Wisconsin's Insect Trends: an Update from the UW Insect Diagnostic Lab

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The UW Insect Diagnostic Lab

- Lab established in 1978 to serve as a resource for Extension colleagues
  - Managed by Phil Pellitteri for 35 years
  - Currently in its 46th year
- Main service: arthropod diagnostics
  - Receive ~2,500 diagnostic requests annually
  - Samples from: general public, Extension colleagues, businesses, farmers, medical/public health, government agencies, and other groups.
- Other services: pest management consultations, outreach, teaching, *providing context*


Phil Pellitteri

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Snapshot of Lab Activities in 2023

- 2,498 Cases
- Cases from 71/72 WI counties
  - ~95% of cases from within Wisconsin
  - Cases from 24 US states/territories; 9 foreign countries
- **Who:** General public (63%), Extension (18%*), green industry (10%), pest control (6%)…farmers/ag, medical, gov't/edu
- **Where:** Yard/landscape (54%), agricultural setting (9%*), buildings/structural (34%), med/vet (3%)
- **What:** 63% "digital" samples, 29% physical specimens, descriptions

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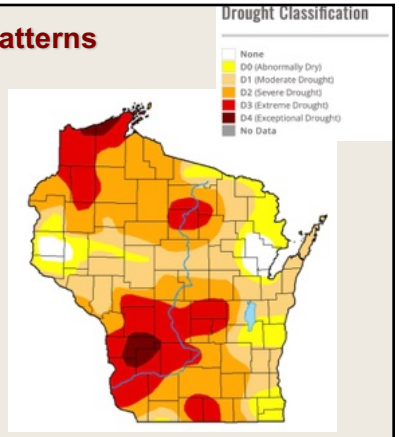
Wisconsin's Weather Patterns

- Many part of Wisconsin experienced dry conditions 2021, 2022, and 2023
- Dry conditions can directly favor or hinder certain arthropods
  - Spongy moth, spider mites, etc.
- Weather patterns can indirectly influence insects via impacts on landscape plants



September 5th, 2023. Map Source: US Drought Monitor

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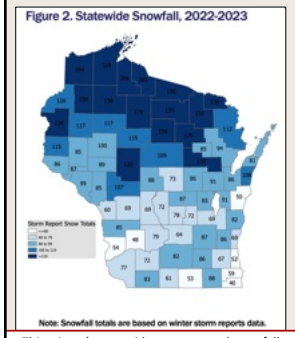
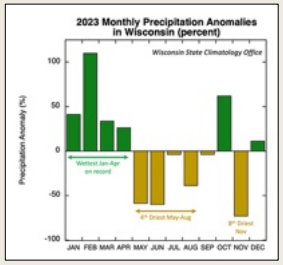
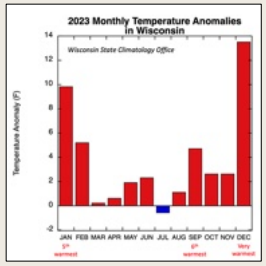
Wisconsin's Recent Weather Patterns







Source: WI State Climatology Office

This winter's statewide average total snowfall was 100.6 inches, over 36 inches above last year.

Source: WI-DOT Report "Winter Maintenance at a Glance"

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Spongy Moth (*Lymantria dispar*)

- Formerly known as the *Gypsy Moth*
- Invasive; native to Europe and northern Asia
  - Introduced in Massachusetts: 1860's
  - Range expanding west/south; outbreaks @ leading edge
- Feeds on a wide range of trees and shrubs

Spongy moth caterpillar

Adult (female) spongy moth w/egg mass

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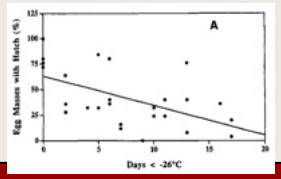
Spongy Moth Trends: 2020 – 2023+

- Populations have been on the rise for several years in Wisconsin
- Dry spring weather plays an important role
- **Fungal disease** (*Entomophaga maimaiga*) causes high mortality if rainy
- Other factors such as heavy snow cover and mild winter temperatures can also increase survival of eggs

