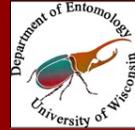


Emerging Wisconsin Insect Pests of 2023

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Trending & Emerging Insect Pests

- Spongy moth
- Spotted lanternfly
- Viburnum leaf beetle
- Lily leaf beetle
- Japanese beetle
- Asiatic garden beetle

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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



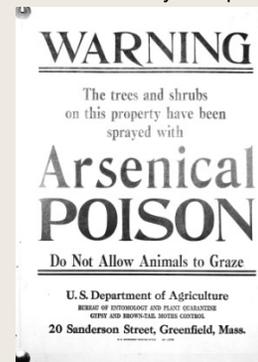
Adult (female) spongy moth w/egg mass

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Spongy Moth History

- Brought to US in 1869 in attempt to breed a hardy silkworm hybrid
- Accidentally escaped his home lab!

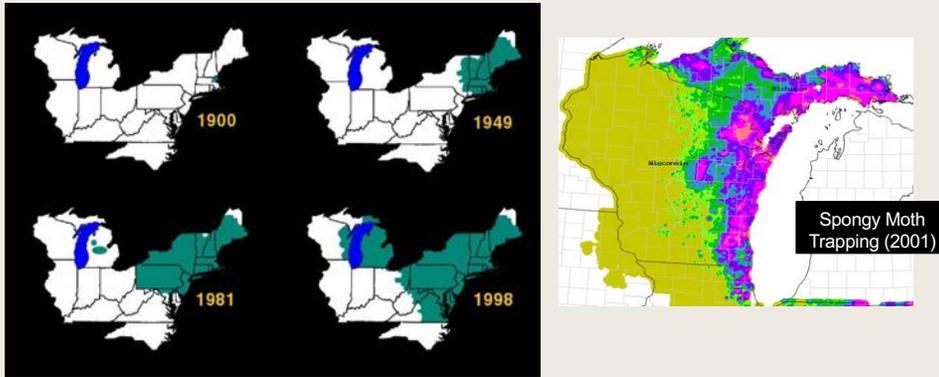


Early Spraying Effort

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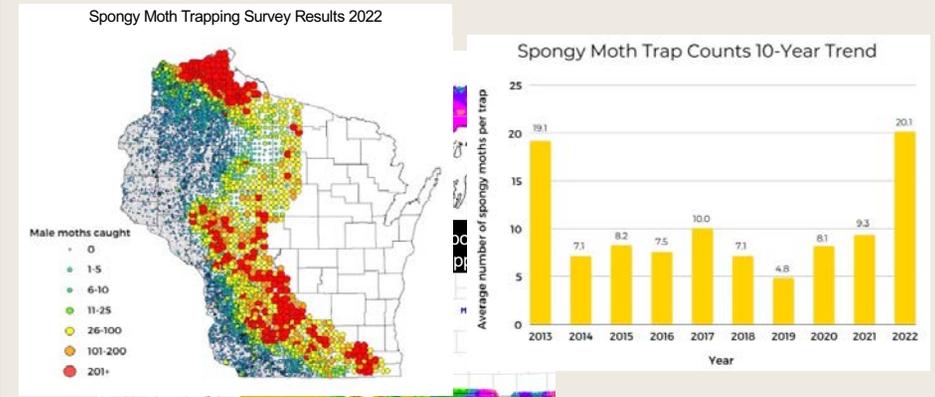
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Spongy Moth History & Spread



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Spongy Moth Trends in Wisconsin



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Why is the spongy moth such a problem?

