Insects that Feed on Trees

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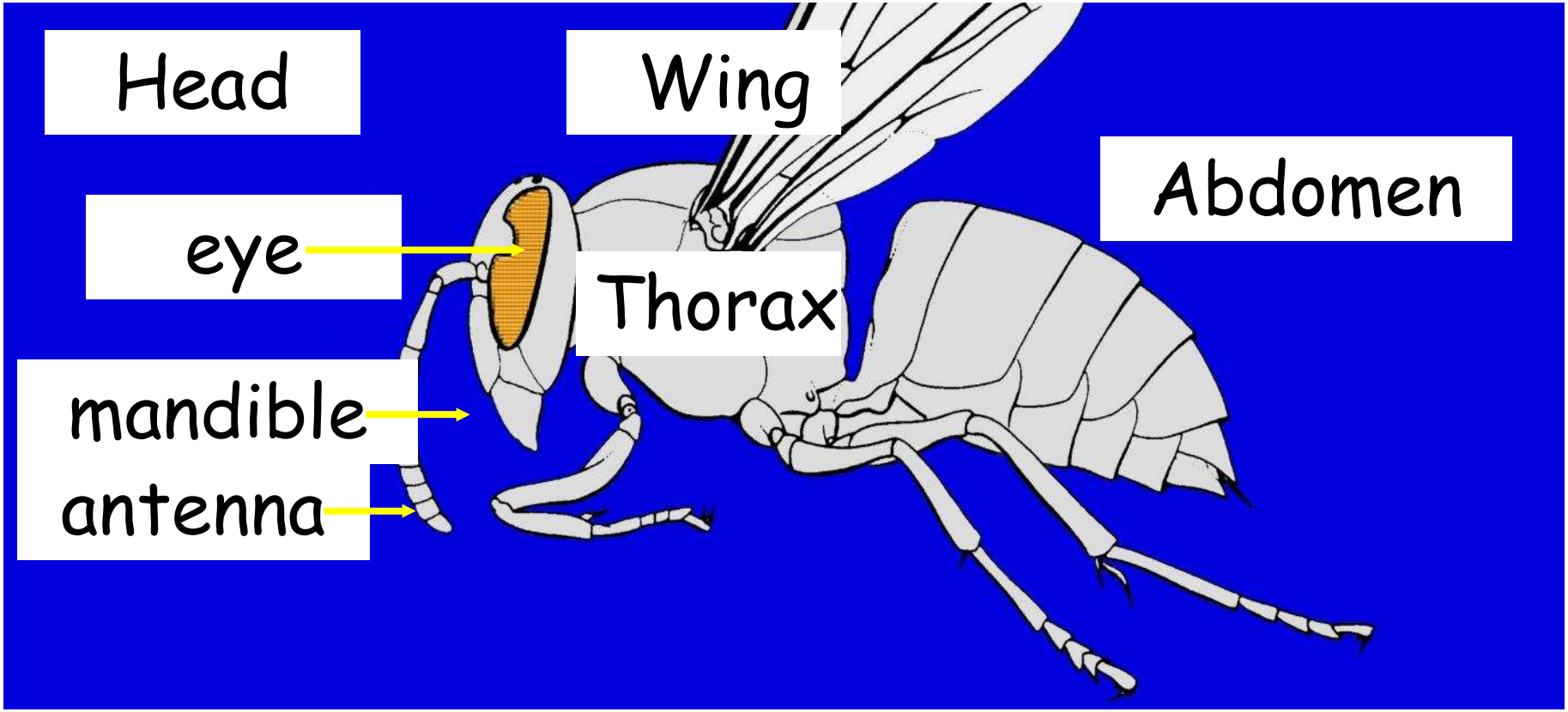
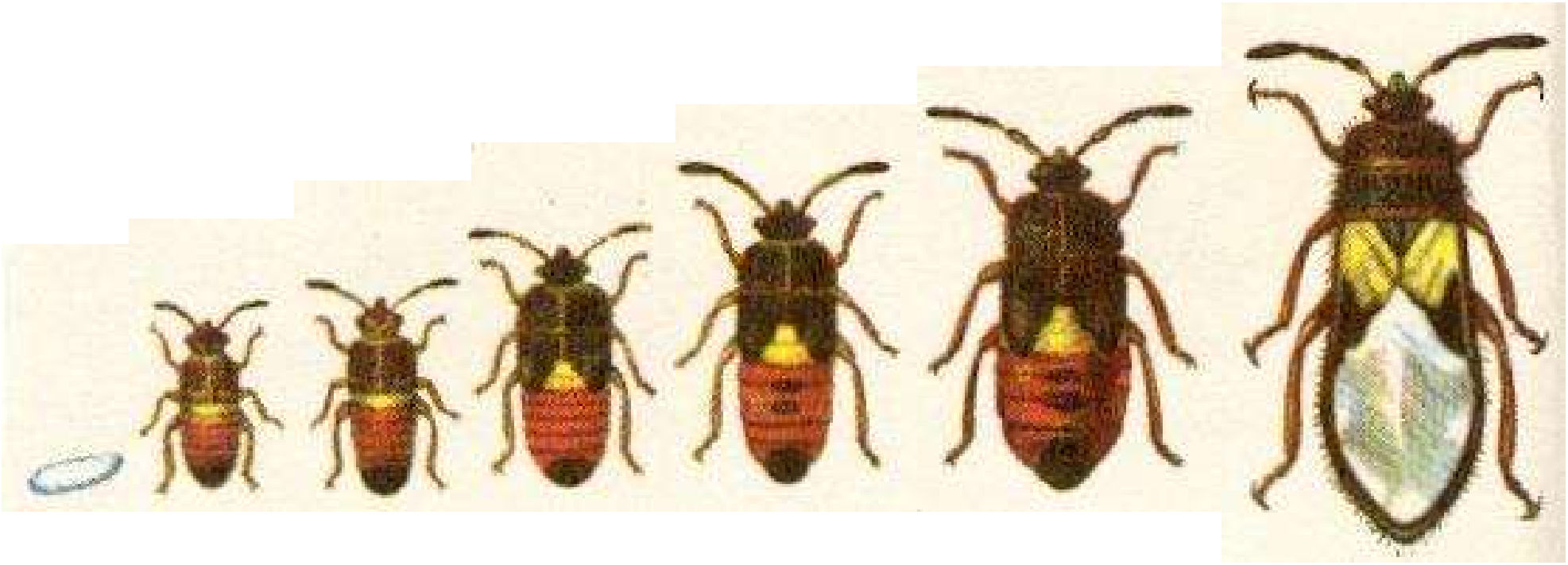
Insect Body Parts



Life Cycle of Insects

Incomplete metamorphosis

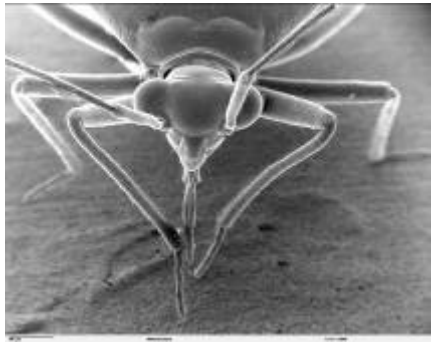


egg nymphs adult

Incomplete metamorphosis

Aphids

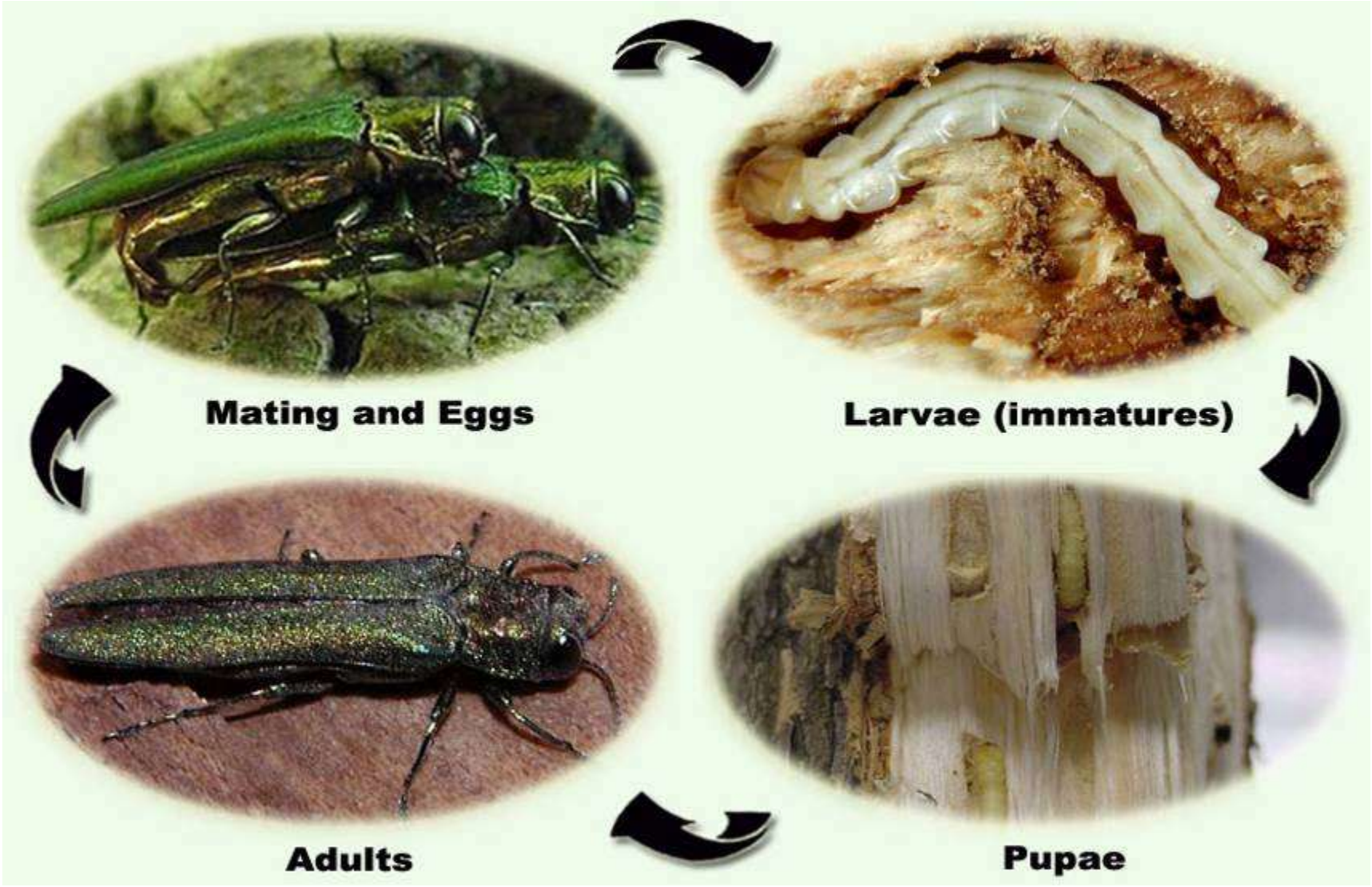
Adelgids



Plant bugs

Lace bugs

Complete Metamorphosis



Complete metamorphosis


Moths (Lepidoptera)

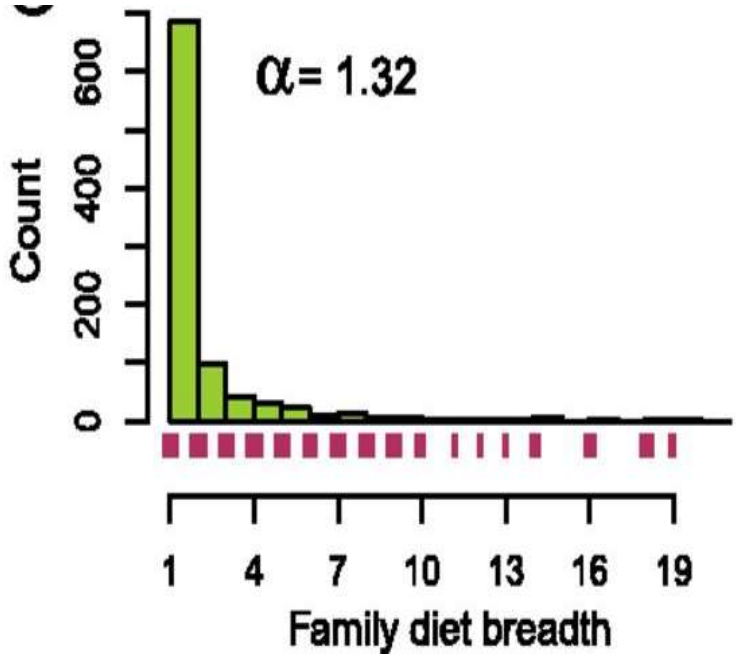

Beetles (Coleoptera)


Sawfly (Hymenoptera)

Fly (Diptera)

What Insects Eat, Host Range

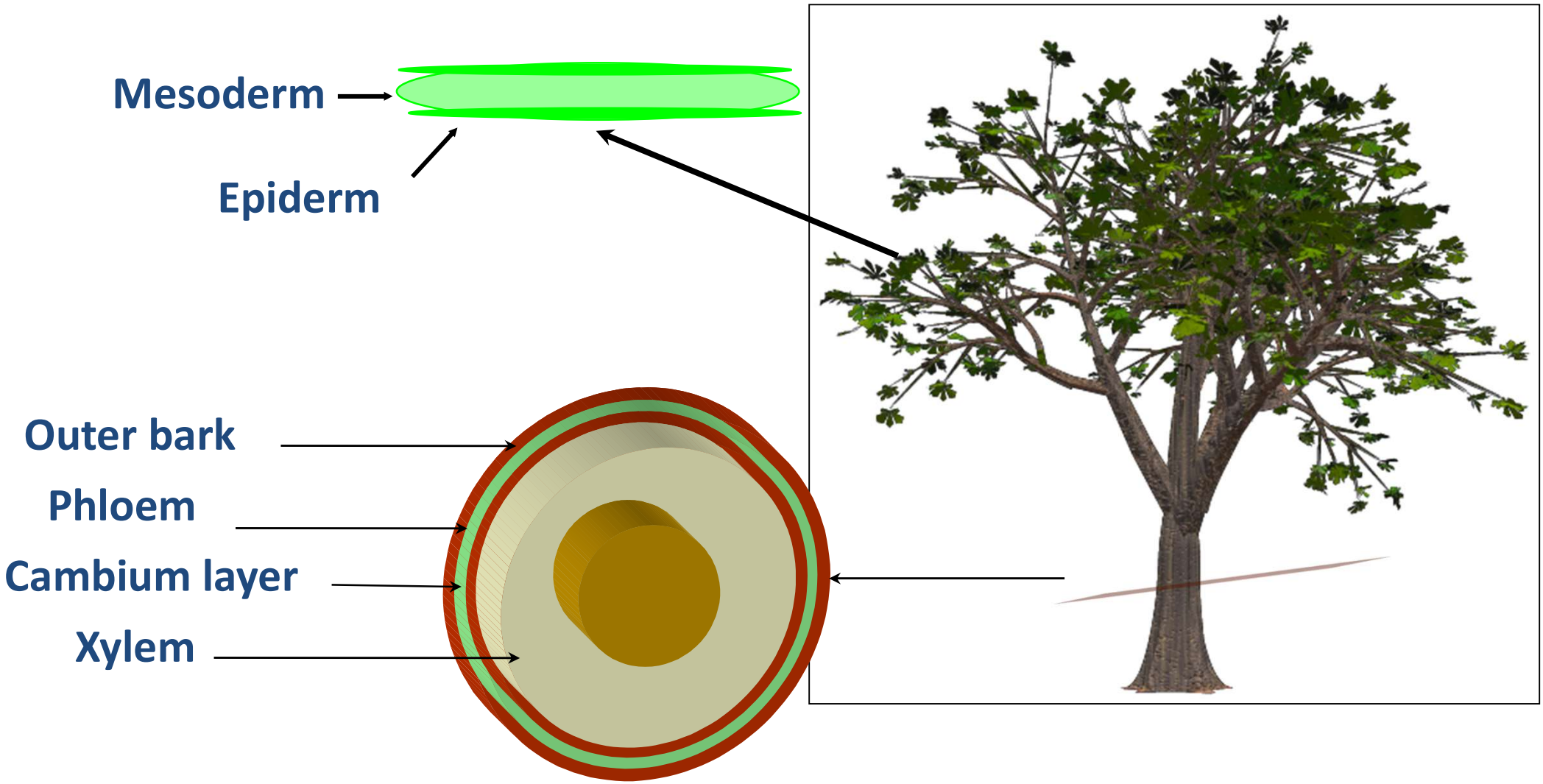
- Trees defend themselves
  - Chemical
  - Physical
- To feed on a tree, insects need to be adapted to that tree's defenses
- Most herbivorous insects are specialists
- So, if you know your tree, you have a great start on identifying your insect



Rickfels 2015

Edible Tree Parts

Edible Tree Parts (continued)



Layout of Talk

- For each insect
  - Show pictures of the life stages
  - Show pictures of damage
  - Discuss biology
  - Discuss management options

Insects That Suck

Damage Types

Form galls

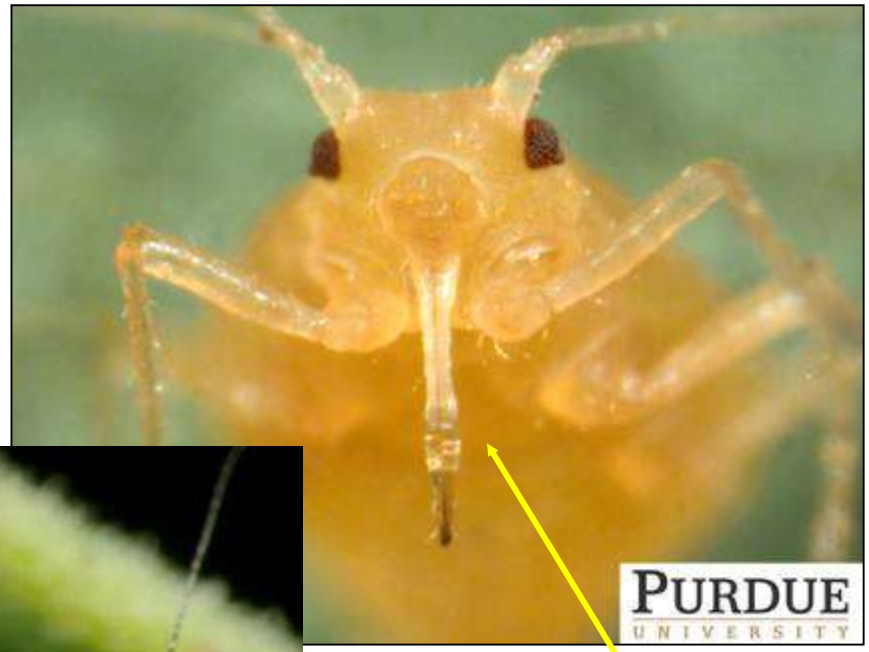
Ingest sap > produce honeydew > sooty mold

Remove cell contents

Inject toxins

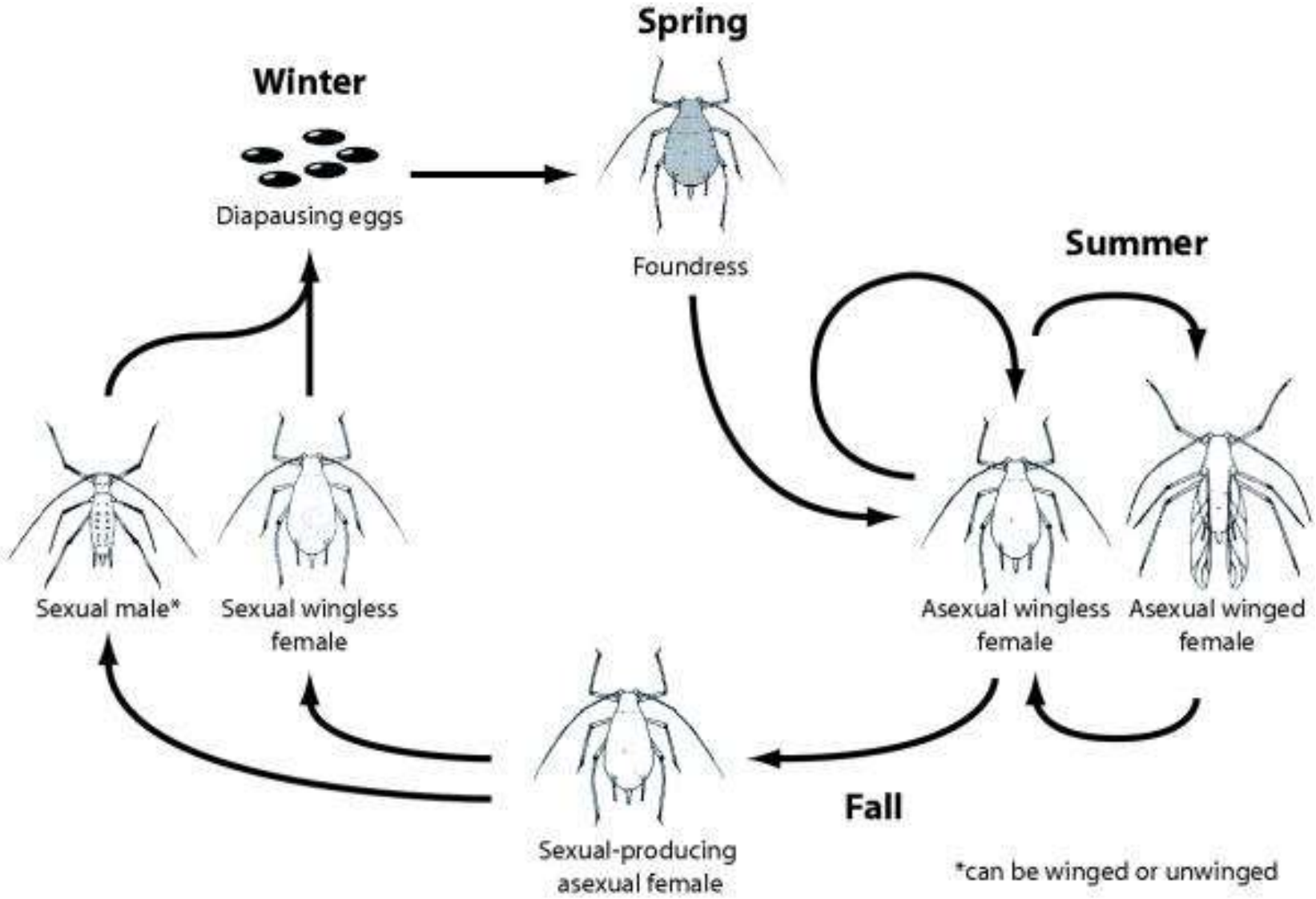
Transmit pathogens

Aphids
Identifying Characteristics



Stylets

Aphids: Life Cycle



Woolly Beech Aphid

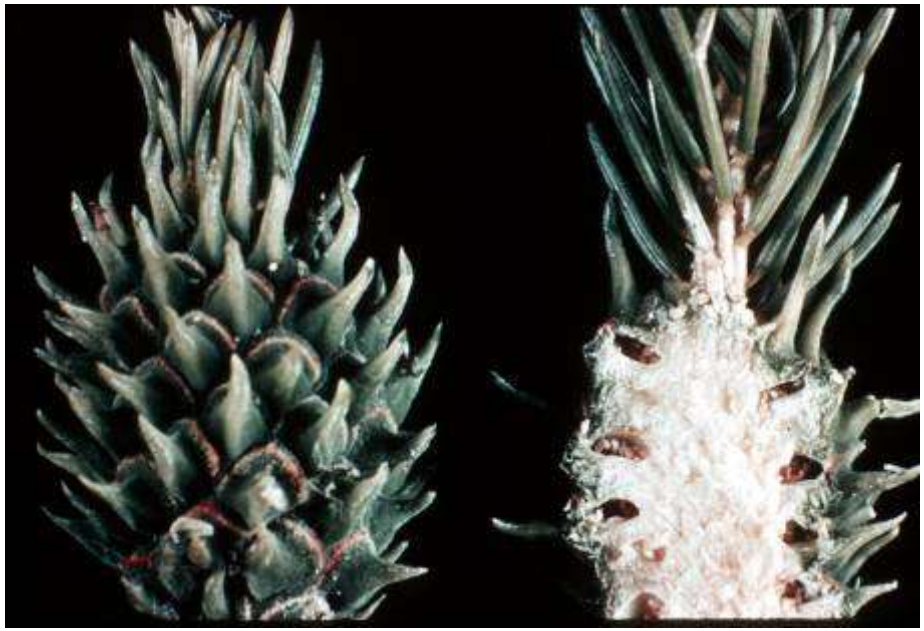
- Have a cottony waxy covering
- Live on underside of beech trees
- Main impact is honeydew production
- Seldom a problem- natural enemies keep in check

Aphid Management

- Usually not needed
- Natural Enemies
- Horticultural Oil
- Systemic insecticides
  - e.g. Acephate, Imidacloprid

Adelgids (Homopetera)

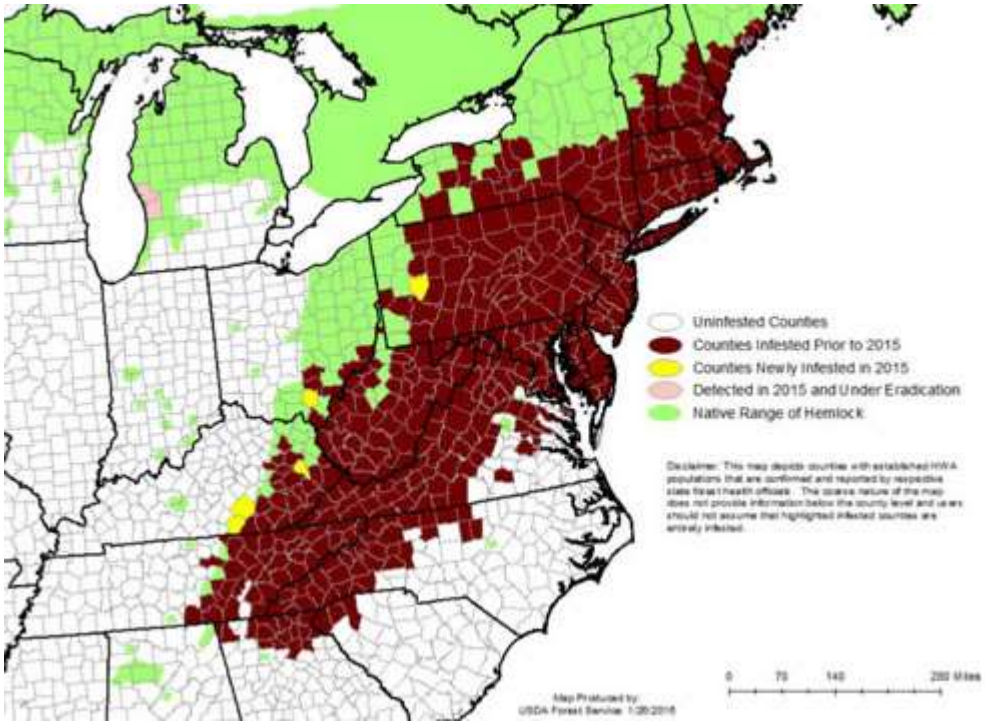
Originally all alternated between spruce and another conifer



- On spruce form characteristic galls

- On alternate host generally have white, fluffy covering

Hemlock woolly adelgid



Native range of hemlock (green) Range of hemlock woolly adelgid (red) in 2015.

