Introduction to Hemiptera

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Introduction to Hemiptera

Hemiptera and Homoptera were previously classified as two orders of the class Hexapoda

Current taxonomists prefer to classify the two as one order (Hemiptera). Suborder Heteroptera are the "true bugs" and Homoptera is no longer recognized.

Introduction to Hemiptera

All Hemiptera share the following:

- Piercing, sucking mouthparts.
- Incomplete, graduate metamorphosis

In addition:

- Insects formerly placed in Homoptera have wings that are held “tent like” over the body.
- Some insects formerly placed Homoptera alternate between sexual and asexual generations.
- Heteroptera have wings that cross over the back of the abdomen.

Families formerly placed in order Homoptera

- Adelgidae: Pine and spruce aphids
- Aphididae: Aphids
- Eriosomatidae: Woolly aphids
- Aleyrodidae: Whiteflies
- Cicadidae: Cicadas
- Cercopidae: Spittlebugs
- Cicadellidae: Leafhoppers
- *Superfamily* Fulguroidea: Planthoppers
- Membracidae: Treehoppers
- Coccidae: Soft scales
- Diaspididae: Armored scales
- Pseudococcidae: Mealybugs and felt scales
- Kermesidae: Kermes scales
- Psyllidae: Psyllids

Families of Heteroptera

- Anthocoridae: Minute pirate bugs
- Lygaeidae: Seed and big-eyed bugs
- Miridae: Plant bugs
- Pentatomidae: Stink bugs
- Reduviidae: Assassin bugs

Cooley Spruce Gall Adelgid

Adelges cooleyi
Family Adelgidae
Native pest

Hosts: Colorado blue spruce or white spruce and Douglas fir.

Cooley Spruce Gall Adelgid

Life History: Galls are formed on spruce, then a winged generation develops on Douglas fir.

Overwintering: Nymphs on spruce.

Cooley Spruce Gall Adelgid

Damage: Twisted, yellow needles on Douglas fir. Cone-shaped galls at tips of new growth on spruces.

Monitoring:
Place sticky traps on terminals.
Look for damage and the insects.

Cooley Spruce Gall Adelgid

Physical Control: Destroy galls and heavily infested trees.

Cultural Control: Plant green forms of Douglas fir and blue forms of Colorado blue spruce.

Chemical Control: Horticultural oil, other insecticides.

Eastern Spruce Gall Adelgid

Adelges abietis
Family Adelgidae
Introduced pest

Hosts: Norway and other spruces.

Life History: One generation per year. Nymphs complete development in spring and lay eggs. New nymphs form galls and become winged adults.

Overwintering: Wax-covered nymphs.

Eastern Spruce Gall Adelgid

Damage: Galls at base of new shoots.

Monitoring: Sticky traps. Look for galls and nymphs.

Physical Control: Destroy galls and heavily infested trees.

Chemical Control: Horticultural oil or soap, dormant oil, other insecticides.

Hemlock Wooly Adelgid

Adelges tsugae
Family Adelgidae
Introduced pest

Hosts: Eastern hemlock, Carolina hemlock.

Life History: Overwintered immatures feed on needles. Two generations a year.

Overwintering: Immatures on twigs.

Hemlock Wooly Adelgid

Damage: White wax, needle yellowing, needle drop, defoliation, and tree death.

Monitoring: Look for cottony wax masses and damage symptoms.

Hemlock Wooly Adelgid

Cultural Control: Choose resistant varieties: Western hemlock, mountain hemlock, and Japanese hemlock.

Chemical Control: Dormant oil, horticultural oil or soap, soil applications of insecticides.

Pine Bark Adelgid

Pineus strobi
Family Adelgidae
Native pest

Hosts: White, Austrian, and Scots pines.

Life History: Several generations of winged and wingless forms per year.

Overwintering: Immature females under bark.

Pine Bark Adelgid

Damage: Wooly wax.

Monitoring: Look for fluffy wax.

Chemical Control: Control is not usually needed, but oils can be used.

Biological Control: Lacewings, syrphid fly larvae, lady beetles.

Balsam Twig Aphid

Mindarus abietinus
Family Aphididae
Native pest

Hosts: Alpine fir, grand fir, Fraser fir, Siberian fir, Colorado blue spruce, white spruce, juniper, balsam fir.

Balsam Twig Aphid

Life History: Several generations per year with three stages: blue-gray, white wax-covered, and winged.

Overwintering: Eggs on bark.

Damage: Yellow, deformed needles, stunted and deformed twigs, rough bark.

Monitoring: Look for blue-gray or white females, curled needles, and honeydew.

Balsam Twig Aphid

Cultural Control: Plant resistant species, avoid crowding.

Chemical Control: Horticultural oil, insecticides.

Biological Control: Ants, yellow jackets, predatory bugs, lace-wings, earwigs, predatory thrips, predatory beetles, hover fly and aphid fly larvae, predaceous midges, *Aphodius* wasps (Braconidae).

Greenbug (Aphid)

Schizaphis graminum
Family Aphididae

Hosts: **Turf grasses.**

Life History: **Carried into Midwest by south winds.**

Overwintering: **Adults in debris.**

Greenbug (Aphid)

Damage:
Yellow streaks.

Monitoring:
Usually appear in July or August.

Cultural Control:
Fertilizing grass in the spring and fall and water during periods of drought.

Chemical Control: Control is suggested when damaging populations are first noted.

Honeysuckle Witches' Broom Aphid

Hyadaphis tataricae
Family Aphididae
Introduced pest

Hosts: Honeysuckle.

Life History:
Eggs hatch in May, nymphs feed on buds until leaves appear.

Overwintering: Eggs.

Honeysuckle Witches' Broom Aphid

Damage: Folded leaves, stunted growth pattern called "witches' broom".

Monitoring: Look for folded leaves, insect colonies, and look for black, oval eggs in fall and winter.

Honeysuckle Witches' Broom Aphid

Physical Control:
Remove and destroy witches' brooms.

Cultural Control:
Replace infected plants with resistant cultivars: Freedom, Arnold Red, Clavey's Dwarf, and Emerald Mound.

Chemical Control: Dormant oil sprays, Foliar or soil insecticide applications.

White Pine Aphid

Cinara strobi
Family Aphididae
Native pest

Hosts: Eastern white and Scots pines.

Life History:
Shiny black eggs are laid on needles in late summer. Several generations a year.

Overwintering: Eggs in rows on needles.

White Pine Aphid

Damage: Honeydew, sooty mold, flagging and death in young trees.

Monitoring: Look for damage, ant activity, and the aphids.

White Pine Aphid

Physical Control: Remove and destroy needles with rows of eggs.

Chemical Control: Dormant oil. Use residual insecticides sparingly.

Biological Control: Lady beetles, syrpid fly and midge larvae.

Wooly Alder Aphid

Paraprociphilus tessellates
Family Eriosomatidae
Native pest

Hosts:
Alder and silver maple.

Wooly Alder Aphid

Life History: Eggs on silver maple hatch in spring and produce all females (asexual generation). Next generation on alder; their offspring may return to silver maple.

Overwintering: Eggs on bark of silver maple.

Damage: Curled leaves, wax, honeydew, sooty mold.

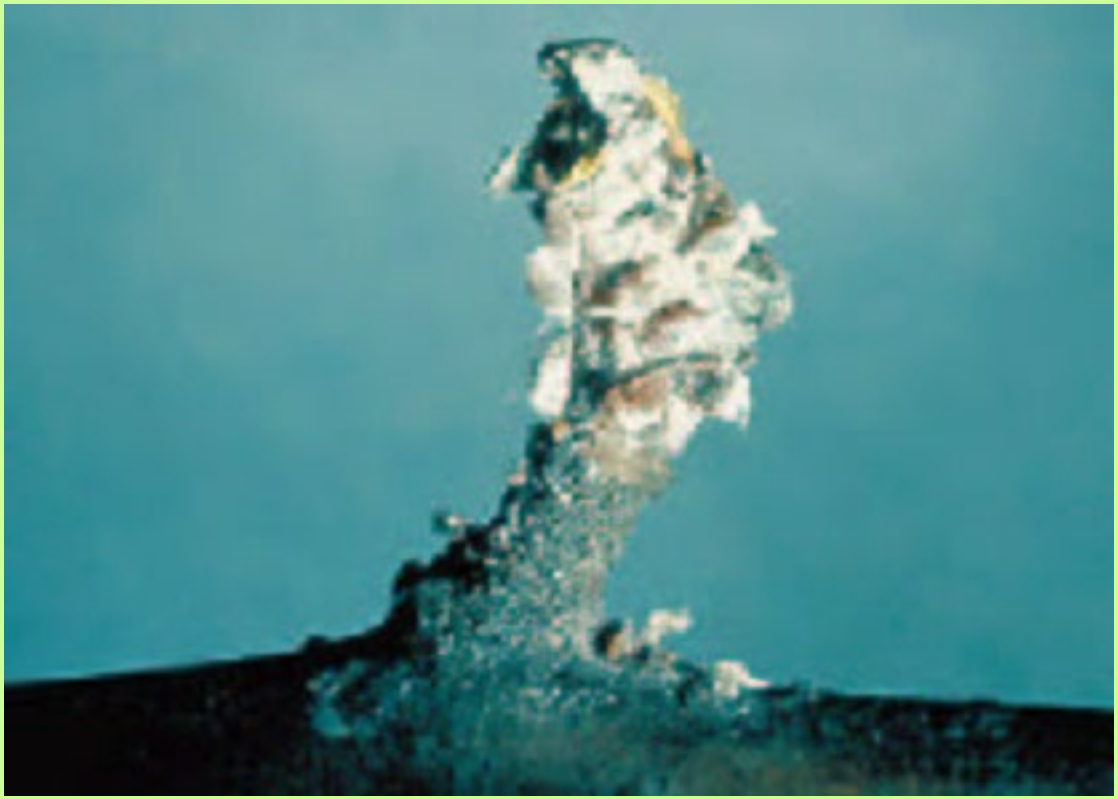
Monitoring: Look for immature aphids, curled leaves, and damage signs.