- Really invasive! — all life stages (esp. eggs) can easily be transported by humans
- Major defoliator of hardwood trees in forested and landscape settings
- Dynamic populations — optimal conditions can lead to steep population increases



Egg masses on underside of truck



Dozens of egg masses on tree

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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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Spongy Moth Host Plants

- Known to feed on over 300 plant species
- Mostly hardwoods, but some conifers can be attacked

Favorite host plants:

- Oaks
- Aspens
- Willows
- Apple/crabapple
- Birches
- Mountain ash
- Lindens
- and many others



Large-scale Defoliation
Due to Spongy Moth

Side note:

- Oak trees stressed by drought and/or spongy moth could be at increased risk for two lined chestnut borer



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Spongy Moth Pupae

- Brownish pod-like structures w/golden hairs
- Can be 1.5+ inches long
- Inactive during this stage
- Remain in pupal stage for ~ 2 weeks
- Present in late June – early August



Spongy Moth Pupae



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Spongy Moth Adults & Eggs

- Adults (moths) ~1.5" long
 - ♀ Whitish, thin antennae, flightless
 - ♂ Brownish, "bushy" antennae
- Males must fly to females to mate
- Adults short-lived
- Egg masses: fuzzy and beige
 - Contain 500-1000 eggs



Spongy Moth
Egg Mass



Adult
Female

Adult
Male

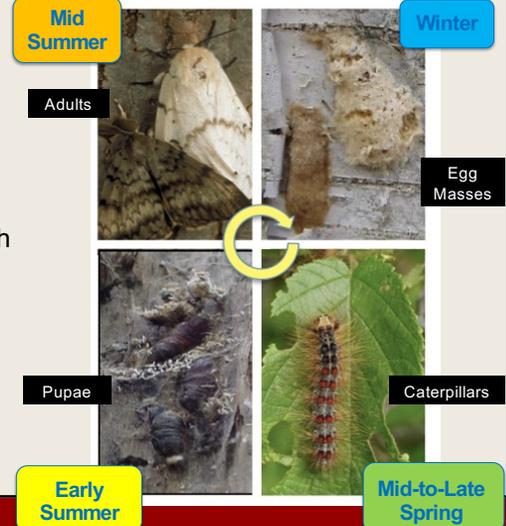


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Spongy Moth Life Cycle

- One generation per year
- Overwinter as egg masses
- Caterpillars emerge in spring; reach maturity in early summer
- Pupate in late June or July
- Adults present July onwards



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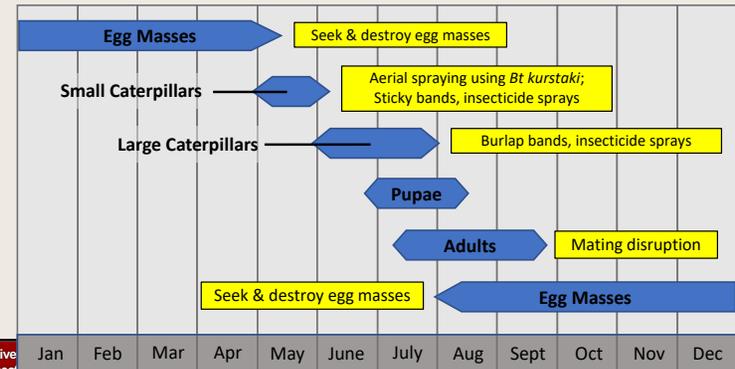
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Spongy Moth Management Options

- **Cultural**
 - Maintain plant vigor
 - Sanitation: keep area clean of egg masses; get rid of hiding spots
- **Physical**
 - Physical removal of egg masses or caterpillars
 - Sticky bands and barrier bands
- **Biological**
 - Pathogens: fungal/viral diseases
 - Many predators/parasites
- **Chemical**
 - Contact insecticide sprays to protect foliage from caterpillars

Spongy Moth Management

- Many management options exist: *cultural, physical, biological, chemical*
- Tailor these for each situation, time of year, and life-stage present!