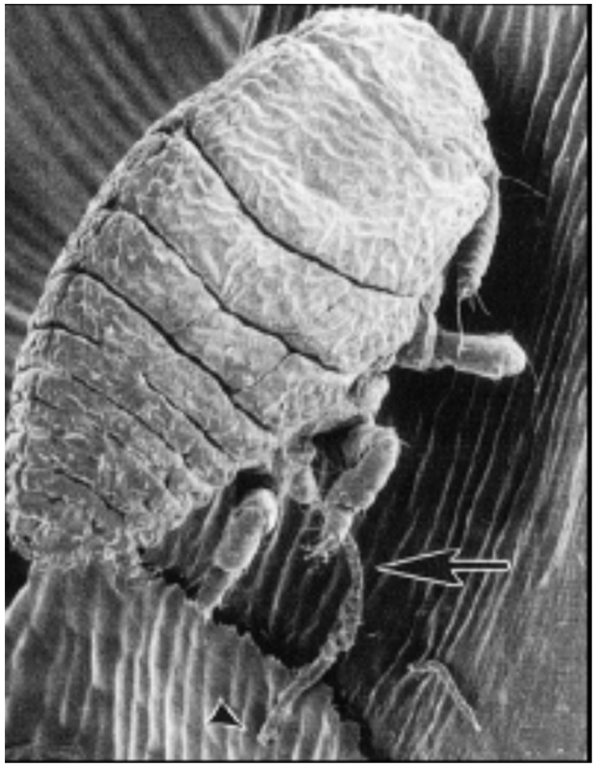
- Native to Japan & maybe China – not a pest due to tree resistance and natural enemies
- Been in Western United States since 1924 - not a pest
- Came to East coast about 1955
- Destructive Pest of Eastern Hemlock and Carolina Hemlock

Hemlock woolly adelgid

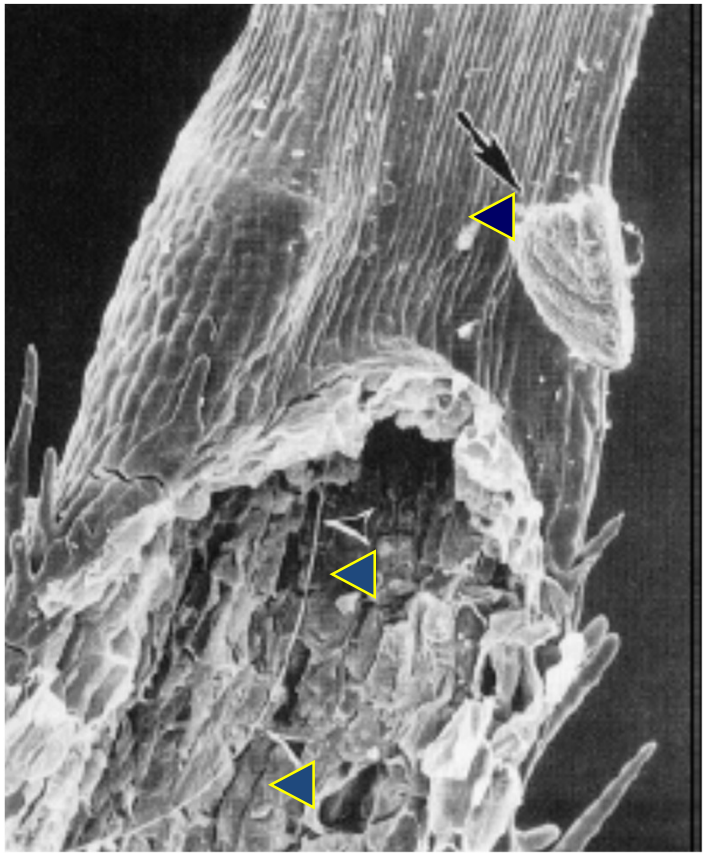
Nymph with
‘wool’ removed

Egg Masses

Hemlock Woolly adelgid Feeding Site

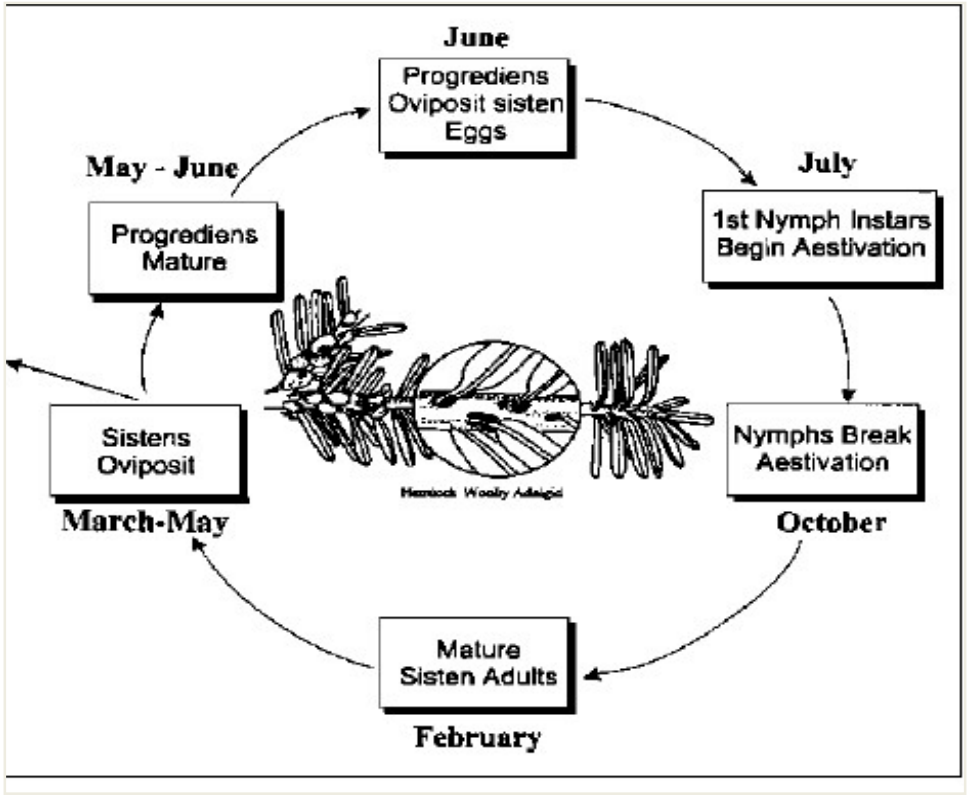


Feeds in Xylem



SEM's by Kathleen Shields, USFS

Hemlock Woolly adelgid Life Cycle



- Eggs laid in wooly sacs in March-May
- 1st generation matures, lays eggs in June
- 2nd generation nymphs crawl to base of needle, settle, enter dormancy until October
- 2nd generation matures over winter, lay eggs in March-May

Hemlock woolly adelgid

- Can kill trees in 1- 4 yrs.
- Systemic treatments (imidacloprid) most effective but can increase spider mite activity.
- Soil applications between late August and early December (before the soil is frozen) or from mid-March to mid-June.
- Horticultural Oil
  - – adults and eggs 3/15-4/30, all stages 6/1-6/15, mid July for dormant, mid-October for active nymphs

Hemlock woolly adelgid

adelgid (Homoptera)

Adult

Larva

Pseudoscymnus tsugae

Cooley spruce gall adelgid Two Hosts

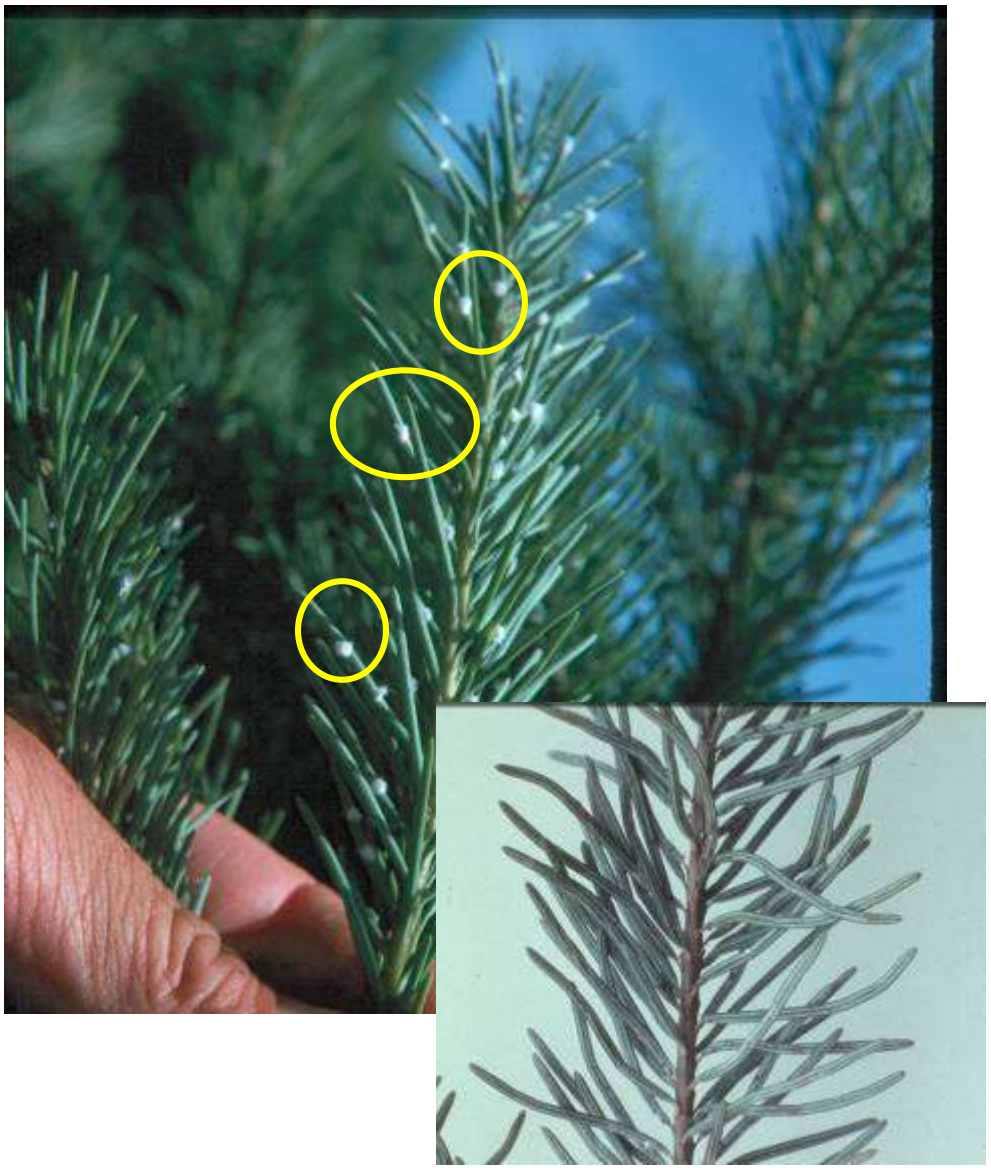
- ON SPRUCE
  - Immature females overwinter on twig terminals
  - Mature in April, lay eggs in white cottony masses on shoot terminals
  - Newly hatched nymphs cause galls to form on new growth
  - Live in galls till midsummer, galls dry and winged females emerge
  - Fly to another spruce OR to alternative hosts

Cooley spruce gall adelgid

Spruce Hosts – Blue Engelmann, and Norway

- Galls may disfigure trees
- Can prune off galls
- Chemical treatment for nymphs in early spring, or mid- late September e.g. horticultural oil, imidacloprid, bifenthrin

Cooley spruce gall adelgid

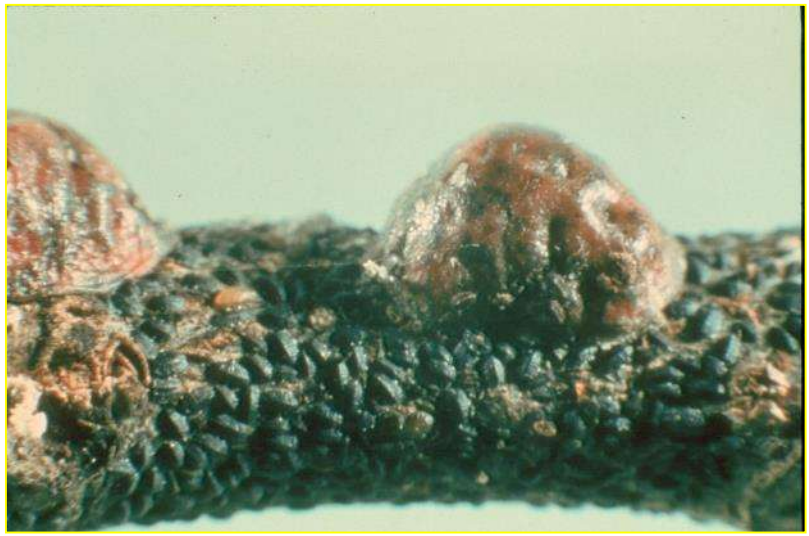


- Douglas Fir
- Winged females lay eggs which hatch to woolly adelgids
- Overwinter as immatures
- Cause distortion of needles/ needle drop/ unsightly
- Avoid planting near spruce (but can still cycle on each host)
- Horticultural Oil, bifenthrin, early May, July 26 – August 6

Scales: Homoptera

Soft Scales

- Have attached Soft Waxy Covers
- Suck Sap
- Produce Honeydew

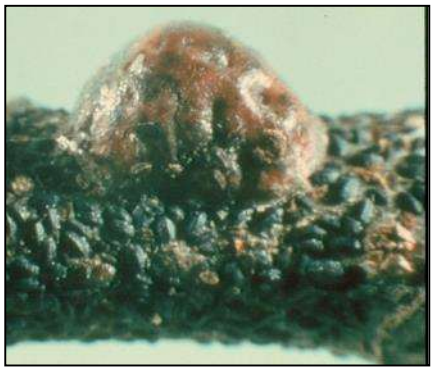


Hard Scales

- Live under Armored Waxy Covers
- Suck cell contents
- DON'T Produce Honeydew

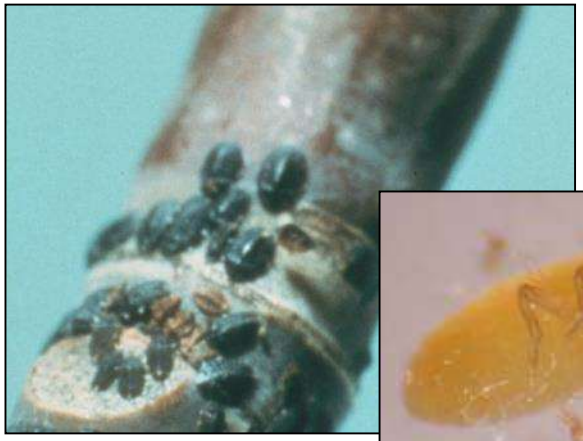
Scale Life Cycle

Adult female



Adult male

Eggs laid under
Female's Scale



VUNERABLE STAGE

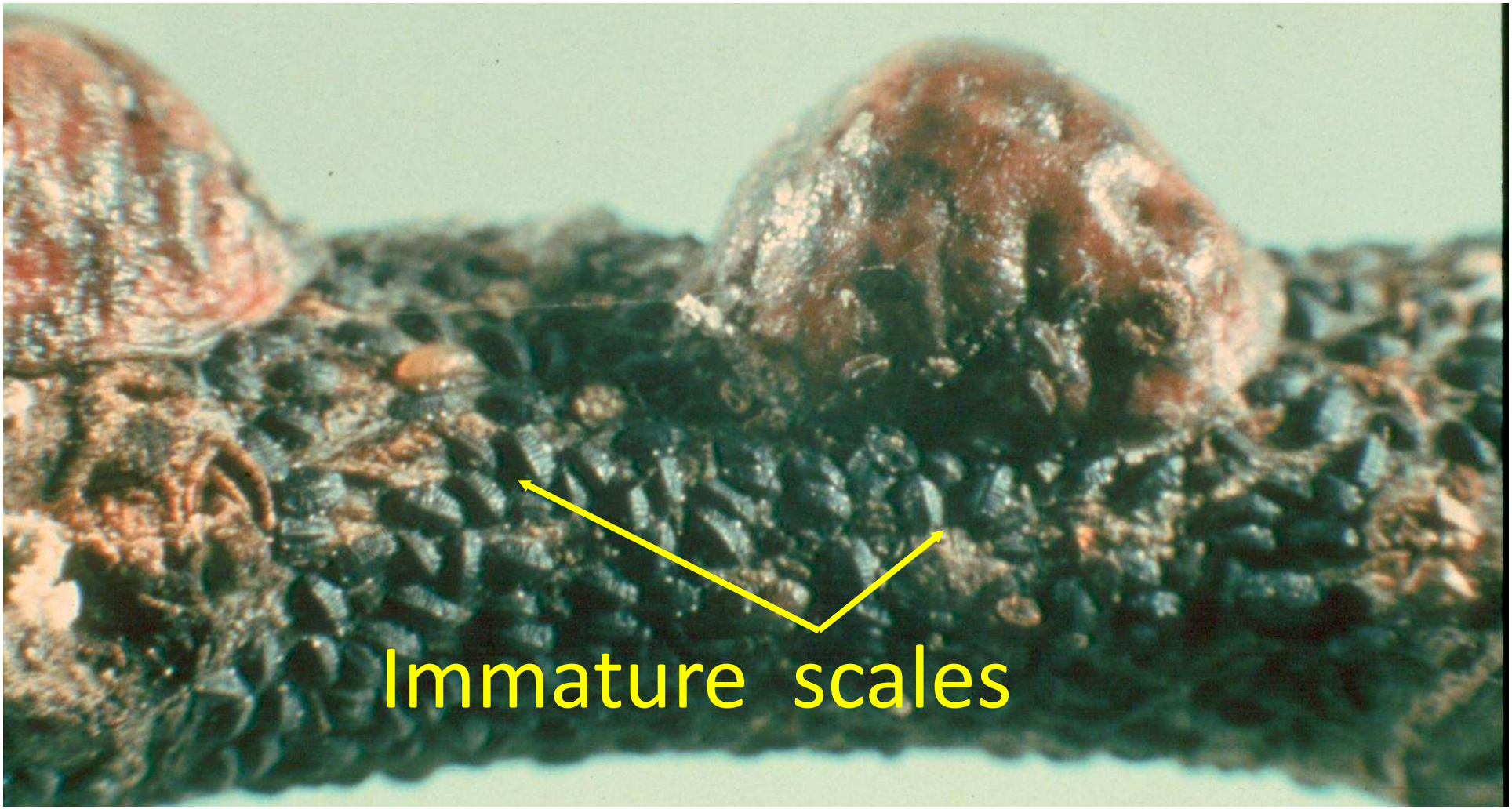
Immatures - Crawlers

Tuliptree scale

soft scale (Homoptera)

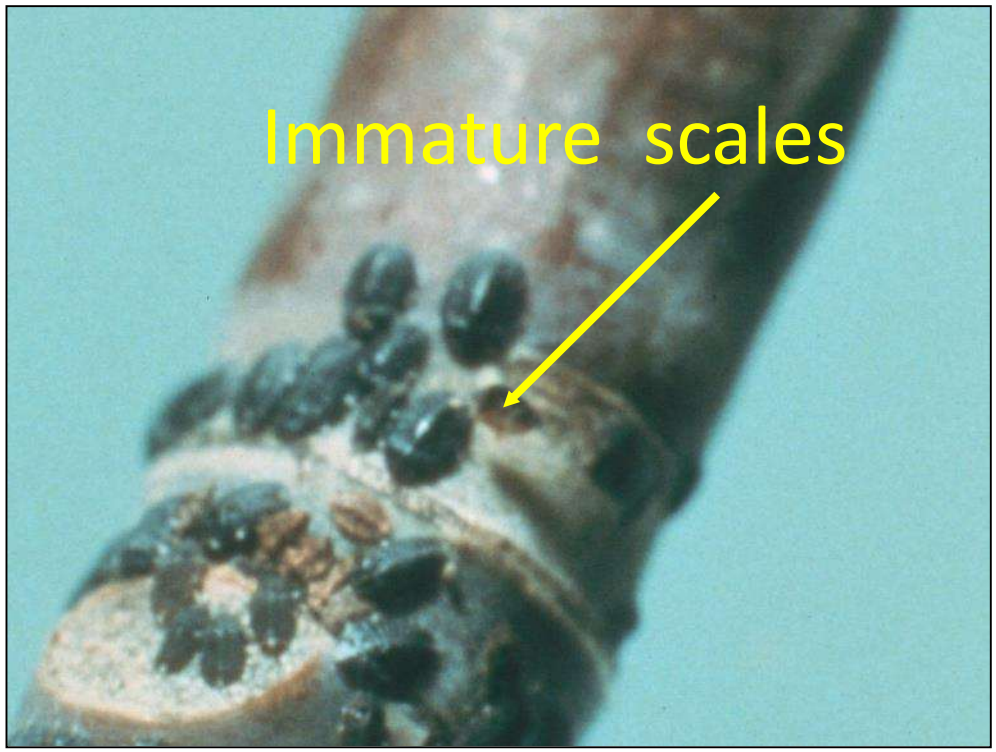
Tuliptree scale

soft scale (Homoptera)



Tuliptree scale

soft scale (Homoptera)



- Hosts – Tuliptree, Linden, catalpa, magnolia
- 1 Generation / yr – overwinter as crawlers
- Lots of honeydew → sooty mold
- May kill branch
- Often controlled by Natural Enemies
- Horticultural Oil in late March – early April

Beech scale

soft scale (Homoptera)

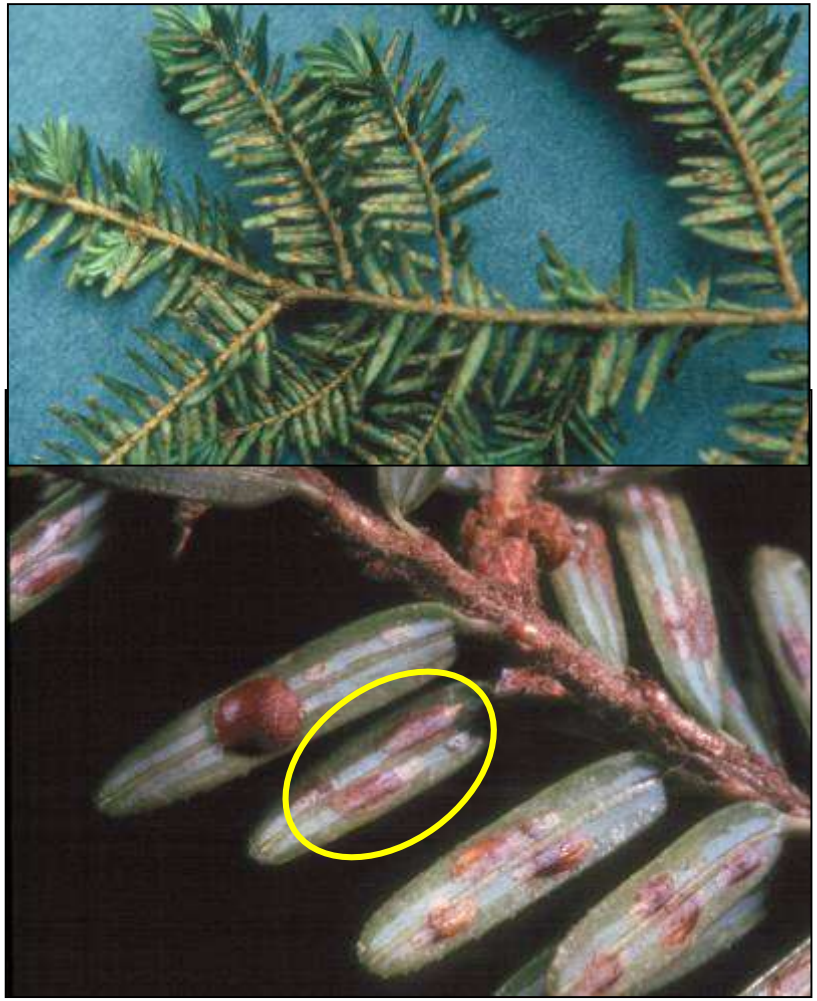
Scales

Spores

- Present on Trunk
- Allows Fungal Disease
- One generation / yr., crawlers overwinter
- Treat in Spring with horticultural oil
- Once diseased no treatment