Chemical Control: Horticultural oil and soap.

Wooly Apple Aphid

Eriosoma lanigerum
Family Eriosomatidae
Native pest

Hosts: **Apple, elm, hawthorn, mountain ash, and pear.**



Wooly Apple Aphid

Life History: Eggs hatch on elm in spring. Later, a winged generation develops which migrates to apple, hawthorn, pear or mountain ash.

Overwintering: Eggs in elm bark cracks.

Damage: Curl and rosettes on terminals, deformed twigs and branches.

Monitoring: Look for aphids under white wax covers on tree roots or around bark wounds.

Chemical Control: Horticultural oil and soap.

Whiteflies

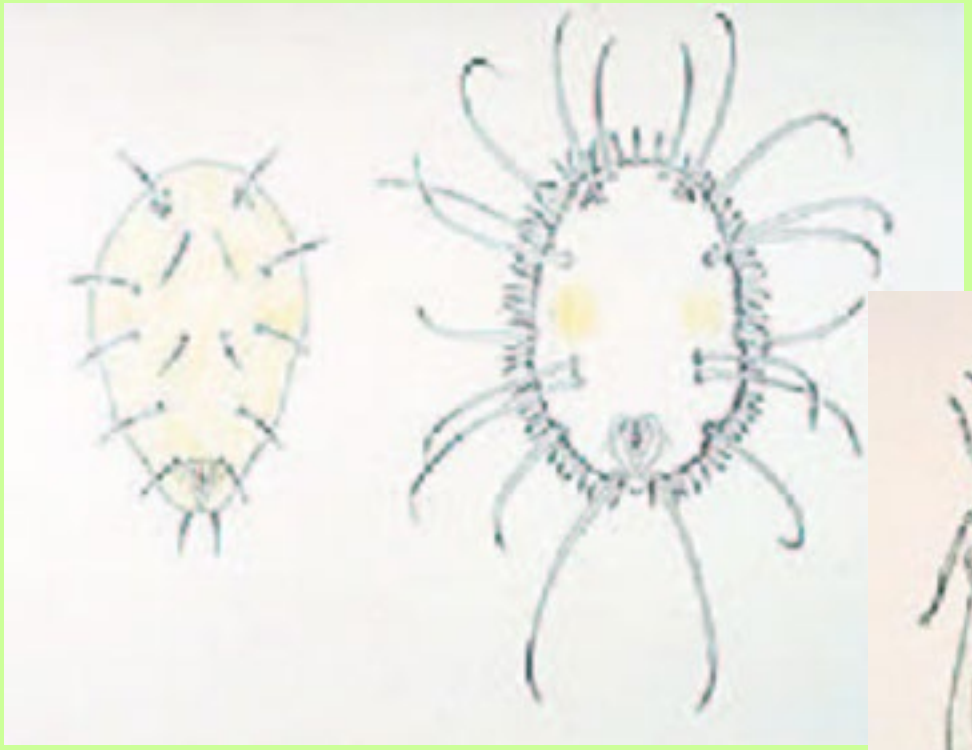
***Tetraleurodes mori*, *Aleurochiton forbesii*, and others**
Family Aleyrodidae

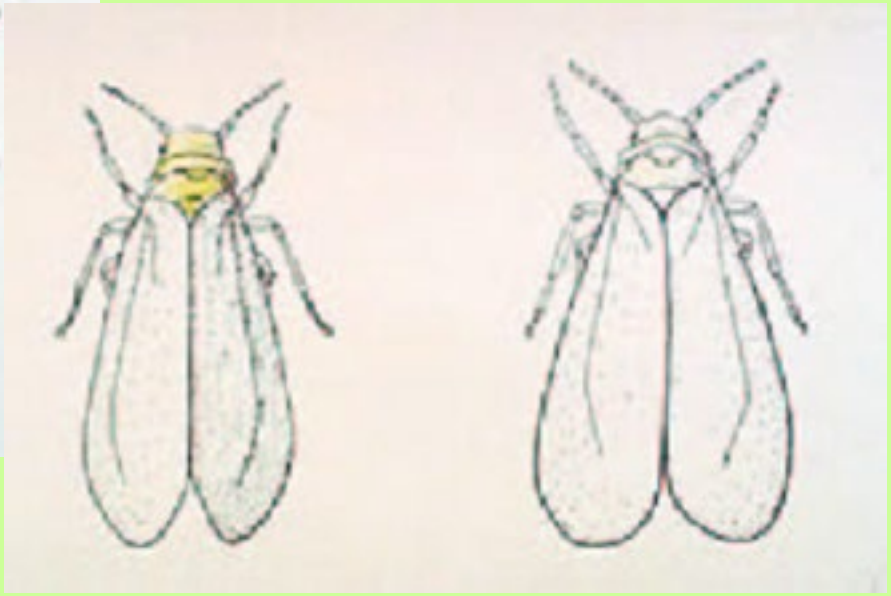
Hosts: The mulberry whitefly feeds on mulberry, boxelder, holly, magnolia, maple, mountain laurel. Maple whitefly feeds on maple. Some species attack greenhouse plants.

Whiteflies

Life History: Several generations per year.

Overwintering: Pupae on leaves.





Whiteflies

Damage: Honeydew, sooty mold, leaf yellowing, leaf drop.

Monitoring: Look for damage and whiteflies under leaves. Look for ants attracted to honeydew.

Cultural Control: Rake and destroy fallen leaves.

Chemical Control: Horticultural oil or soap.

Cicada

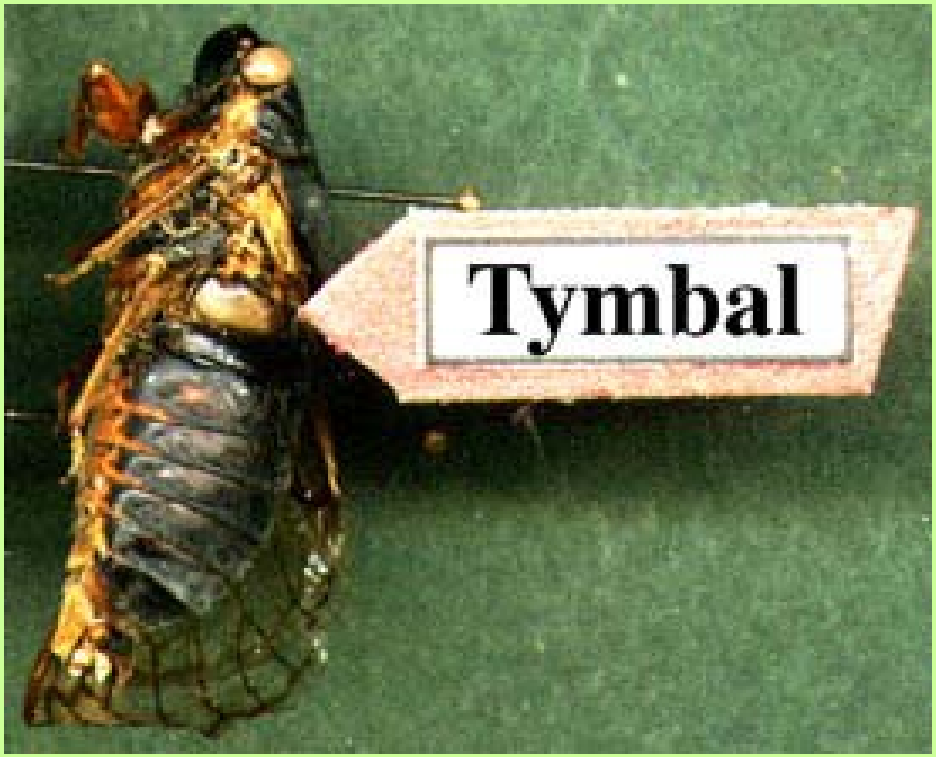
Several species
Family Cicadidae
Native insect

Hosts:
Deciduous trees.

Description:
Large (>1 inch) with clear wings. Strong fliers that spend time high in the trees.

Cicada

Life History: Multiple years underground as juveniles, followed by 2-6 weeks above ground as adults. Males produce a loud mate-attracting song using sound-producing organs called tymbals. Females do not have tymbals, but may produce clicking or snapping sounds with their wings.

