

NEW EXOTIC AND INVASIVES PESTS

VIBURNUM LEAF BEETLE, SPOTTED LANTERN FLY, ELM ZIGZAG SAWFLY, WHITE OAK SLUG 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 $\frac{1}{4}$ to $\frac{3}{8}$ inch long
- Golden-brown coloration with golden-grey pubescence



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

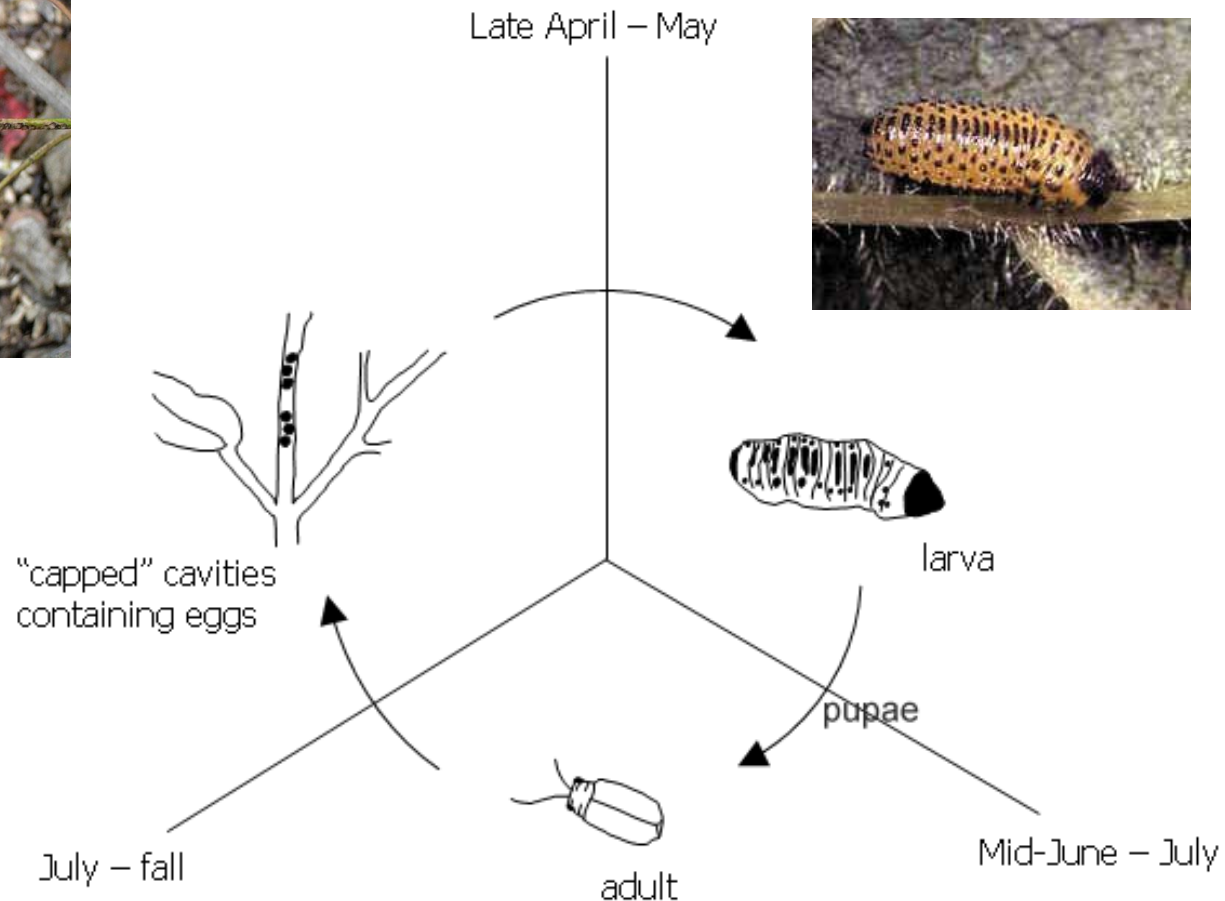


IDENTIFYING LARVAE

- Larvae are $\frac{1}{2}$ 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

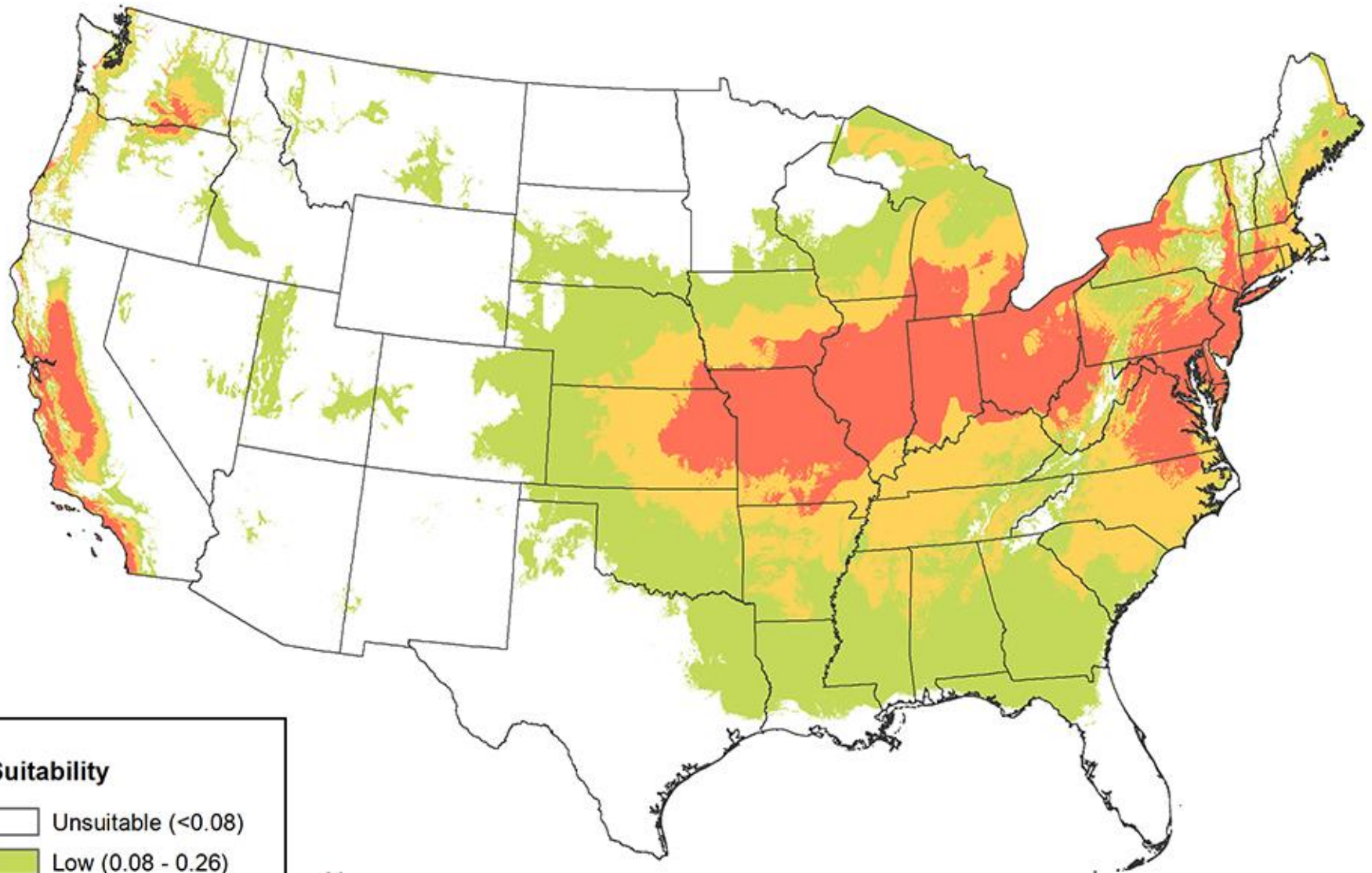


SPOTTED LANTERNFLY (SLF)