Elongate hemlock scale

Armored Scale



- Introduced into New York in 1908
- Hosts- Hemlock, fir, spruce, pine
- 2 Generations / year overwinter as mature females
- All stages present through summer
- Yellowing, needle loss, death
- Horticultural Oil before bud break
- Foliar Sprays WHEN crawlers active – two peaks May and September
- Do not use nitrogen fertilizers

Scale Management

- Resistant Cultivars
- Natural Enemies: Parasitic Wasps, Ladybeetles
- Horticultural Oils
- Foliar/ Bark Sprays
- TIMING: Need to target Crawlers, adults resistant due to waxy covering
- Hard vs. Soft: Check labels!

  systemic insecticides only work on soft

Katherine Dugas, M.S. CAES

Spotted Lanternfly

- "New kid on the block" – found in southeastern PA in 2014
- Effective hitchhiker, moves through trade and travel
  - Egg masses like SM, well camouflaged
- 2020 found in Greenwich and West Haven
- Large planthopper, related to cicadas and aphids
  - Turgor-pressure feeder, sucks on sap, produces honeydew
- Preferred reproductive host is tree-of-heaven
- Threat to local agriculture, 65 known hosts
  - Large infestations in the fall create lots of honeydew, are a nuisance and can appear alarming

Spotted Lanternfly

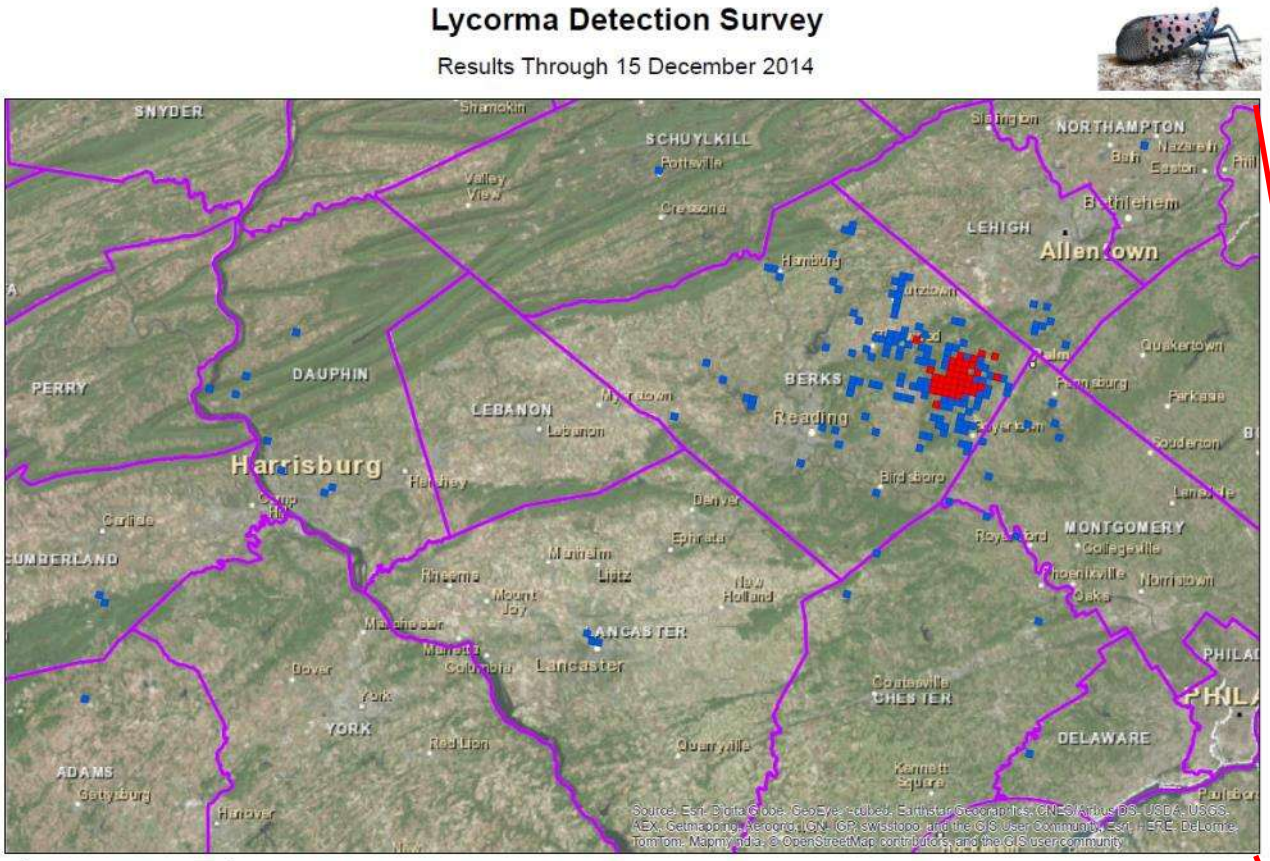
- *Lycorma delicatula*
- Native to China, India, Vietnam
- Invasive species in Korea since 2006
- Found September 2014 in PA, first North American record

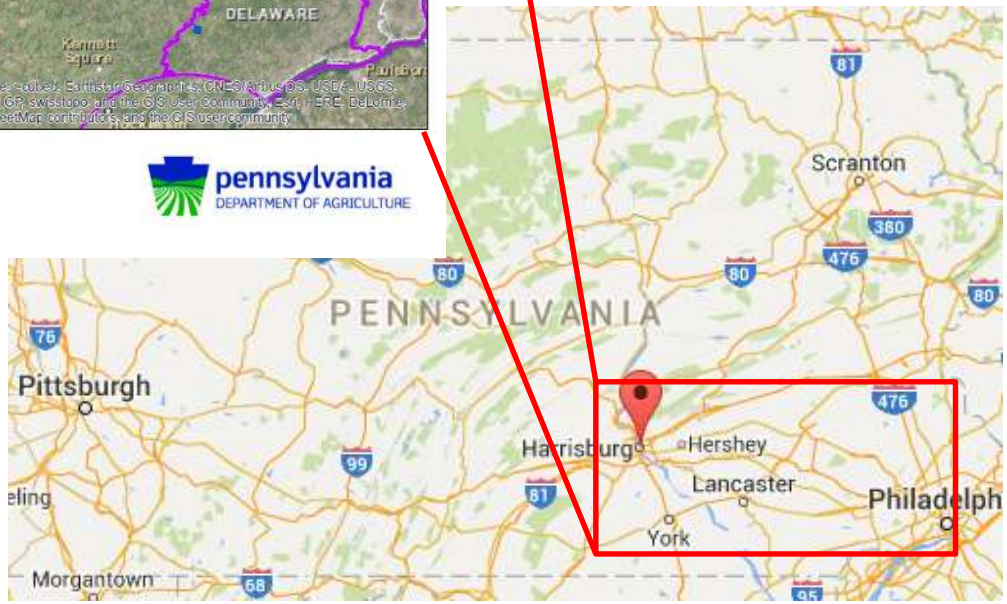
Lanternflies - Fulgoridae

- Planthoppers – related to aphids, cicadas, and stink bugs
- Many are large and colorful, especially tropical species
- Named after the elongated head found in some species, which was once believed to be luminescent.

First Detection of Spotted Lanternfly: Berks County, PA

Late 2014

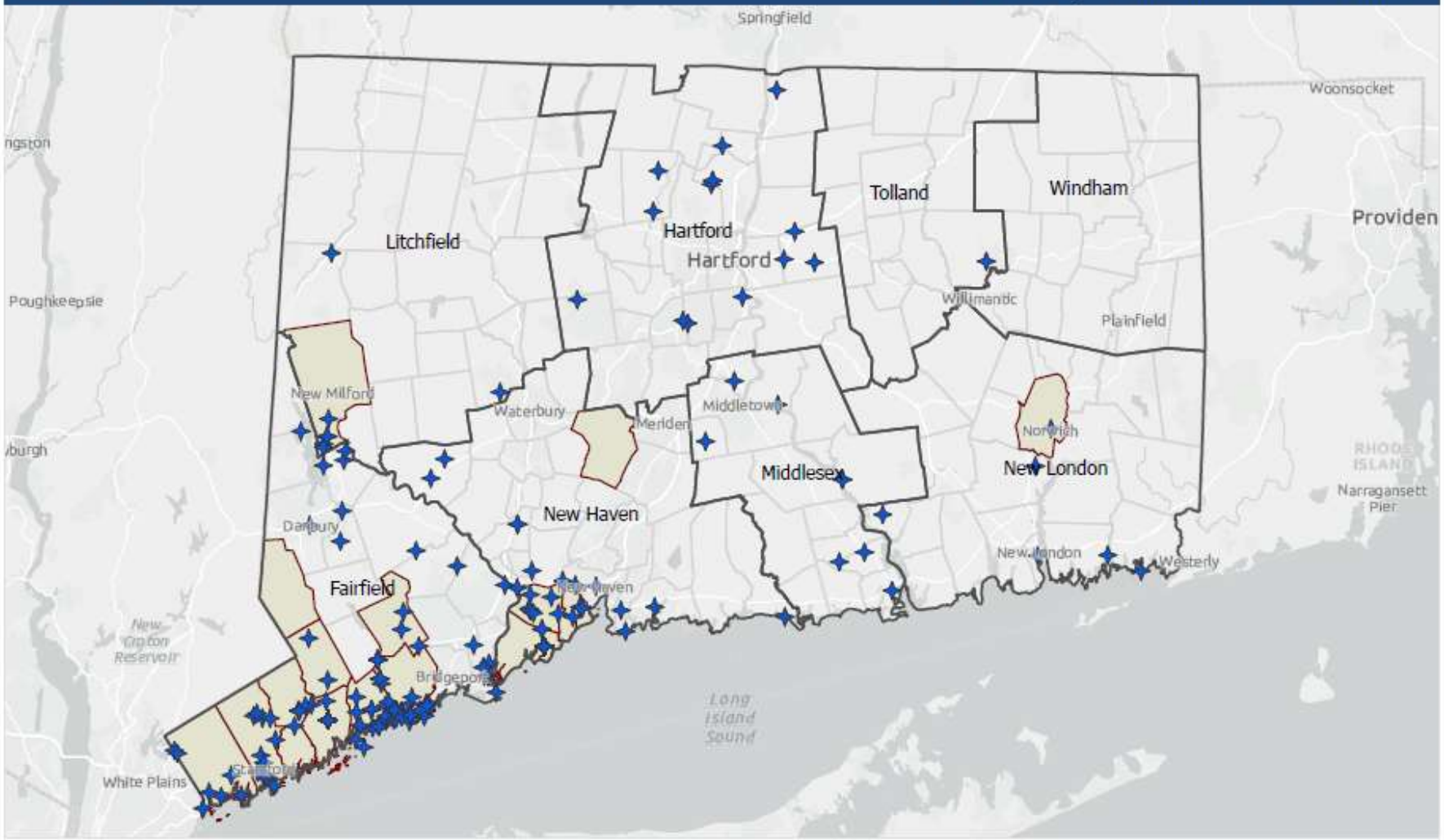




USDA United States Department of Agriculture

PPQ CT SPOTTED LANTERNFLY (LYCORMA DELICATULA) PROGRAM

CAES SLF Reports and State SLF Quarantine



CT County Boundary

CT Town Boundary

CT SLF Quarantine Towns

CAES SLF Reports (9/27/2022)

0 10 20 Miles

0 10 20 Kilometers

Date Created: 9/29/2022

USDA APHIS
97 Barnes Rd
Unit 20
Wallingford, CT 06492

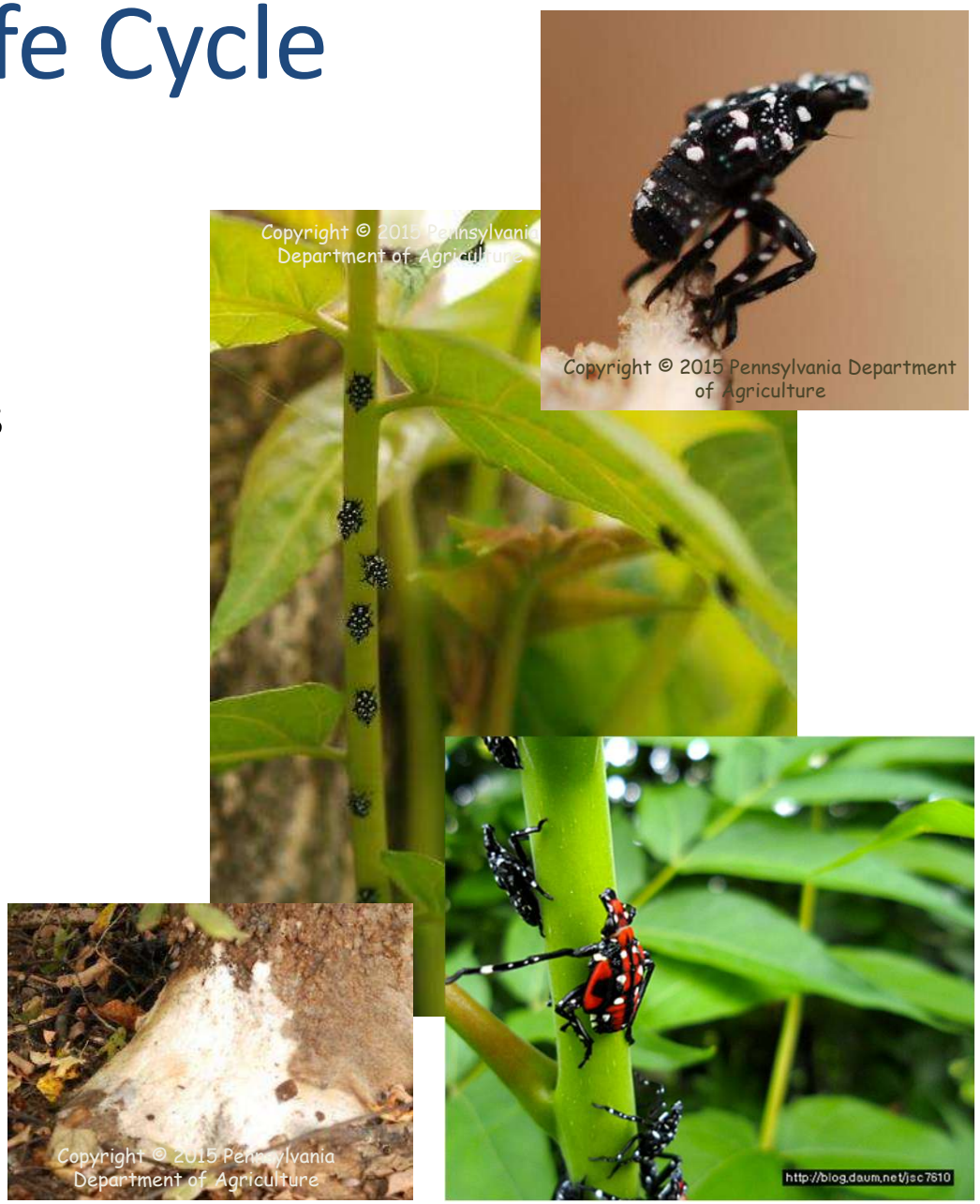
Spotted Lanternfly Hosts

They are phloem-feeders with piercing-sucking mouthparts; much like aphids

- stone fruit trees
- pine
- oak
- walnut
- poplar
- tree of heaven (*A. altissima*) – preferred host
- grape –Korean literature and PA have reported damage to vines, increased winter kill

Life Cycle

- Nymphs are black with white spots, later instars have red patches
- Nymphs feed on smaller plants and vines, moves to trees as they mature
- Feeding damage similar to aphids, honeydew can collect at plant base, large amounts from heavy infestations may produce fungal mats.

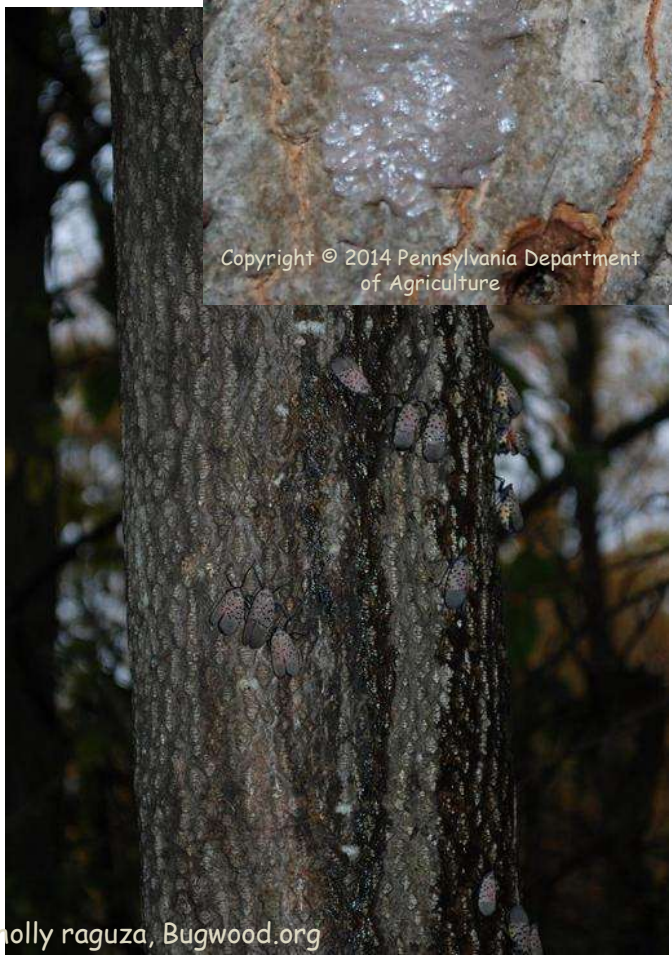


Lifecycle Timeline

- November – April: Egg masses overwinter
- May: Nymphs emerge
- June – July: Nymphs develop, potential early adults
- August: Adults begin appearing
- September: Adults feed, disperse, mate
- October: Females oviposit egg masses

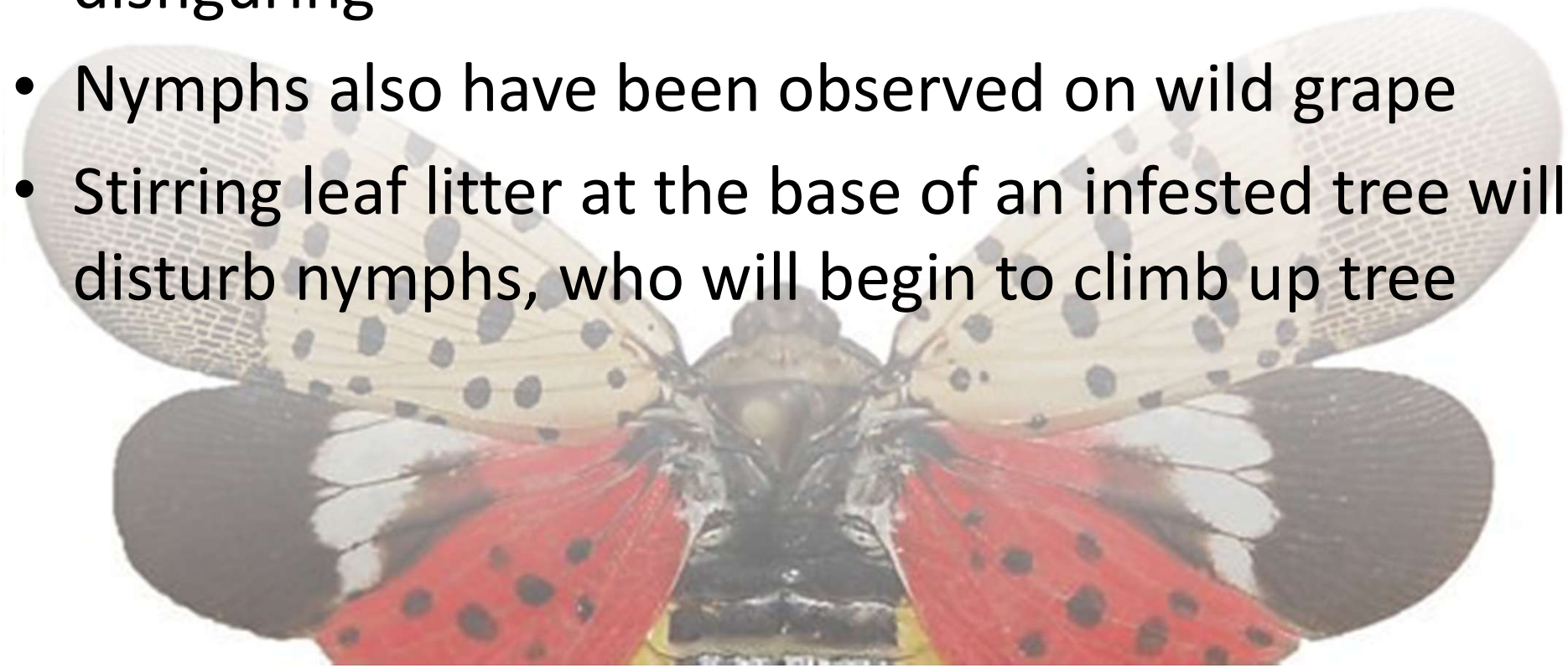
Life Cycle

- Adults could appear as early as July but start mostly in August
- Adults prefer Tree of Heaven as host for feeding, congregating and egg laying
- Adults are not strong fliers but are good jumpers – can travel!
- Egg masses are laid on under a waxy deposit – similar to spongy moth but harder to spot!
- Egg masses may be laid on smooth barked trees or smooth vertical surfaces such as stonework – can be moved!