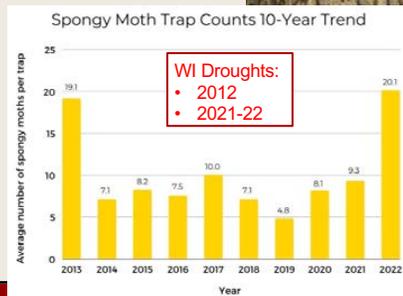
Biological Control

- **Fungus: *Entomophaga maimaiga***
 - Brought from Japan in early 1900's; not effective until 1980's!
 - Spores are spread via wind; infects young larvae
 - Helps regulate populations; *requires rain!*
- **Virus: NPV**
 - Can be transmitted to eggs by ♀



Caterpillars killed by NPV

Spongy moth caterpillars killed by *Entomophaga maimaiga*



Biological Control

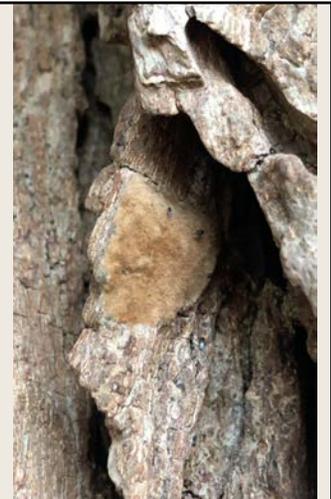
- **Predators/Parasites:**
 - Parasitoid wasps & flies
 - Predatory ground beetles
 - Mice — *love pupae!*



Mouse



"Fiery searcher" Ground Beetle



Egg parasitoids (wasps)

Physical Controls

- **Egg Masses:** inspect for and scrape away
 - Late summer through the following spring
- **Sticky Band:** cover trunk with duct tape or cling wrap; coat with sticky material
 - In spring to target small caterpillars
- **Burlap Band:** hang burlap "taco" around tree to concentrate caterpillars
 - In mid/late spring to target larger caterpillars



Sticky Band Method



Burlap Band Method



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Chemical Control

- **Conventional foliar sprays:** acephate, bifenthrin, carbaryl, chlorantraniliprole, cyfluthrin, deltamethrin, lambda-cyhalothrin, permethrin, spinosad & other AIs
- **Systemic options:** acephate, clothianidin, dinotefuran, emamectin benzoate
- **Lower risk option:** azadirachtin, *Bacillus thuringiensis kurstaki* (Btk), SPLAT-GM (pheromone), insecticidal soap, horticultural spray oil
- **Dormant treatment (egg masses):** Golden pest spray oil



Mating Disruption with SPLAT-GM



Aerial spraying with Btk



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Spotted Lanternfly (*Lycorma delicatula*)

- 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

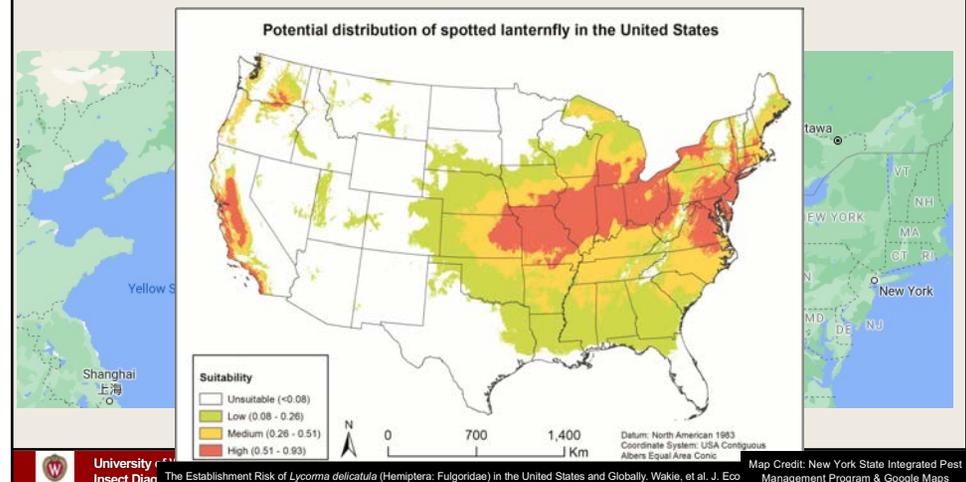
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Photo Credit: Lawrence Barringer, Pennsylvania
Department of Agriculture, Bugwood.org

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Current Distribution & Potential Spread

