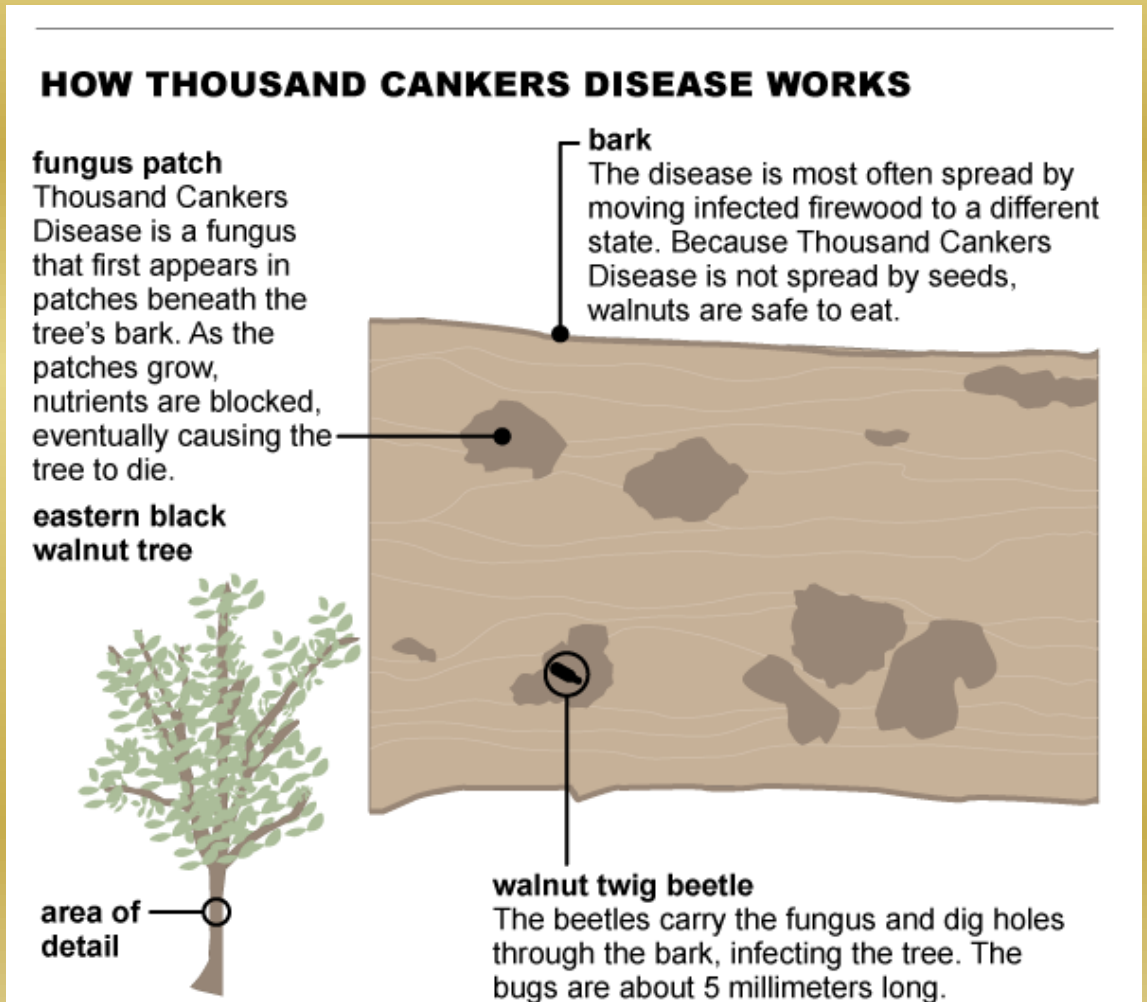
DISTRIBUTION OF BLACK WALNUT AND TCD

Distribution of Thousand Cankers Disease as of August 29, 2014



Source: www.thousandcankers.com

THOUSAND CANKERS DISEASE CYCLE



SYMPTOMS OF THOUSAND CANKERS DISEASE

- Yellowing and thinning of upper crown
- Death of larger branches
- Leaf wilt

SYMPTOMS OF THOUSAND CANKERS DISEASE

- Trees die within three years of symptoms

CANKERS ASSOCIATED WITH THOUSAND CANKERS DISEASE

- Initial cankers caused by ***Geosmithia* spp.**
- Small and develop around nuptial chambers of **walnut twig beetle**
- Cankers are not visible without bark peeling

CANKERS ASSOCIATED WITH THOUSAND CANKERS DISEASE

- Second of canker caused by ***Fusarium solani***
- Occurs on trees in advance states of decline
- **Larger and more diffuse**

WALNUT TWIG BEETLE AND THOUSAND CANKERS DISEASE

- Beetle is native to North America and range coincides with Arizona walnut (*Juglans major*)
- Wide spread decline of walnut began in the late 1990's and early 2000's.