Observations from PA:

- Nymphs are feeding on the upper sides of leaves on oak and ailanthus, causing discoloration and disfiguring
- Nymphs also have been observed on wild grape
- Stirring leaf litter at the base of an infested tree will disturb nymphs, who will begin to climb up tree



Monitoring for Spotted Lanternfly

- Survey is visual; no lures currently available though potential attractant pheromone isolations are in progress
- Sticky bands/Tanglefoot have been used to trap and detect nymphs and adults
- Tree-of-Heaven is a preferred host; it may help in establishing new populations, so surveys should focus on areas with established *Ailanthus*.
- Egg masses laid on furniture or stonework (or vehicles!) could be moved and spread infestation in a similar way to spongy moth

Insects That Chew


Moths (Lepidoptera)

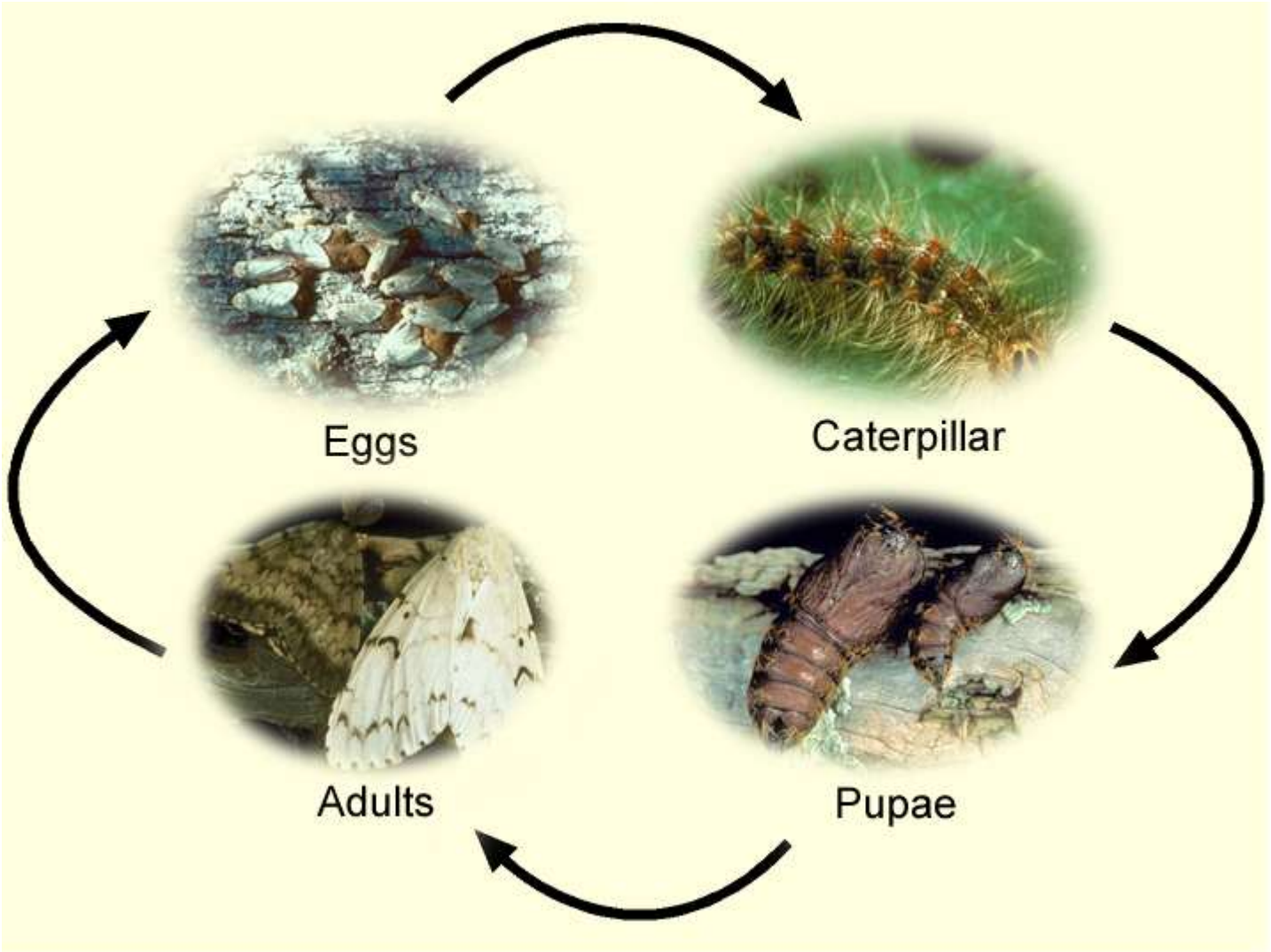

Beetles (Coleoptera)


Sawfly (Hymenoptera)

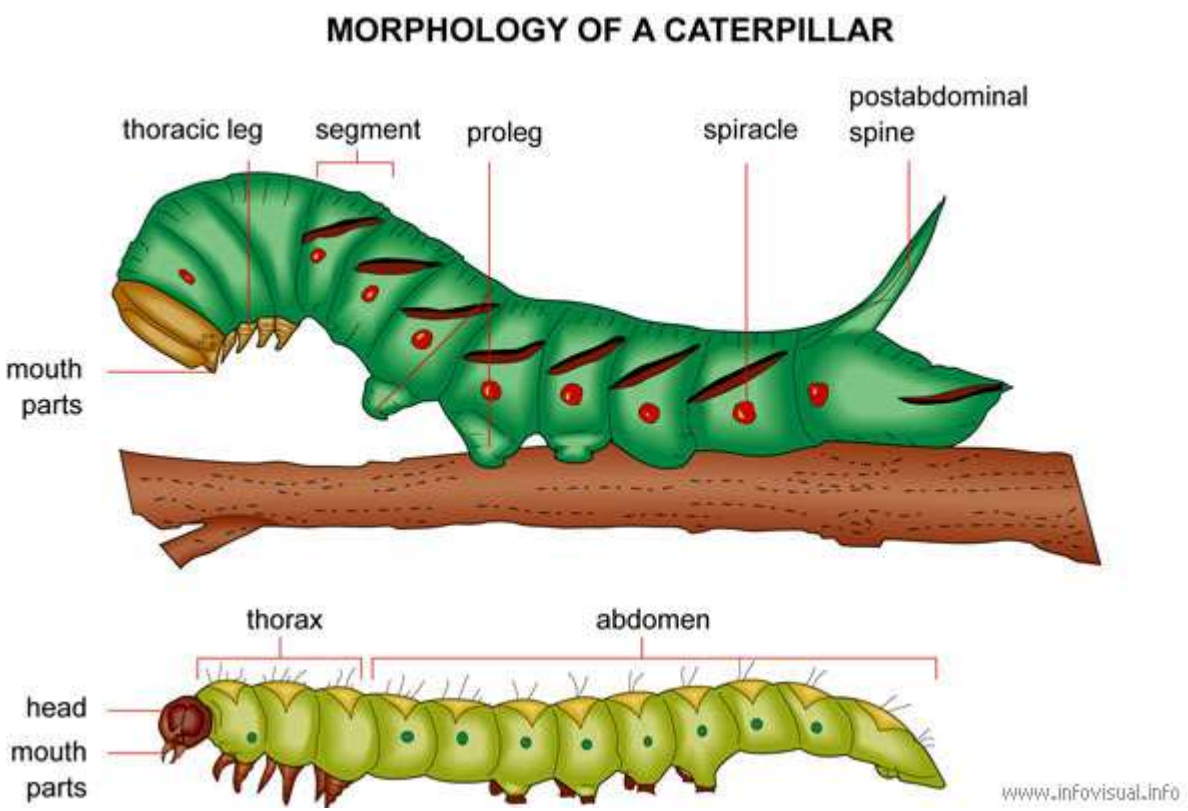
Fly (Diptera)

Moths: Lepidoptera

Moths Life Cycle

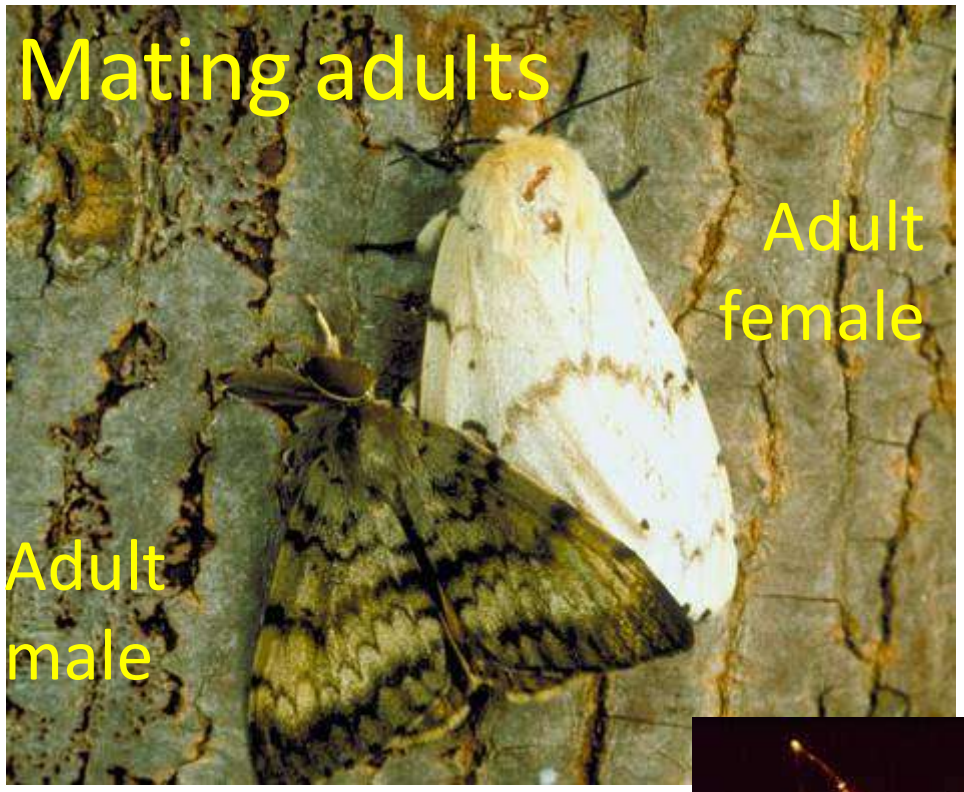


Caterpillars – Larval Moths

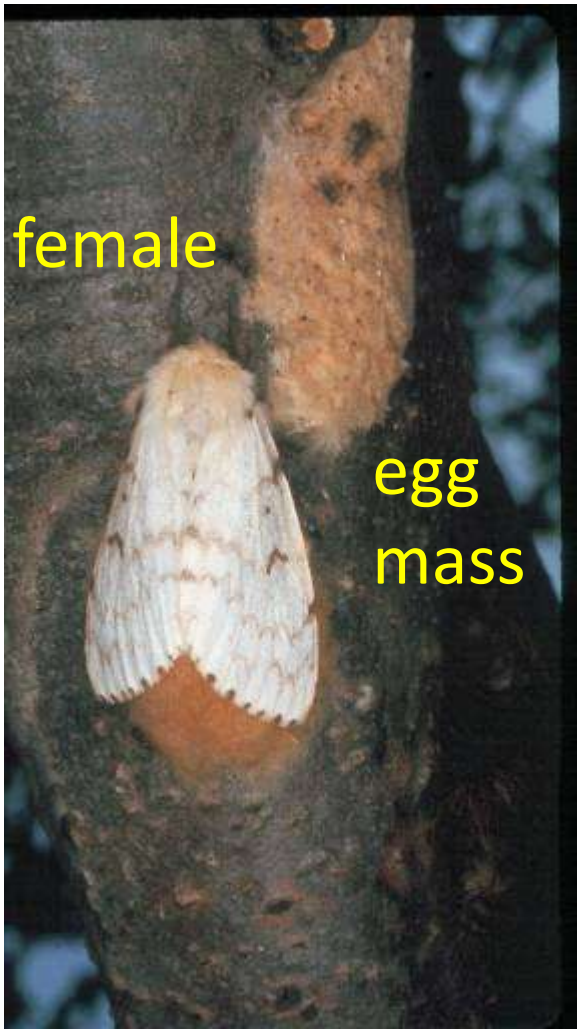


Spongy Moth

moth (Lepidoptera)



Adult male



DEFOLIATER

Spongy Moth

moth (Lepidoptera)

Spongy Moth

moth (Lepidoptera)

Winter in June

Favored Spongy Moth Host Trees

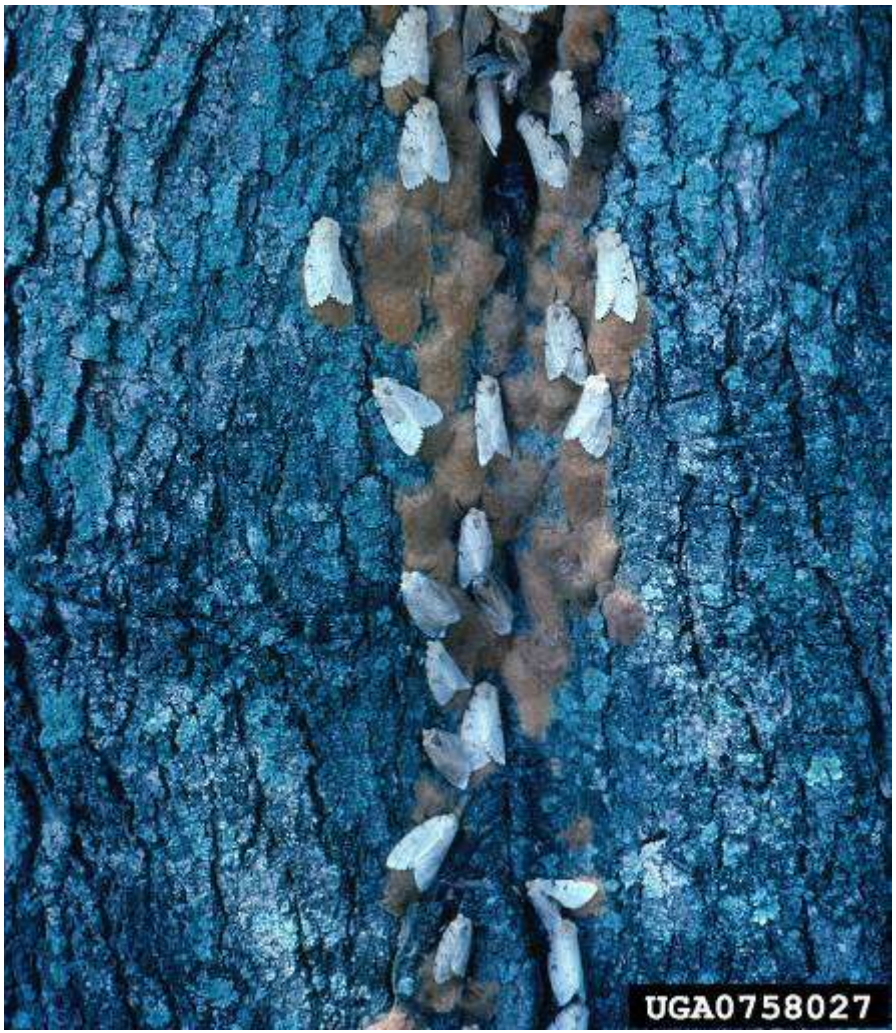
- Oaks, White Oak is most preferred
- Paper Birch
- Hophornbeam
- Basswood
- …. And when there is

an outbreak, anything it can get its mandibles on!

White Oak

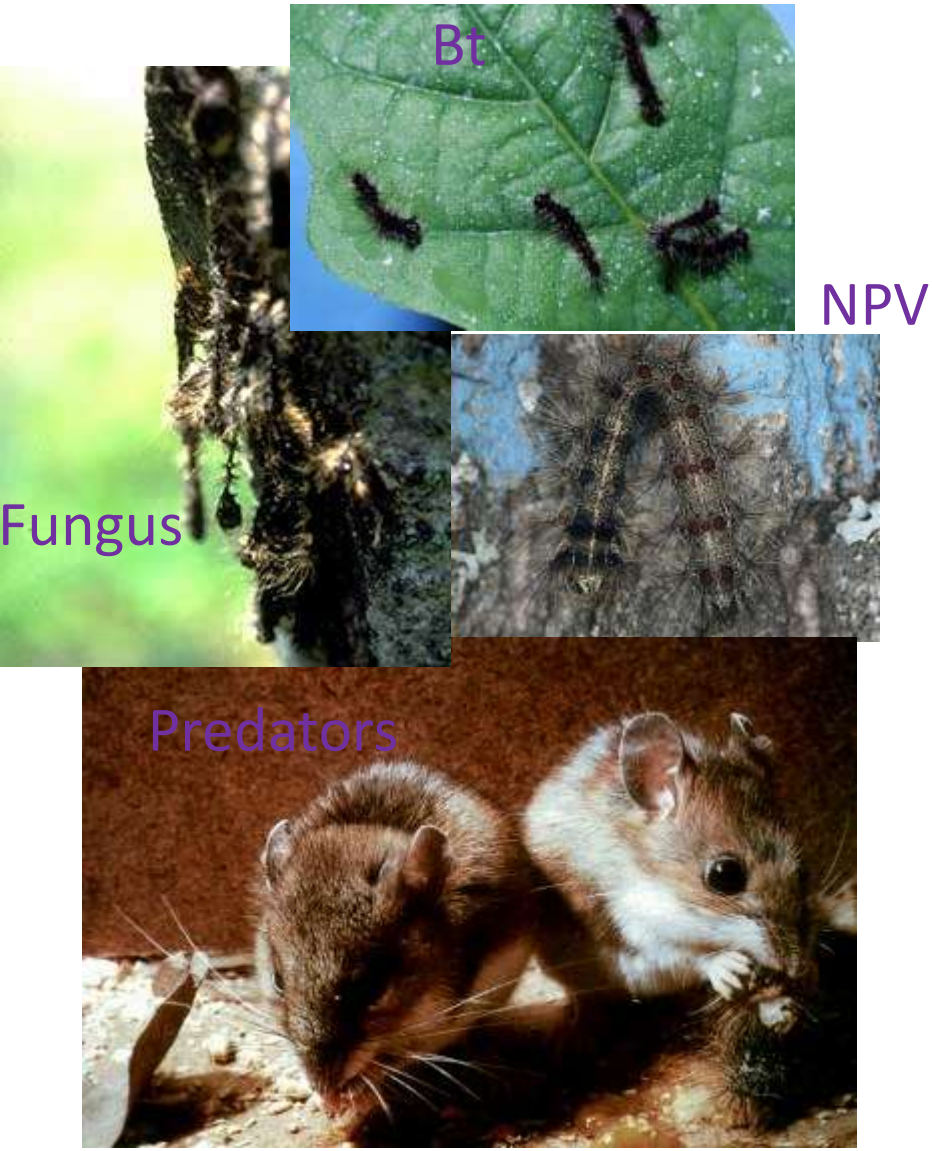
Spongy Moth

moth (Lepidoptera)



- One generation/ year
- Overwinter as eggs
- 1st instar is dispersal stage/ balloon
- Larvae eat at night, hide by day
- Larval feeding done by late June
- Females can’t fly (not true for Asian Spongies)
- Males find females by sex pheromone

Spongy Moth Management

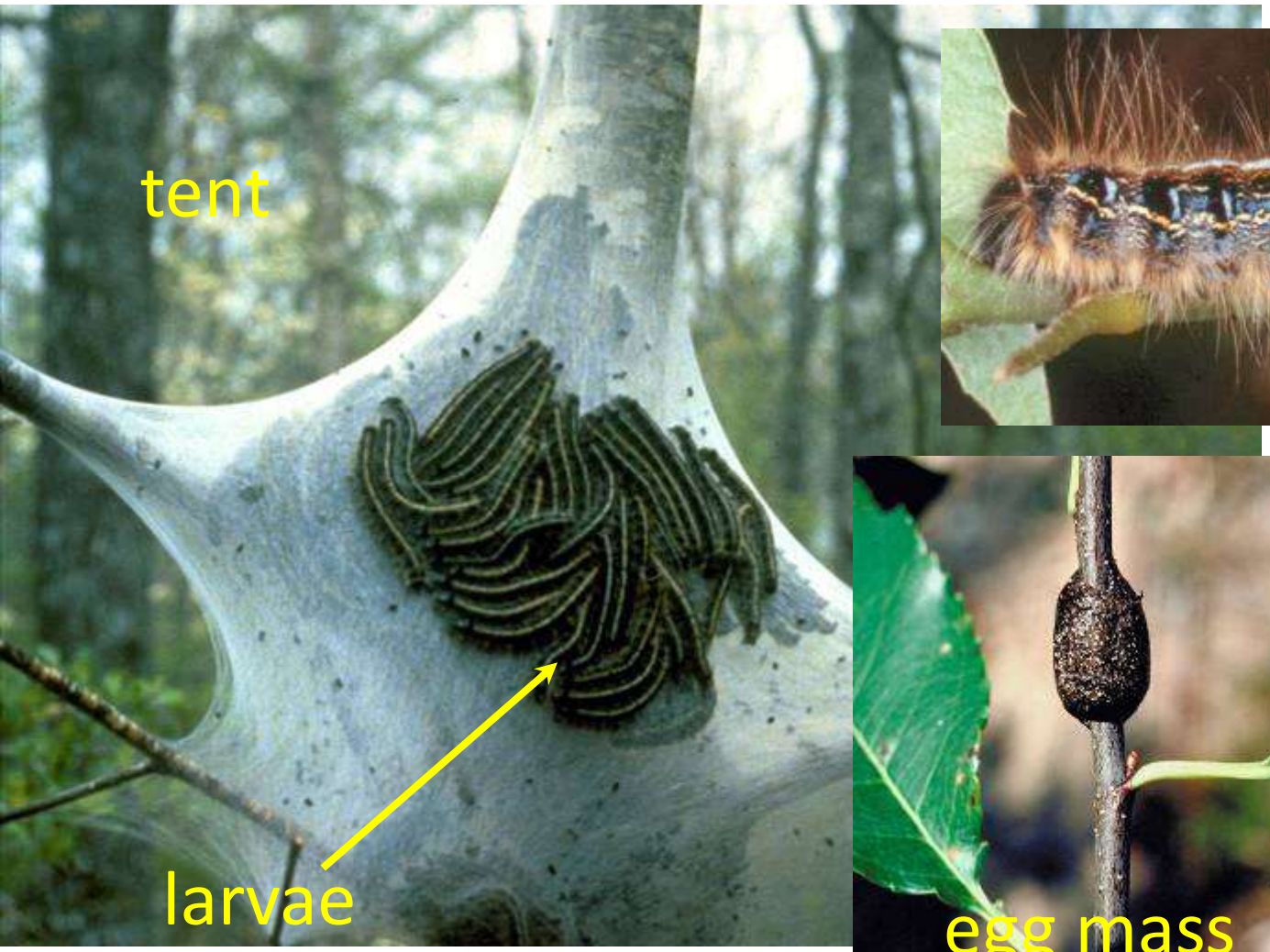


- Spongy moth outbreaks in cycles.
- Outbreaks ended by natural enemies, viruses, FUNGUS, (epidemics) predators, parasitoids
- Area-wide management (forests): aerial spraying of virus or bacteria
- Specific trees protect with burlap bands, sprays: virus, conventional insecticides (lots)
- Target young caterpillars, older ones harder to kill

DEFOLIATER

Eastern Tent Caterpillar

moth (Lepidoptera)



mature larva

DEFOLIATER

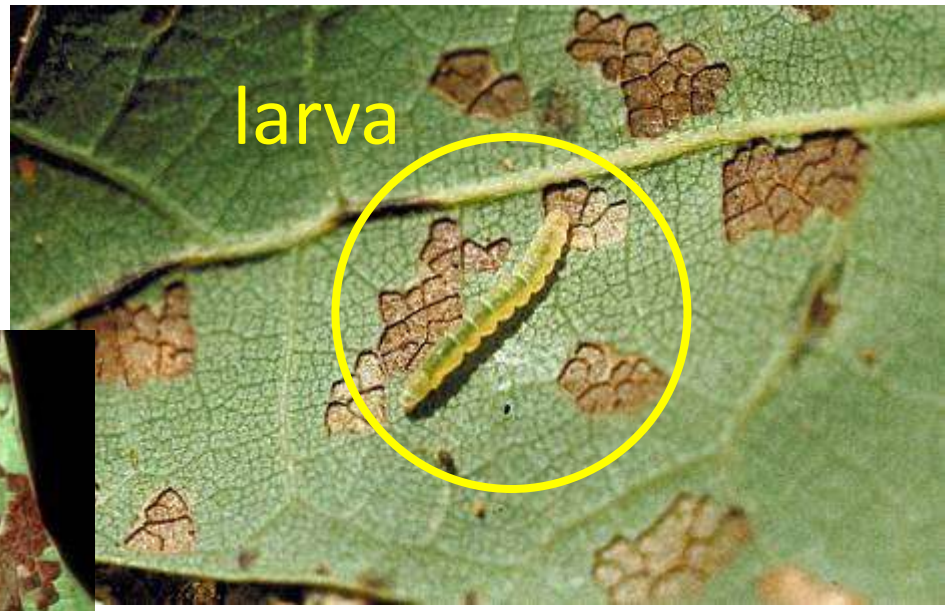
Eastern Tent Worm Management

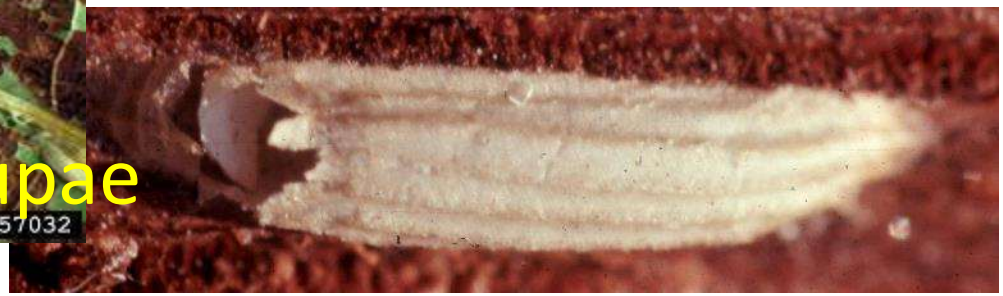
- Hosts – wild cherry, apple, elm maple, others
- Hatch in early spring/ timed to wild cherry
- Feed during day/ in tents at night
- One generation / yr.
- Can remove egg masses

Oak skeletonizer

moth (Lepidoptera)

adult

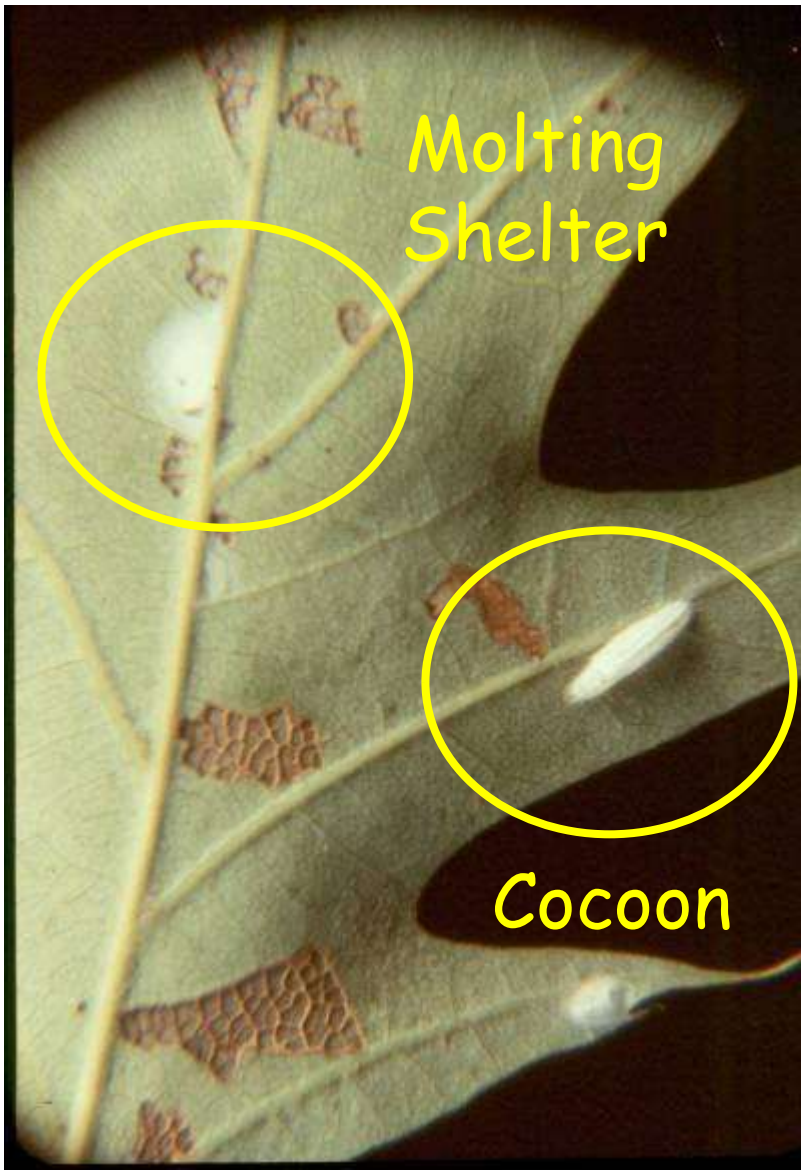




Oak skeletonizer

moth (Lepidoptera)