- First discovered in PA in 2014, more recently in **Michigan Ohio, Iowa, Indiana and Illinois (south Cook County)**
- **Major pest of vineyards and tree fruits**
- Native to China, India, South Korea, and Vietnam
- Feeding results in weeping wounds leaving greyish or black trail on trunk
 - **Tree of heaven, walnut, and willow**
- Eggs laid in late fall on hosts, outdoor furniture, vehicles, structures



Potential distribution of spotted lanternfly in the United States



Suitability

- Unsuitable (<0.08)
- Low (0.08 - 0.26)
- Medium (0.26 - 0.51)
- High (0.51 - 0.93)

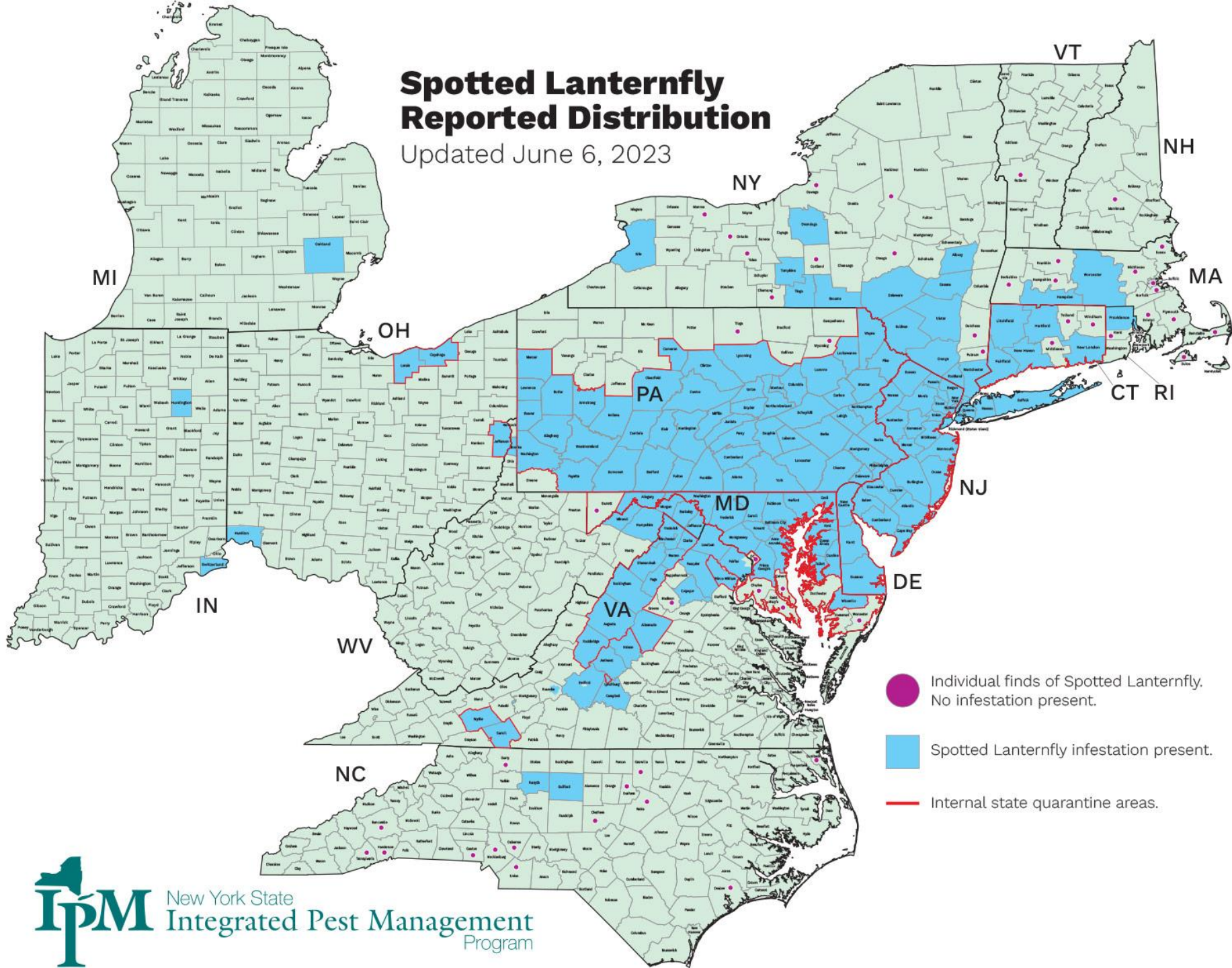


0 700 1,400 Km

Datum: North American 1983
Coordinate System: USA Contiguous
Albers Equal Area Conic

Spotted Lanternfly Reported Distribution

Updated June 6, 2023



SPOTTED LANTERNFLY LIFE CYCLE

Adult forms can be seen as early as July.



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



Nymphs begin to hatch in late April to early May.



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



SLF LIFE STAGES AND DEGREE DAYS (DD₅₀)

