

Insect Defoliators of Landscape Trees & Shrubs

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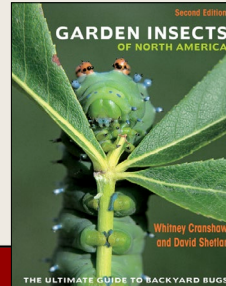


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Defoliators:

- Use chewing-type mouthparts to remove leaf tissues
- Main insect defoliators:
 - Beetles
 - Caterpillars
 - Sawflies

CHAPTER TWO INSECTS THAT CHEW ON LEAVES AND NEEDLES



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Management of Insect Defoliators:

- Many "tools" in the toolbox from an IPM perspective:
 - Cultural
 - Physical/mechanical
 - Biological
 - Chemical
- Need to tailor management approaches to each scenario:
 - 1 shrub vs. 50 shrubs
 - Shrub vs. tree
 - Time available to manage, etc.



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Beetles (Coleoptera)

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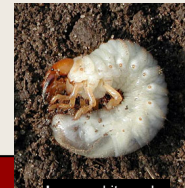
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Japanese Beetle (*Popillia japonica*)

- Scarab beetle native to Japan; New Jersey in 1916
- Found across much of eastern US; some pockets in West
- Adults: above ground foliar feeder; 350+ plants attacked
- Larvae (white grubs): below-ground turf pest



Adults: ~1/3" long; copper & green colored; white spots along side of body



Larva: white grub

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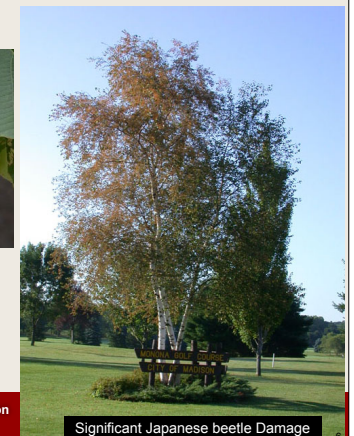
Japanese Beetle Damage



Skeletonization



Feeding on flowers



Significant Japanese beetle Damage

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Japanese Beetle Management

- Cultural**
 - Choosing less-susceptible plant species/varieties
 - Plant location in landscape
 - Maintain plant vigor
- Biological**
 - Adults – *Bt galleriae*
- Chemical** (varies by plant/size)
 - Small plants: foliar sprays
 - Generally as-needed
 - Trees: systemic insecticides
 - Preventative; high-value trees
- Physical**
 - Physical removal (by hand)
 - Physical barriers (mesh netting)
 - Removal/replacement of damaged plants
 - Trapping? (*Bad idea...*)

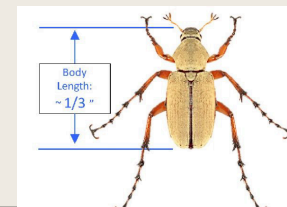


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Rose Chafer (*Macrodactylus subspinosus*)

- Basically our native version of the JB; active about a month earlier
- Native scarab beetle; found in parts of eastern US with sandy soil
- Adults: above ground foliar feeder
- Larvae (white grubs): minor below-ground pest

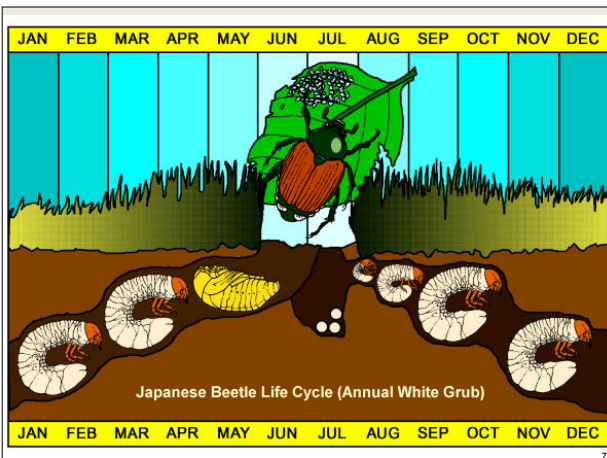


Adults: ~1/3" long; oblong/oval shape, beige with orange legs;