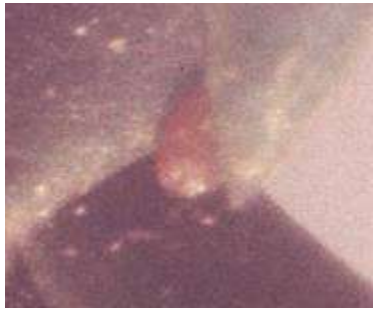
Oak Skeletonizer Management



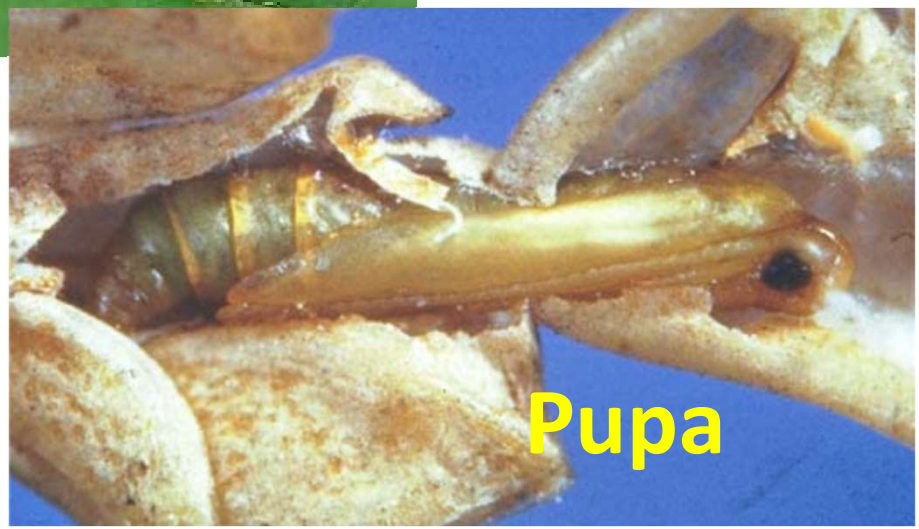
- Hosts – Oaks
- 2 gens. / yr. Larvae active 6/4-20 & 8/7-24
- Occasionally high enough levels to be damaging –usually a nuisance due to larvae dropping on silk, and numerous cocoons
- If necessary, spray when large numbers of young larvae

Arborvitae leafminer

moth (Lepidoptera)



egg



Arborvitae leafminer

moth (Lepidoptera)

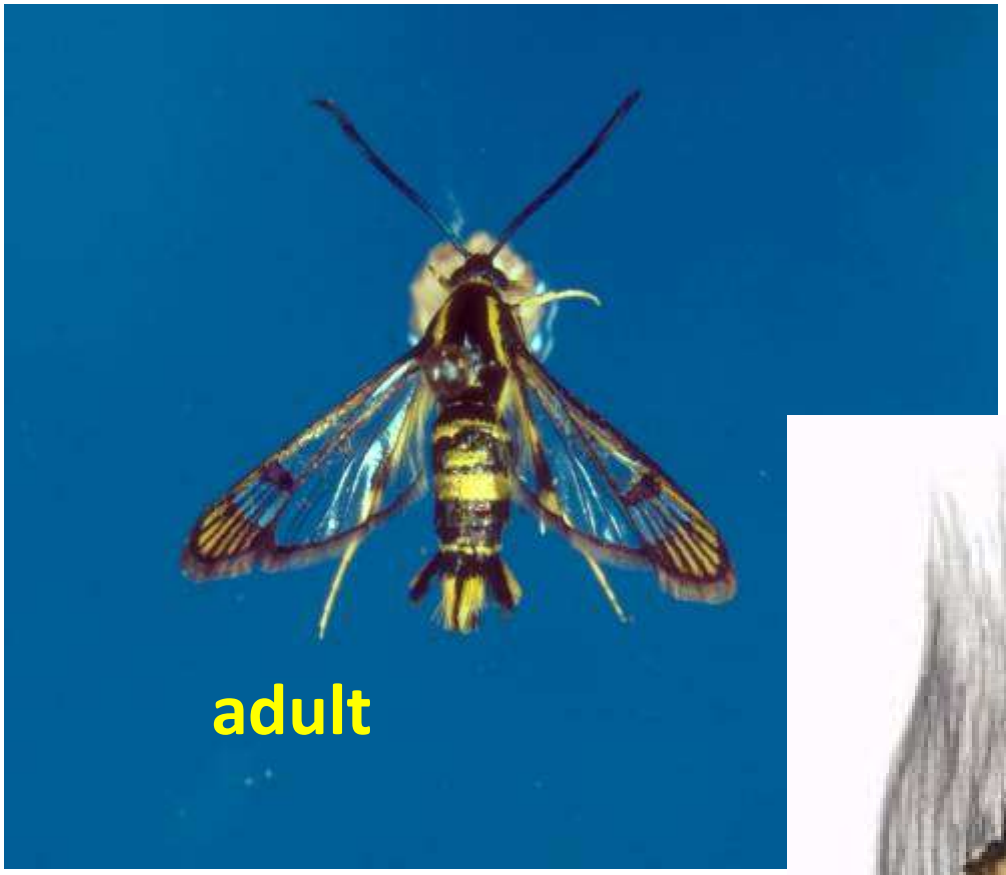
Damage
(Mined needles)

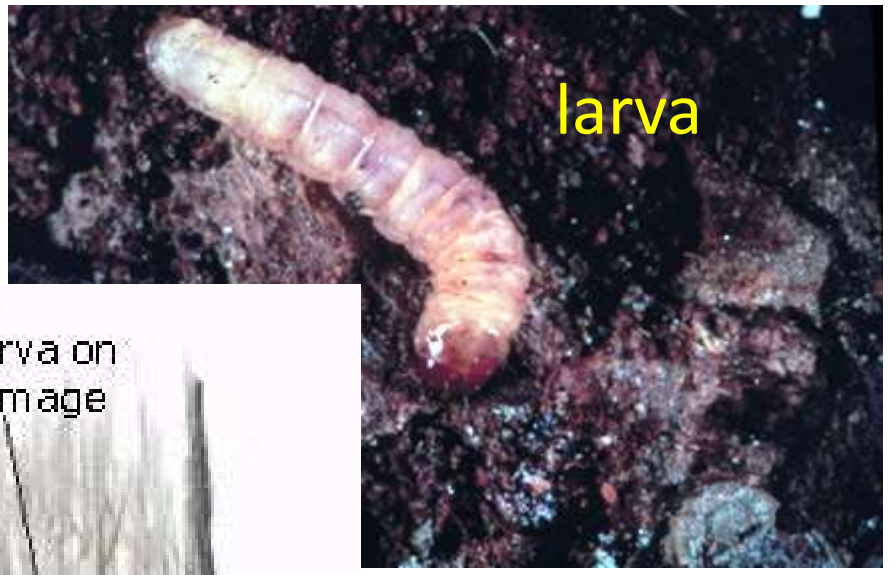
Arborvitae Leafminer Management

- Host – Arborvitae
- Moth – mid May to June
- Larvae – mid June / overwinter as larvae
- Damage on tips of twigs
- Usually only aesthetic damage
- Trim and discard brown tips
- If needed – overwintering larvae treat 5/10-22, adults 6/10-20, summer larvae - 8/7-16 imidicloprid, acephate for adults

Dogwood borer

moth (Lepidoptera)





Dogwood borer

moth (Lepidoptera)

BORER

Dogwood Borer Management

- Hosts – Flowering dogwood, apple, mountain ash, oak, other deciduous trees
- Larvae feed on cambium, girdle tree
- Adults emerge mid May. Peak is late June – mid July.
- Monitor adults with pheromone traps
- Larvae can only get in wounds or cracks: Avoid bark damage
- Control : one bark drench 14 days after 1st adult caught e.g. permethrin

Sawflies (Hymenoptera)

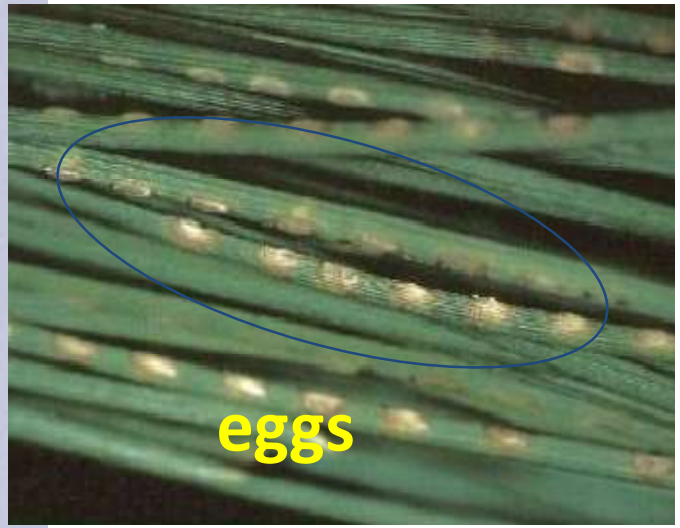
Sawfly (Hymenoptera)

DEFOLIATOR

European Pine Sawfly & Redheaded Pine Sawfly sawfly

(Hymenoptera)

adult



larvae

DEFOLIATOR

European Pine Sawfly & Red Headed Pine Sawfly sawfly (Hymenoptera)

European Pine Sawfly

sawfly (Hymenoptera)

- Hosts- Pines
- One generation per year
- Eggs Overwinter
- Hatch in late April
- Feed gregariously on older needles till mid May
- Trees < 15 ft most at risk
- Feed from top to bottom of tree

DEFOLIATOR

Redheaded Pine Sawfly

sawfly (Hymenoptera)

- Hosts – Pines
- One generation per year
- Overwinter in cocoons in ground
- Trees < 15 ft most at risk
- Larvae feed gregariously in June

DEFOLIATOR

European Pine & Redheaded Pine Sawfly Management

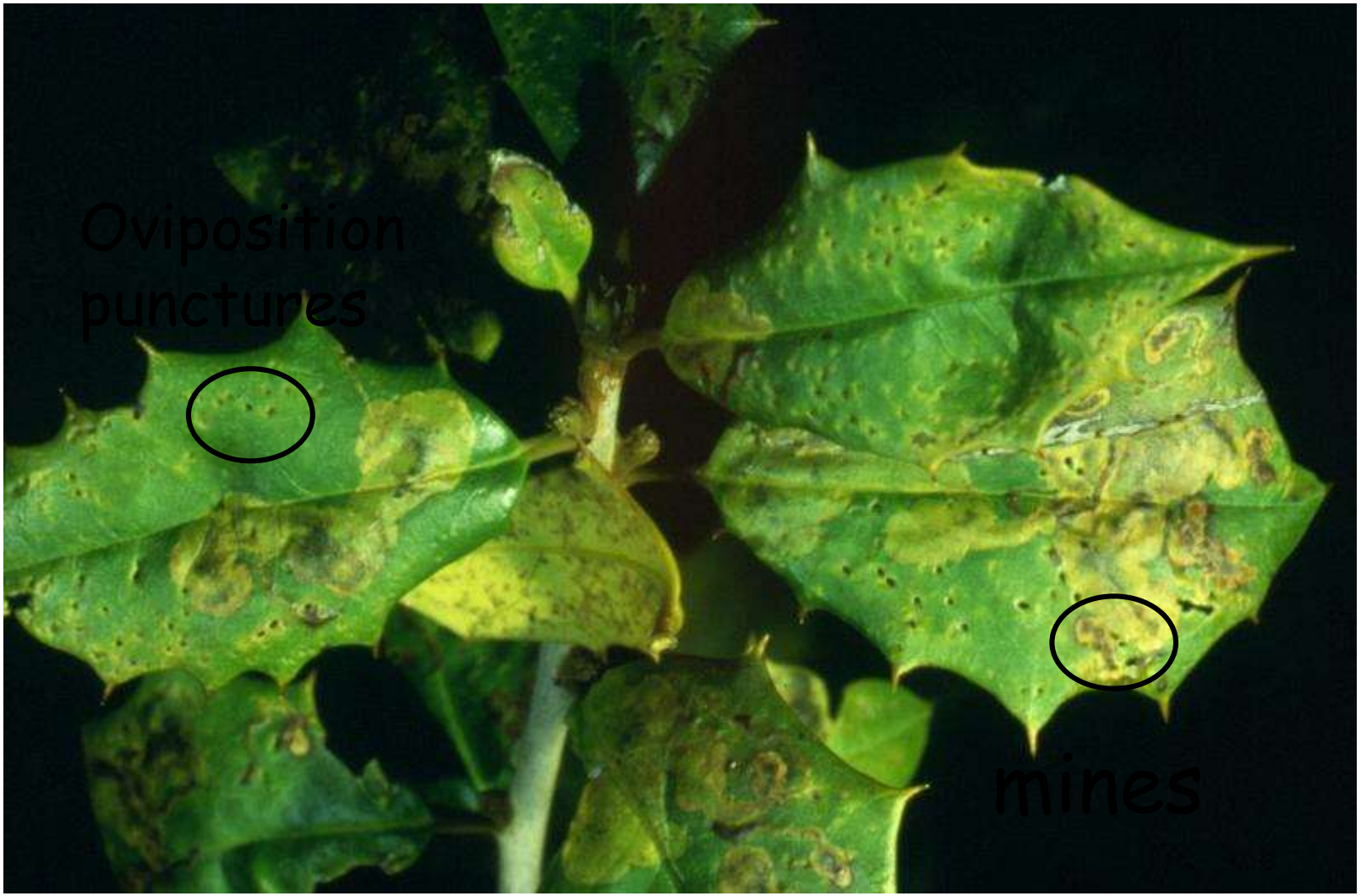
- Scout pine trees beginning late-April to mid-May
- Infestations sporadic/ lots of Natural Enemies
- Spot treatment often adequate

Holly Leafminer

fly (Diptera)

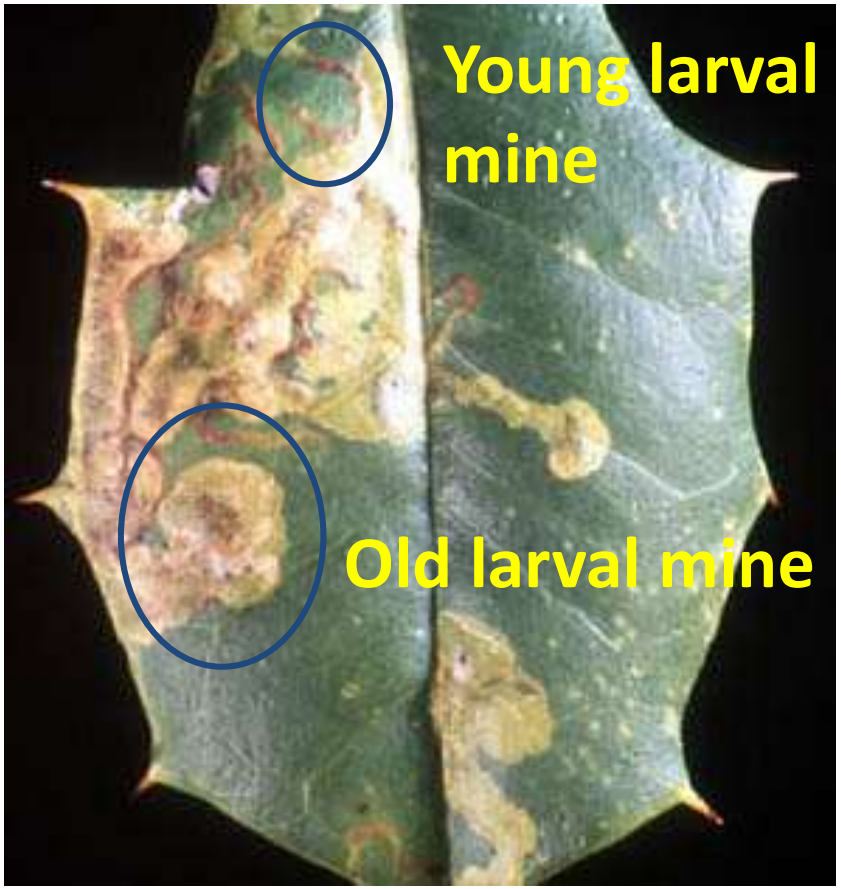
Holly Leafminer

fly (Diptera)



Holly leafminer

fly (Diptera)



- Hosts – Holly
- Adults appear mid-to-late May
- Maggots yellow
- Maggots overwinter in mine, can see now
- One generation per year

Holly Leafminer Management

- Damage mainly aesthetic, in heavy infestations may lose leaves
- Lays eggs only American Holly
- Gather and destroy dropped leaves w/ mines
- Soil treatment with systemic between 5/14-24
- Foliar spray for adults 5/21-6/5, must cover tops and bottoms of the leaves. Can fine tune timing by looking for oviposition/ feeding scars

Beetles (Coleoptera)

Beetle Grubs (larvae) (Coleoptera)

Borer: Larvae Defoliator: Adult

Black vine weevil

beetle (Coleoptera)

- Intro 1910 CT
- Hosts – Taxus, hemlock, rhododendron, azalea, mountain laurel
- One generation/ year
- Adults feed on leaves at night, hide in leaf litter by day
- Can’t fly, so move in pots
- Larvae overwinter in soil, feed on roots in spring

Borer: Larvae Defoliator: Adult

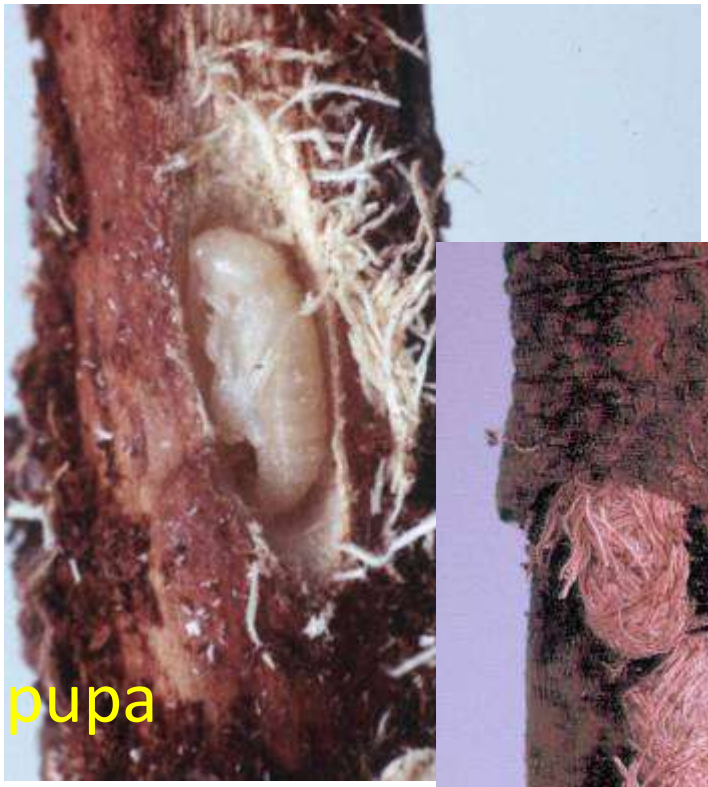
Black Vine Weevil Management

- Larval damage in spring most serious
- Monitor for adults by creating hiding space on ground with burlap, then look during day
- Goal: prevent egg laying. Control adults between 6/10-20, 3 weeks after first seeing adults
- Larvae may be controlled by entomophathogenic nematodes in soil drench, most effective in pots Rich Cowles

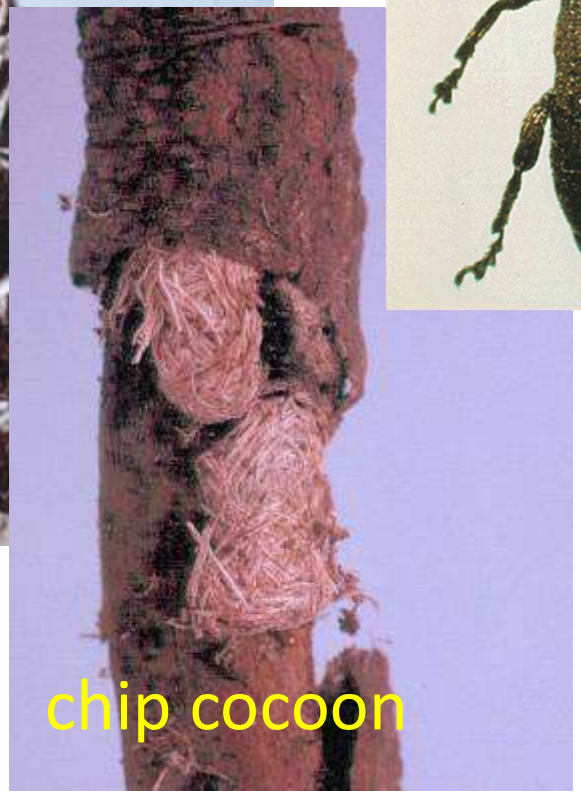
White Pine Weevil

beetle (Coleoptera)

adult



pupa



chip cocoon

larvae

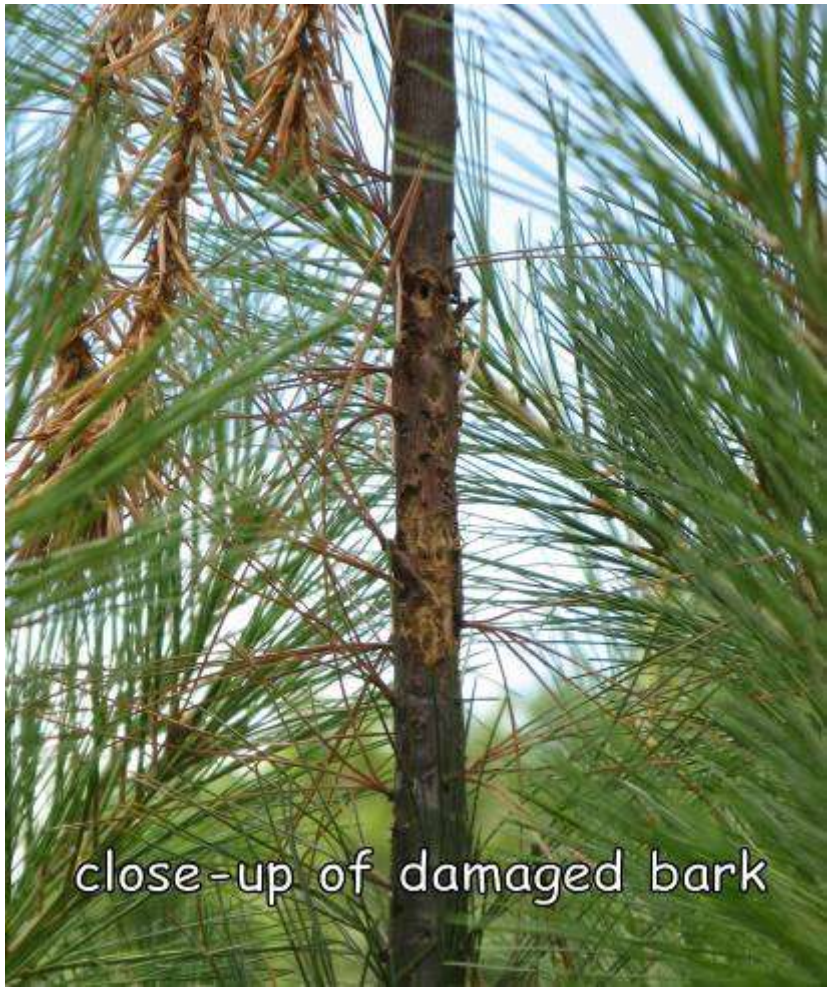
BORER

White Pine Weevil

beetle (Coleoptera)

White Pine Weevil

beetle (Coleoptera)



- Hosts – Pines, spruces
- One generation / yr.
- Adults overwinter in ground litter
- Adults emerge April 1 – 20
- Feed in leader, leave tiny holes, resin drops
- Eggs laid in leader
- Larvae tunnel and feed in leader

White Pine Weevil Management

- Trees < 15 ft. most susceptible
- Larvae girdle leader, leading to stunted growth and distorted growth forms
- Cut out and destroy infested leader before late June/ prune all but 1 live lateral shoot
- If spray, between April 1 and April 20, targets adults

White Pine Weevil Management

- Trees < 15 ft. most susceptible
- Larvae girdle leader, leading to stunted growth and distorted growth forms
- Cut out and destroy infested leader before late June
- If spray, between April 1 and April 20, targets adults

Bronze Birch Borer

beetle (Coleoptera)