USFS: winter egg mortality 48-72 hours at -20˚F (-28˚C)



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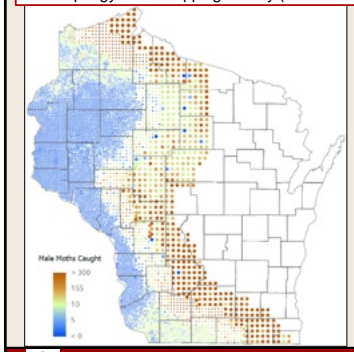
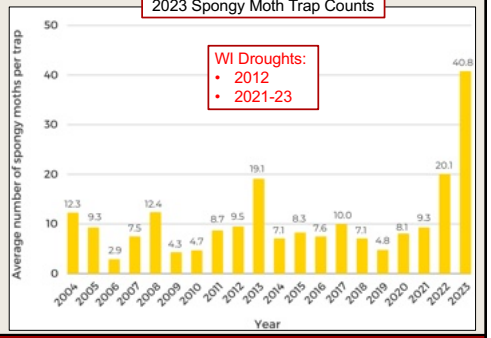
Spongy Moth Trends in Wisconsin

2023 Spongy Moth Trapping Survey (WI-DATCP)



2023 Spongy Moth Trap Counts



WI Droughts:
- 2012
- 2021-23

Chart & Map Source: WI-DATCP

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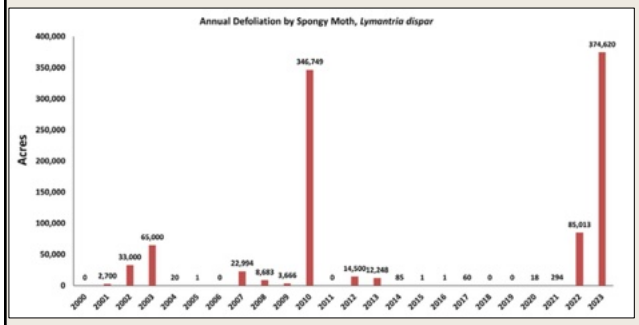
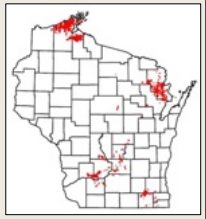
Spongy Moth Trends in Wisconsin





Areas of Defoliation in 2023
Credit: Mike Hillstrom, DNR

Credit: WI-DNR

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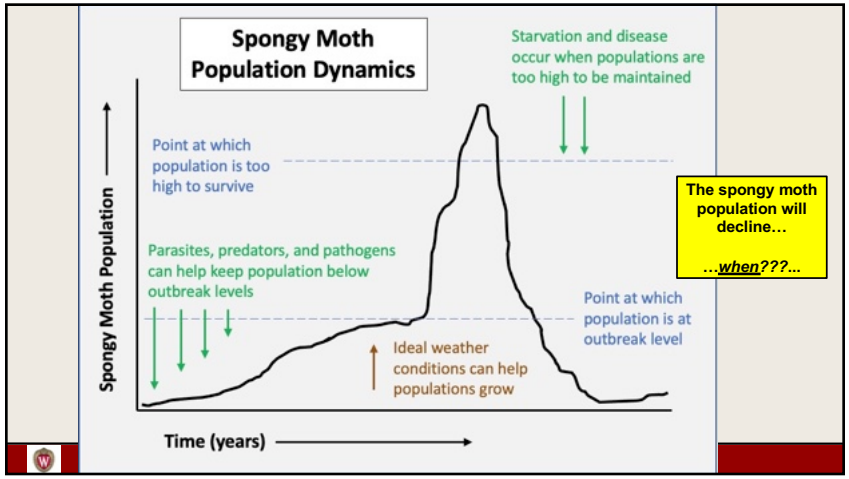

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Spongy Moth Caterpillars

- Larvae (caterpillars) are the damaging life stage
  - Use chewing mouthparts to feed on foliage
- Pass through 5-6 larval sub-stages (instars)
  - Small caterpillars (1st & 2nd instar):
    - Dark w/pale spots; "shaggy" w/raised bumps
    - Active day & night
    - Can disperse via ballooning
  - Large caterpillars (3rd + instar)
    - Up to ~2" long
    - Grayish w/raised blue and red nodules
    - Active at night
    - Most feeding damage caused by last two instars!