DISTRIBUTION OF THE WALNUT TWIG BEETLE

WALNUT TWIG BEETLE (*Pityophthorus juglandis*)

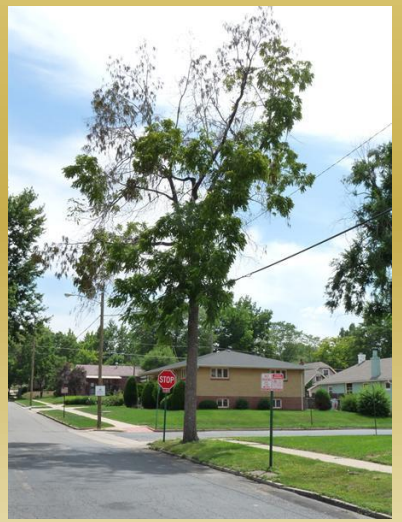
- Yellowish-brown beetle 1/20 inch long
- Attacks one inch diameter branches and greater

WALNUT TWIG BEETLE (*Pityophthorus juglandis*)

- Overwinters as an adult with peak emergence mid July-late August
- Two or more generations per year

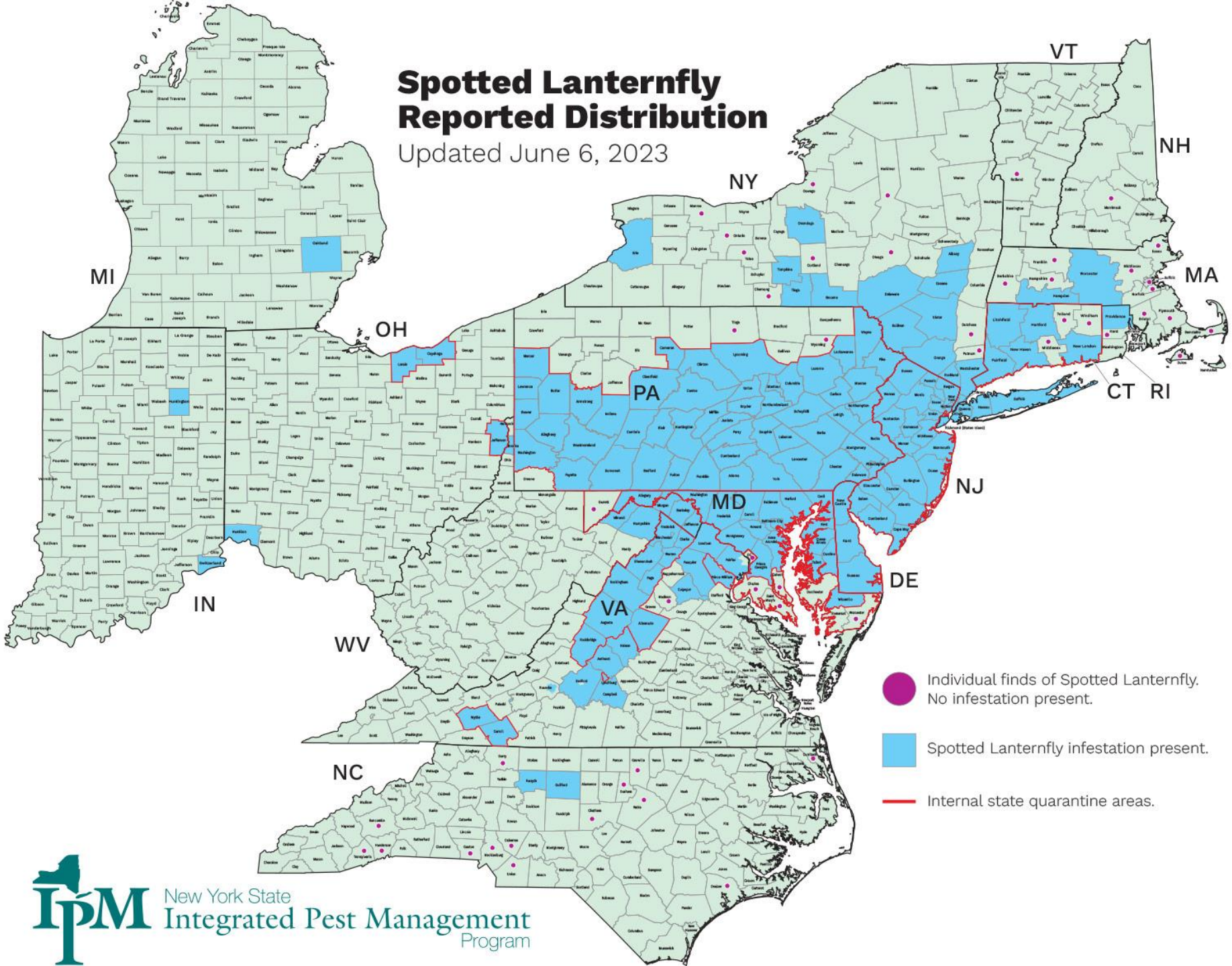
MANAGEMENT OF THOUSAND CANKERS DISEASE

- **No control available at present**
- Insecticide sprays for beetle is not practical
- Rapid detection and sanitation are critical