(Dechaine et al., 2021)

LIFE STAGE	2019	2020
First Instar	135	112
Second Instar	300	129
Third Instar	413	304
Four Instar	649	566
Adult	835	887
Egg Mass	1,674	1,612

LONG DISTANCE SPREAD OF SLF

- Egg masses with grey mud-like covering
- Potential sites for new infestations near rail lines and major transportation routes
- Iowa study (2019) found a **high positive correlation between the establishment and detection of EAB and length of railroads in each county** (*Short et al., 2019. Rail transport as a vector of EAB*)



MANAGEMENT OF SLF

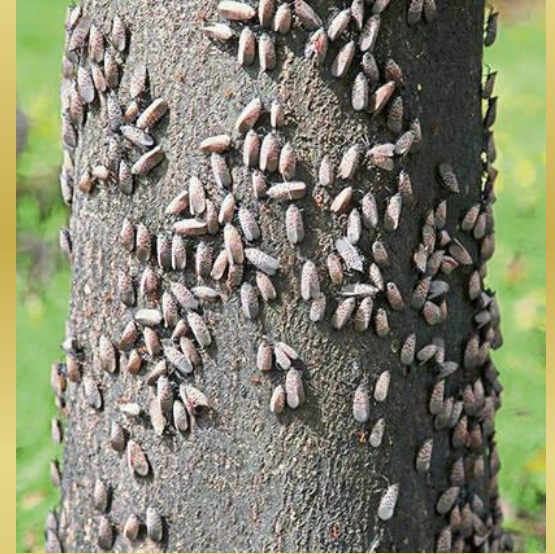
- IDA is not promoting any radical management strategies
 - Remove grape, TOH, and any scrubby trees or vegetation on property
- **Landscape Plants:**
 - Mature, established trees do not require protection
 - Young, establishing plants may need protection



SLF AND FOREST MANAGEMENT

- **Traditional Forestry:**

- Mature trees should be fine, but high numbers of SLF may be a stressor leading to flagging or premature yellowing, but tree mortality is minimal