Early instar spongy moth caterpillar

Late instar spongy moth caterpillar

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Leaf Consumption by Caterpillars

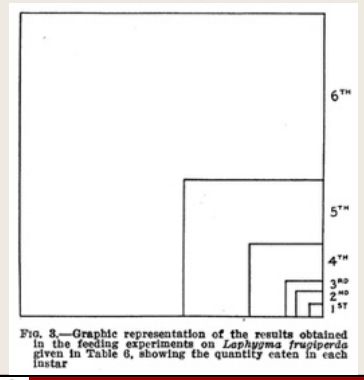

Fig. 3.—Graphic representation of the results obtained in the feeding experiments on *Lophyrma frupiperda* given in Table 6, showing the quantity eaten in each instar

- Later instars consume much more leaf area than younger larvae
- For spongy moth, 80-90% of feeding damage is caused by final two instars!
- This can give the impression of a sudden or overnight appearance of caterpillars

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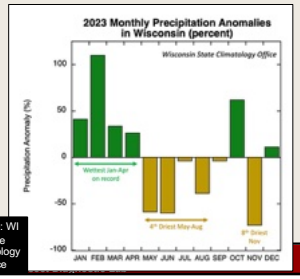
An ace in the hole?...*Entomophaga maimaiga*

- Fungus from native range of spongy moths
- Purposefully introduced in 1910-11 & 1985-86; infected caterpillars found in 1989
- Can kill caterpillars in a matter of days; additional spores produced
- Weather plays a key role…*moisture/humidity is critical!*



Source: WI State Climatology Office

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Two Lined Chestnut Borer (*Agrilus bilineatus*)

- Native metallic wood boring beetle (Buprestidae)
- Associated with stressed/compromised oaks; *"secondary" borer*
- *If warranted, treatments similar to EAB*

Larvae & Galleries

Adults

TLCB Symptoms:
Discolored foliage (left) & thinning canopy (right)

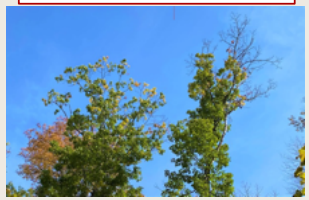

Photo credit of oak canopies: WI-DNR

Year	Number of 2LCB Cases
2019	10
2020	11
2021	16
2022	26
2023	48

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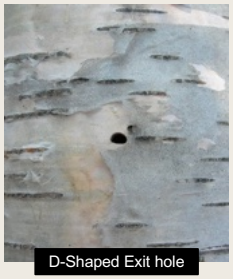
Bronze Birch Borer (Agrilus anxius)

- Native metallic wood boring beetle (Buprestidae)
- Associated with stressed/compromised oaks; *"secondary" borer*
- *If warranted, treatments similar to EAB*

Adults

Larva



D-Shaped Exit hole

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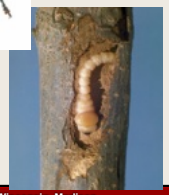
Other "Secondary" Borers

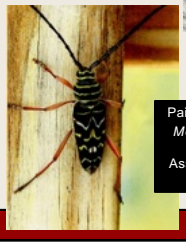
Flatheaded Appletree Borer
Chrysobothris femorata

Associated w/stressed hardwoods (many species)