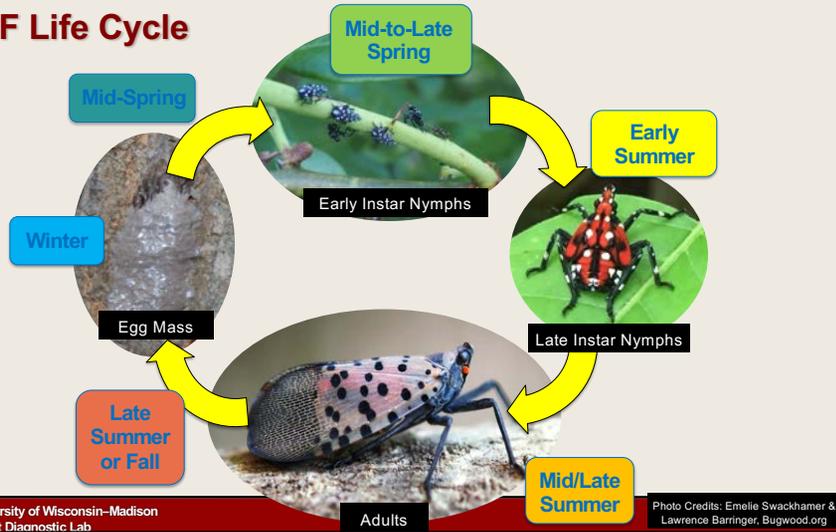


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The Establishment Risk of *Lycorma delicatula* (Hemiptera: Fulgoridae) in the United States and Globally, Wakie, et al. J. Eco. Map Credit: New York State Integrated Pest Management Program & Google Maps

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SLF Life Cycle



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



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

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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!)



Photo Credits: Pennsylvania Department of Agriculture, Bugwood.org

SLF Eggs...Potential Route of Invasion



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Photo Credits: Pennsylvania Department of Agriculture, Bugwood.org & Colin Purrington via Twitter

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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

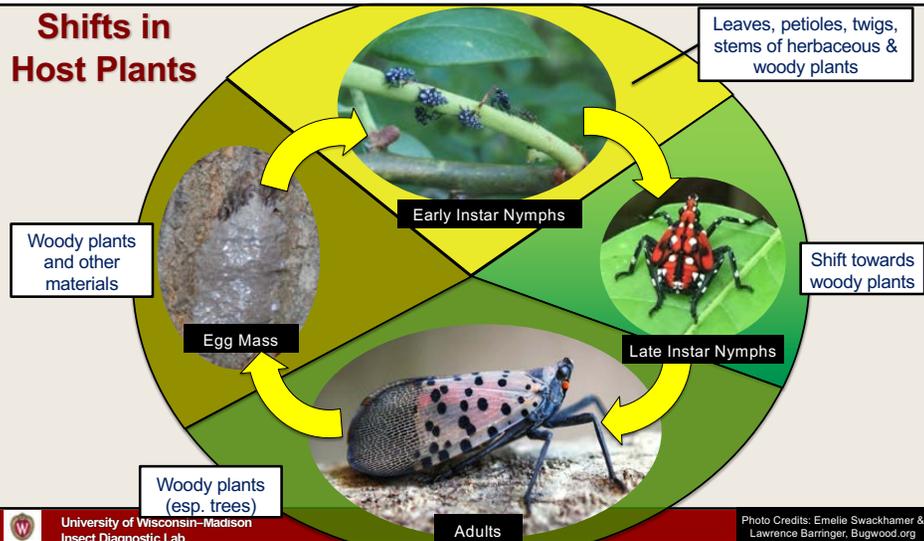


Photo Credits: Emelie Swackhamer, Penn State University, Bugwood.org

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

Shifts in Host Plants



Shift in Plant Hosts

HOST	NYMPHS			ADULTS		
	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER
Rose (cultivated, multiflora, etc.)						
Perennials						
Grape (wild and cultivated)						
Tree-of-heaven						
Black walnut, butternut						
River birch						
Willow						
Sumac						
Red/silver maple						