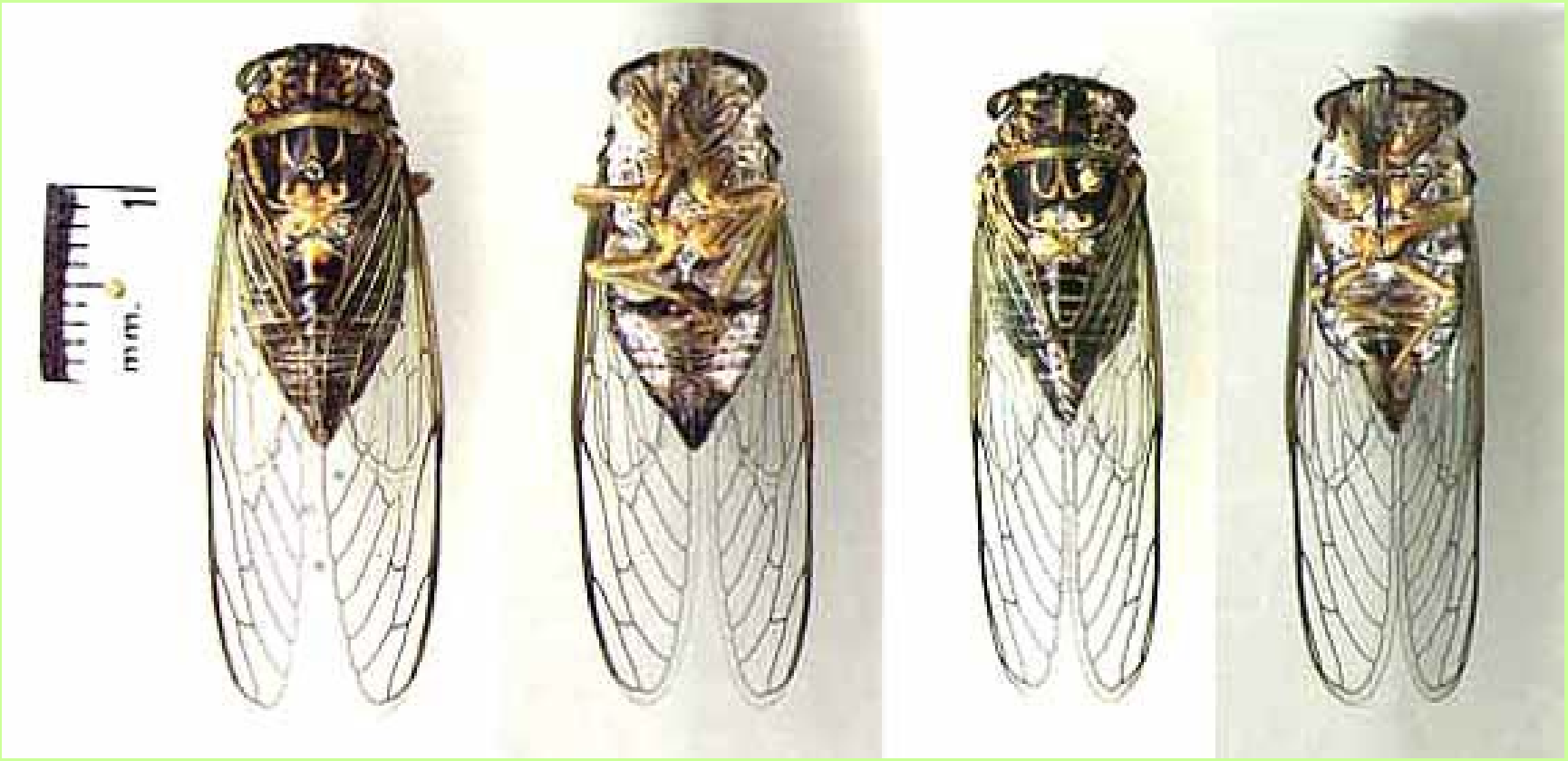


Cicada

Life History: **Females lay eggs in bark or twigs; the eggs hatch later in the season and new nymphs burrow underground and begin feeding on roots.**

Adult (above) and nymph (right)

Cicada: *Diceroprocta vitripennis*

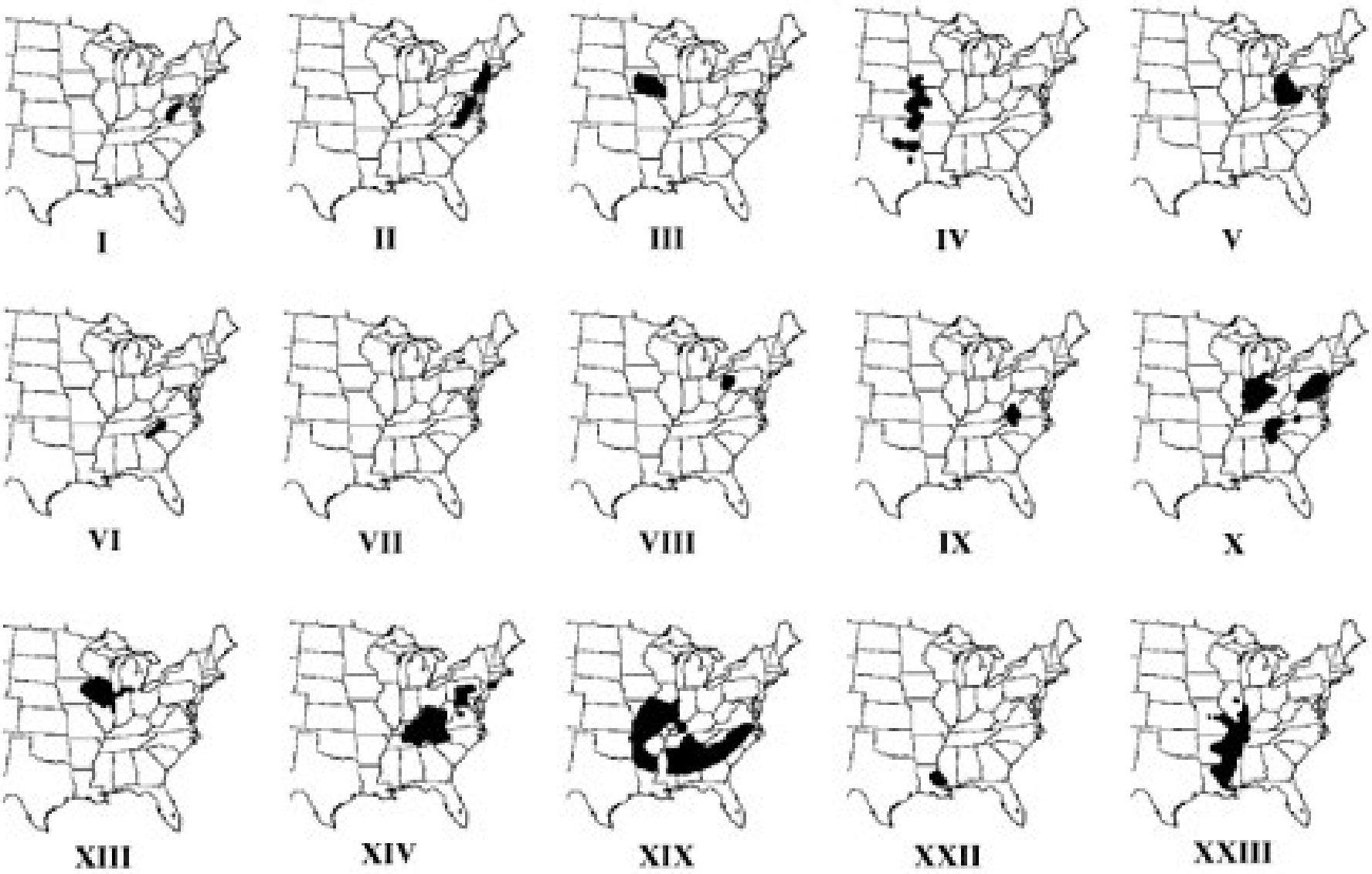


Cicada: *Magicicada septendecim*

Periodical Cicada

Life history: In the genus *Magicicada* are four species with 13-year life cycles and three with 17-year cycles. Emergence is synchronized and adults are absent in the 12 or 16 years between emergences. They emerge in huge numbers, forming much denser aggregations than those achieved by most cicadas.

Periodical Cicada



Spittlebugs

Several species
Family Cercopidae
Native pest

Hosts: Herbaceous and woody plants.

Life History: Eggs in May. Nymphs feed under a frothy honeydew foam. Adults do not make spittle. Usually one generation a year.

Overwintering: Eggs on bark.

Spittlebugs

Damage: Dieback. May vector the fungus *Diplodia pini* (causes flagging).

Monitoring: Look for nymphs under spittle.

Spittlebugs

Physical Control: Remove insects with a water spray or by hand.

Chemical Control: Residual insecticides for heavy infestations.

Biological control: Mymarid and aphelinid egg parasitoids, the pipunculid fly *Verrallia virginica.*

Leafhoppers

Several species
Family Cicadellidae
Native and introduced

Hosts: Many trees, ornamentals, and turf.

Life History: Arrive annually from the south. Eggs are inserted into leaf tissue.

Overwintering: Adults, eggs.

Leafhoppers

Damage: Yellowed or bleached-out lesions.

Monitoring: Look for stippling, curled leaves and stunted growth.

Physical Control: Removed damaged branches.