Whitespotted sawyer
Monochamus scutellatus

Associated dead & dying conifers



Painted Hickory Borer
Megacyllene caryae

Associated w/dying & dead hickories

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"Secondary" Bark Beetles

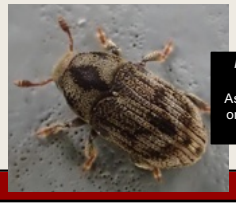
Pityogenes hopkinsi

Associated w/smooth barked portions of dead/dying white pines

Many bark beetles show up to trees that are severely stressed or actively dying

Pseudopityophthorus minutissimus

Associated w/really stressed oaks & cut branches/wood



Hylesinus aculeatus

Associated w/dead, cut or seriously-weakened ash trees

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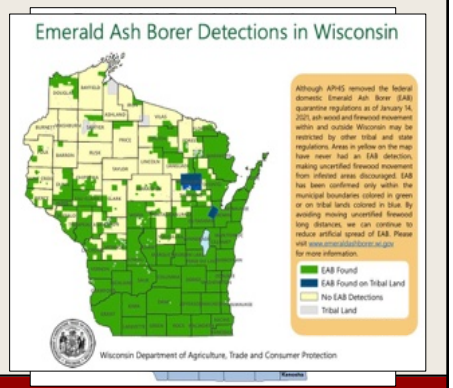
Emerald Ash Borer



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Periodical Cicadas

- Brood XIII 17-year periodical cicadas will emerge this year
  - Last emerged in 2007

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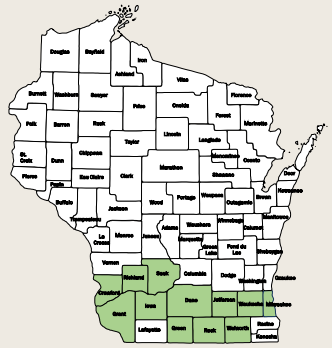
Where will we see periodical cicadas? *When?*



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Potential impacts to nursery & landscape plants:

- Females use ovipositor to cut slits into twigs/branches
  - Large trees: damage mainly cosmetic; "flagging"
  - Small trees: damage can be more problematic—*consider mesh netting*

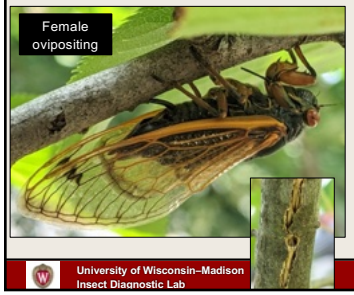

Photo credits: CicadaMania website

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Key Things to Know About Periodical Cicadas:

1. Distribution is restricted to very specific spots on the map
   - *Most of Wisconsin will not see these*
2. Site history is a key factor!
   - *Were they present at a site in 2007? If not, you won't see them in 2024 either…*
3. Periodical cicadas are generally harmless and don't need to be managed
   - Small trees would be the exception

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Japanese beetles

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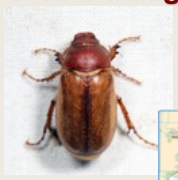
"New" Chafers & Grub Damage

Masased Chafer



European Chafer

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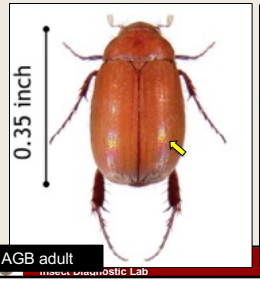
Asiatic Garden Beetle (*Maladera castanea*)

- Invasive Scarab beetle from east Asia
  - Detected 1920's in New Jersey; now established NE US
  - Adults cause chewing damage
  - Larvae (grubs) cause below-ground chewing damage



AGB adult


AGB white grub

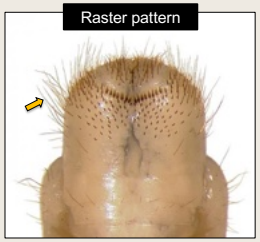


Photo credits: Cornell CALS

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AGB Biology & Impacts

- *Usually* less of a pest than Japanese beetles
- Mostly known as a turfgrass pest (grubs)
  - Tend to be associated with poorly-maintained lawns
- Adults—feed on above-ground plant parts
  - Broad host-plant range: field/veg/fruit crops & tree/shrubs
- **Key biology points:**
  - Adults ***strongly*** nocturnal
  - Strong fliers; readily come to lights at night; esp. hot nights (70˚F+)
  - Adults resemble native genus *Serica*—best to confirm w/specimens


Damage by Asiatic garden beetle adult. Photo credit: Whitney Cranshaw


Native *Serica* spp.