Common SLF host plants reported in Pennsylvania

Source: Penn State Extension

Damage



SLF nymphs on roses



Fungal Growth at Base of Tree



SLF adults covering tree trunk



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

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Spotted Lanternfly Management Options

- **Cultural**
 - Inspection for egg masses, nymphs, adults
 - Remove tree of heaven
- **Physical**
 - Physical removal of egg masses* or nymphs/adults
 - Traps for nymphs
- **Chemical**
 - Contact sprays for nymphs (pyrethroids, carbaryl, insecticidal soap, horticultural oils)
 - Systemic treatments for adults (e.g., imidacloprid and dinotefuran)
 - Dormant oil treatment (egg masses) – Golden pest spray oil



Sticky band trap Source: Penn State



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*Penn State University reports that ~2% of egg masses in trees were under 10 feet

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Next Steps?

- Learn to ID Tree-of-Heaven (WIFDN)
- Check out Extension & DATCP materials on SLF
- Watch for SLF—*contact UW Insect Diagnostic Lab or DATCP if found*

hort.extension.wisc.edu



SLF.wi.gov



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Viburnum Leaf Beetle (*Pyrrhalta viburni*)

- Leaf beetle native to Europe; introduced to eastern Canada 1940's
 - Northeast US in 1990's; Wisconsin in 2014
 - Also in Pacific NW
- Adults and larvae skeletonize foliage of viburnum shrubs



Adults: ~1/4" long;
yellowish-green colour



Larva: ~1/3" long; pale with pattern of spots; dark head capsule and 6 legs

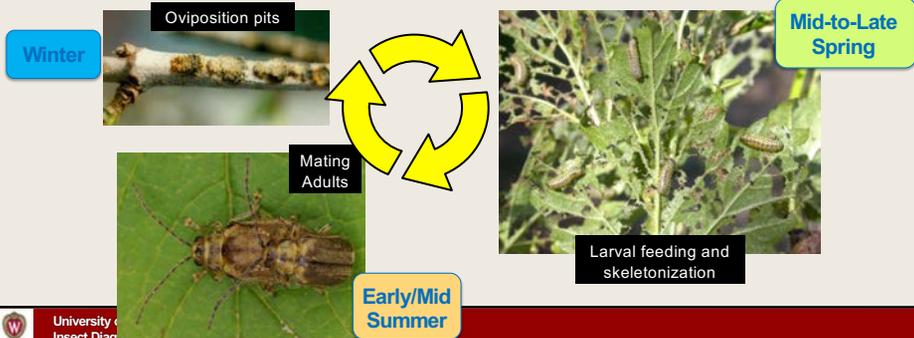


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VLB Life Cycle

- ONE year life cycle
 - Overwinter as eggs; larvae emerge in April/May and feed
 - Larvae walk down to soil to pupate; adults emerge in June/July
 - Adults feed and ♀ lay up to 500 eggs (in pits of 5-8 eggs)



VLB Damage and Trends

The images show:

- Skeletization Damage:** A leaf with many holes.
- Severe damage:** A tree with sparse foliage.
- Oviposition (egg-laying) pits:** A branch with small pits.

Viburnum Leaf Beetle in Wisconsin:
updated August 2021

Legend:

- Light blue: Previously detected
- Dark blue: First confirmed in 2021

Viburnum Leaf Beetle Management

- Cultural**
 - Choosing less-susceptible cultivars
 - Maintain plant vigor
- Physical**
 - Prune out egg sites
 - Removal/replacement of damaged plants
- Biological**
 - Limited research to date
- Chemical**
 - Foliar insecticide sprays targeting larvae in spring and adults in summer
 - Systemic insecticides in spring