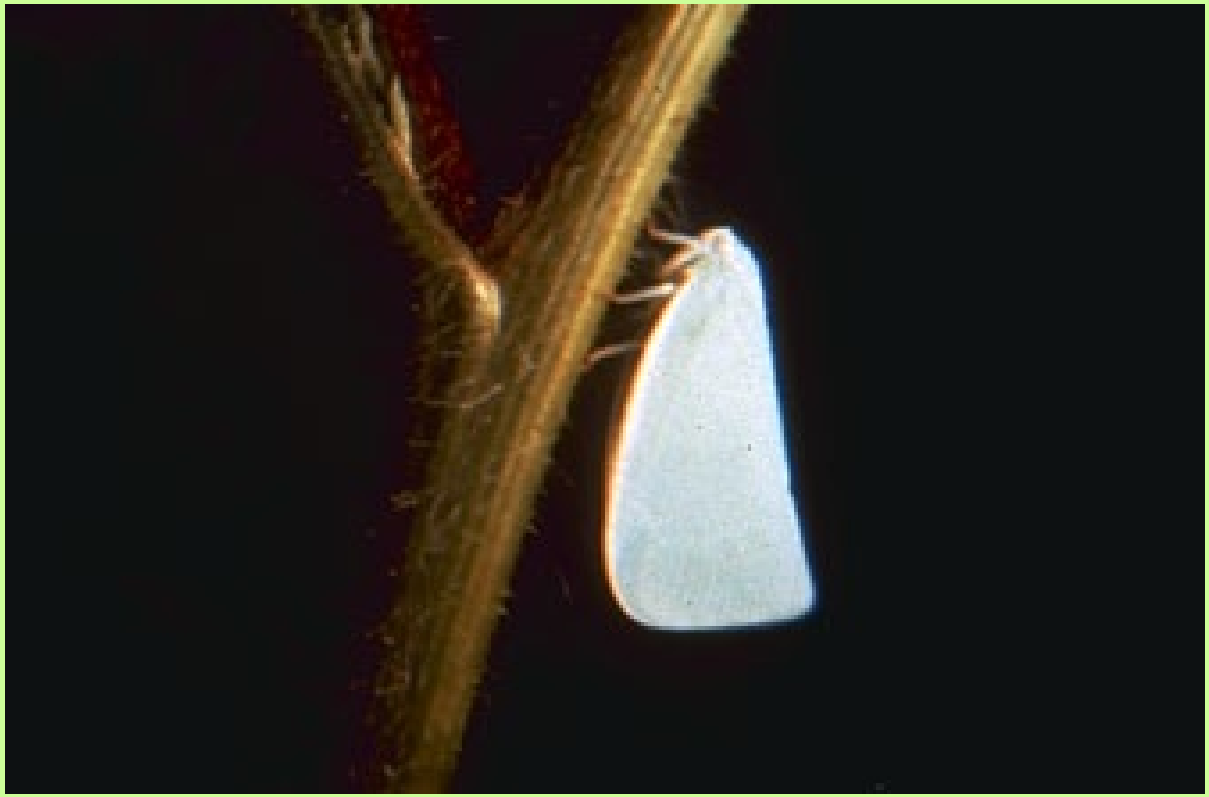
Cultural Control: Maintain plant health.

Biological Control: Big-eyed bugs, damsel bugs, assassin bugs, lacewings.

Planthoppers

Several families and species
***Superfamily* Fulguroidea**
Native pest

Hosts: Many trees and shrubs.



Planthoppers

Life History: Nymphs hatch in spring and summer, adults mature in summer. One generation per year.

Overwintering: Eggs under bark.

Damage: Wax, honeydew, sooty mold.

Monitoring: Look for honeydew and sooty mold.

Physical Control: Spray with strong stream of water.

Treehoppers

Several species
Family Membracidae

Hosts: Many tree species.

Life History: Eggs in masses or in leaf tissue. One or more generations per year.

Overwintering: Eggs on host plants.

Treehoppers

Damage: Oviposition damage and sucking damage from feeding.

Monitoring: Look for adults.

Chemical Control: Dormant oil sprays.

Bacterial Leaf Scorch

www.muextension.missouri.edu/xplor/agguides/hort/g06881.htm

Bacterial Leaf Scorch

- Nymph and adult spittlebugs,
- treehoppers, and
- leafhoppers could carry
- Bacteria, *Xylella fastidiosa*
- In xylem causes leaf scorch.

www.muextension.missouri.edu/xplor/agguides/hort/g06881.htm

Bacterial Leaf Scorch

Leaf scorch, sometimes called marginal leaf burn, describes the death of tissue along the edge of the leaf. This develops when sufficient water does not reach the leaf margin cells.

- **There is insufficient moisture in the soil.**
- **Water is lost too quickly from the leaves to be replaced adequately.**
- **Roots have been killed by plant pathogens, excavation, or compaction.**
- **Fungi or bacteria invade and plug the water conducting vessels (xylem) in the plant.**

Bacterial Leaf Scorch

- ***Xylella fastidiosa*** **is found in the xylem and cause leaf scorching.**

- ***Xylella*** **has been associated with leaf scorch on oak, elm, sycamore, mulberry, red maple, and sweetgum, Pierce's disease on grapevine, phony peach disease, plum leaf scald, periwinkle wilt, almond leaf scorch, alfalfa dwarf, and ragweed stunt.**

Bacterial Leaf Scorch

- **Nymph and adult spittlebugs, treehoppers, and leafhoppers are known to carry *Xylella* from plant to plant.**

- **Once the bacteria are picked up, they are in some cases immediately transmittable or, in other cases, have a 2 hour latent period before they are transmittable.**

Bacterial Leaf Scorch

- The insect will continue to carry the bacteria until it molts and the bacteria can actually multiply inside the insect foregut. As the insect feeds, bacteria are egested into the feeding site.

- Although the symptoms seem distinctive, it is difficult to be certain of the cause of a marginal leaf burn. Commercial diagnostic services, such as Agia, can confirm the presence of *Xylella*.

Bacterial Leaf Scorch

- **Phony peach disease was first reported in California in 1890 and Pierce's disease on grapevines (*Vitis vinifera* L.) in 1892 in California.**

- **Elm leaf scorch has been observed in the Washington, D.C. area since the 1950s.**

- **Oak leaf scorch on pin oak is widespread and severe.**

Bacterial Leaf Scorch

- **Elm leaf scorch**

- **Leaf margins die and have a distinct yellow border separating the dead tissue from the green tissue.**

- **Scorching begins on leaves at the base of the tree and moves upward through the canopy.**

- **Leaves on branches that were affected during the previous season appear normal in the Spring but later show symptoms.**

Bacterial Leaf Scorch

- **Elm leaf scorch**

- **Some premature defoliation may occur.**

- **Affected trees are very attractive to elm bark beetles and are much more susceptible to Dutch elm disease than trees free of leaf scorch.**

Bacterial Leaf Scorch

- **Red maple leaf scorch**

- **Leaf scorch occurs on localized, individual branches and more branches are affected each year.**

- **While leaves appear normal early in the season, leaf discoloration begins at the leaf margin and migrates with an undulating front toward the midrib and base of leaf beginning mid to late July.**

Bacterial Leaf Scorch

- **Red maple leaf scorch**

- **Premature defoliation can occur in late August.**

- **This disease may make affected trees more sensitive to damage caused by site-related stresses such as deicing salts and limited growing space.**

- **Although the symptoms seem distinctive, it is difficult to be certain of the cause of a marginal leaf burn. Commercial diagnostic services can confirm the presence of *Xylella.***

Aster Yellows and Ash Yellows: Phytoplasmas/MLO

www.oznet.ksu.edu/dp_hfrr/extensn/problems/AsterYellows.htm

Aster Yellows and Ash Yellows: Phytoplasmas/MLO

- Phytoplasmas are plant pathogens that do not have cell walls and have nuclear material but do not have a distinct nucleus.

- Phytoplasmas were discovered in 1967 and initially called MLO's (mycoplasmalike organisms). In 1994 MLO's were renamed phytoplasmas.

Aster Yellows and Ash Yellows: Phytoplasmas/MLO

- 200 phytoplasma diseases affecting herbaceous and woody plants
  - Aster yellows
  - Elm yellows
  - Ash yellows
  - Grapevine yellows
  - Peach- X-disease
  - Pear yellows

Aster Yellows and Ash Yellows: Phytoplasmas/MLO

- Phytoplasma symptoms
  - Yellowing or bronzing
  - Stunting
  - Sterile flowers
  - Abnormal fruit and seeds
  - Proliferation of roots
  - Virescence (greening caused by development of chloroplasts in plant organs normally white or colored)
  - Witches'brooms

Aster Yellows and Ash Yellows: Phytoplasmas/MLO

Aster yellows is a viral-like disease and is caused by a phytoplasma and is spread by aster leafhoppers *Macrosteles phytoplasma*.

www.gov.mb.ca/agriculture/crops/insects/fad51s00.html

Aster Yellows

www.oznet.ksu.edu/dp_hfrr/extensn/problems/AsterYellows.htm

Aster Yellows

- Aster yellows is not fatal to the infected plants but does distort floral parts and yellows leaves.