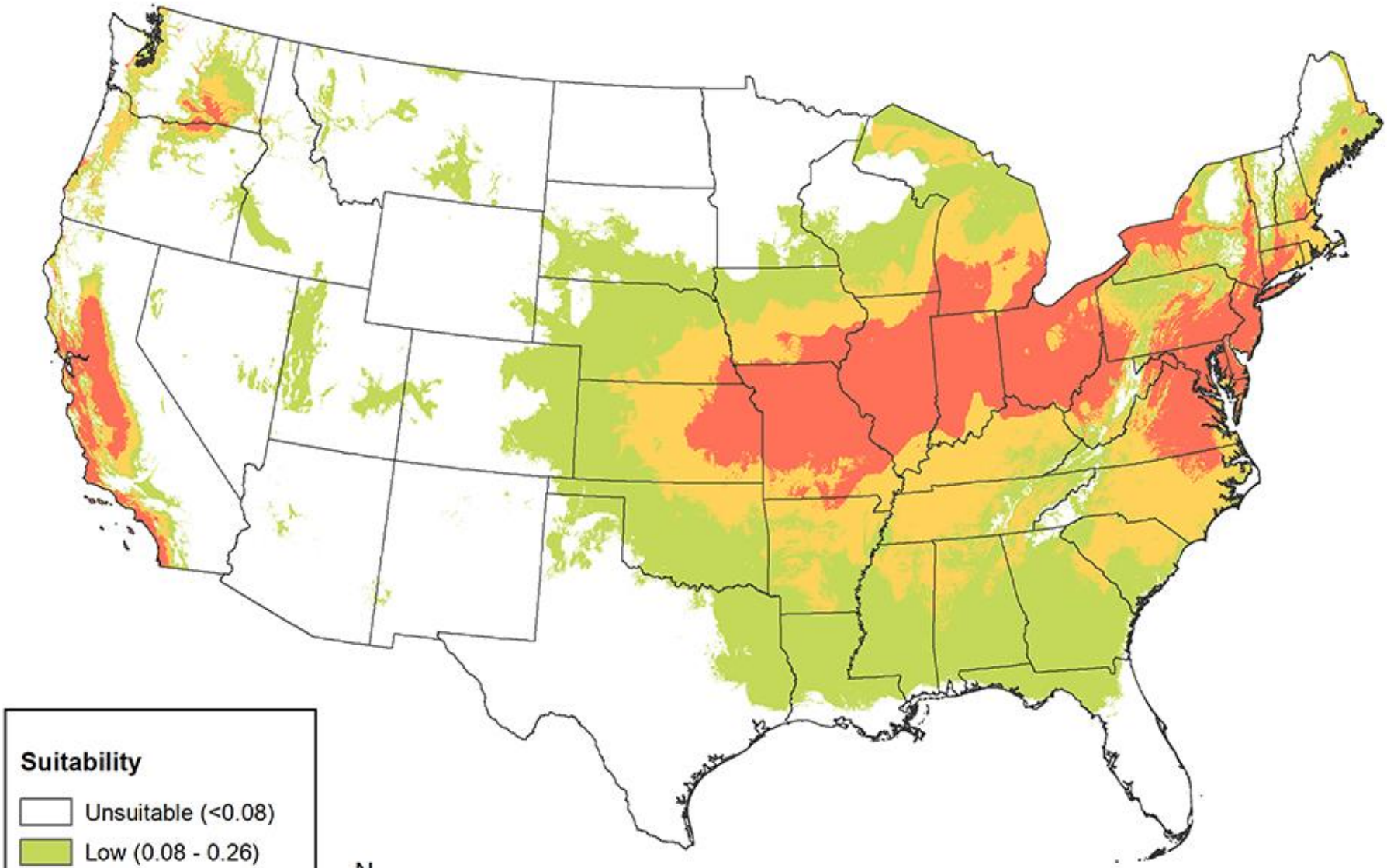


SPOTTED LANTERN FLY

- Pest is native to China, India, Japan, and Vietnam
- Has been introduced into Korea


Spotted Lanternfly
Reported Distribution
Updated June 6, 2023
VT
NH
NY
MA
MI
OH
PA
CT
RI
NJ
MD
DE
IN
WV
VA
NC
Individual finds of Spotted Lanternfly. No infestation present.
Spotted Lanternfly infestation present.
Internal state quarantine areas.
New York State
Integrated Pest Management
Program

Potential distribution of spotted lanternfly in the United States



SPOTTED LANTERN FLY

- Forewing is grey with black spots
- Hindwing has contrasting patches or red and black with a white band

SPOTTED LANTERN FLY

- Adults are found on Tree of Heaven trees in fall and grape in clumps
- Considered a poor flyer, but strong and quick jumper

SLF LIFECYCLE

Adult forms can be seen as early as July.

The nymphs have 4 instars and develop red spots in addition to the white spots exhibited in earlier instars.

Nymphs begin to hatch in late April to early May.

The eggs are laid in the fall. Preferred host is the Tree of Heaven, *Ailanthus altissima,* but any smooth bark tree will do.