- **SLF has preference for high value trees**

- Maple, walnut, tulip poplar and willow



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

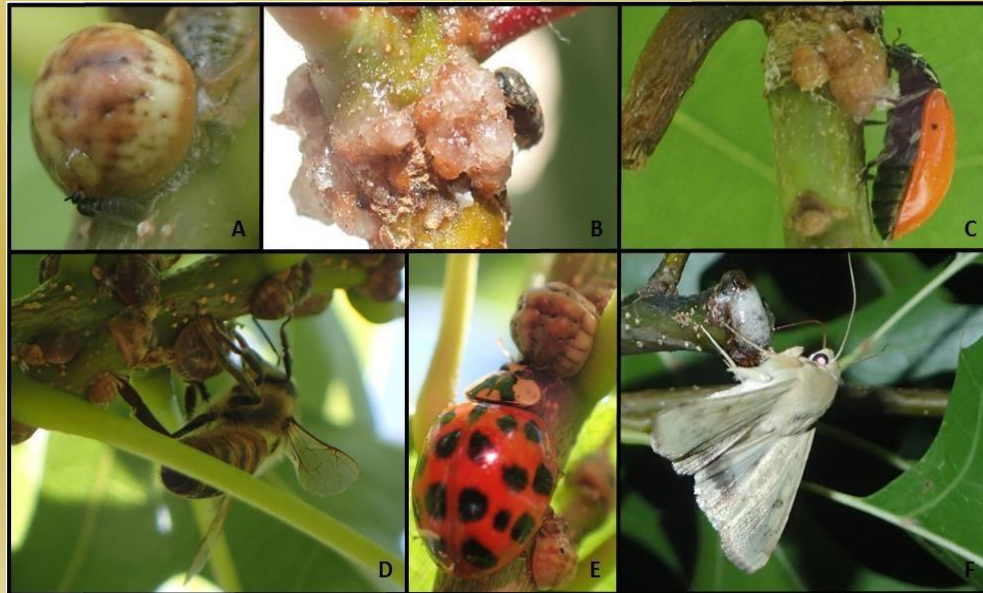
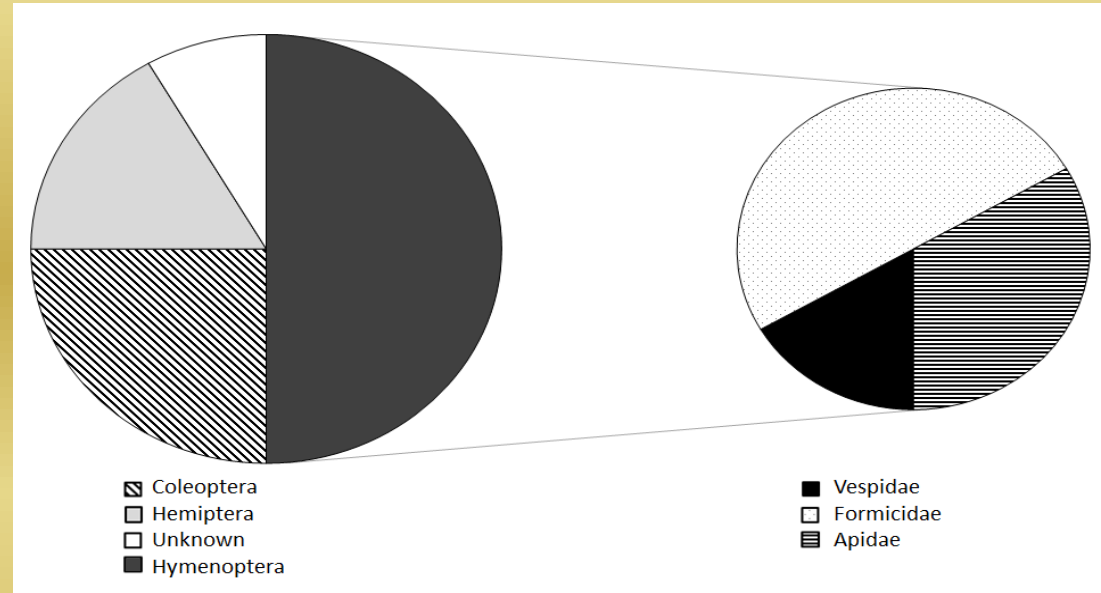
Nordin, G.L., and E.L. Johnson. 1984. Biology of *Caliroa quercuscoccineae* (Dyar) (Hymenoptera: Tenthredinidae) in Central Kentucky II. Development and Behavior *Journal of the Kansas Entomological Society*, Vol. 57, No. 4, pp. 569-579