- The aster yellows pathogen infects over 300 hosts, with plant species occurring in 50 families. Aster yellows is capable of infecting such cultivated crops as carrot, celery, cucurbits, potato, sage, tomato, echinacea, canola, flax, barley, wheat, oats, rapeseed, sunflower and fava beans.

Aster Yellows

- Susceptible flowers include aster, chrysanthemum, cockscomb, coreopsis, cosmos, daisy, dianthus, echinacea (coneflower), gladiolus, marigold, petunia, and phlox.

- Weeds such as dandelions, plantain, and thistle are also susceptible and can serve as a source of inoculum.

Aster Yellows

- Aster leafhopper may overwinter as eggs, but substantial numbers migrate from the south, usually arriving in early to mid June. The migrants are attracted to grasses and forages, such as winter wheat and alfalfa, for breeding purposes.

- The eggs takes two weeks and five nymphal stages to reach the first generation, which appear in late June to early July.

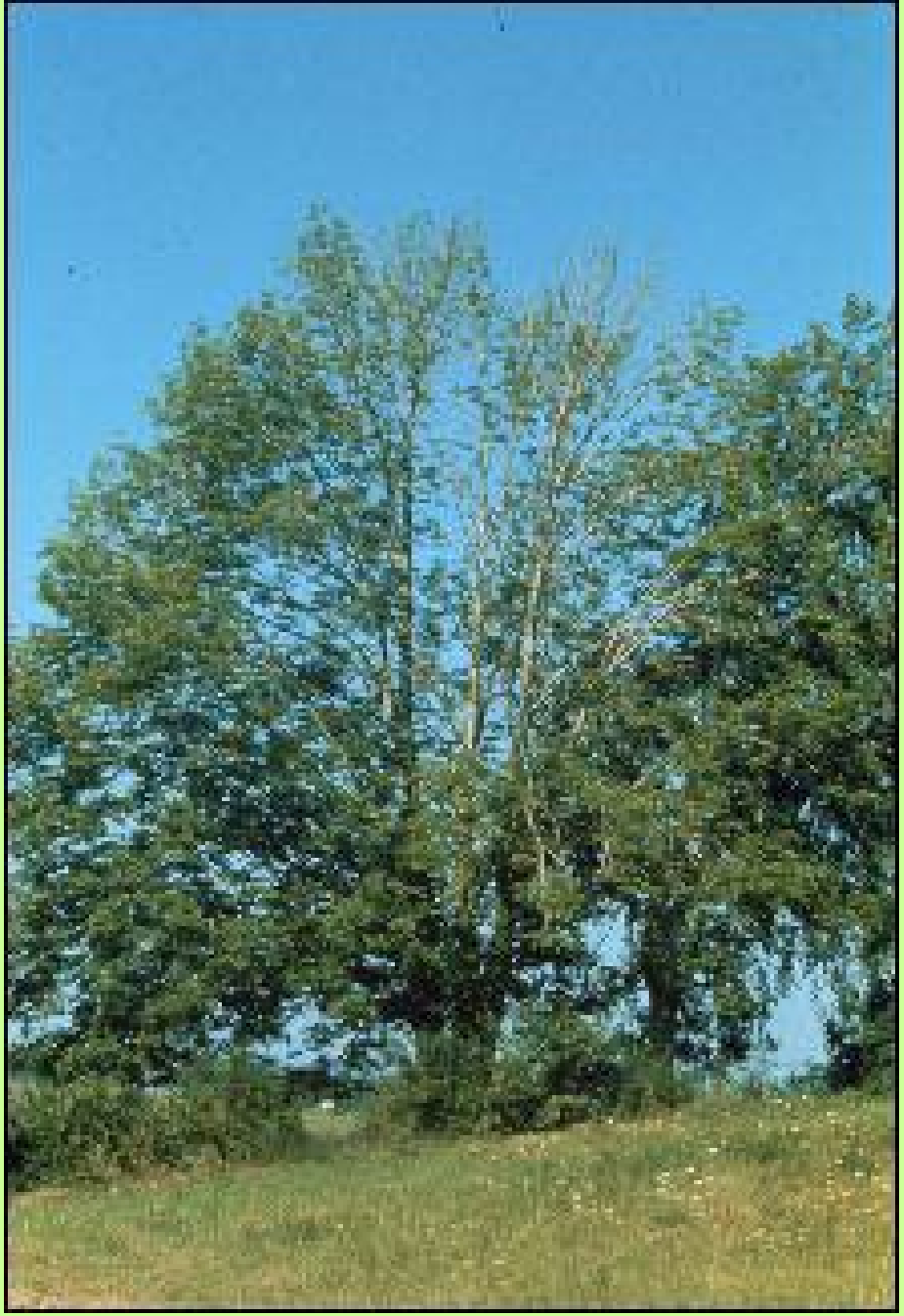
- Three to five generations are possible.

Aster Yellows

- Early detection and increases in leafhopper populations can be detected with yellow sticky traps. Monitoring should take place between the end of May to mid-August.

- Promptly destroy and discard diseased plants to prevent further spread. Remove weeds (many act as reservoirs for the microorganism) and monitor plants for leafhoppers. Growers need to control the leafhoppers with conventional pesticides.

Ash Yellows



www.na.fs.fed.us/spfo/pubs/howtos/ht_ash/ht_ash.htm

Ash Yellows

- Certain leafhoppers and the meadow spittlebug are highly suspect in northeastern United States.

- Symptoms develop on young ash one year after infection, while an incubation period longer than one year is likely in large trees.

- Ash yellows is not known to be transmitted through seeds, but it can be transmitted by grafting.

Ash Yellows

- White ash, *Fraxinus americana*, is the most susceptible; green ash, *F. pennsylvanica*, is intermediate in susceptibility

- Black ash, *F. nigra*, is thought to be the least susceptible at this time.

- Green ash is the dominant ash species in landscape and natural areas in Minnesota.

IPM of Ash Yellows

- Green ash exhibit symptoms similar to white ash, but appear to sustain less dieback and sometimes produce witches' brooms without other distinctive symptoms.

- Radial growth loss has been detected in green ash.

- Proper maintenance (fertilization, irrigation and pest control) of infected trees is suggested, as chemicals will not eradicate the disease from infected trees.

Ash Yellows

- A proliferation of pale green to yellow shoots, called witches brooms, are common on the lower trunk during the last stages of decline.

www.extension.umn.edu/distribution/horticulture/DG5898.html

Ash Yellows

- On white ash, brooms occur most often on trees with severe dieback, or on suppressed saplings.

www.extension.umn.edu/distribution/horticulture/DG5898.html

Ash Yellows

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Hackberry Nipple Gall Maker

Pachypsylla celtidismamma
Family Psyllidae
Native pest

Hosts: **Hackberry.**

Life History: **Eggs are laid in spring, larvae form galls and emerge as adults in September.**

Overwintering: **Adults in bark crevices and houses.**

Hackberry Nipple Gall Maker

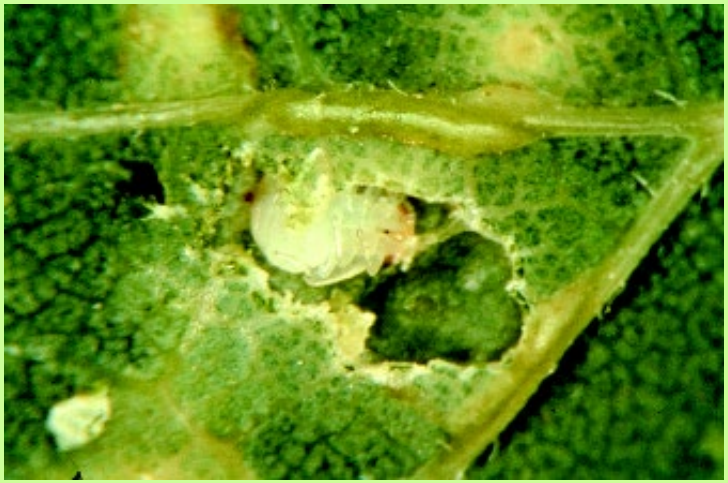
Damage: Galls on underside of leaves, leaf drop.

Monitoring: Look for galls.

Hackberry Nipple Gall Maker

Chemical Control: **Insecticides are optional and usually not needed.**

Biological Control: **Parasitic wasps *Torymus pachpsyllae*, *Psyllaephagus pachypsyllae, and Eurytoma semivenae.***



Calico Scale

Eulecanium cerasorum
Family Coccidae
Native pest

Hosts: Crabapple, dogwood, elm, firethorn, maple, sweet gum, star magnolia, zelkova, and all stone fruit trees.

Calico Scale

Life History: One generation per year. Crawlers feed on leaf veins during summer.

Overwintering: Second instar.

Monitoring: Look for adults and crawlers, honeydew, and sooty mold.

Chemical Control: Dormant oil, horticultural oil or soap residual insecticides.

Biological Control: Minute pirate bugs, lacewings, lady beetles, predaceous midges; parasitoids *Aphytis, Coccophagus, Encarsia*, and *Metaphycus*; yellow-rumped warbler.