SPOTTED LANTERN FLY

- After hatching, nymphs move to other hosts in spring
  - 65 different species in Korea

DAMAGE CAUSED BY SPOTTED LANTERN FLY

- Weeping wounds develop on trunk of Tree of Heaven from adult feeding

- Adults lay eggs masses of 30-50 eggs on trees and smooth surfaces
  - Stone, outdoor furniture, vehicles, structures

MANAGEMENT OF SPOTTED LANTERN FLY

- Scrape off egg masses and destroy
- Report findings to Illinois Department of Agriculture (IDA)
- Chemical management is being evaluated

ELM ZIGZAG SAWFLY

- Native to China and Japan
- First discovered in Central Europe in 2003, Canada in 2020, in **VA in 2021**
- **Defoliator of most elms**
  - Siberian and American elms
- **Important ecological impacts**
  - Elms used in urban forests and landscapes
  - **500 insect species** depend on elms

LIFE HISTORY OF THE ELM ZIGZAG SAWFLY

(Aproceros leucopoda)

- Reproduces **parthenogenetically (no males)**
- **4 to 6 generations per year**
- **Strong flyer** (can disperse 30 to 50 miles per year)
- Feeds from the edge of leaf in a zigzag pattern
- Very rapid adult emergence

LIFE HISTORY OF THE ELM ZIGZAG SAWFLY

(Aproceros leucopoda)

- Can supercool to -22F
- Forms two types of cocoons
  - Summer
  - Winter

MANAGEMENT OF THE ELM ZIGZAG SAWFLY

- Quarantines in Europe
- Early detection (EDRR programs)
- Chemical management

WHITE OAK "SLUG SAWFLY"

(Joe Boggs-OSU Extension)

- Commonly observed the so-called **scarlet oak sawfly larvae** skeletonizing oaks in the white oak group including burr oak (*Quercus macrocarpa*), white oak (*Q. alba*), and swamp white oak (*Q. bicolor*).
- Convinced that the sawfly feeding on white oaks is not the scarlet oak sawfly but a different species (Genus *Caliroa)*
- Until the species conundrum is resolved: "white oak slug sawflies."
- Odd-looking larvae have semi-transparent bodies that are flattened towards the front and tapered towards the back

Nordin, G.L., and E.L. Johnson. 1983. Biology of Caliroa quercuscoccineae (Dyar) (Hymenoptera: Tenthredinidae) in Central Kentucky I. Observations on the Taxonomy of Principal Life Stages, *Journal of the Kansas Entomological Society*, Vol. 56, No. 3, pp. 305-314

Nordin, G.L., and E.L. Johnson. 1984. Biology of Caliroa quercuscoccineae (Dyar) (Hymenoptera: Tenthredinidae) in Central Kentucky II. Development and Behavior *Journal of the Kansas Entomological Society*, Vol. 57, No. 4, pp. 569-579

KERMES SCALE AND "DRIPPY DISEASE" OF OAKS

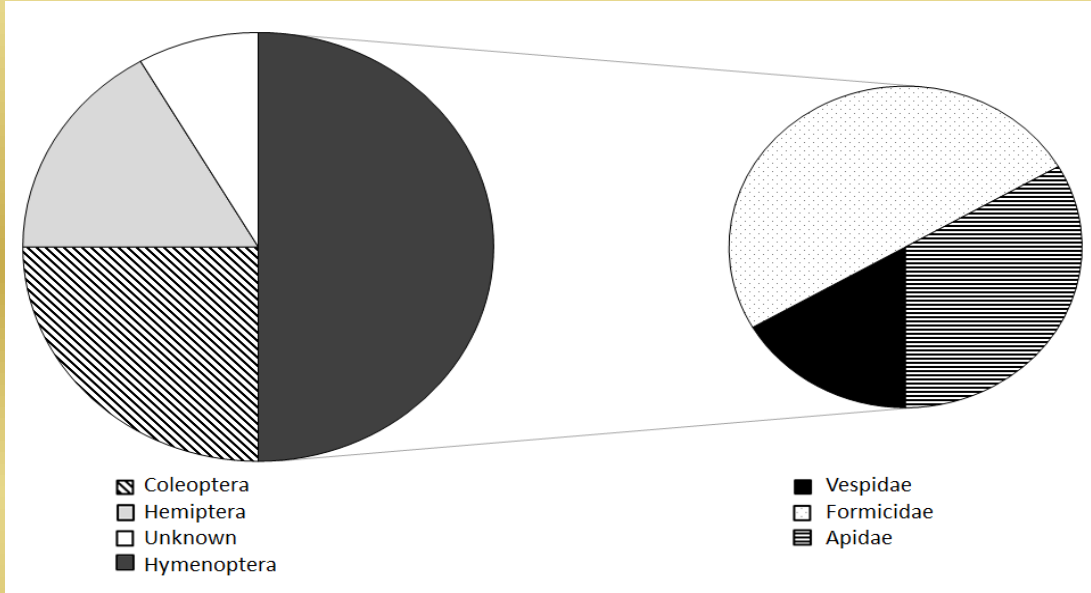
- Unique association between a **kermes scale insect** (*Allokermes galliformis*) and **bacterium** (*Lonsdalea quercina* subsp. *quercina*)