Bronze Birch Borer

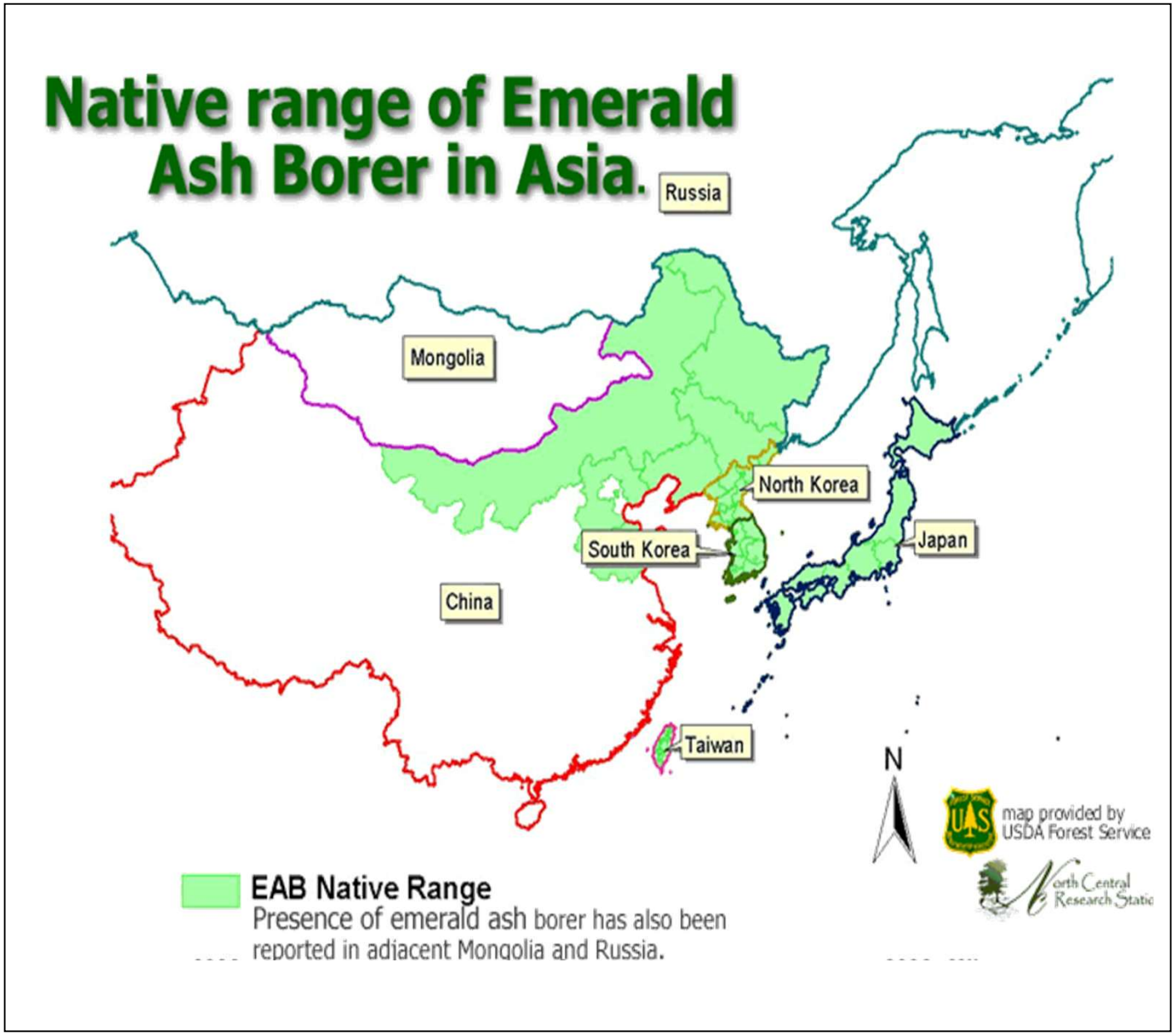
beetle (Coleoptera)

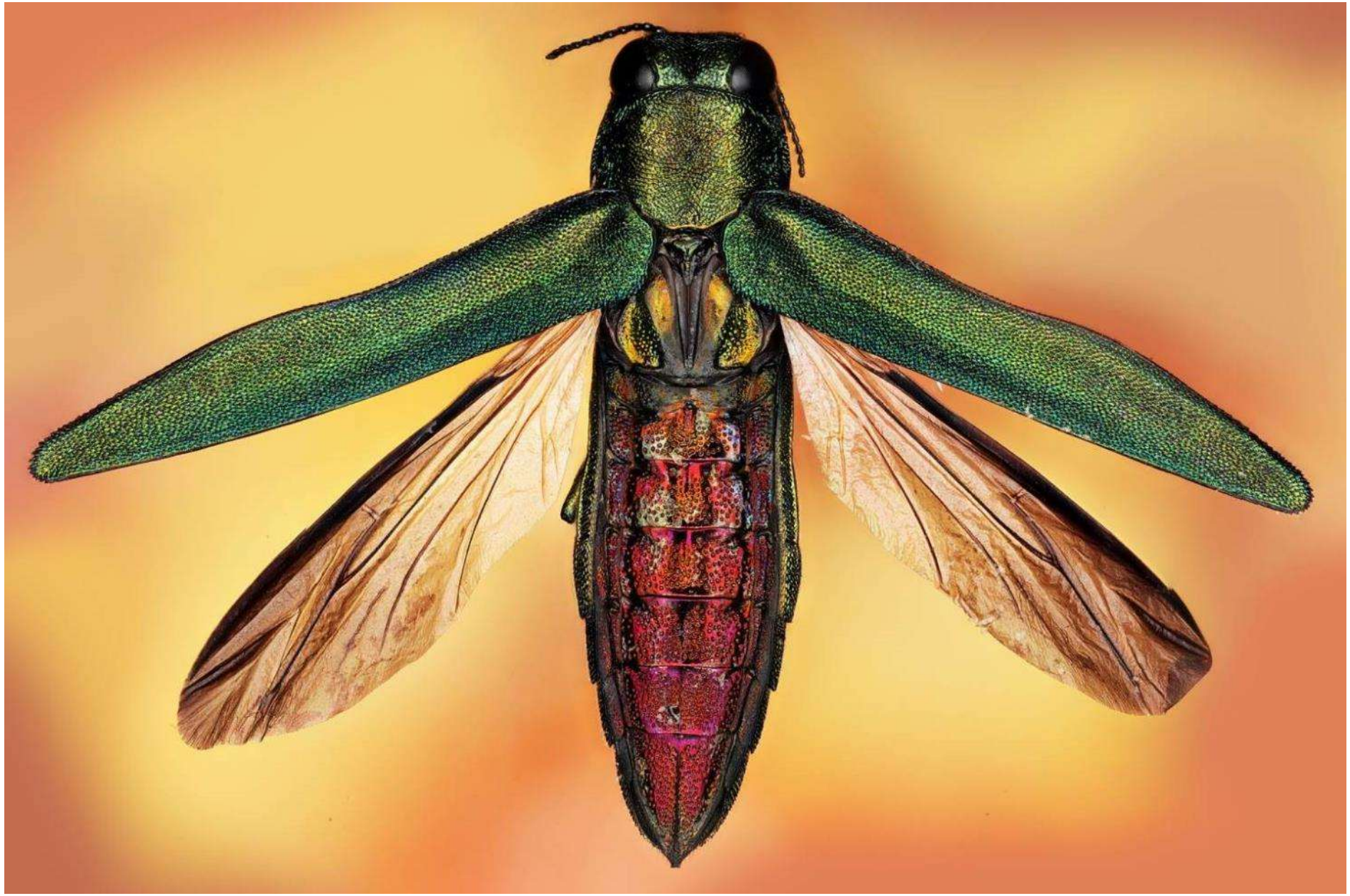
- Hosts – Birch, paper, white, grey, Jacquemontii
- Adults emerge early June – August, most in June
- Lay eggs in crevices of bark
- Larvae tunnel in phloem / cambium
- Overwinter as larvae in tree

Bronze Birch Borer Management

- Resistant Cultivars –, non-native birches more susceptible, native species/ cultivars preferable e.g. Heritage
- TLC – watering, fertilizer, limit wounding: stressed trees are susceptible, healthy trees resist
- Systemic insecticides: e.g. Imidacloprid, Dinotefuran

The Emerald Ash Borer *Agrilus planipennis*


Native range of Emerald Ash Borer in Asia.
Russia
Mongolia
North Korea
South Korea
Japan
China
Taiwan
N
map provided by USDA Forest Service
North Central Research Station
EAB Native Range
Presence of emerald ash borer has also been reported in adjacent Mongolia and Russia.



Host Trees

- All Ashes: *Fraxinus* spp.
- Not Mountain Ash
- Not Prickly Ash

How to Identify Ash Trees

Authors: Kimberly Rebek
and Mary Wilson

CAES

Not all Ash is Equal

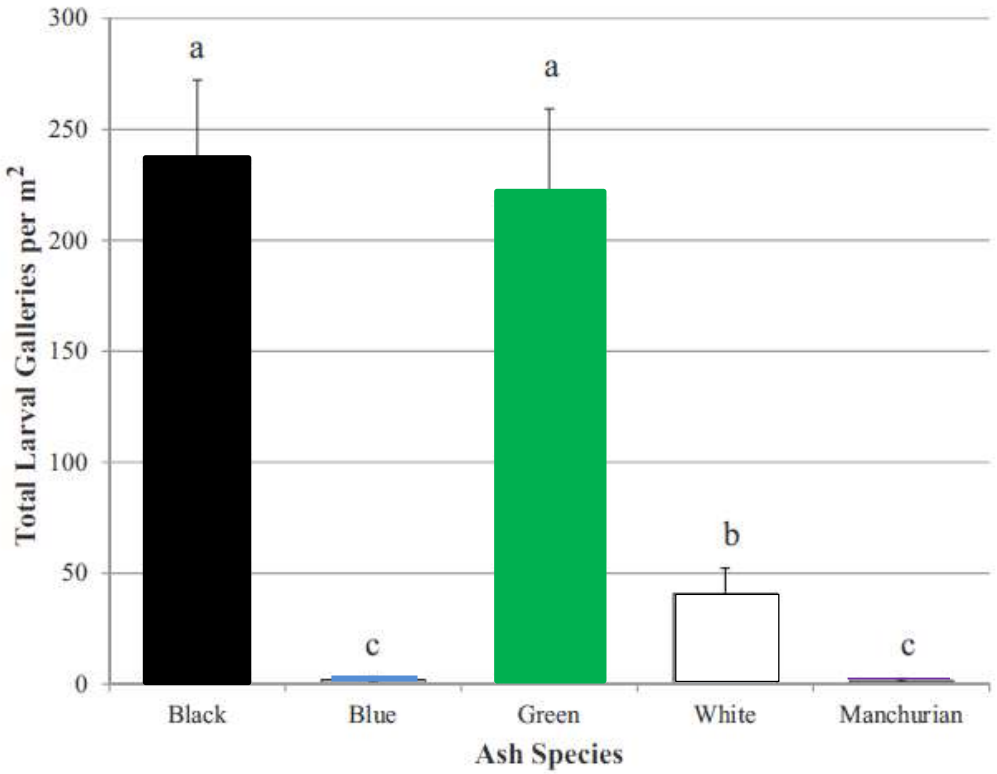


Fig. 3. Mean (± SE) number of *Agrilus planipennis* larval galleries per square meter of debarked phloem on black, blue, green, white, or Manchurian ash trees harvested in 2011 ($N = 21$ trees per species). Letters indicate differences among species ($\alpha = 0.05$).

Tanis & McCullough 2015

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White fringetree, *Chionanthus virginicus* L. (Oleaceae)

Courtesy of Dan Herms, Ohio Agricultural Research and Development Center, Wooster, Ohio

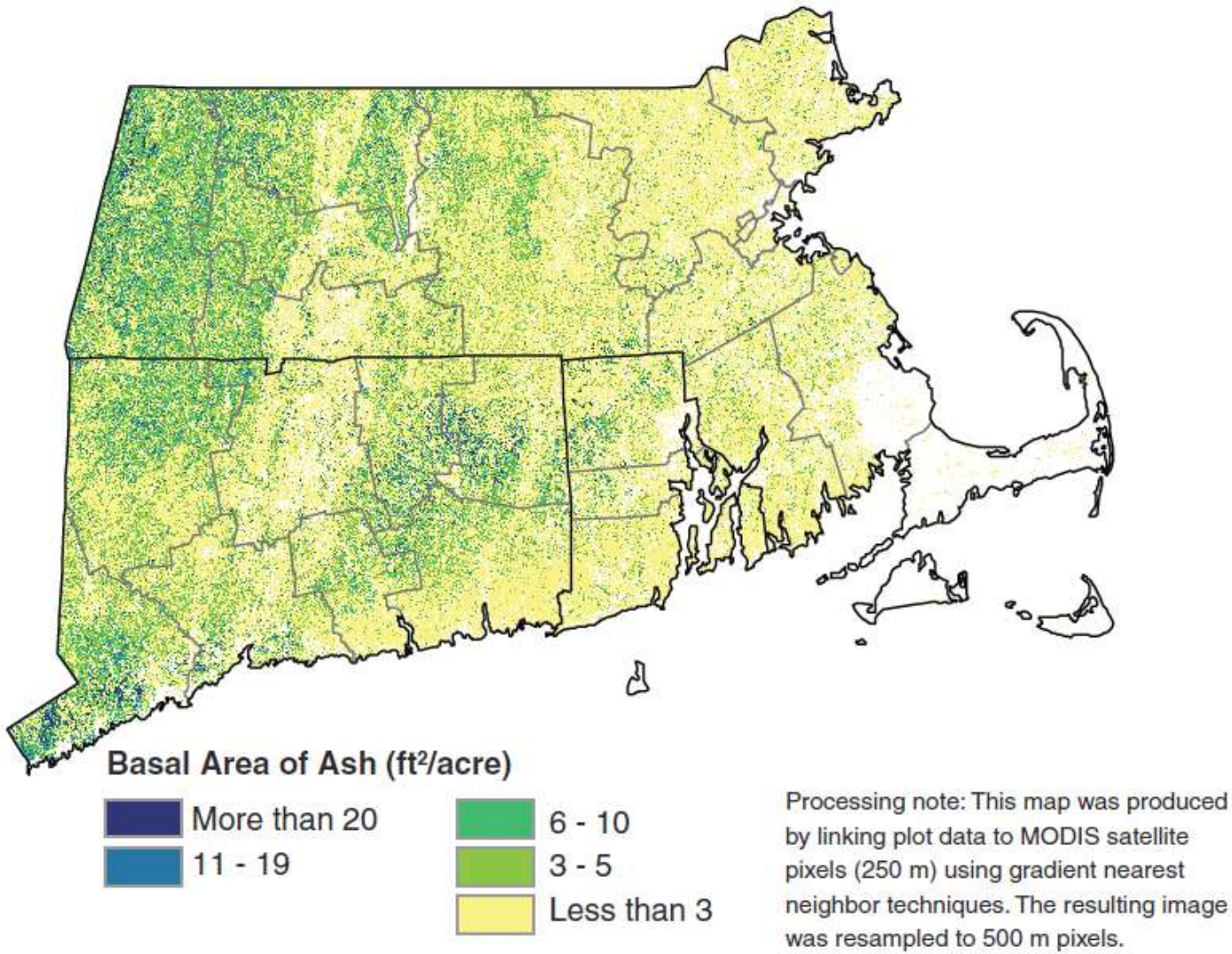

Figure 35.—Distribution of ash species on forest land, Southern New England, 2007.

NRS-55 USDA FS NRS 2011

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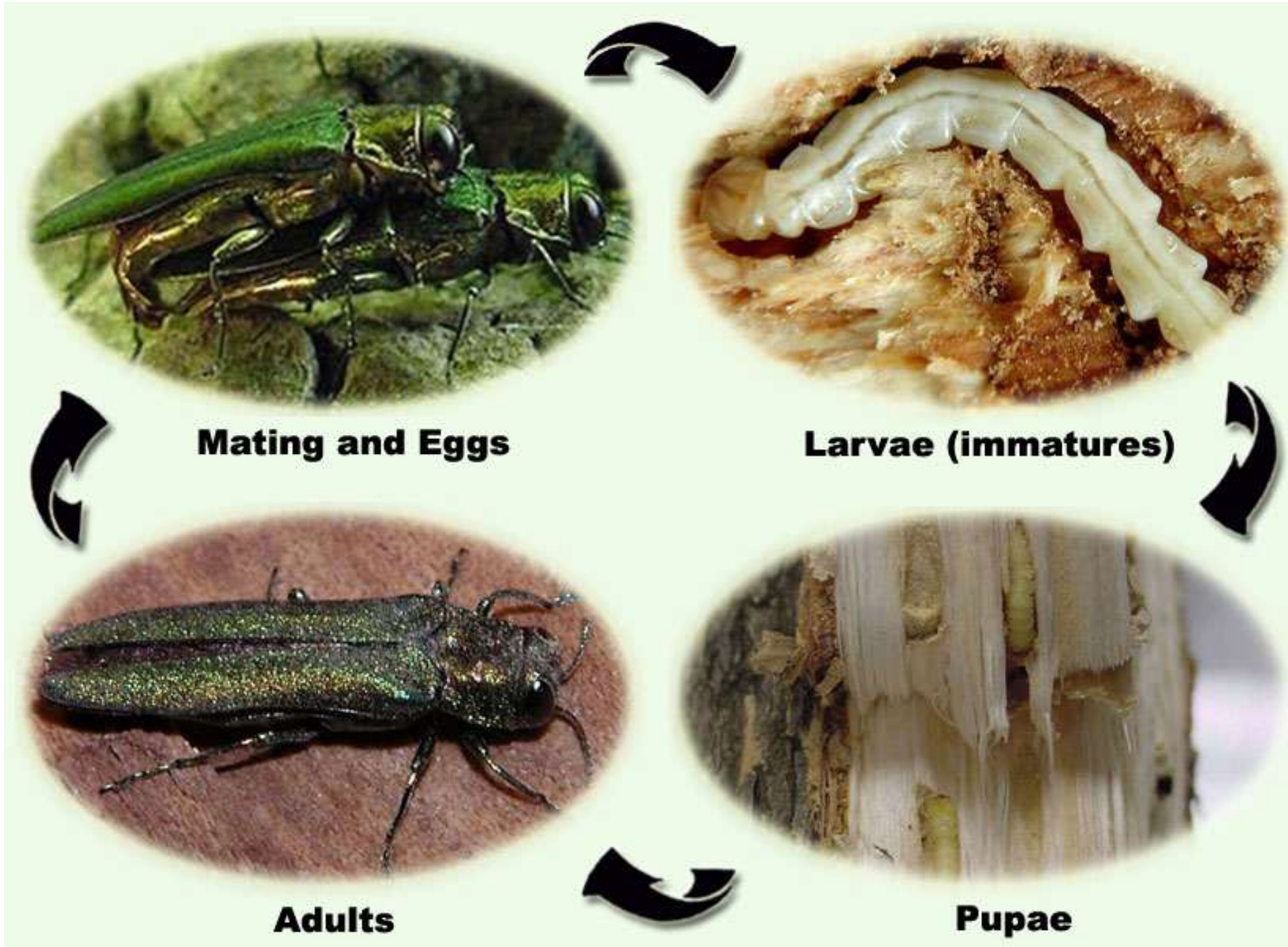
Mating and Eggs
Larvae (immatures)
Adults
Pupae

Biology

- Most adults emerge in June, but emergence can last all summer/ black locust bloom
- Adults feed for about 10 days before mating
- Both males and females mate multiple times
- Adults live about 5 weeks

Biology

- One female can lay up to 200 eggs, average is 50
- Eggs laid in crevices of bark
- Hatch in 10 – 12 days
- Larvae tunnel into and feed on cambium/ phloem
- Feed through summer

Serpentine Galleries

- All stages eat the phloem, cambium and score the outer layer of sapwood
- Kills tree by girdling it

Biology

- Spend winter as pre-pupae in small chamber in wood or in thick bark

- Pupate and develop starting in spring

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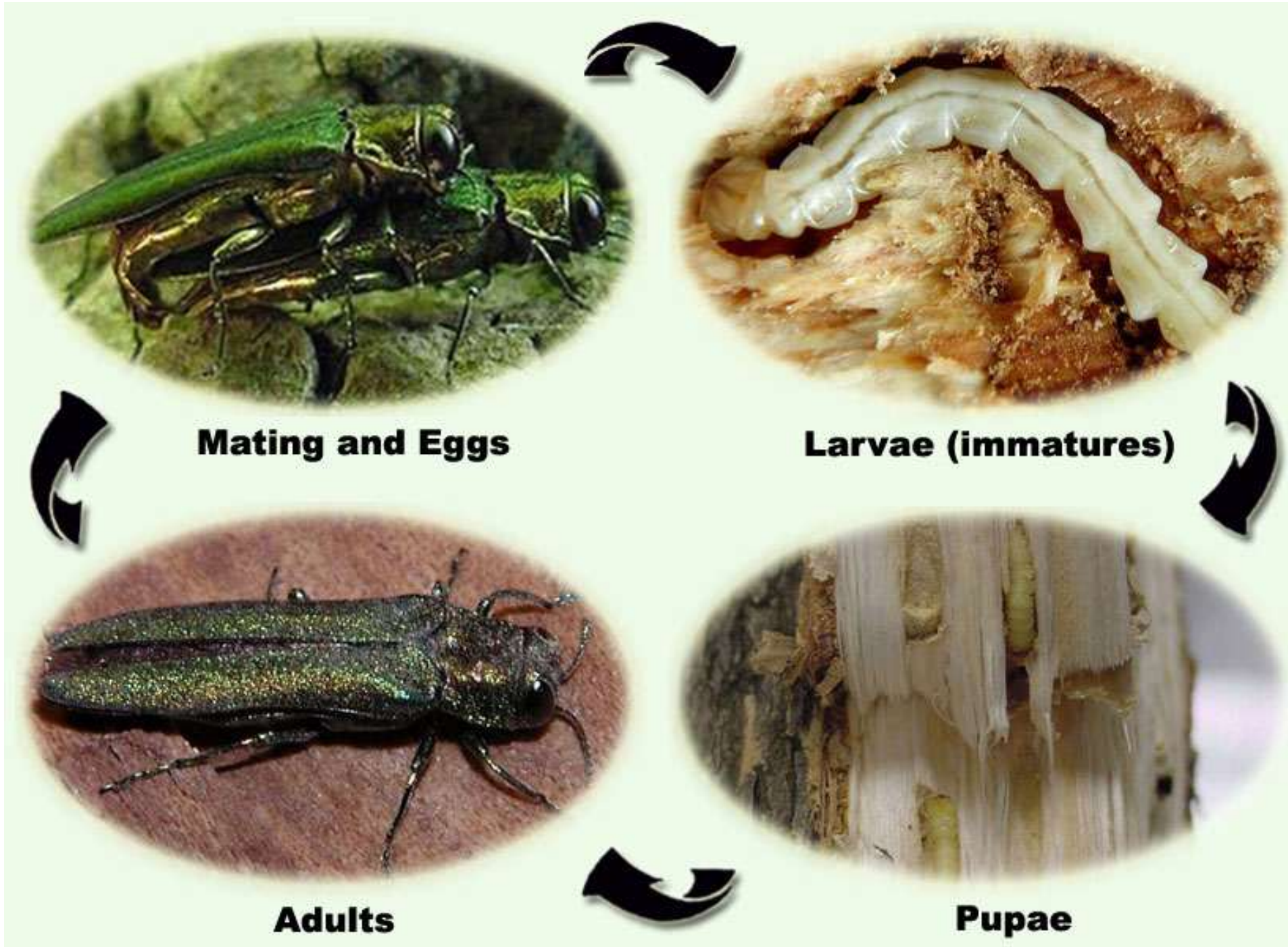
Mating and Eggs
Larvae (immatures)
Adults
Pupae

Death of an Ash Tree

1 2 3 4 5

Ash canopy health condition rating scale

Smith (2006)

CAES

dead and dying ash

Prospec

CAES

Branch Die-Back, Bristol

Picture courtesy of Chris Donnelly DEEP

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Dead Neighborhood Trees in Middletown, CT

Cassandra Day / Hearst Connecticut Media

4/23/2019

Dieback

Hamden

Prospect

Dead Ash, Thomaston

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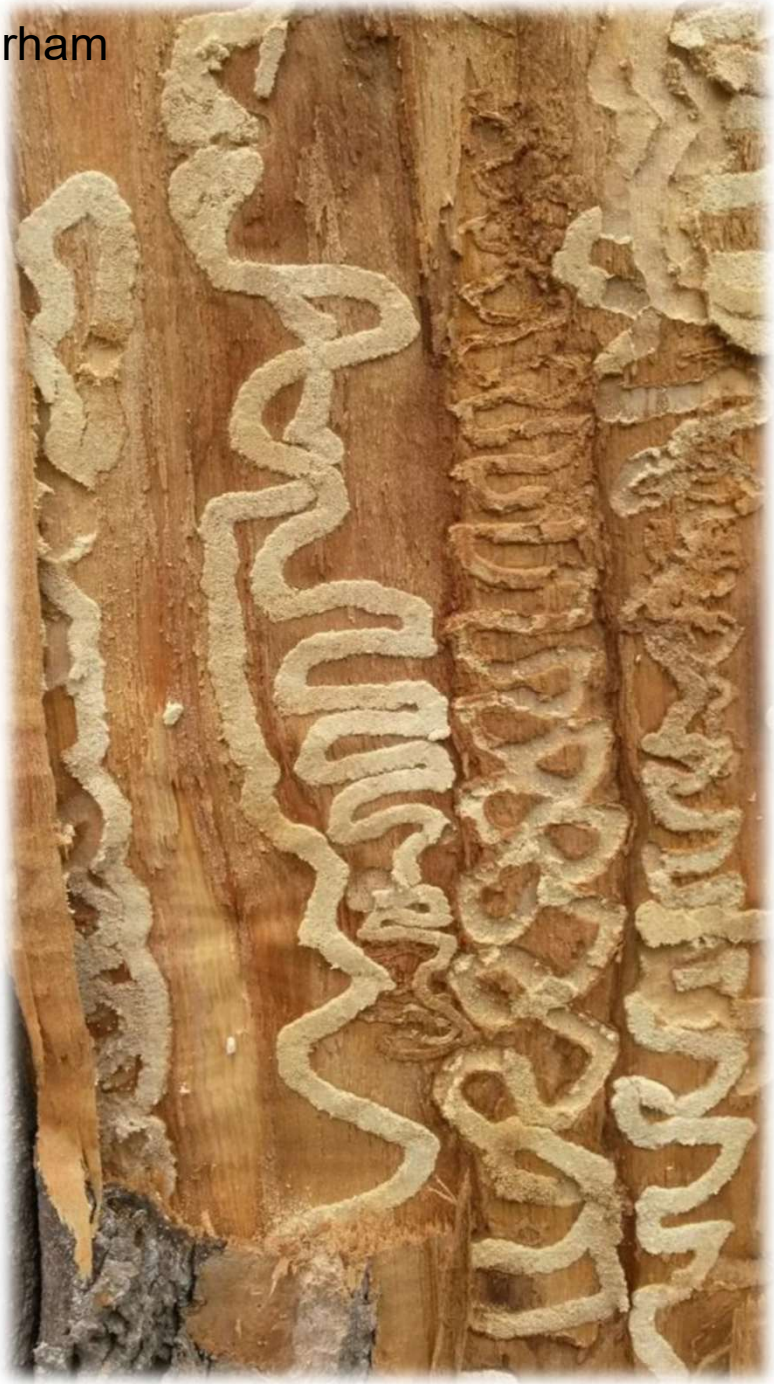
Tunnels