Larva: white grub


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Rose Chafer Management

- **Cultural**
 - Choosing less-susceptible plant species/varieties
 - Maintain plant vigor
- **Physical**
 - Physical removal (by hand)
 - Physical barriers (mesh netting)
 - Removal/replacement of damaged plants
 - Trapping may help
- **Chemical** (Varies by plant/size)
 - Small plants: foliar sprays
 - Generally as-needed
 - Trees: systemic insecticides
 - Preventative; high-value trees







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May/June Beetles

- Native scarab beetles; *Phyllophaga* spp.
 - Dozens of species in US—29 in Wisconsin alone!
- Adults: above ground foliar feeder
 - Chew irregular holes/notches in leaves
- Larvae (white grubs): below-ground plant pest (turf, etc.)

Adults: Up to 1" long; brownish body

Larva: white grub

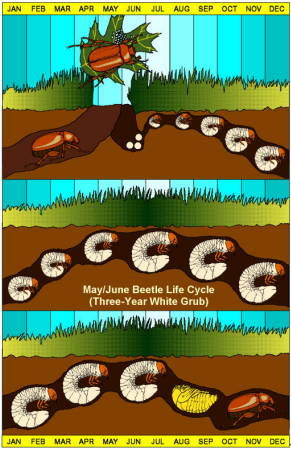



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May/June Beetles

- Oaks are a favorite food
- Adult damage generally minor; occasional/minor pest
 - Rarely need to treat for adults
- Associated with meadow/pasture areas
- Can be very localized
- 3-year life cycle
- Chemical controls similar to that of Japanese beetles



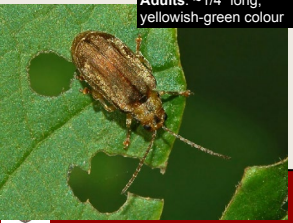



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Viburnum Leaf Beetle (*Pyrrhalta viburni*)

- 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 Damage


- Both larvae and adults feed on foliage
- Adult ♀ also chew pits in twigs

Skeletonization damage

Oviposition damage (twigs)

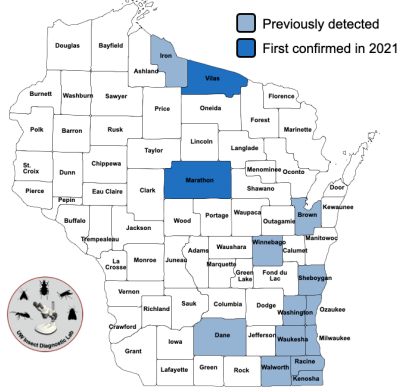
Severe damage




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Viburnum Leaf Beetle in Wisconsin: updated August 2021








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Viburnum Leaf Beetle Biology


- 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)

Oviposition pits

Mating Adults

Larval feeding and skeletonization



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Viburnum Leaf Beetle Management

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

Highly susceptible:

- *V. dentatatum* complex, arrowwood viburnum
- *V. nudum*, possum-haw, smooth withered viburnum
- *V. coccineus*, European cranberrybush viburnum
- *V. bicolor* var. *americanum* (formerly *V. trilobum*), American cranberrybush viburnum
- *V. prunifolium**, Chinese viburnum, Taiwanese viburnum
- *V. rafinesquianum*, Rafinesque viburnum

Susceptible:


- *V. acerifolium*, mapleleaf viburnum
- *V. dentatum*, wayfaringtree viburnum
- *V. nudum*, toads blackhaw, southern black-haw
- *V. acerifolium*, Sargent viburnum
- *V. acerifolium*, Wright viburnum

Moderately susceptible

- *V. alnifolium* (syn. *V. lanceolatum*), hobblebush
- *V. burkwoodii*, Burkwood viburnum
- *V. carolinianum*, Carolina viburnum
- *V. cassinoides*, withered viburnum
- *V. ellipsoides*, Indian viburnum
- *V. dentatum*, fragrant viburnum (except 'Nanum', which is highly susceptible)
- *V. dentatum* (syn. *V. alnifolium*), hobblebush
- *V. dentatum*, nannyberry viburnum
- *V. macrocarpum*, Chinese Sargent Viburnum
- *V. x pragnense*, pragnense viburnum
- *V. acerifolium*, blackhaw viburnum
- *V. x thibetico-villosum*, lantanaphyllum viburnum
- *V. finkii**, hairystem viburnum