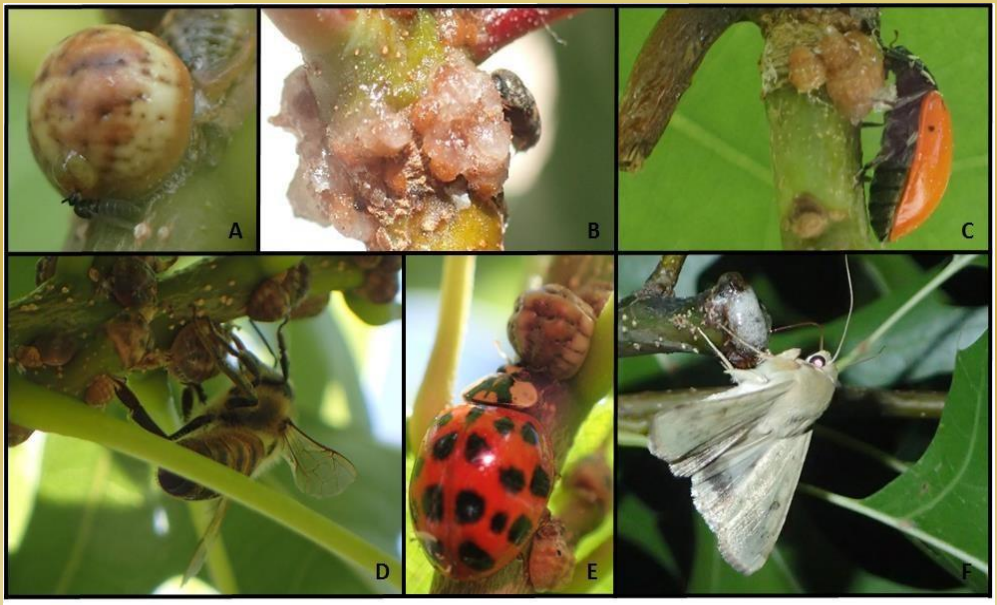
- **Hosts include:** Northern red oak (*Quercus rubra*), pin oak (*Q. palustris*), and Shumard oak (*Q. shumardii*)
- Scale feeding wounds are entry and exit courts for bacterium

- Scale-bacterium combo increases impact of scale feeding resulting in branch dieback and decline

OTHER INSECT VECTORS OF "DRIPPY DISEASE"

- Beetles
- True Bugs
- Ants
- Bees
- Wasps
- Flies

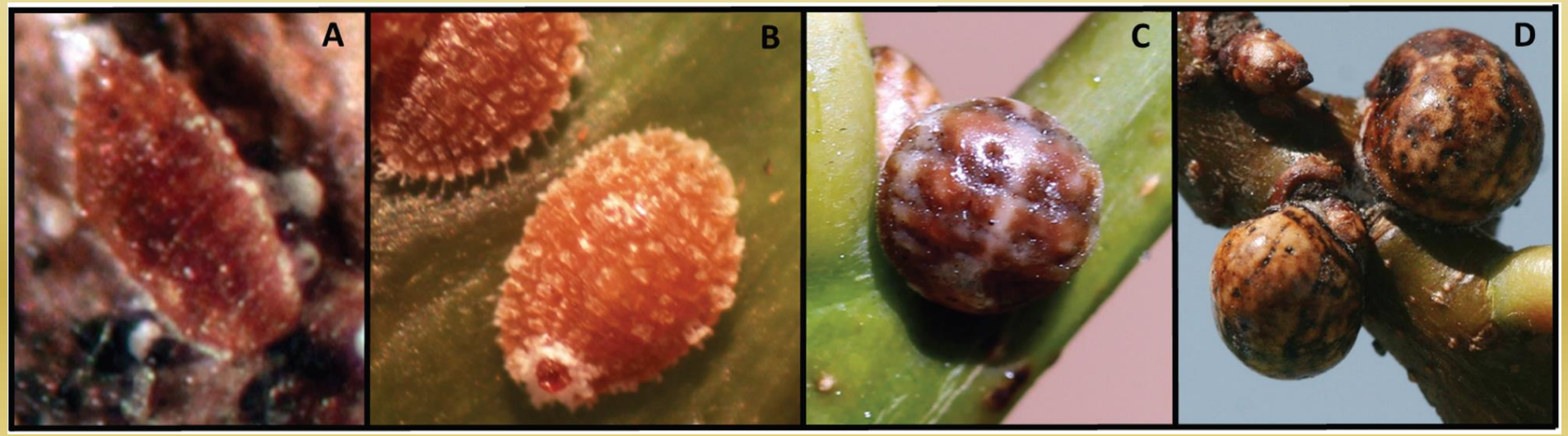




SYMPTOMS AND SIGNS OF "DRIPPY DISEASE"