Cottony Maple Scale

Pulvinaria innumerabilis
Family Coccidae
Native pest

Hosts: **Maples, honey locust, linden, other hardwoods.**

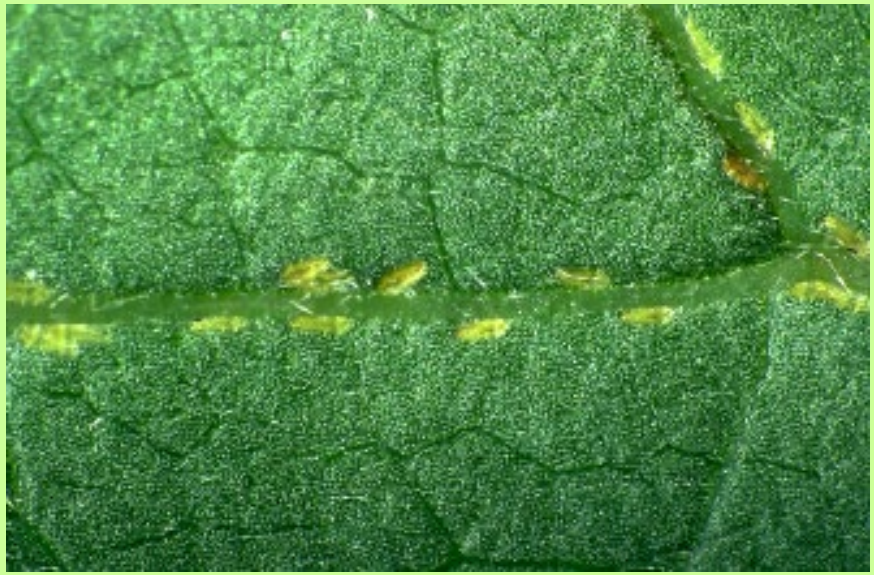
Life History: **Immature females emerge in spring. White egg sacs and crawlers appear in summer.**

Overwintering: **Mated females on twigs.**

Cottony Maple Scale

Damage: Sooty mold, leaf yellowing, premature foliage drop, dieback of twigs and branches.

Monitoring: Look for old egg sacs and crawlers on the underside of leaf margins.



Cottony Maple Scale

Chemical control: Insecticides, horticultural oil or soap.

Biological Control: Minute pirate bugs, lacewings, lady beetles, predaceous midges; parasitoids *Aphytis, Coccophagus, Encarsia*, and *Metaphycus*; English sparrow.

European Fruit Lecanium

Parthenolecanium corni
Family Coccidae
Native pest

Hosts: Flowering fruit trees, maples, others.

Life History: Females mature in spring and lay eggs. Crawlers feed in summer. One generation per year.

Overwintering: Immatures.

European Fruit Lecanium

Damage: Honeydew, sooty mold, dieback.

Monitoring: Look for adult females, crawlers, honeydew, and sooty mold.

Chemical Control: Soil application of insecticides, oil sprays.

Biological Control: Minute pirate bugs, lacewings, lady beetles, predaceous midges; parasitoids *Aphytis, Coccophagus, Encarsia*, and *Metaphycus*.

Fletcher Scale

Parthenolecanium fletcheri
Family Coccidae
Native pest

Hosts: **Yew, arborvitae, juniper.**

Life History: **Immatures in spring, eggs in May and June, crawlers feed on needles. One generation per year.**

Overwintering: **Immatures on shoots and undersides of leaves.**

Fletcher Scale

Damage: Honeydew, sooty mold, yellow needles, needle drop.

Monitoring: Look for honeydew, sooty mold, and the insects.

Chemical Control: Soil application of insecticides, horticultural oil.

Biological Control: Minute pirate bugs, lacewings, lady beetles, predaceous midges; parasitoids *Aphytis, Coccophagus, Encarsia*, and *Metaphycus*.

Pine Tortoise Scale

Toumeyella parvicornis
Family Coccidae
Native pest

Hosts: Pines.

Life History: One generation per year on twigs.

Overwintering: Immatures on twigs.

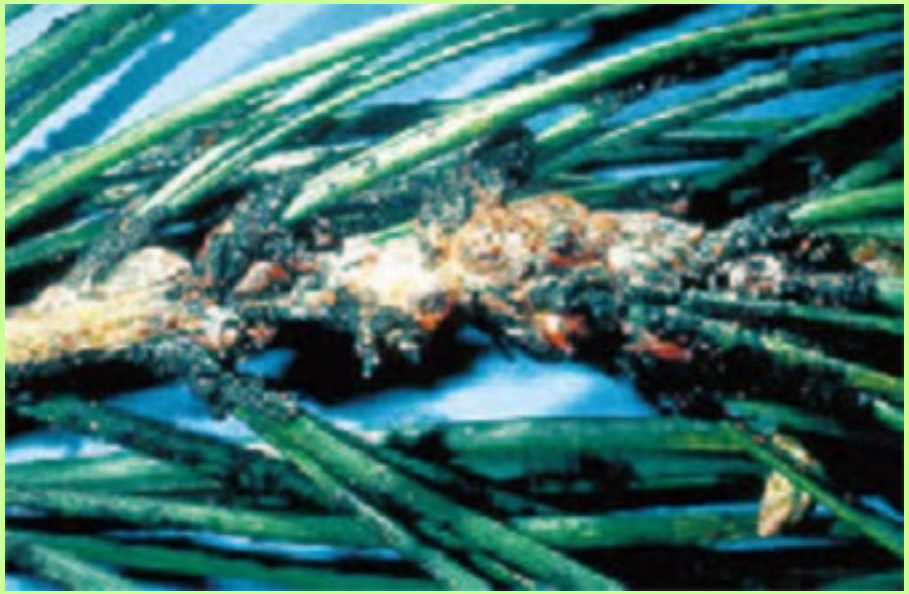
Pine Tortoise Scale

Damage: Sooty mold, yellowing of branch tips, dieback.

Monitoring: Look for scale covers and reddish crawlers. Look for ants seeking honeydew, sooty mold, and needle yellowing.

Physical Control: Remove and destroy infested branches.

Chemical Control: Dormant oil sprays.



Tuliptree Scale

Toumeyella liriodendri
Family Coccidae
Native pest

Hosts:
Tuliptree, magnolia, basswood, hickory, buttonbush, linden, redbay, and walnut.

Tuliptree Scale

Life History: Females mature in spring, males emerge in June, live crawlers are produced. One generation per year.

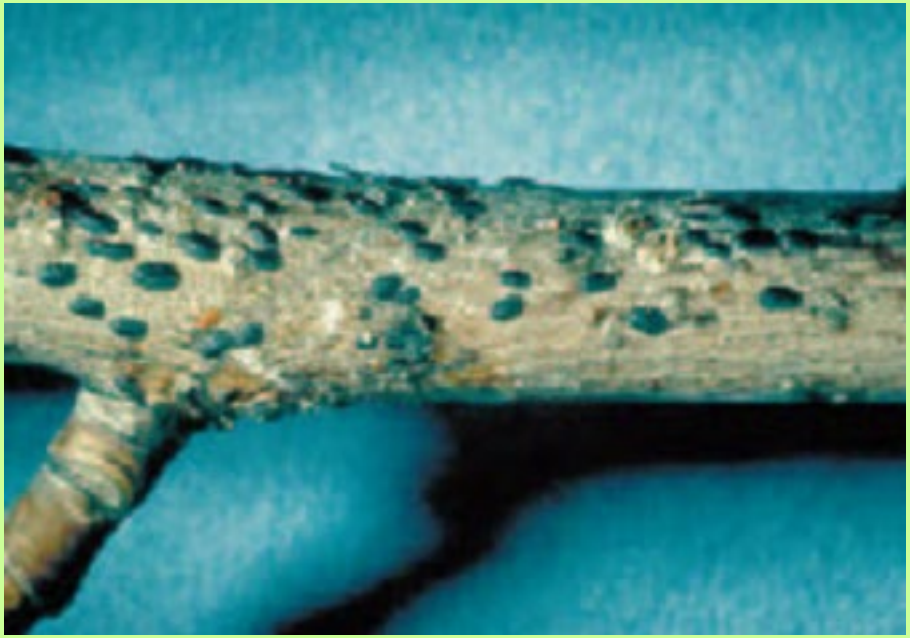
Overwintering: Second instars on twigs.

Tuliptree Scale

Damage: Honey dew, sooty mold, leaf yellowing, leaf drop, and dieback.

Monitoring: Look for black immatures overwintering on twigs. Look females and ants tending aphids.

Chemical Control: Dormant oil sprays, oil or soap in late June.



Spruce Bud Scale

Physokermes picea
Family Coccidae
Native pest

Hosts: **Spruce.**

Life History: **Females complete mature in April. Crawlers appear in June and July. One generation per year.**

Overwintering: **Immatures on the underside of needles.**

Spruce Bud Scale

Damage: Honey dew, sooty mold.

Monitoring: Look for adult females, honeydew, sooty mold, and dieback.

Chemical Control: Dormant oil sprays, oil or soap in late June.

Black Pineleaf Scale

Nuculaspis californica
Family Diaspididae
Native pest

Hosts: Douglas fir, jack and mugo pines, other pines.

Life History: One generation per year on needles.

Overwintering: Immature stages.

Black Pineleaf Scale

Damage: Yellow needles, loss of needles, short needles.

Monitoring: Look for adults and crawlers, yellow and short needles.

Chemical Control: Dormant oil, insecticides.