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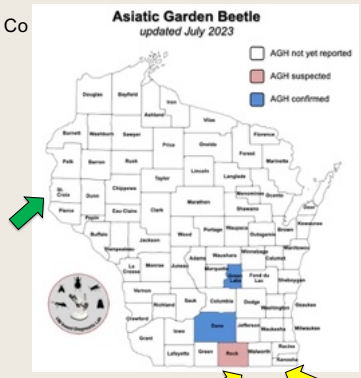
AGB Status in Wisconsin

- 2021: 1st specimens collected & confirmed – Dane Co
- 2022-23: More specimens collected – Dane Co.
- 2023: Adults & plant damage – Green Lake Co.
  - Adults & plant damage – Twin Cities (MN)

Take-Home Messages:

- Watch for adults on warm nights; unexpected grub damage—*esp. SE WI and along IL-state line*
- Suspect AGB? — collect sample and send to UW Insect Diagnostic Lab



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Broad-Nosed Weevils (Curculionidae: Entiminae)

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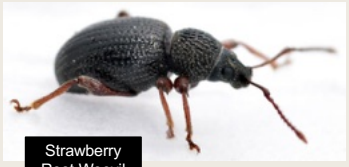
Commonest Broad-Nosed Weevils



Strawberry Root Weevil

Black Vine Weevil (Taxus Weevil)

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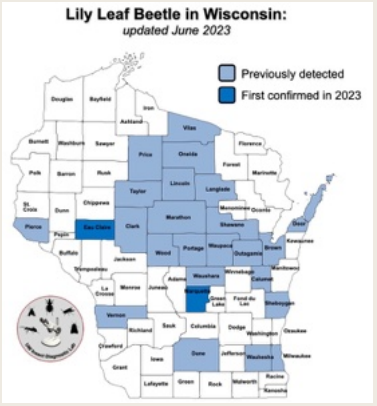
Lily Leaf Beetle

- First detected 2014 (Marathon Co.)
- Adults and larvae feed on true lilies
  - *Don't feed on daylilies*

Lily leaf beetle adult

Heavily-Infested Lily Plant



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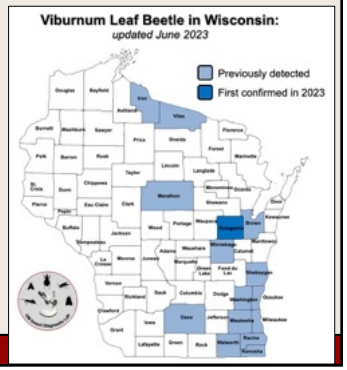
Viburnum Leaf Beetle

- First est. population found in 2014 (Ozaukee Co.)
- Adults and larvae feed on viburnums
  - Skeletonization damage

VLB Larvae and "Skeletonization" Damage

Oviposition (egg-laying) pits



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Sucking Insect Pests

Aphids

Thrips

Triozids (Serviceberry)

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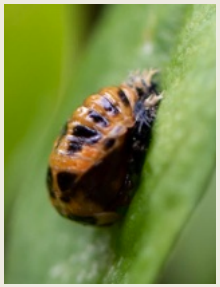
Multicolored Asian Lady Beetles

Adults (Indoors)



Pupa (Outdoors)

Larva (Outdoors)

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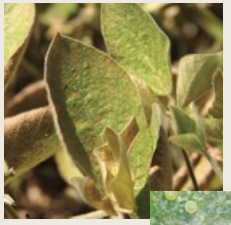
Sucking Pests: Spider Mites



Two-Spotted Spider Mite

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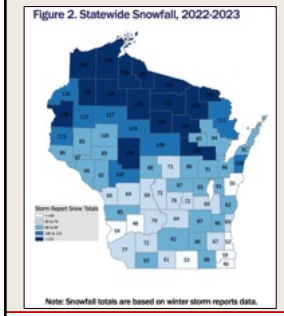
Weather Patterns & Mosquito Activity



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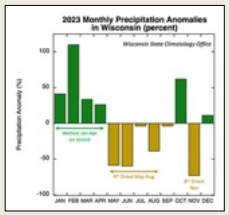
Source: WI-DOT Report "Winter Maintenance at a Glance"