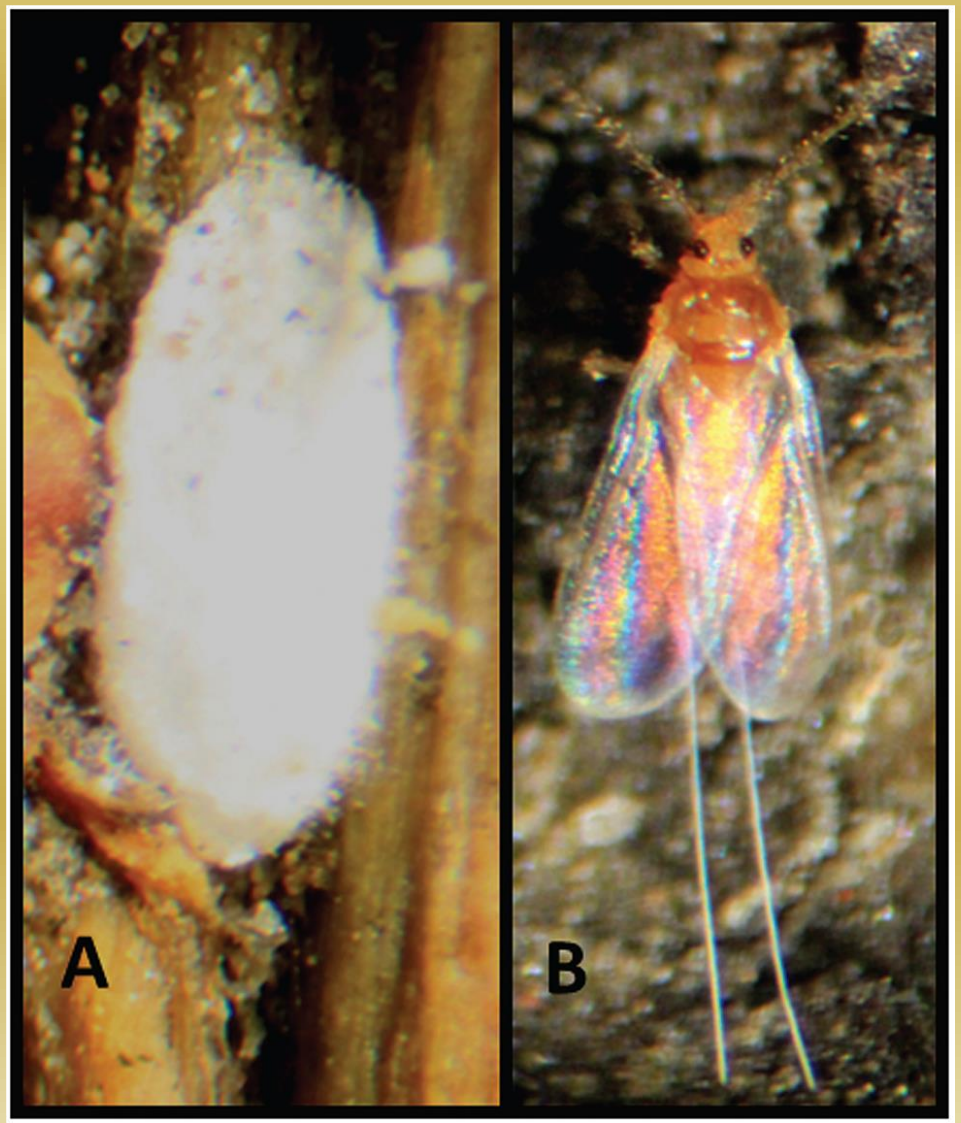
- Leaf scorching, leaf drop, and dieback of small diameter twigs
- Branch cankers form, cankers "drip", branches become brittle, snap
- New shoot growth results in small **witch's brooms**

a) Symptomatic pin oak showing witch's brooms and dieback, **b)** NRO branches exhibiting flagging and dieback, **c)** adult kermes scale insect, (**arrow**) next to bacterial exudates (**star**), **d)**dead (shriveled) and live (round) kermes scales surrounded by bacterial cankers