Hamden

Durham



Woodpecker damage

Waterbury

Southbury

Middlebury

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Bethany 2016

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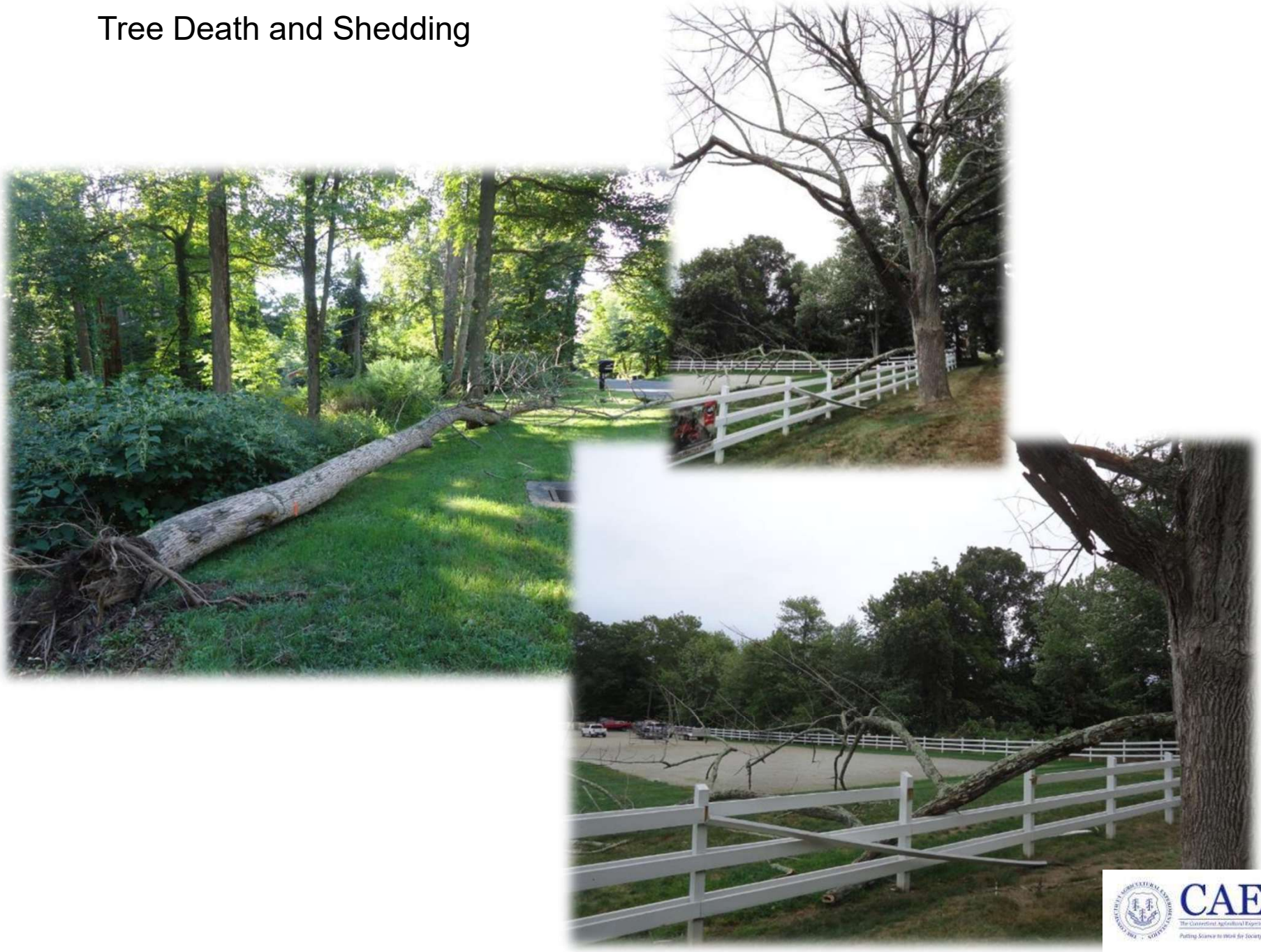
Tree Death and Shedding



Falling tree kills woman, seriously injures Horlick High School teacher in Caledonia

Jacquelyn Abad WDJT –Milwaukee
Posted: Oct 22, 2018 10:13 CDT

Loss of life and limb: Michigan's weakened trees pose deadly threat

John Barnes, Special to The Detroit News Published 11:01 p.m. ET Oct. 27, 2018

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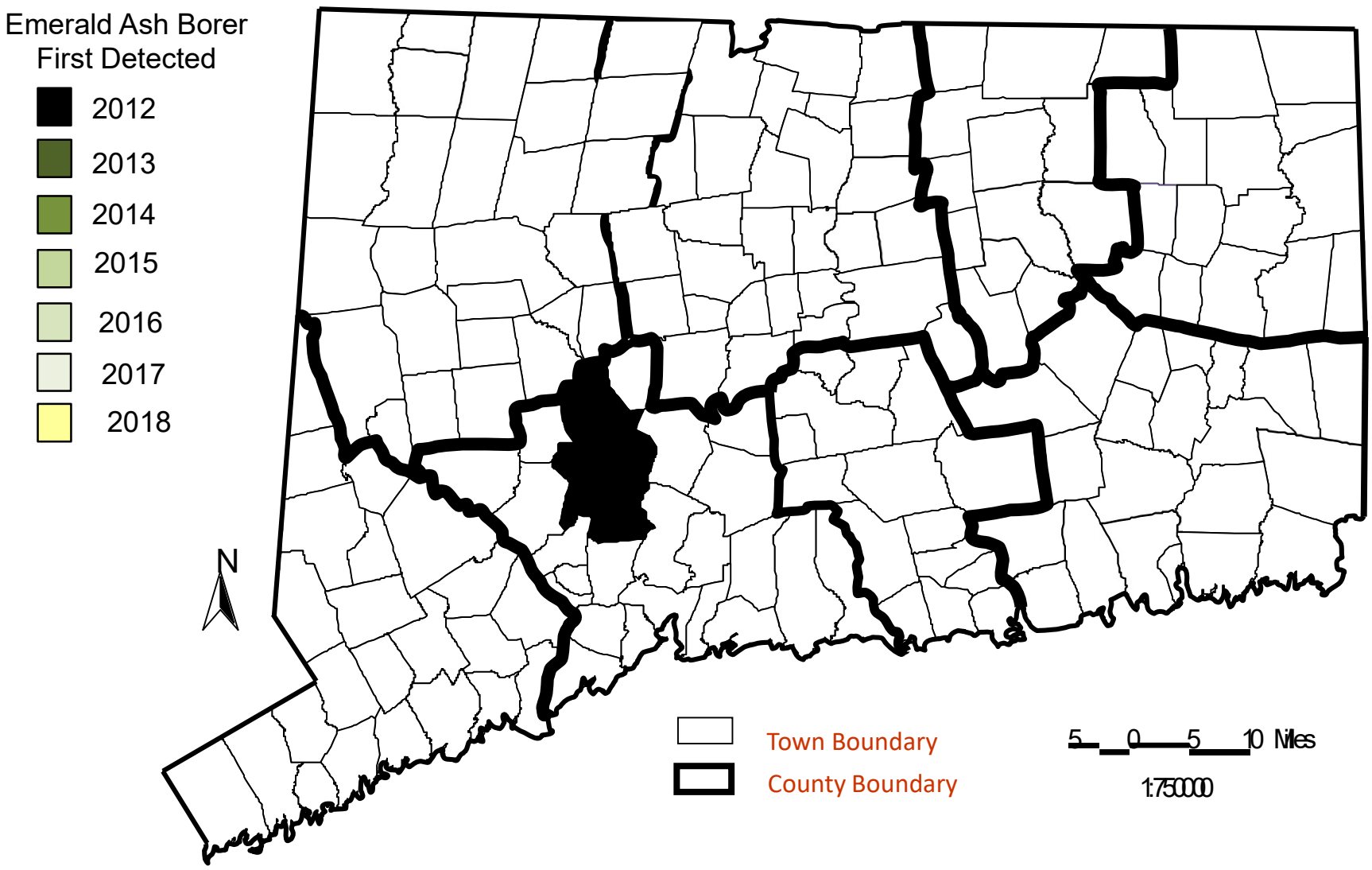
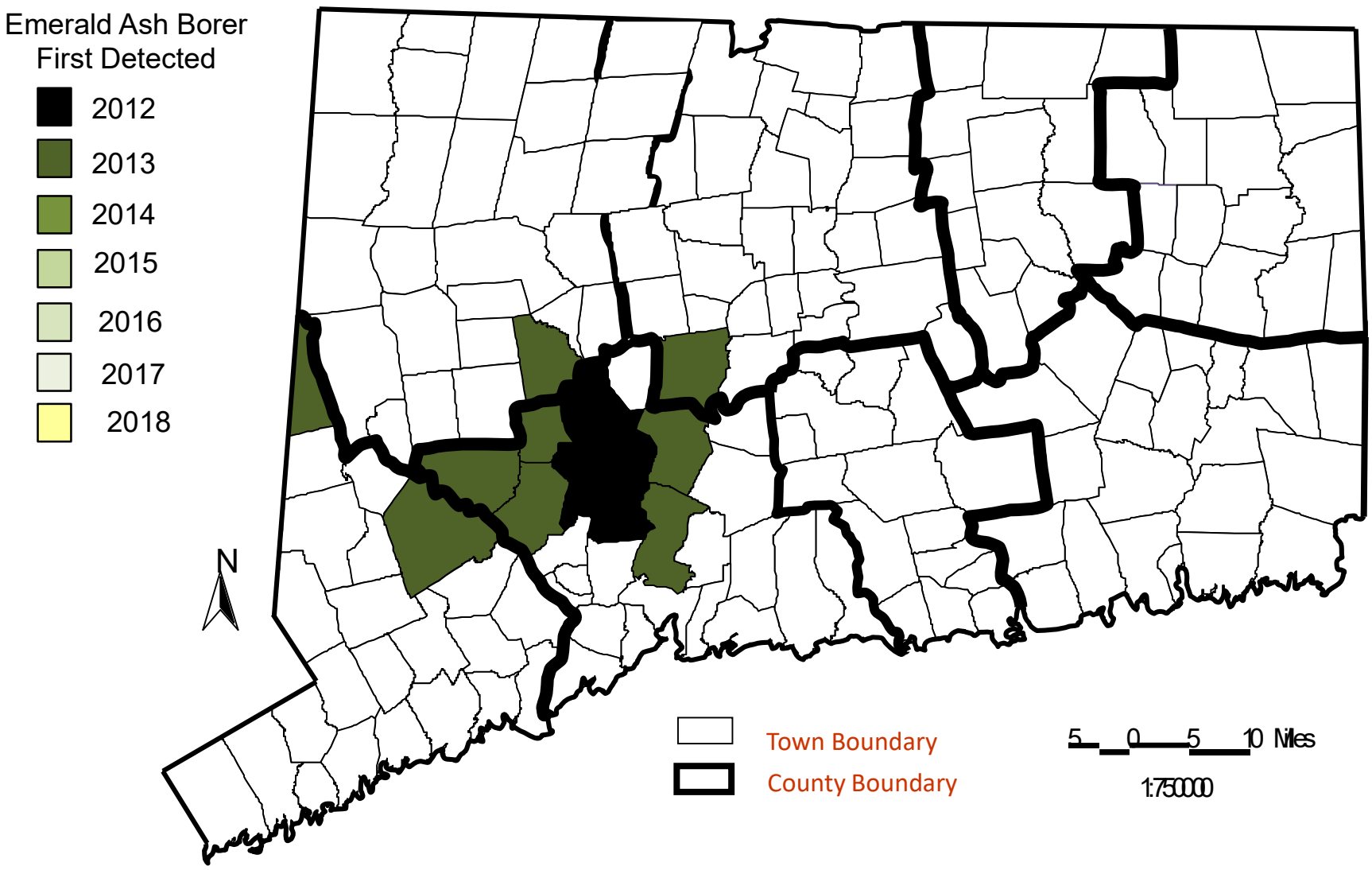

Emerald Ash Borer
First Detected
2012
2013
2014
2015
2016
2017
2018
N
Town Boundary
County Boundary
5 0 5 10 Miles
1:75000

2012

CAES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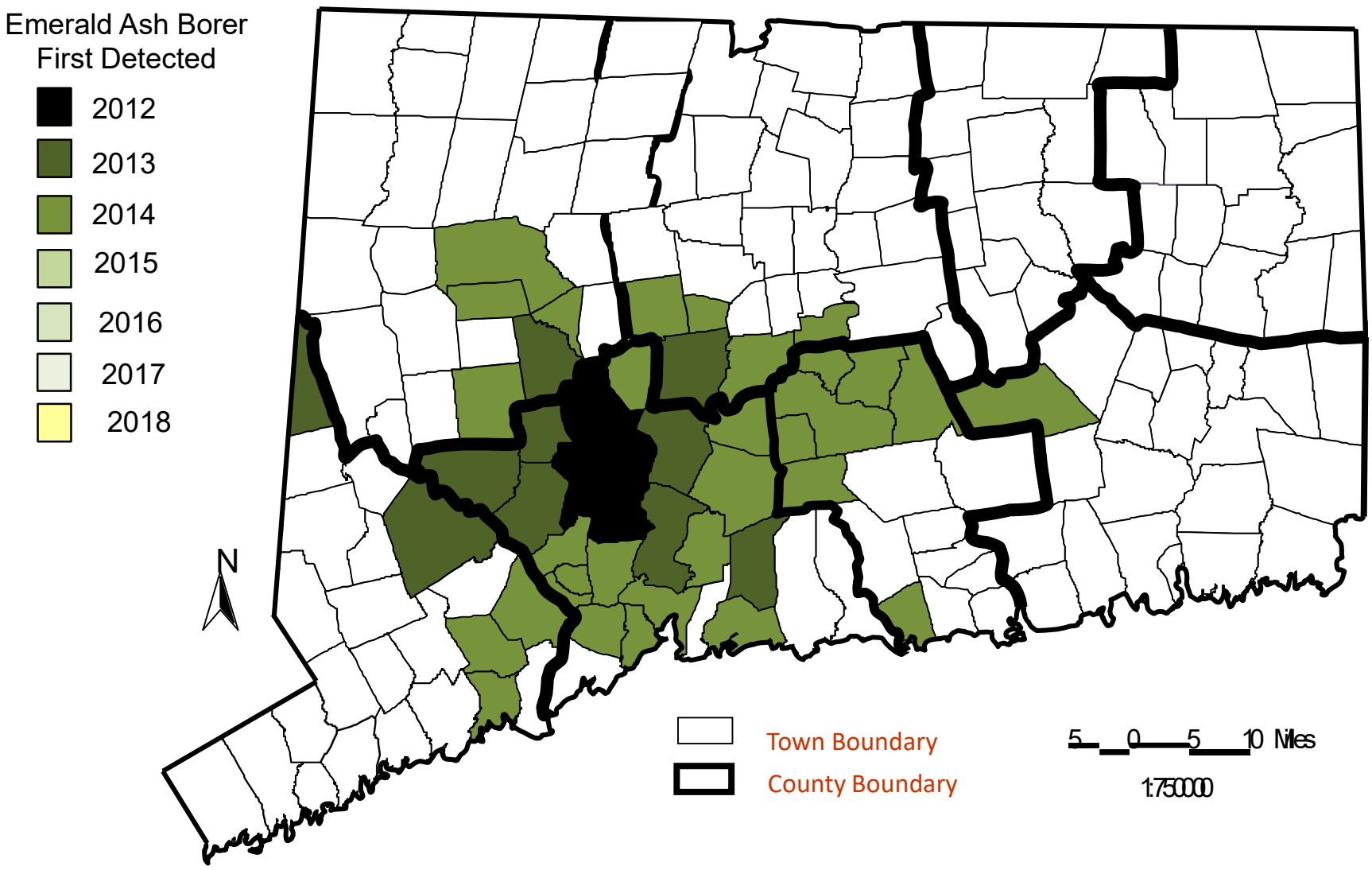
2013

CAES


Emerald Ash Borer
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2014

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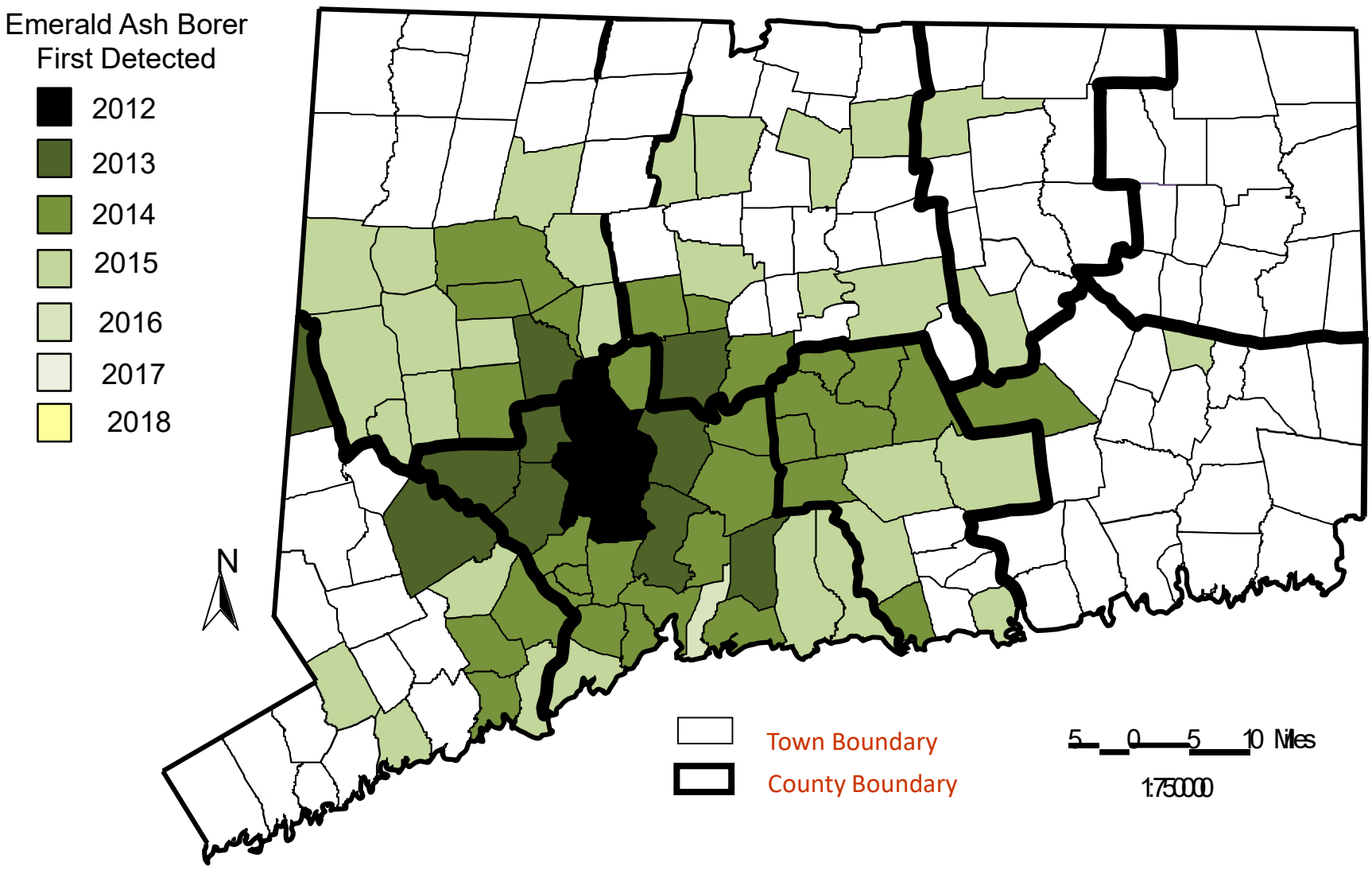
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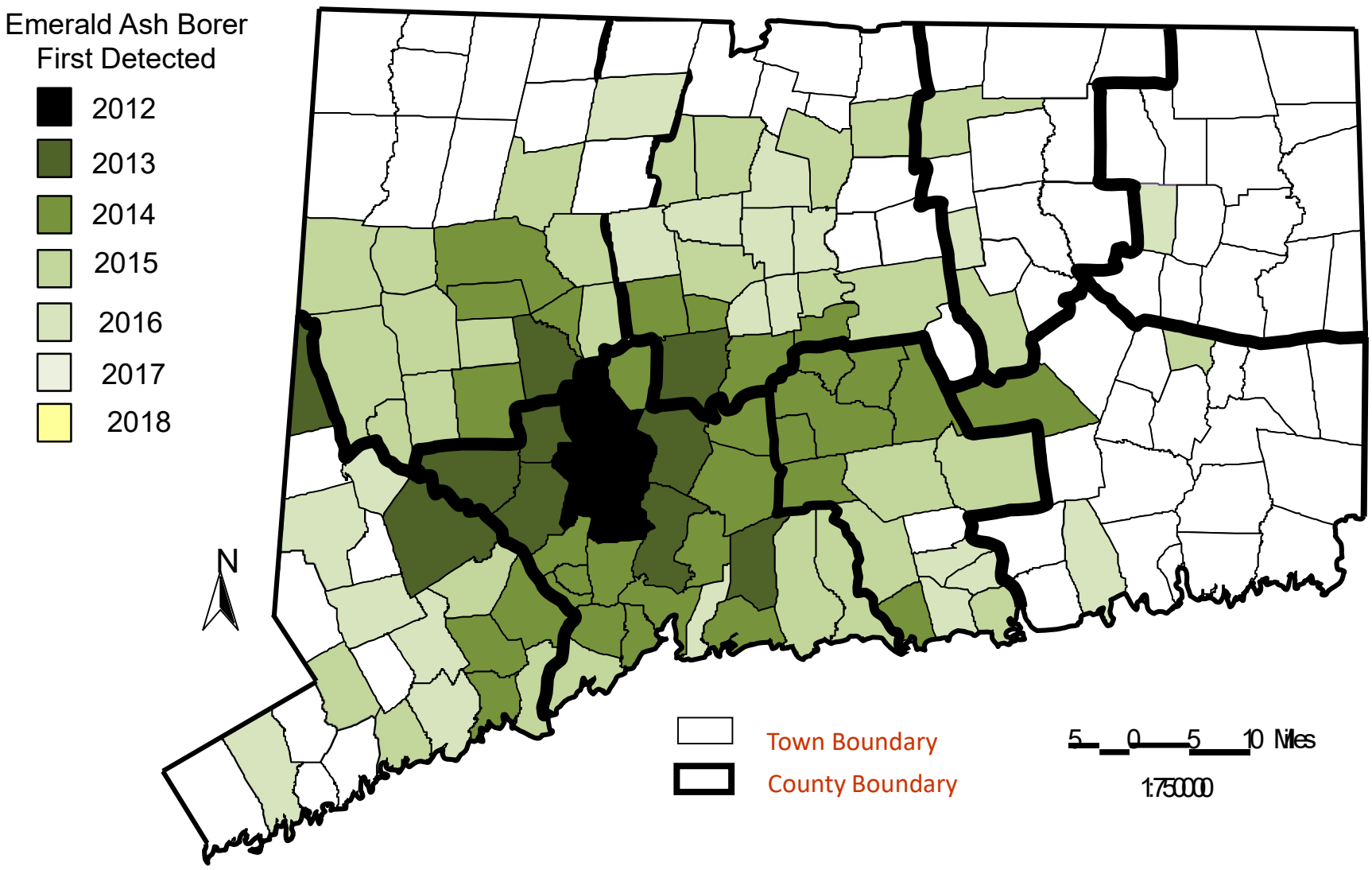
2015