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

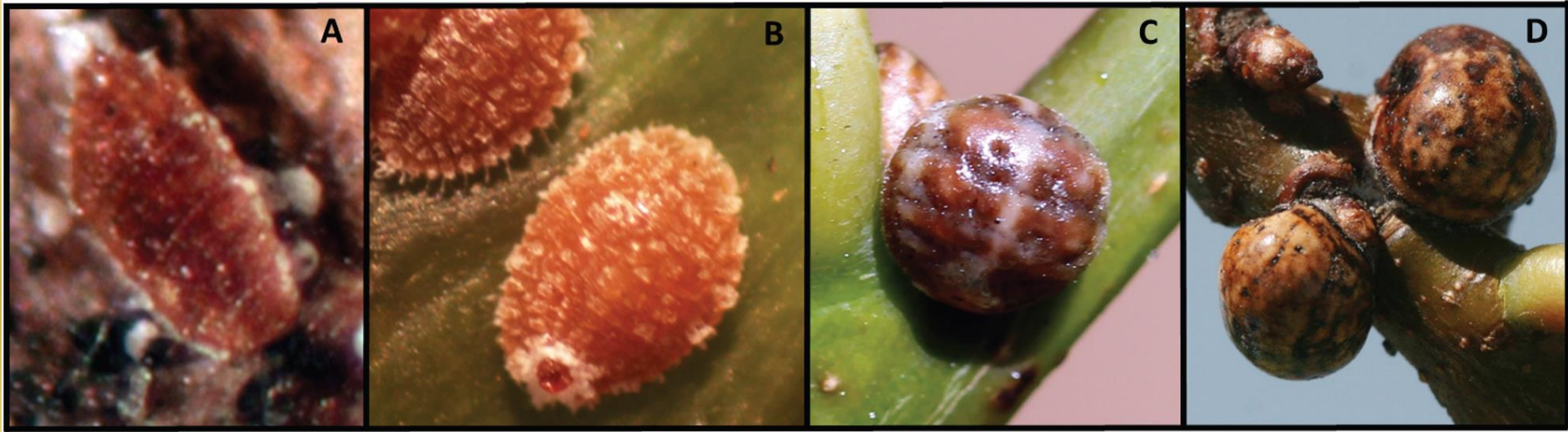


SYMPTOMS AND SIGNS OF “DRIPPY DISEASE”