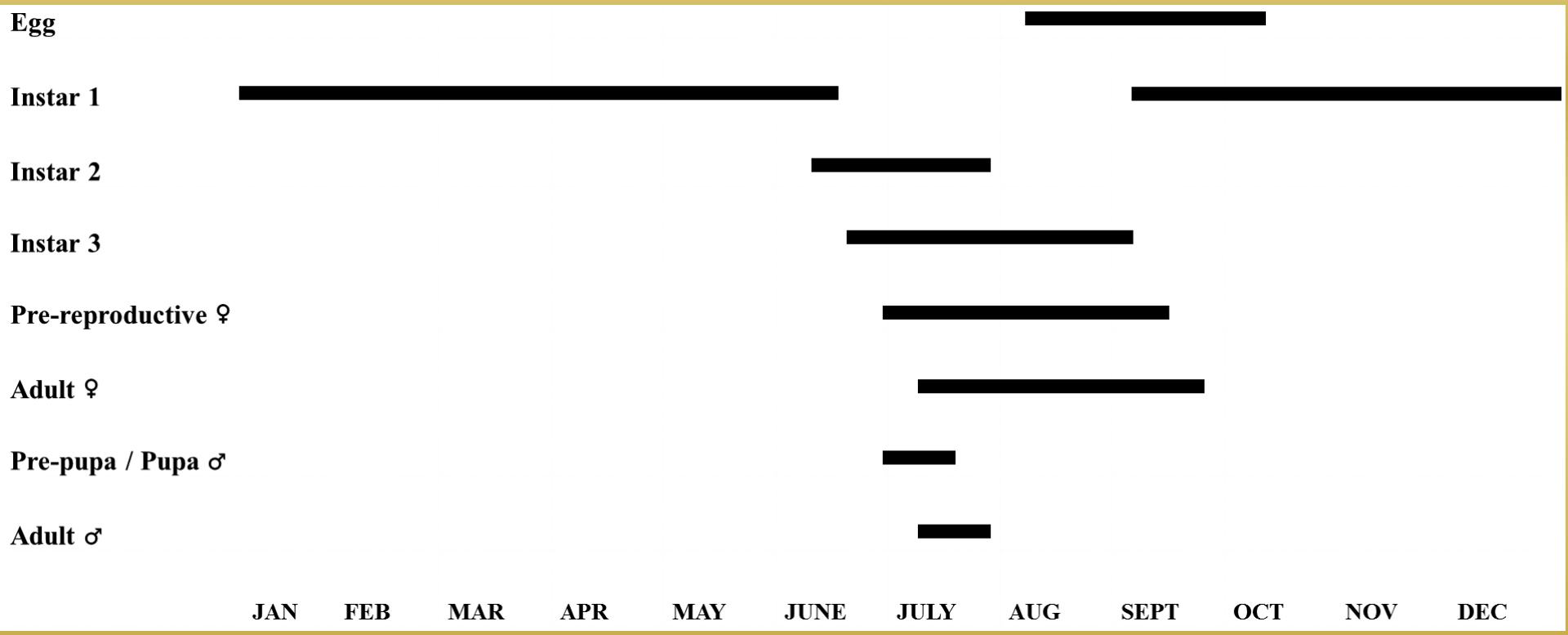


Life stages of female *A. galliformis* including (**A**) 1st instar, (**B**) 2nd instar, (**C**) 3rd instar, and (**D**) post-reproductive adult female