Viburnum most resistant to the viburnum leaf beetle:

- *V. bodianense*, dawn viburnum
- *V. coccineus*, Korean spice viburnum
- *V. dentatum*, David viburnum
- *V. x juddii*, Judd viburnum
- *V. acerifolium*, doublefile viburnum
- *V. acerifolium* var. *dentatum*, doublefile viburnum
- *V. x thibetico-villosum*, leatherleaf viburnum
- *V. acerifolium*, tree viburnum
- *V. acerifolium*, Siebold viburnum




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Other Landscape Beetles

- Many other beetle species can be found in the landscape
- To narrow down: appearance, host plants, time of year




Blister beetles

Minor/temporary damage; usually spring




Black Vine Weevil

Yew (*Taxus*) and 100 others;
Adult in June-August




Elm Leaf Beetle

Elms; 2-3 generations per year



Imported Willow Leaf Beetle

Willows; 2-3 generations per year



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Caterpillars (Lepidoptera)

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Lymantria dispar (formerly known as Gypsy Moth)

- Native to Europe and northern Asia
- Purposefully/accidentally introduced to US in 1860's
- Major defoliator of hardwood forests; 100+ trees attacked
- **Significant invasive species!**



Large-scale Defoliation
Due to Gypsy Moth

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Gypsy Moth Caterpillars

- Larvae (caterpillars) are the damaging life stage
 - Use chewing mouthparts to feed on foliage
 - Caterpillars feed on > 350 species of plant material
- Larvae: up to ~2" long; spiky; grayish w/raised blue and red nodules
- Younger larvae (1st and 2nd instars) are both diurnal and nocturnal
- Older larvae (3rd-5/6th instars) are nocturnal



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Gypsy Moth Adults & Eggs

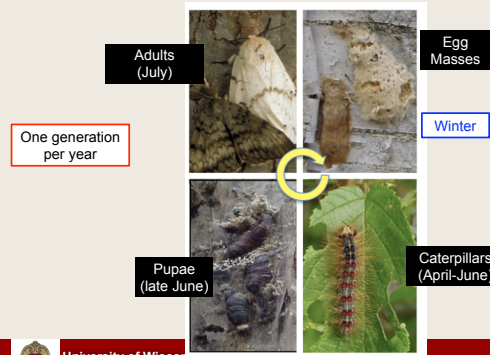
- Adults (moths) ~1.5" long
 - ♀ Whitish, thin antennae, flightless
 - ♂ Brownish, "bushy" antennae
- Males must fly to females to mate
- Egg masses: fuzzy and beige
 - Contain 500-1000 eggs



Adult Male

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Gypsy Moth Life Cycle



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Gypsy Moth Management

- **Cultural**
 - Maintain plant vigor
 - Sanitation: keep area clean of egg masses; get rid of hiding spots
- **Physical**
 - Hand-picking or squishing 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
 - Systemic products can be an option for large, high-value trees



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Eastern Tent Caterpillar (*Malacosoma americanum*)

- Native pest with a single generation of caterpillars in spring
- Narrow host plant range: cherries (*Prunus* sp.), crabapple/apple
- Construct conspicuous webs*

Caterpillars: up to 2+'' long

Fuzzy dark bodies with white mid-dorsal strip; hints of orange and blue



Eastern Tent Caterpillar Damage

- Caused by the larvae (caterpillars)
- Use chewing mouthparts to feed on newly emerged foliage
- Occasionally may defoliate small trees
 - Healthy trees can put out another batch of leaves



Tent at trunk-branch junction

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Eastern Tent Caterpillar Life Cycle

- Spend the winter as eggs
- Caterpillars emerge in spring and feed on host plants
- Leave plant to pupate
- Adults active in late summer
- Eggs laid in late summer & fall

Only one generation per year





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Eastern Tent Caterpillar Control