- 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**

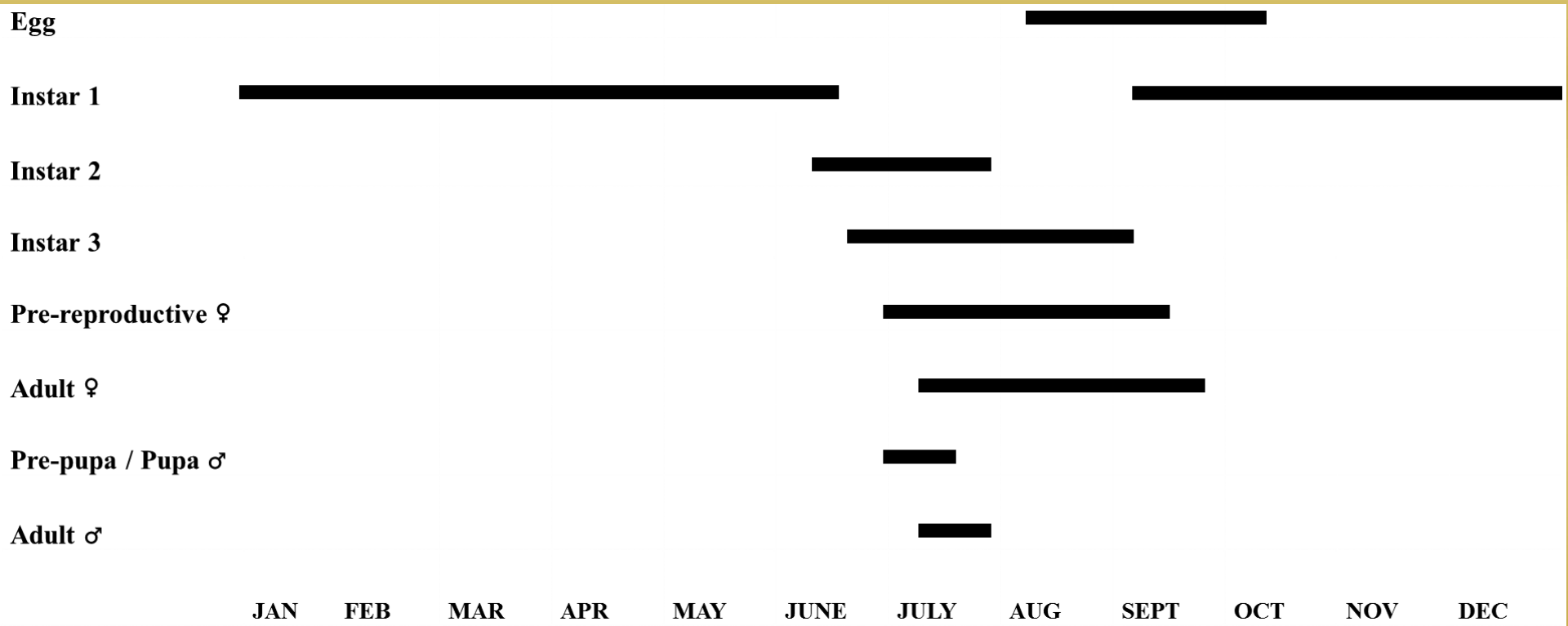


a) Symptomatic pin oak showing witch’s brooms and dieback, **b)** NRO branches exhibiting flagging and dieback, **c)** adult kermes scale insect, (**arrow**) next to bacterial exudates (**star**), **d)** dead (shriveled) and live (round) kermes scales surrounded by bacterial cankers