Biological Control: Parasitic wasps, *Prospaltella* sp. and *Physcus varicornis*.

Euonymus Scale

Unaspis euonymi
Family Diaspididae
Introduced pest

Hosts: **Euonymus, bittersweet, and pachysandra.**

Life History: **Two generations per year. Females on bark, males on leaves.**

Overwintering: **Mated females.**

Euonymus Scale

Damage: Yellow spots on leaves, loss of leaves, dieback.

Monitoring: Look for white male covers on leaves, brown female covers on bark, and damage.

Euonymus Scale

Cultural Control: Plant resistant species of Euonymus, such as *E. alatus* and *E. kiautschovicus.*

Chemical Control:
Dormant oil.

Biological Control:
The lady beetle *Chilocorus kuwaanae.*

Gloomy Scale

Melanaspis tenebricosa
Family Diaspididae
Native pest

Hosts: Red and silver maples, boxelder, catalpa, elm, hackberry, mulberry, sycamore.

Life History: Eggs and crawlers in June and July, adults in August. One generation a year.

Overwintering: Mated females.

Gloomy Scale

Damage: Stunting and dieback.

Monitoring: Look for scale covers and crawlers.

Chemical Control: Dormant oil.

Biological Control: Minute pirate bugs, lacewings, lady beetles, predaceous midges; parasitoids *Aphytis, Coccophagus, Encarsia*, and *Metaphycus*.

Obscure Scale

Melanaspis obscura
Family Diaspididae
Native pest

Hosts: **Oaks.**

Life History: **Adults in May, eggs in June, crawlers in July. One generation a year.**

Overwintering: **Immature stages.**

Obscure Scale

Damage: Dieback on small branches.

Monitoring: Look for gray scale covers and crawlers.

Cultural Control: Avoid over-fertilizing.

Chemical Control: Dormant sprays, summer summer oil sprays.

Juniper Scale

Carulaspis juniperi
Family Diaspididae
Introduced pest

Hosts: Juniper, cryptomeria, northern white cedar, cypress.

Life History: Crawlers appear in late June. One generation per year.

Overwintering: Adult females on needles.

Juniper Scale

Damage: Failure of new growth to develop, yellowing, dieback.

Monitoring: Look for yellowing and scale covers.

Chemical Control: Dormant oil. Do make further insecticide applications if natural enemies are present.

Biological Control: Lady beetles *Hippodamia, Cryptolaemus,* and *Rhizobius*.

Oystershell Scale

Lepidosaphes ulmi
Family Diaspididae
Native pest

Hosts: Ash, beech, birch, boxwood, cotoneaster, elm, fruit trees, lilac, maple, poplar, willow.

Oystershell Scale

Life History: Nymphs mature in mid-summer to mate. Eggs in late summer and early fall. One generation a year.

Overwintering: Eggs under the cover of the dead mother scale.

Oystershell Scale

Damage: Cracked bark and chlorotic, stunted foliage, yellowing, wilting, dieback.

Monitoring: Look for crawlers, scale covers, and damage.

Cultural Control: Remove and destroy heavily infested branches.

Chemical Control: Horticultural oils.

Pine Needle Scale

Chionaspis pinifoliae
Family Diaspididae
Native pest

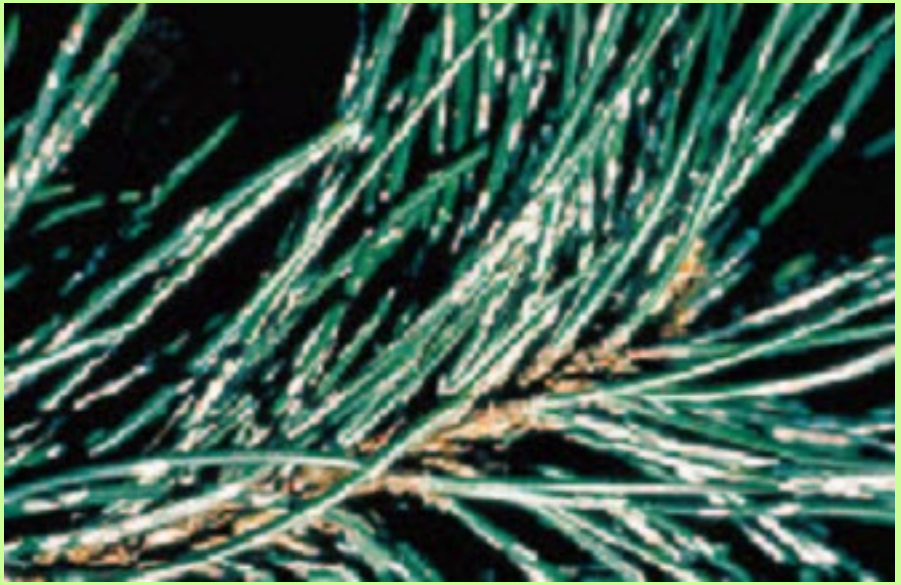
Hosts: Douglas fir, fir, hemlock, pine, spruce.

Life History: Crawlers hatch and mature during the summer and eggs are laid in the fall. One generation per year.

Overwintering: Eggs under scale covers.

Pine Needle Scale

Damage: Brown needles, loss of needles.



Monitoring: Look for scale covers and crawlers.

Physical Control: Remove and destroy heavily infested branches.

Chemical Control: Dormant oil sprays.

Scurfy Scale & Elm Scurfy Scale

Chionaspis furfura* & *C. americana
Family Diaspididae
Native pest

Hosts: **Elm, apple, crabapple, mountain ash willow, dogwood.**

Life History: **Crawlers appear in June mature in August, mate and lay eggs. One generation, possibly two, per year.**

Overwintering: **Eggs under dead mother scale.**

Scurfy Scale & Elm Scurfy Scale

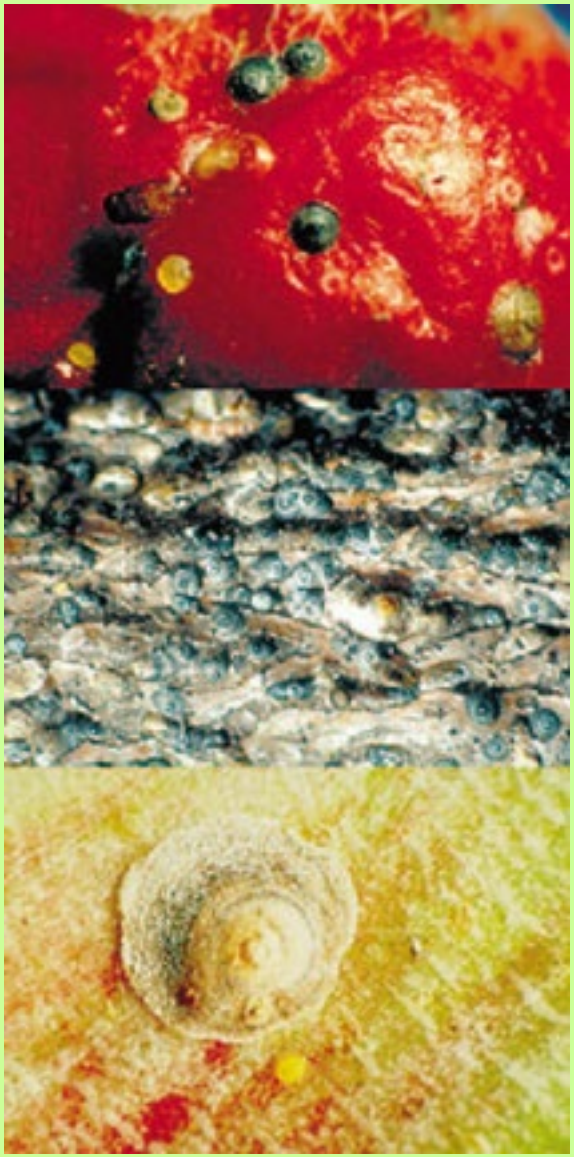
Damage: Twig and branch dieback.

Monitoring: Look for scale covers and crawlers.

Cultural Control: Most populations can be controlled by reducing tree stress. Avoid killing natural enemies with insecticides.

Chemical Control: Horticultural oil or soap during crawler emergence.

San Jose Scale



Quadraspidiotus perniciosus
Family Diaspididae

Hosts: Rosaceous flowering fruits and plants.

Life History: Generations overlap from mid-May through September. Yellow crawlers are active from late June to early July.

Overwintering: First instars on bark.

San Jose Scale

Damage: Inner bark turns red. Leaf wilting, dieback.