- **Cultural**
 - Maintain plant vigor
 - Choose non-preferred hosts
- **Physical**
 - Pruning out egg masses (fall — spring)
 - Physically remove tents and squish caterpillars
- **Chemical**
 - Conventional contact insecticides applied to tent
 - Low impact sprays: insecticidal soap to tent, *Bacillus thuringiensis kurstaki* (Btk), dormant spray oil to eggs



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Forest Tent Caterpillar (*Malacosoma disstria*)


- Native pest with a single generation of caterpillars in spring
- Close relative of eastern tent caterpillar, but they don't make tents!
- Occasional large-scale outbreaks can occur

Caterpillars: up to 2+” long
Fuzzy sky-blue bodies with “foot print” pattern; faint orange stripes






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Forest Tent Caterpillar Damage

- Caused by the larvae (caterpillars)
- Use chewing mouthparts to feed on newly emerged foliage
- Can defoliate small or large trees; sometimes large wooded areas
 - Healthy trees can put out another batch of leaves
- Wide host plant range: alder, basswood, birch, cherry, oak, poplar, willow, and other hardwoods
- Large scale outbreaks typically occur every 8-12 years




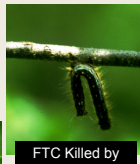
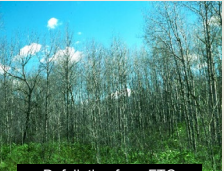
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Forest Tent Caterpillar Outbreaks

- **Factors:**
 - Weather: very cold temperatures (-30°F) or late spring freezes can kill
 - Crowding/Starvation: forces dispersal onto non-preferred hosts
 - Diseases: viral diseases, etc.
 - Predators/Parasites: including the “friendly fly” (*Sarcophaga aldrichi*)
 - Insecticide Treatments: such as aerial applications




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Forest Tent Caterpillar Control

- **Cultural**
 - Maintain plant vigor
 - Choose non-preferred hosts (?)
- **Physical**
 - Pruning out egg masses (fall — spring)
- **Chemical**
 - Conventional contact insecticides applied to foliage if needed
 - Low impact sprays: *Bacillus thuringiensis kurstaki* (Btk), dormant spray oil to eggs





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Fall Webworm (*Hyphantria cunea*)


- Native pest with a single generation of caterpillars in late summer
- Not a true “tent” caterpillar, but it does make a conspicuous tent
- Easily separated from ETC by appearance and timing

Caterpillars: up to 1+” long
Pale fuzzy bodies; series of small black spots on dorsal surface



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Fall Webworm Damage

- Feed on a wide range of host plants (100+ species): alder, apple, ash, birch, boxelder, cherry, elm, mulberry, poplar, willow...
- Very similar to eastern tent caterpillar damage except that caterpillars are active and feeding in late summer and fall
- Tents located at tips of branches rather than at branch “crotches”





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Fall Webworm Life Cycle


- Adult ♀'s lay 100's of pale eggs on undersides of leaves in spring
 - Adults cover eggs w/pale hairs
- Eggs hatch in late-summer/early-fall
- Larvae begin constructing nests and feeding on leaves
- Overwinter as pupa in cocoon

Only one generation per year




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Fall Webworm Control

- **Cultural**
 - Maintain plant vigor
- **Physical**
 - Physically remove tents and squish caterpillars
- **Chemical**
 - Conventional contact insecticides applied to tent
 - Low impact sprays: insecticidal soap to tent, *Bacillus thuringiensis kurstaki* (Btk)



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Euonymus Caterpillar (*Yponomeuta cagnagella*)

- Pest native to Europe, Middle East, and parts of Asia
 - Found in Wisconsin in late 1980's
- Only on euonymus shrubs (burning bush, etc.); extensive tenting
- One generation per year in late spring
- Control similar to other tent-making caterpillars

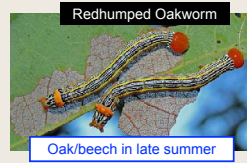
Caterpillars: up to 3/4" long
Pale bodies with black head and black "polka dots" on dorsal surface



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Other Landscape Caterpillars

- Many other caterpillar species can be found in the landscape
- To narrow down: appearance, host plants, time of year