Cultivar Selection

- Highly susceptible:**
 - V. dentatum* complex, arrowwood viburnum
 - V. nudum*, possum-haw, smooth withered viburnum
 - V. opulus*, European cranberrybush viburnum
 - V. opulus* var. *americana* (formerly *V. trilobum*), American cranberrybush viburnum
 - V. propinquum**, Chinese viburnum, Taiwanese viburnum
 - V. rafinesquianum*, Rafinesque viburnum
- Susceptible:**
 - V. acerifolium*, mapleleaf viburnum
 - V. lantana*, wayfaringtree viburnum
 - V. rufidulum*, rusty blackhaw, southern black-haw
 - V. sargentii*, Sargent viburnum
 - V. wrightii*, Wright viburnum
- Moderately susceptible**
 - V. alnifolium* (syn. *V. lantanoides*), hobblebush
 - V. burkeanoides*, Burkwood viburnum
 - V. x cariceobalium*, Cariceobalium viburnum
 - V. cassinioides*, withered viburnum
 - V. dilatatum*, linden viburnum
 - V. fascioides*, fragrant viburnum (except 'Nanum', which is highly susceptible)
 - V. lantanoides* (syn. *V. alnifolium*), hobblebush
 - V. bicoloris*, nannyberry viburnum
 - V. macrocephalum*, Chinese Snowball Viburnum
 - V. x pragense*, pragensis viburnum
 - V. plicatum*, blackhaw viburnum
 - V. x rhytidobalium*, lantanaphyllum viburnum
 - V. tinus**, laurustinus viburnum
- Viburnum most resistant to the viburnum leaf beetle:**
 - V. bodnantense*, dawn viburnum
 - V. carolinense*, Koreanspice viburnum
 - V. davidii**, David viburnum
 - V. x juddii*, Judd viburnum
 - V. plicatum*, doublefile viburnum
 - V. elaeagnifolium* var. *fremontianum*, doublefile viburnum
 - V. rhytidobalium*, leatherleaf viburnum
 - V. setigerum*, tea viburnum
 - V. sissibolii*, Siebold viburnum

Lily Leaf Beetle (*Lilioceris lili*)

- Also known as the "scarlet lily beetle"
- Leaf beetle native to Europe; introduced to eastern Canada 1940's
 - Northeast US in 1990's; Wisconsin in 2014
- Cause significant damage to **true lilies**



Adults: ~1/3" long; bright red colour; "squeak" when picked up



Larvae: ~1/3" long; yellow body; cover themselves with excrement giving a slimy appearance

LLB Life Cycle

- ONE year life cycle
 - Overwinter as adults; mate and lay eggs in spring
 - Larvae feed and camouflage themselves; head to ground to pupate
 - Adults feed and ♀ lay 400+ eggs (in batches of 8-12)

The diagram illustrates the LLB life cycle with the following stages and seasonal markers:

- Eggs:** Shown as small red clusters on a green leaf.
- Larvae:** Shown as small, dark, segmented creatures on a leaf.
- Cocoon Stage (in soil):** Shown as a white, textured mass.
- Adults:** Shown as red beetles.
- Mating Adults:** Shown as two red beetles on a leaf.

Seasonal markers and cycle indicators:

- Spring (mid-late):** Indicated by a green box.
- Summer:** Indicated by a yellow box.
- Winter:** Indicated by a blue box.
- A yellow circular arrow with three arrows indicates the continuous cycle.

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LLB Damage and Trends

The photographs illustrate the damage caused by LLB:

- Heavily-Infested Lily Plant:** A lily plant with many red flowers and buds, showing signs of infestation.
- Damage of small larvae:** A close-up of a leaf with several small larvae feeding, causing visible damage to the leaf tissue.
- Adult Feeding:** A close-up of an adult red beetle feeding on a lily bud.

Lily Leaf Beetle in Wisconsin:
updated May 2022

Legend:
■ Previously detected
■ First confirmed in 2022

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Lily Leaf Beetle Management

- Cultural**
 - Choosing non-preferred plants
 - Maintain plant vigor
- Physical**
 - Hand-picking or squishing
 - Removal/replacement of infested plants
- Biological**
 - Parasitoid wasps released in northeastern US
 - Limited impact thus far
- Chemical**
 - Contact insecticide sprays targeting larvae and/or adults
 - Conventional or reduced-impact (soaps, oils)

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Japanese Beetle (*Popillia japonica*)

- Invasive Scarab beetle from Japan
 - Detected in New Jersey (1916); now established E. US
 - Adults cause chewing damage (skeletonization, etc.)
 - Larvae (grubs) cause below-ground chewing damage
- Broad host-plant range: field/veg/fruit crops & tree/shrubs

The photographs show the Japanese beetle in its adult and larval stages:

- Japanese beetle adult:** A dark beetle with characteristic white spots on its elytra, feeding on a green leaf.
- Japanese beetle larva (white grub):** A white, grub-like larva with a brown head and legs, shown in the soil.