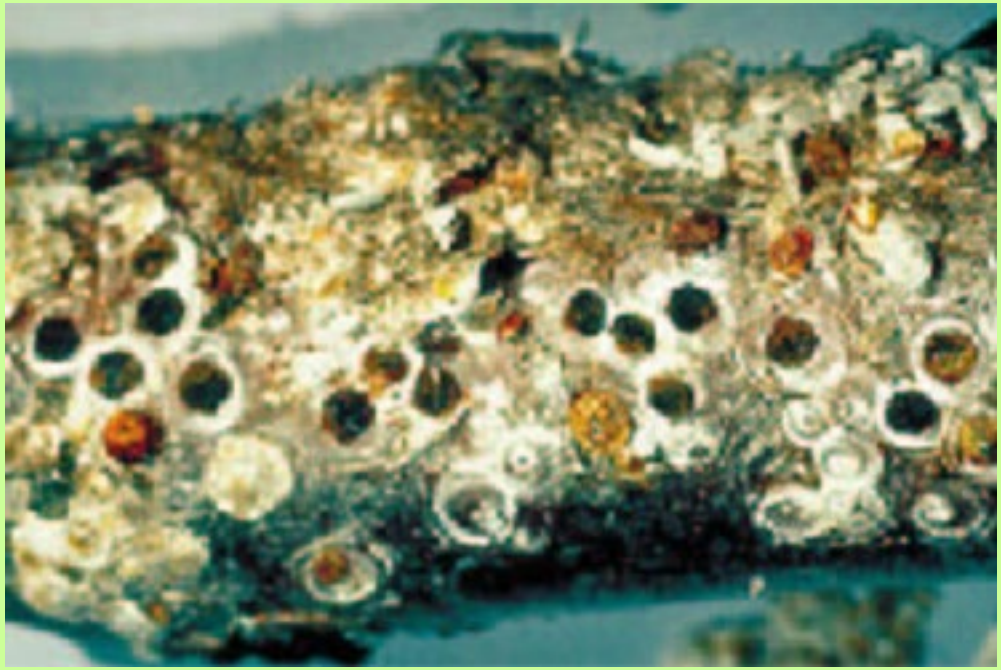
Monitoring: Look for scale covers, yellow crawlers, and damage.

Physical Control: Remove and destroy heavily infested branches and braches showing dieback.

Chemical Control: Dormant and summer oil sprays, insecticides.

White Peach Scale

Pseudaulacaspis pentagona
Family Diaspididae



Hosts: **Mulberry, peach, persimmon, and redstemmed dogwoods.**

Life History: **Several generations a year.**

Overwintering: **Adult females.**

White Peach Scale

Damage: Leaf yellowing, leaf drop, dieback.

Monitoring: Look for damage, white male covers, and pink crawlers.

Physical Control: Prune out heavily infested limbs that are showing dieback. Remove accessible white patches on healthy trees by scrubbing.

Chemical Control: Horticultural oil or soap. Use residual insecticides sparingly.

White Prunicola Scale

Pseudaulacaspis prunicola
Family Diaspididae

Hosts: ***Prunus*** **spp., lilac, privet.**

Life History: Several generations a year.

Overwintering: Adult females on bark.

White Prunicola Scale

Damage: Leaf yellowing, leaf drop, dieback.

Monitoring: Look for damage, white male covers, and white and pink crawlers.

Physical Control: Prune out heavily infested limbs that are showing dieback. Remove accessible white patches on healthy trees by scrubbing.

Chemical Control: Horticultural oil or soap. Use residual insecticides sparingly.

European Elm Scale

Gossyparia spuria
Family Eriococcidae
Introduced pest

Hosts: Elm, *Celtis* species, and zelkova.

Life History: Eggs in May, crawlers in June and July. One generation a year.

Overwintering: Immatures in bark cracks.

European Elm Scale

Damage: Stunted, chlorotic foliage, premature leaf drop, branch dieback, sooty mold.

Monitoring: Look for honeydew, mature females, crawlers, and damage.

Chemical Control: Insecticides, oil.

Biological Control: Beneficials usually occur.

Pubescent Leaf Kermes & Pin Oak Kermes

Nanokermes pubescens* & *Allokermes galliformis
Family Kermesidae
Native pest

Hosts: **Oak.**

Life History: **Females on leaf stems, males on branches. Eggs in June and July. One generation per year.**

Overwintering: **Crawlers in bark.**

Pubescent Leaf Kermes & Pin Oak Kermes

Damage: Leaf distortion, flagging, yellowing, dieback.

Monitoring: Look for the insects.

Chemical Control: Dormant oils, residual insecticides.

Biological control: Parasitic wasps (family Encrytidae), the lady beetle *Chilocerus stigma*.

Minute Pirate Bug

Orius tristicolor **and**
O. insidiosus
Family Anthocoridae

Life History: One generation takes 20 days to complete, multiple generations per year.

Prey: Spider mites, insect eggs, aphids, thrips, scales, caterpillars.

Minute Pirate Bug

Orius insidiosus **nymph**

Minute pirate bug feeding on thrips

Seed/ Big-Eyed Bug

Geocoris species
Family Lygaeidae

Life History: Many Lygaeids feed on plants, but some are predaceous.

Prey: Insect eggs, aphids, mealybugs, spider mites, leafhoppers, plant bugs, whiteflies, caterpillars, and beetle larvae.

Pirate Bug

Deraeocoris nebulosus
Family Miridae

Life History: Most mirids feed on plants, but the pirate bug is predaceous.

Prey: Mites and plant-feeding insects; lace bugs, cotton aphid, tobacco budworm.

Predaceous Stink Bug

Several species
Family Pentatomidae

Life History: Most stink bugs feed on plants, but some are predaceous. Many discharge a pungent smell when handled.

Predaceous stink bug feeding on elm leaf beetle larva

Prey: Caterpillars and beetles such as Colorado potato beetle and Mexican bean beetle.

Predaceous Stink Bug

CW from top left: *Podisus maculiventris* adult attacking tussock moth caterpillar, *Perillus bioculatus* nymph feeding on beetle larva, *P. bioculatus* nymph feeding on hornworm

Assassin Bug

Several species
Family Reduviidae

Life History: Assassin bugs feed by piercing prey with their beaks to suck out juices.

Prey: Caterpillars, small flying insects, aphids, and leafhoppers.

Bottom: Wheel bug (*Arilus cristatus*)

Ash Plant Bug

Tropidosteptes amoenus
Family Miridae
Native pest

Hosts: **Ash**

Description:
Adults are yellow or brown to black, with yellow or pink markings dorsally. They are about 5-6 mm in length. Nymphs are wingless, sometimes lighter in color, and about 1.5-5 mm in length.

Ash Plant Bug

Life History: Two generations a year. The first nymphal generation hatches in May and feeds for about one month on shoots, leaf stems and the undersurface of leaves.

Overwintering: Eggs.

Ash Plant Bug

Damage: Yellowish white stippling, browning, to drying, premature leaf drop, deformation or dwarfing of young leaves. Black excrement may appear under leaves.

Ash Plant Bug

Monitoring: Look for adults in early and late summer, and nymphs in mid May and late July.

Chemical Control: Horticultural soap and oil, pyrethrins.

Honeylocust Plant Bug

Diaphnocoris chlorionis
Family Miridae
Native pest

Hosts: Honeylocust

Description: Adults are pale green, about 5-6 mm long. Immatures are smaller, pale green, with wing buds.

Honeylocust Plant Bug

Life History: Eggs hatch as honeylocust leaf buds open and nymphs feed on new leaves. Adults present from June to July. One generation per year.

Overwintering: Eggs under bark of 2-3 year old twigs.

Adult and nymph

Honeylocust Plant Bug

Damage: Yellow or brown blotches, distorted and stunted leaves, holed leaves, defoliation. Nymphal damage is more severe than adult damage.

Honeylocust Plant Bug

Monitoring: Look for nymphs inside leaves when leaves begin to unfold. Later, look for distorted or stunted leaves. Look for adults in June and July.

Chemical Control: Horticultural oil (1% for nymphs, 2% for adults) or residual insecticides.

Nymph

Fourlined Plant Bug

Poecilocapus lineatus
Family Miridae
Native pest

Hosts: Amur maple, azalea, dogwood, forsythia, rose, viburnum, and others.

Steve Mayer, Extension Educator, Marion County
http://www.ppdl.org/dd/id/4-lined_plant_bug.html

Fourlined Plant Bug

Description: Adults are 7 mm long and have yellow to bright green forewings with four black stripes down the back. Nymphs are red to yellow with black stripes on wing buds.

Fourlined Plant Bug

Life History: Eggs hatch in late April to May. The nymphs develop for 30 days. Adults feed on upper surface of leaves. One generation per year.

Steve Mayer, Extension Educator, Marion County
http://www.ppdl.org/dd/id/4-lined_plant_bug.html

Fourlined Plant Bug

Damage: Stippling, yellow, brown, or black spots, holes.

Monitoring: Look for stippling in May and June. Use a sweep net to confirm presence.

Chemical Control: Horticultural oils in May and June.

Steve Mayer
Extension Educator
Marion County
http://www.ppdl.org/dd/id/4-lined_plant_bug.html

Lace Bugs

Several species
Family Tingidae
Native and introduced

Hosts: **Oak, basswood, hackberry, chokecherry, azalea, sycamore, and many others.**

Description: **Adults are 3 mm long, white or light brown with darker markings and sculptured wings.**

Sycamore lace bug (*Corythucha ciliata*)

Lace Bugs

Life History: Eggs are laid on the underside of leaves. Nymphs feed gregariously. Several generations per year. Females guard eggs and often guard nymphs.

Sycamore lace bug female and nymphs

Lace Bugs

Damage: Stippling, yellowing, browning, fecal spots, dieback.

Monitoring: Look for stippling damage and black eggs.

Chemical Control: Horticultural oils, contact or systemic insecticides.

Damage on sycamore

Bruce W. Kauffman, Tennessee Department of Agriculture
www.insectimages.org