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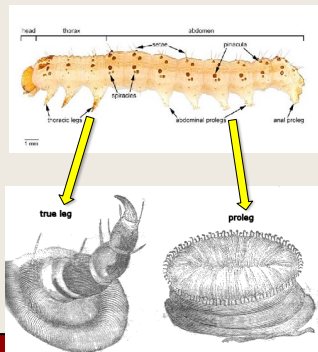
Sawflies (Hymenoptera)



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Caterpillars vs. Sawflies



Caterpillars:

- 3 pairs of true legs
- 4-5 pairs of prolegs often present, have hooks called crochets



Sawflies:

- Not Lepidoptera!
- 7 pairs of prolegs (typical)
- No crochets on prolegs

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Elm Sawfly (*Cimbex americana*)

- Common native species; our largest sawfly in N.A.
- Widely distributed: most US states and Canadian provinces
- Feed on a wide range of hardwood trees:
 - Elm/willow (favored); alder, basswood, birches, maples, poplars
- Primary damage is from larvae in mid/late summer
 - Use chewing mouthparts to feed on foliage
 - Adults can also girdle small twigs

Elm Sawfly Feeding



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Elm Sawfly Life Cycle

Only one generation per year

- Overwinter as in cocoon stage on ground (in litter or soil)
 - Pupate in spring
- Adults active in spring/summer
- Larvae present during summer months
- Leave tree en masse to pupate



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Elm Sawfly Control

- **Cultural**
 - Tolerate plant damage (typically minor)
- **Physical**
 - When larvae leave en masse: collect/squish/etc.
 - Sticky band for down-climbing larvae(?)
- **Chemical**
 - Conventional contact insecticides applied to foliage (timing)
 - Low impact sprays: insecticidal soap, light horticultural oils, pyrethrins, neem oil, spinosad
 - Btk won't work (not a true caterpillar!)



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Elm Sawfly ID

Adults: ~1 1/4" long

Resembles large wasp; clubbed antennae

Dark bodies, pale patch on dorsal surface

♀ with yellow spots along abdomen

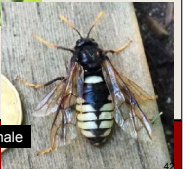


Larvae: up to 2" long

Pale bodies; usually w/dark stripe

Color varies from whitish, greenish, yellow to orange and pink

Often curled up



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European Pine Sawfly (*Neodiprion sertifer*)

- Non-native pest—originally from Europe
- Commonest "pine" sawfly in spring
- Introduced in 1920's, now widespread in northeastern US & Canada

Larvae: ~1" long

Dark green bodies with black head; w/stripes

Gregarious



Adults: ~3/4" long

Brownish bodies; wasp-like appearance



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European Pine Sawfly Damage

- Feed specifically on pines:
 - Mugo and Tabletop Pines (favored)
 - Scotch, red, Jack, and Japanese pines (alternative hosts)
 - White, Austrian, Ponderosa, Shortleaf and Pitch pines (rare)
- Gregarious—often found in large numbers
- Feed on last year's needles (not new needles)

Mugo Pine:
Common in
Landscape



Group of European
Pine Sawfly Larvae



"Charlie Brown"
Damage

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European Pine Sawfly Impacts

- Impacts on forested areas typically minor
 - Can be problematic on Christmas tree farms
- Small landscape trees particularly susceptible
- Damage can be severe if left unchecked
 - Luckily, EPS is relatively easy to control

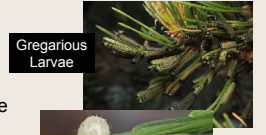


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European Pine Sawfly Life Cycle

- Only one generation per year
- Overwinter as eggs
- Eggs hatch April/May
- Larvae active in late April-early June
- Pupate (often on ground)
- Adults active in August/September
 - Eggs laid in small slits in pine needles



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European Pine Sawfly Control

- **Cultural**
 - Maintain plant vigor (plants rarely killed)
 - Choose non-preferred hosts
- **Biological**
 - Several parasitoids introduced from Europe provide some control
- **Physical**
 - Physically remove/squish larvae (easy since usually on small plants)
- **Chemical**
 - Conventional contact insecticides applied to foliage (timing)
 - Low impact sprays: insecticidal soap, light horticultural oils, pyrethrins, neem oil, spinosad
 - Btk won't work (not a true caterpillar!)