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Japanese Beetle Damage (Adults)



Skeletonization damage



Feeding activity on corn silks



Damage to floral structures

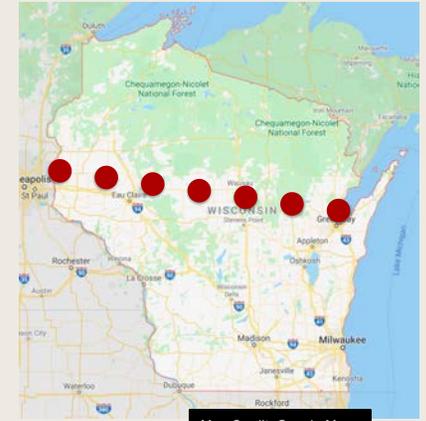


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JB Status in Wisconsin

- 1960's: First reports
- Well established in southern WI
 - Can occur in "pockets"
- Gaining footholds in northern WI
- Recent patterns influenced by weather (2021 & 2022)



Map Credit: Google Maps

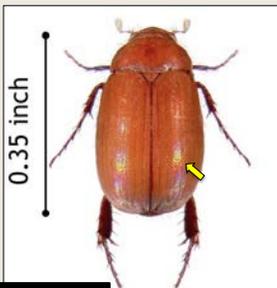


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Asiatic Garden Beetle (*Maladera castanea*)

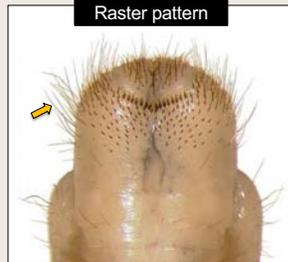
- Invasive Scarab beetle from east Asia
 - Detected 1920's in New Jersey; now established NE US
 - Adults cause chewing damage
 - Larvae (grubs) cause below-ground chewing damage



AGB adult



AGB white grub



Raster pattern

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)
 - Adults can feed on above-ground plant parts
- Broad host-plant range: field/veg/fruit crops & tree/shrubs
 - Vegetables hosts:** bean, **beet**, broccoli, cabbage, **carrot**, corn, eggplant, kahlrabi, parsley, **parsnip**, pea, **pepper**, potato, radish, rhubarb, spinach, Swiss chard, **turnip**
- Key biology points:**
 - Adults **strongly** nocturnal; prefer hot nights (70°F+); strong fliers
 - 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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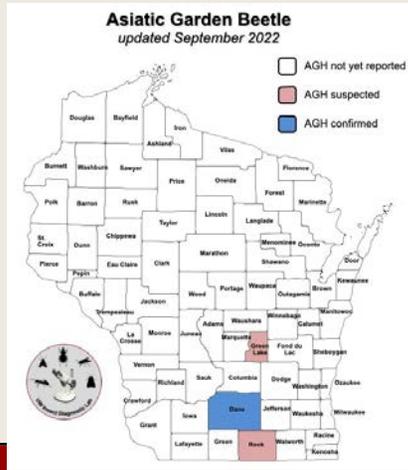
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AGB Status in Wisconsin

- 2021: First specimens collected and confirmed [Dane County]
- 2022: Additional specimens collected
- No documented plant damage to date

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



The UW Insect Diagnostic Lab



Key Info:

- Your contact info
- Location (State/County/Town)
- Where/when the specimen was found, what it was doing, size of the specimen, and any other relevant notes

Submission template
for physical samples

insectlab.russell.wisc.edu

Questions?

insectlab.russell.wisc.edu