A. galliformis Male Pupal Case (A) and Adult Life Stage (B)



Seasonal Life History of *A. galliformis* on Northern Red Oak



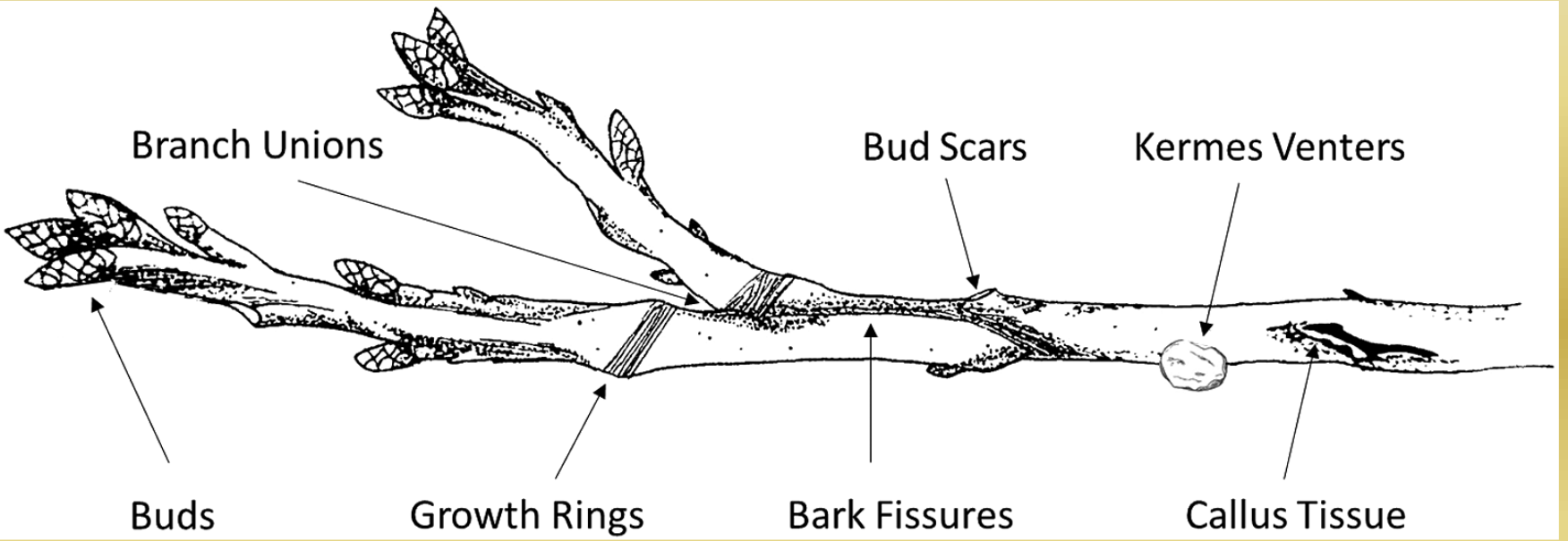
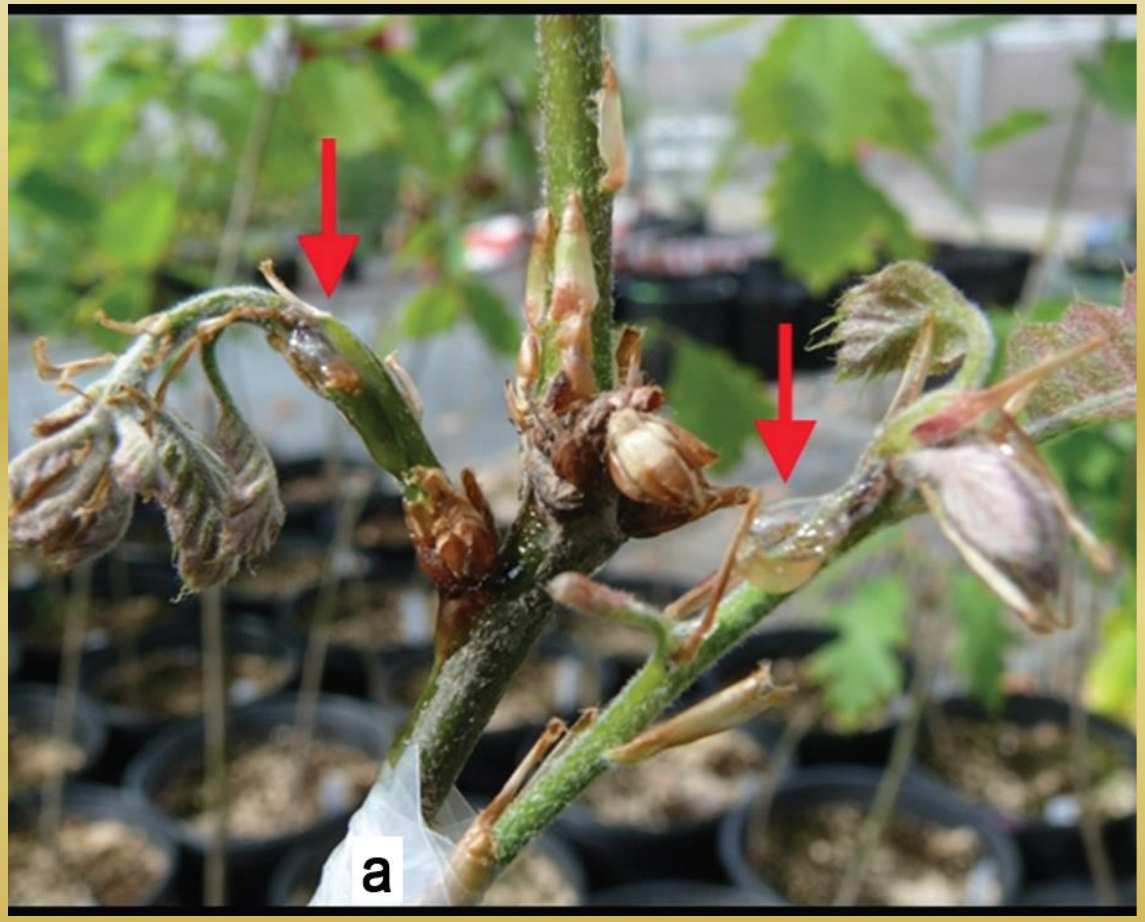


Figure 1. A red oak branch showing the locations where overwintering *A. galliformis* crawlers were observed. These locations include around the base of buds, branch unions, growth rings, bark fissures, bud scars, callus tissue/ wounds, and around old kermes venters



Inoculation experiment: **a)** Shumard oak, 14 days post leaf whorl inoculation with *Lonsdalea quercina* subsp.*quercina* (note the bacterial ooze at inoculation sites, arrows); **b)** canker formation in northern red oak on one

MANAGEMENT OF "DRIPPY BLIGHT" OF OAKS

- Pesticides are not all that effective against kermes
- Horticultural oils applied during dormant season to control overwintering crawlers
- Mixes results with horticultural oils combined with insecticides
- Mechanical removal of infested branches/scale
- No effective natural enemies have been observed

Sitz, R.A. et al. 2018. Drippy Blight, a Disease of Red Oaks in Colorado, U.S., Produced from the Combined Effect of the Scale Insect *Allokermes galliformis* and the Bacterium *Lonsdalea quercina* subsp*. quercina*. Arboriculture & Urban Forestry 44(3):146–153

Sitz, R.A., and W.S. Cranshaw. 2018. Life History of *Allokermes galliformis* (Hemiptera: Kermesidae) in Colorado. Annuals of the Entomological Society of America 111(5): 265-270

END OF PRESENTATION