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Other Conifer Sawflies

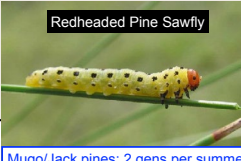
- Many other sawfly species are associated with conifers
- To narrow down: appearance, host plants, time of year



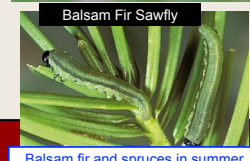
White/red pines in summer



Spruces in late spring & early summer



Mugo/Jack pines; 2 gens per summer



Balsam fir and spruces in summer

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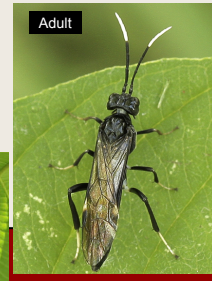
Dogwood Sawfly (*Macremphytus tarsatus*)

- Native pest with a single generation in mid-late summer
 - A few other species in same genus have similar habits
- Wasp-like adults; larvae feed on dogwoods (*Cornus* spp.)

Larvae: up to ~1" long
Black and yellow coloring; often covered by whitish waxy coating



Larvae



Adult

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Dogwood Sawfly Damage

- Only feed on dogwoods (*Cornus* spp.)
- Chew notches in leaves; consume entire leaves
 - Occasional complete defoliation; plant death rare
- Wood damage to homes occasionally observed...



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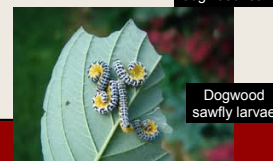
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Dogwood Sawfly Life Cycle

- Only one generation per year
- Overwinter as pupae
- Adults emerge May-July
 - Mate and lay eggs in
- Larvae typically noticed in mid-late summer
- Leave plants to excavate small pupal chamber in soft wood



Eggs laid in
dogwood leaves



Dogwood
sawfly larvae

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Dogwood Sawfly Control

- **Cultural**
 - Maintain plant vigor
 - Choose non-preferred hosts (they only like dogwoods...)
- **Physical**
 - Physically remove or squish larvae (check undersides of leaves)
- **Chemical**
 - Conventional contact insecticides applied to foliage (timing)
 - Low impact sprays: insecticidal soap, light horticultural oils, pyrethrins, neem oil, spinosad
 - Btk won't work (not a true caterpillar!)



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Slug Sawflies: Roseslug Sawfly and Pearslug Sawfly



- Larvae have slug-like appearance; ~1/2" long
- Adults are small and wasp-like in appearance

Roseslug Sawfly

Larvae: up to ~3/4" long
Yellow-green body, orange head; slug-like
Can blend in well on undersides of leaves

Pearslug Sawfly

Larvae: up to ~1/2" long
Dark, slimy, slug-like body

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Slug Sawfly Damage and Life Cycles

Roseslug Sawfly

- Native to Eurasia
- One generation per year
- Larvae feed on roses in late spring
 - Esp. underside of rose leaves
 - "Window pane" skeletonization
 - Damage minor/cosmetic

Pearslug Sawfly


- Two generation per year
 - June/July & August/September
- Larvae feed on rosaceous plants
 - Fruit trees, serviceberry, crabapple, pears, cotoneaster, mountain ash
 - "Window pane" skeletonization
 - Damage minor/cosmetic

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Slug Sawfly Control

- Cultural**
 - Maintain plant vigor—damage rarely has significant impact
 - Choose non-preferred hosts (*easy for roseslug!*)
- Physical**
 - Physically remove or squish (*watch for thorns...*)
- Chemical**
 - Conventional contact insecticides applied to foliage (timing)
 - Low impact sprays: insecticidal soap, light horticultural oils, pyrethrins, neem oil, spinosad
 - Btk won't work (not a true caterpillar!)




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Other Landscape Sawflies

- Many other sawfly species can be found in the landscape
- To narrow down: appearance, host plants, time of year




Dusky Birch Sawfly

Birches, 2 generations per summer




Lysimachia Sawfly

Loosestrifes & Creeping Jenny; summer



Mountain Ash Sawfly

Mountain Ash; 2 gens per summer




Columbine Sawfly

Columbine; 1 generation in late spring

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Questions?



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