Source: WI State Climatology Office

Temporary Meltwater Pool

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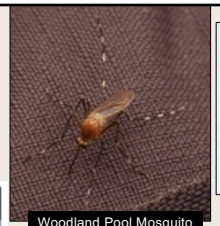
Mosquitoes

- 2023: Mosquito activity varied greatly around the Midwest
- Moderate WNV cases

Wisconsin 2023 WNV Data Source: DHS

Type	Number of cases
Human confirmed	12
Human probable*	6
Deaths**	1
Hospitalizations**	17
Mosquito pools	35
Equine (horse)	5
Avian (bird)	5
Counties reporting West Nile virus activity	14

*Probable cases have presumptive positive laboratory results without confirmatory testing at CDC.
**Deaths and hospitalizations are included among the confirmed and probable cases.



Woodland Pool Mosquito (*Aedes canadensis*)

Cattail Mosquito (*Coquillettidia perturbans*)

Northern House Mosquito (*Culex pipiens*)

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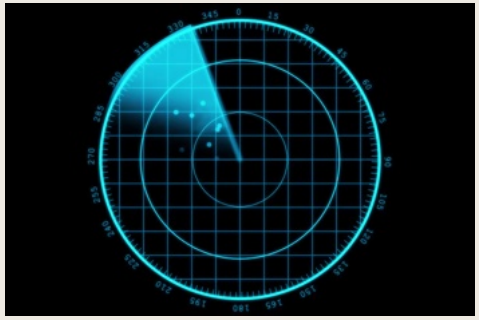
Nursery & Landscape pests to have on your radar:



- Spotted lanternfly
- Box tree moth
- Elm zigzag sawfly

- **Not yet in Wisconsin**
- *If you suspect any of these, **please report**!*

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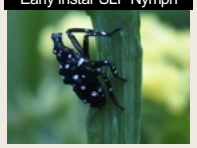
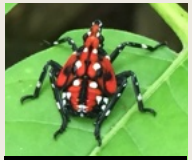
Spotted Lanternfly

- Invasive Fulgorid planthopper from southeast Asia
  - Spread to Japan and Korea
  - Arrived in USA in 2014 (PA)
  - Not yet in WI…
- Eggs can easily be transported
- SLF feeds on 100+ plant species
  - Tree of Heaven (*Ailanthus altissima*)
  - Fruits: grapes & tree fruits
  - Hops
  - Landscape/forest trees (maple, walnut, poplar, willow, etc.)


SLF Adult

Early instar SLF Nymph




4th instar SLF Nymph

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SLF Adults

- Large size (~1" long)
- Forewings: grey w/spots
- Hindwings: B&W w/pink
- Abdomen: black & yellow

- Not a strong flier
- Active crawler, can hop

- Gregarious
- Feed; lay eggs in late summer & fall

Adult: Side View

Adult: Dorsal View

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SLF Eggs

- Laid in groups of 30-50
  - Female lays 1-2 egg masses
- Covered w/protective secretion
  - Eventually disappears to reveal eggs
  - Remnants may remain after hatching
- Often laid on trees w/ smooth bark
  - *Sometimes laid on man-made objects*
  - Multiple egg masses can occur in same area (100's!)


SLF Egg Mass

40

SLF Nymphs (Juveniles)

- Smaller than adults and lack wings
  - Start out as ~1/8" long and progressively get larger
  - Pass through 4 juvenile sub-stages (instars)
- Appearance varies by instar:
  - 1st – 3rd instars: black w/ white spots
  - 4th instar: red & black w/ white spots
- Very active and mobile
- Feed on succulent tissues; upper parts of plants


Early instar SLF Nymph


4th instar SLF Nymph

Photo Credits: Emelie Swackhamer, Penn State University, Bugwood.org

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Damage & Impacts

- Nymphs & adults possess sucking-type mouthparts
  - Restricted to a liquid diet (phloem feeders)
- Feeding location varies by life stage:
  - Nymphs: leaves, petioles, branches, and young stems (of wide range of plants)
  - Adults: trunk and branches (mostly on trees)
- Primary Impacts: oozing wounds, branch/twig dieback, honeydew
  - Also – fungal growth & nuisance impacts
- Bottom line: doesn't kill plants; messy nuisance (trees); reduced yield (grapes)
  - Can kill TOH, grapes, black walnut saplings