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

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



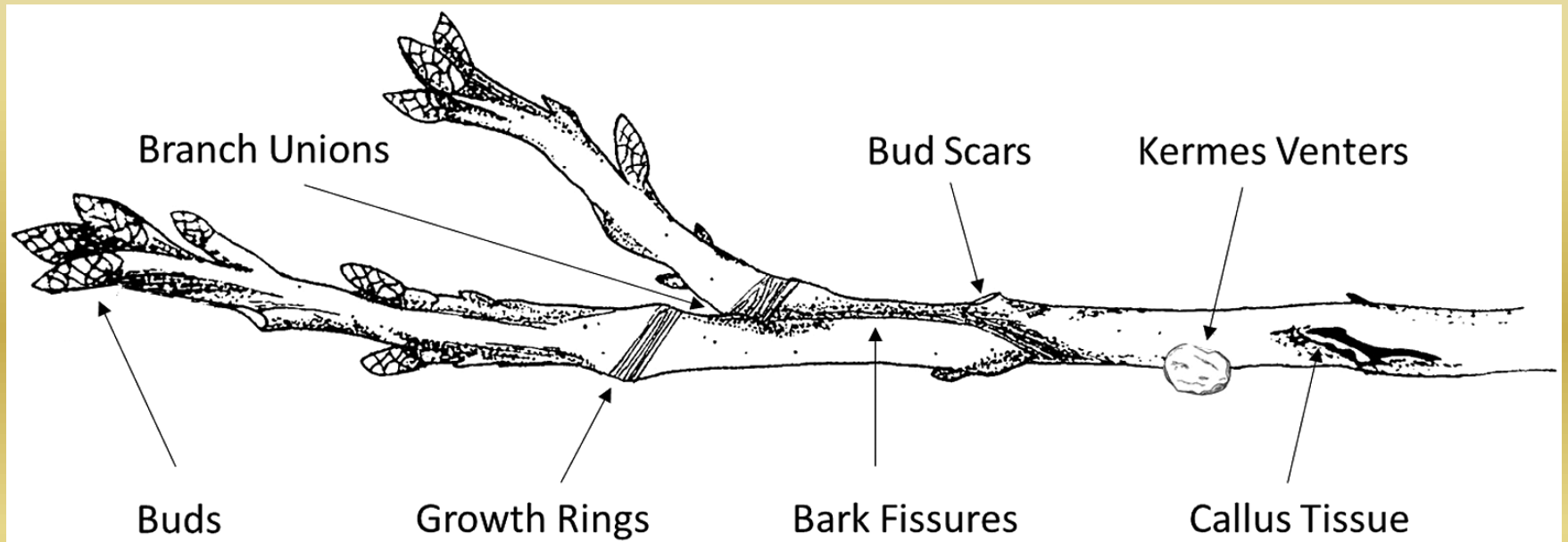
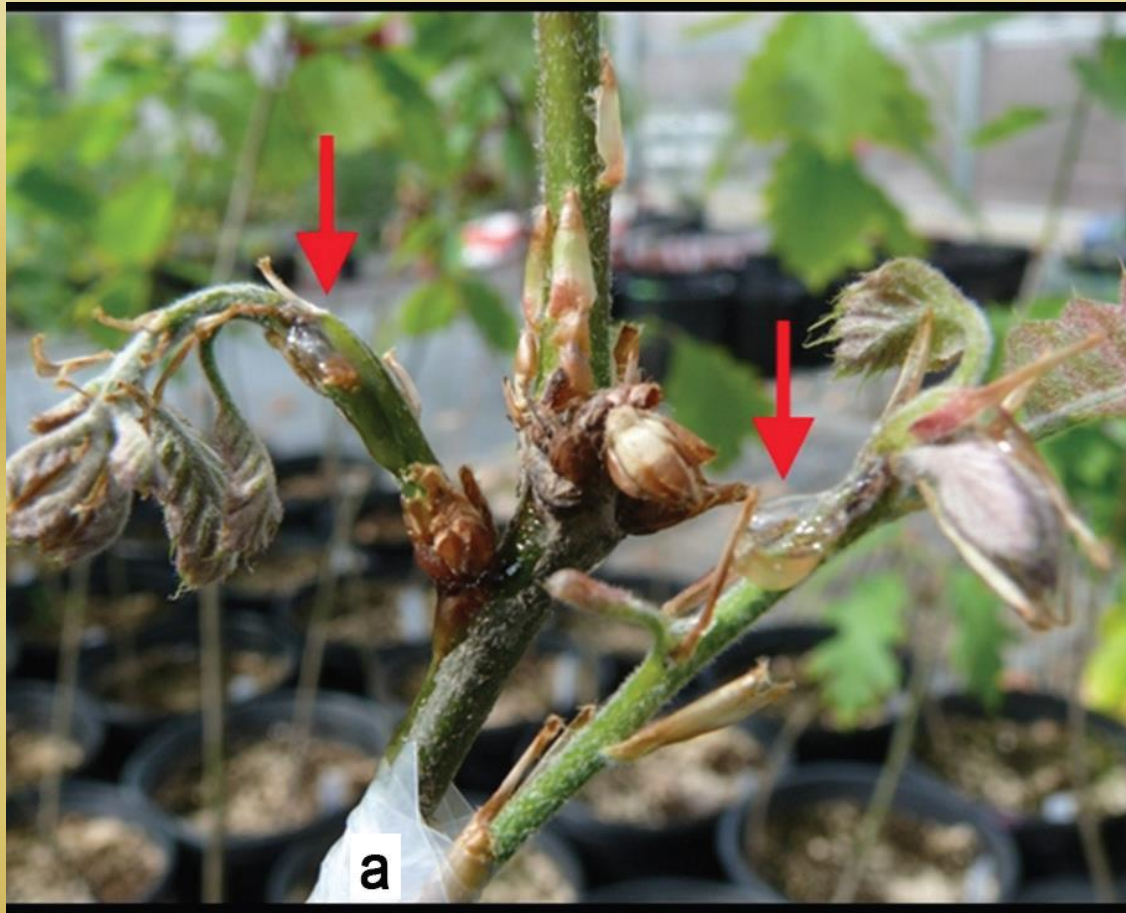


Figure 1. A red oak branch showing the locations where overwintering *A. galliformis* crawlers were observed. These locations include around the base of buds, branch unions, growth rings, bark fissures, bud scars, callus tissue/ wounds, and around old kermes venters



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. *Annals of the Entomological Society of America* 111(5): 265-270

END OF PRESENTATION