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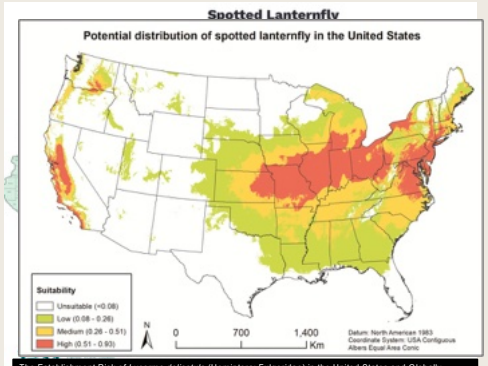
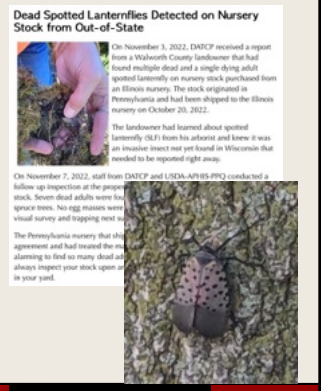
Current SLF Distribution & Potential Range



The Establishment Risk of *Lycorma delicatula* (Hemiptera: Fulgoridae) in the United States and Globally. Wakie, et al. J. Econ Entom. 2019.



Map Credit: New York State Integrated Pest Management Program & Google Maps

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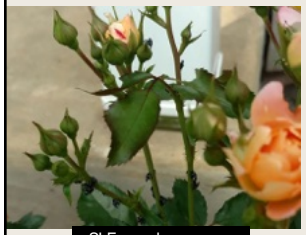
Damage


SLF nymphs on roses


Fungal Growth at Base of Tree


SLF adults covering tree trunk

Photo Credits: Lawrence Barringer, Pennsylvania Department of Agriculture, Bugwood.org

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Box Tree Moth

- Invasive caterpillar; native to Asia
  - Also a problem in Europe
- Host: Boxwoods
- Found in:
  - Canada (Toronto) – 2018
  - New York – 2021
  - Michigan – 2022

Insect Diagnostic | Credit: Szabolcs Sáfián, University of West Hungary, Bugwood.org

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Box Tree Moth

- Damage caused by caterpillars
  - Use chewing mouthparts
  - Consume foliage
  - Create silken webbing

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Elm Zigzag Sawfly

- Invasive sawfly; native to Asia
  - *Also an invasive pest in Europe*
- Host: elms
- Found in:
  - Quebec, Canada – 2020
  - VA – 2021
  - NC, MD, PA, NY – 2022
  - VT, MA, OH – 2023

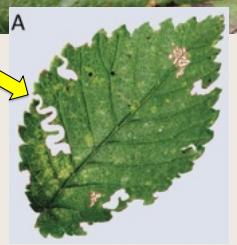

Photo source: First records of elm zigzag sawfly (Hymenoptera: Argidae) in the United States. 2023. K. Oten, et. Al.

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Elm Zigzag Sawfly

- Damage caused by larvae
  - Use chewing mouthparts
  - Chew zigzag notches out of leaves
  - Complete defoliation can occur

Table 1. Documented host species of EZS in the United States

Species	Common name	Location (state)
Ulmus americana	American elm	PA, NC, MD, NY
Ulmus alata	winged elm	NC
Ulmus parvifolia	Chinese elm	VA
Ulmus procera	English elm	VA
Ulmus pumila	Siberian elm	VA
Ulmus rubra	slippery elm	MD
Ulmus × 'Cathedral'	Japanese × Siberian hybrid	VA

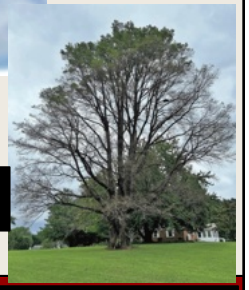

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Photo source: First records of elm zigzag sawfly (Hymenoptera: Argidae) in the United States. 2023. K. Oten, et. Al.

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