CAES


Emerald Ash Borer
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2012
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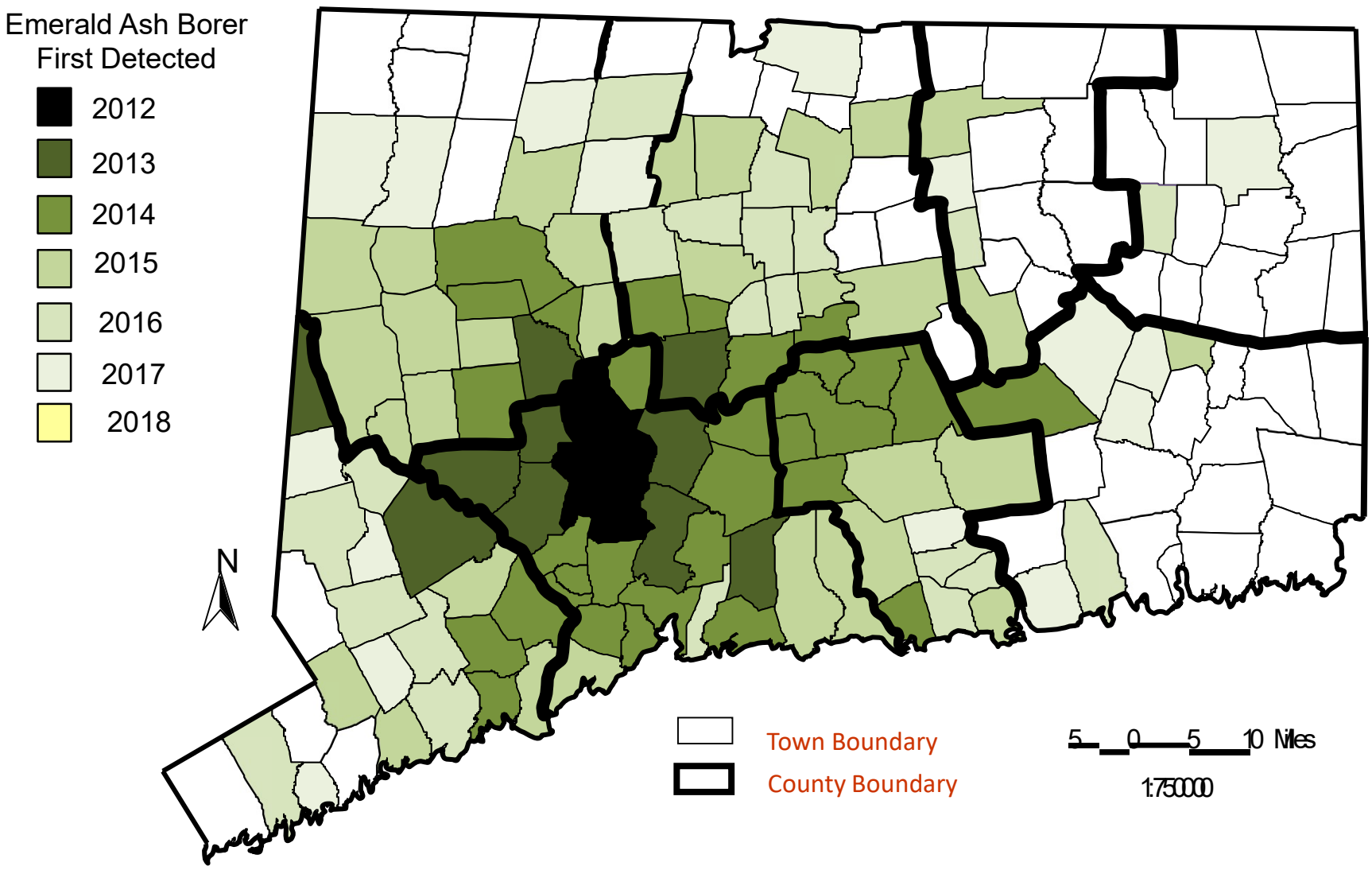
2016

CAES


Emerald Ash Borer
First Detected
2012
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Town Boundary
County Boundary
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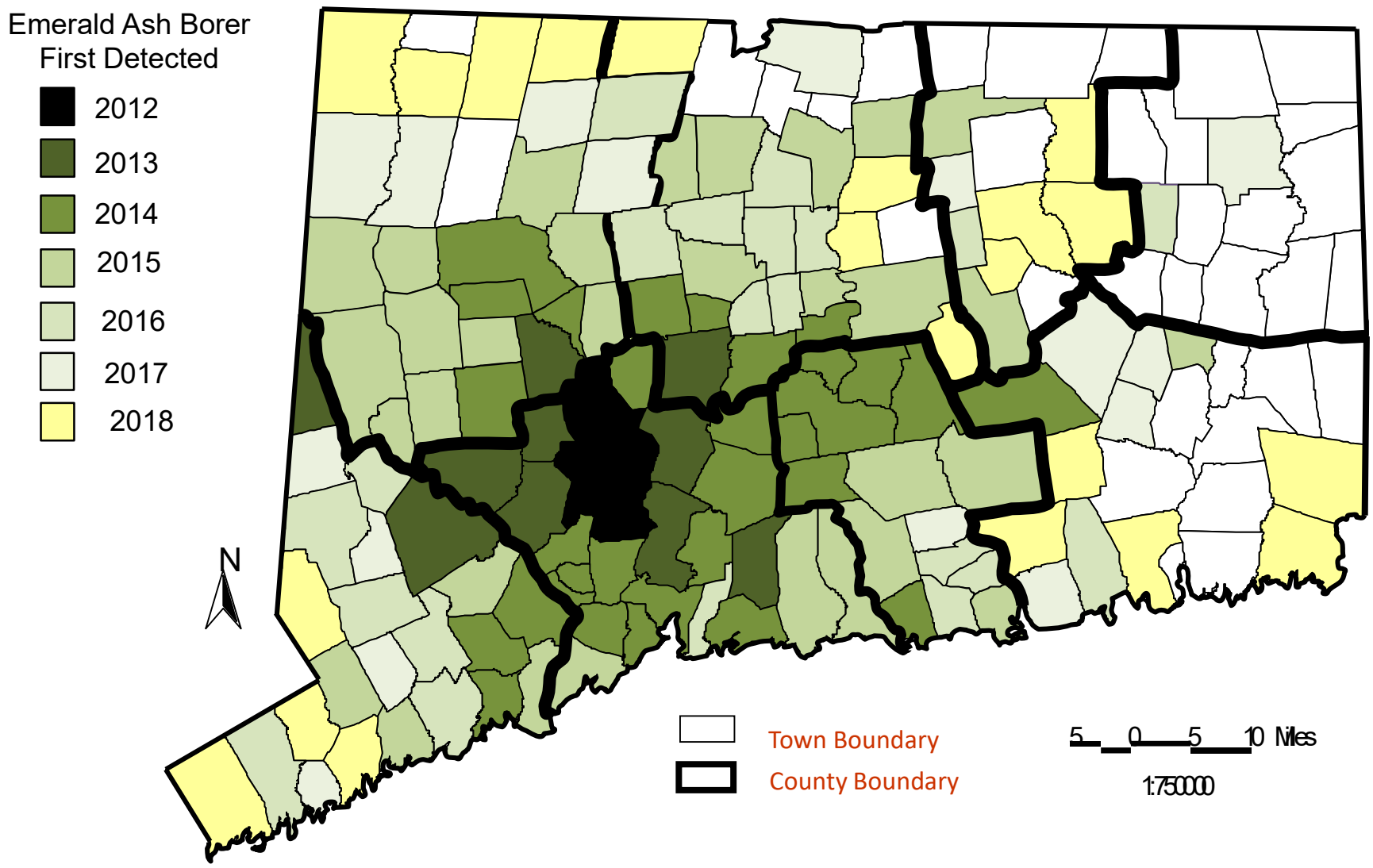
2017

CAES


Emerald Ash Borer
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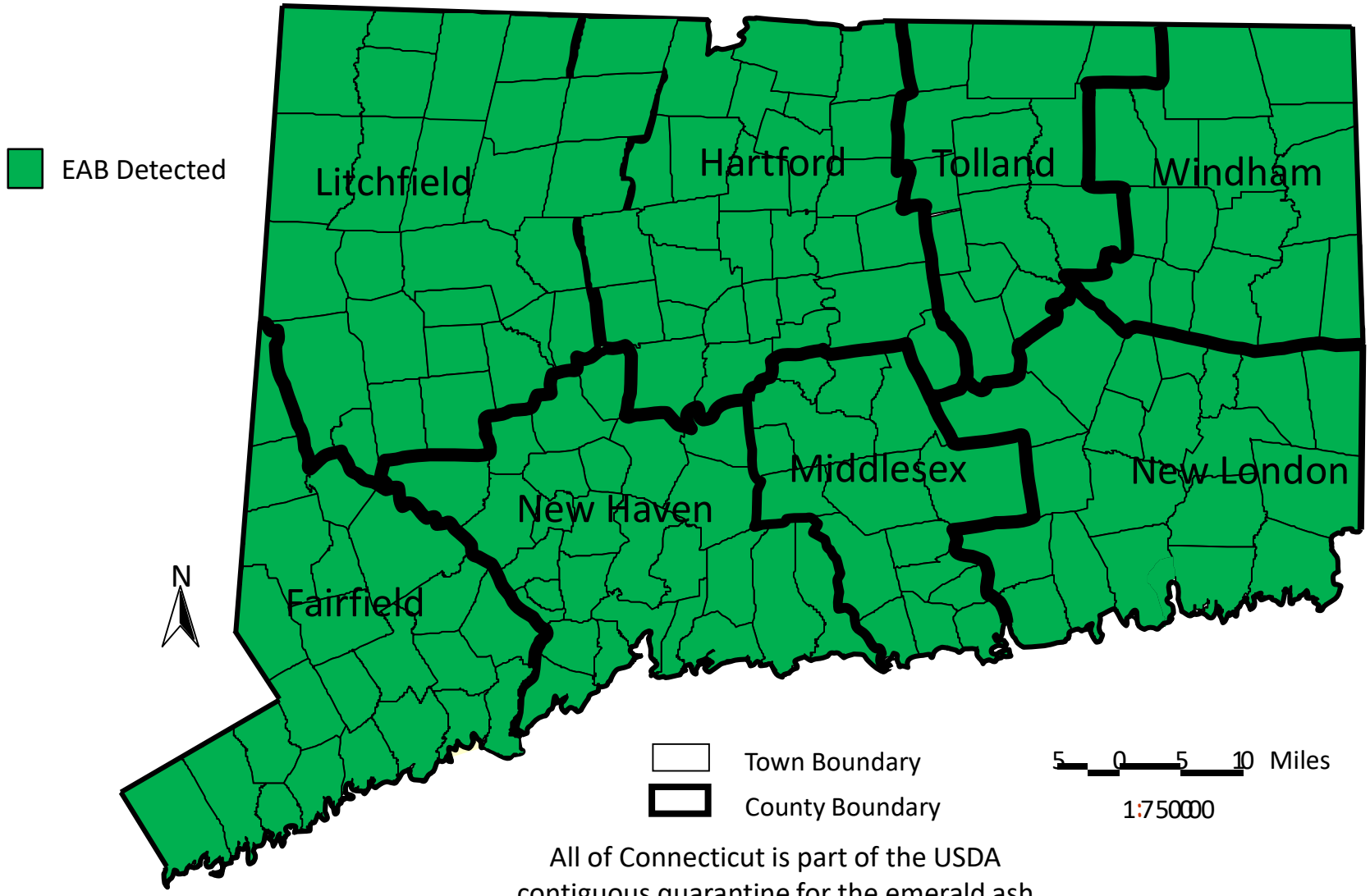
2018

CAES



All of Connecticut is part of the USDA contiguous quarantine for the emerald ash borer. EAB detections by town shown

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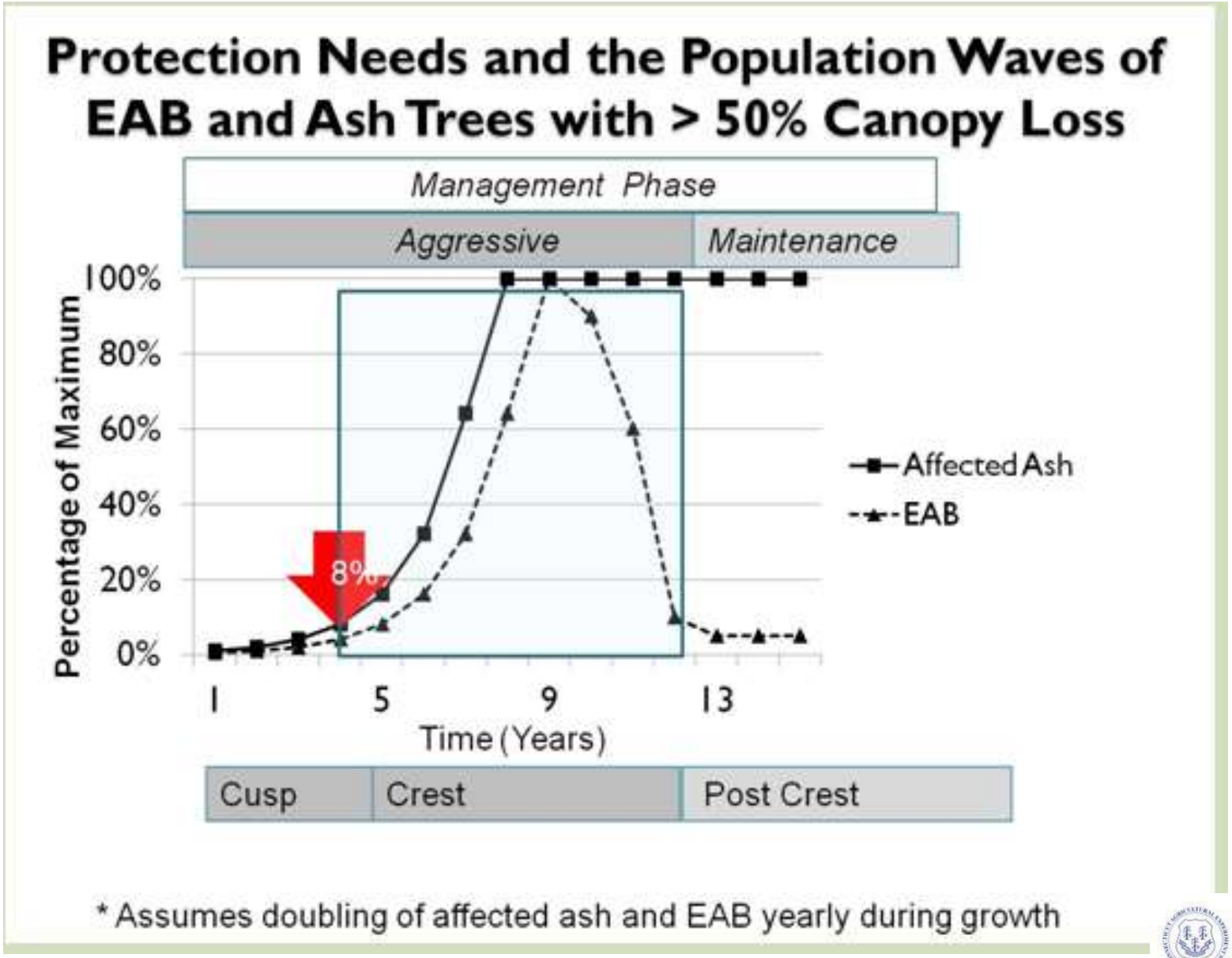
The Destruction Wave



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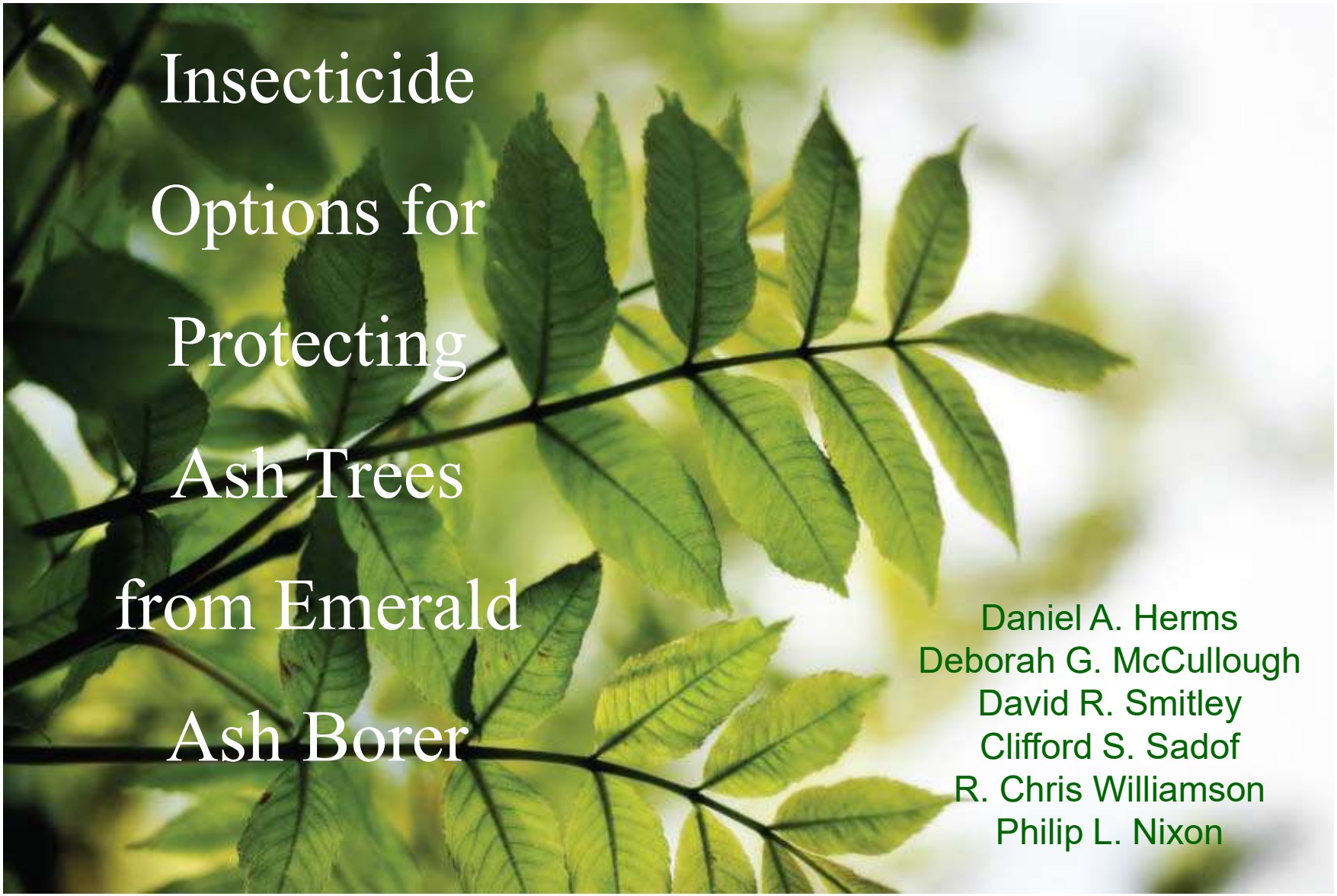

Insecticide Options for Protecting Ash Trees from Emerald Ash Borer

Daniel A. Herms
Deborah G. McCullough
David R. Smitley
Clifford S. Sadof
R. Chris Williamson
Philip L. Nixon

Insecticides Can Protect Ash Trees

Product	Time of Year	Other Considerations[ab]
Imidacloprid	Spring (early April to mid-May) Fall (October to November)	Spring treatments more effective than those in fall (up to 20”)
Dinotefuran	Spring (early May to mid-June)	Soil injection or trunk sprays equally effective up to 16 “ DBH
Emamectin benzoate	Bud-break** to mid-June Mid-Summer to Fall color	Spring 2012 treatments will kill this year’s egg laying beetles Mid-Summer /Fall applications will kill next year’s beetles (8 to 25”DBH)
Azadiractan	Early Summer	Will last up to two years, is considered to be ‘organic’

[a] Applications are timed so that enough insecticide is in the leaves to kill EAB adults that feed on leaves before they have laid most of their eggs

[b] Trees must be actively transpiring to take up these products

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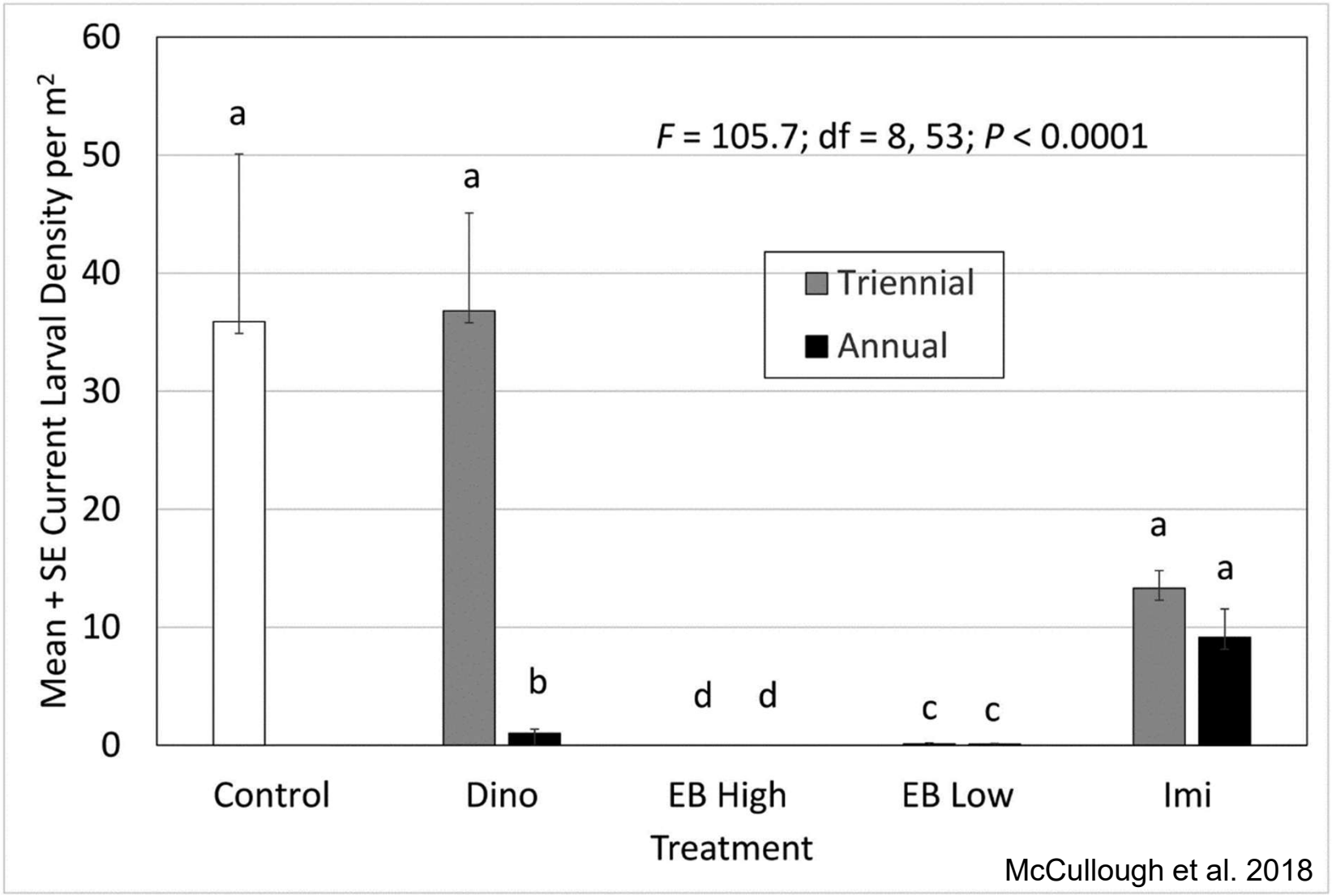

EAB larval density in trees treated with systemic insecticides annually or triennially in mid-June from 2008-2013, felled in 2013

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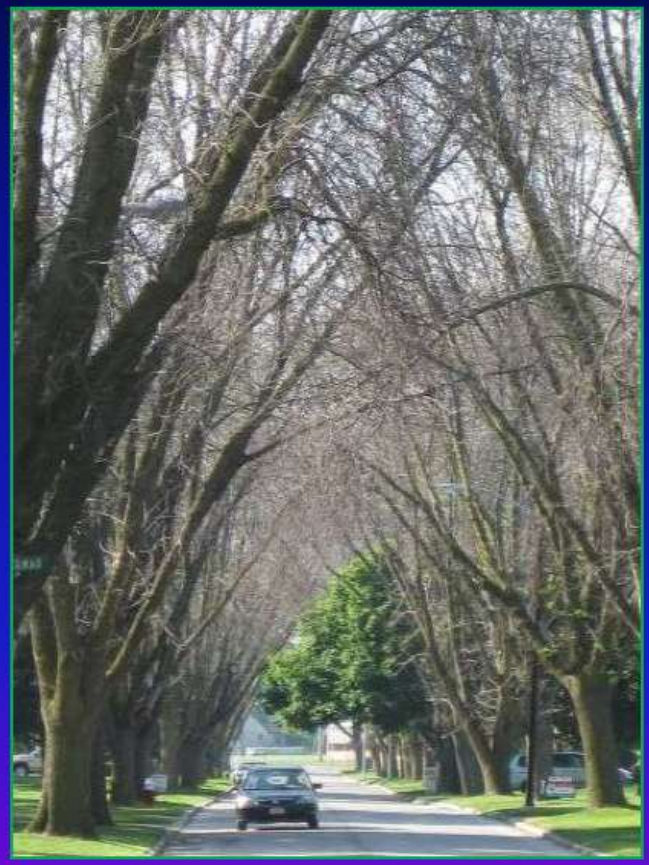
Benefits of Protecting Ash in Town

- Declining, dying and dead trees reduce property values
- Become hazard trees that must be removed
- Less disruptive than removing large trees
- Retains ecological services such as stormwater uptake
- Predictable treatment cost and scheduling

Toledo, Ohio – BEFORE & AFTER

June 2006



August 2009

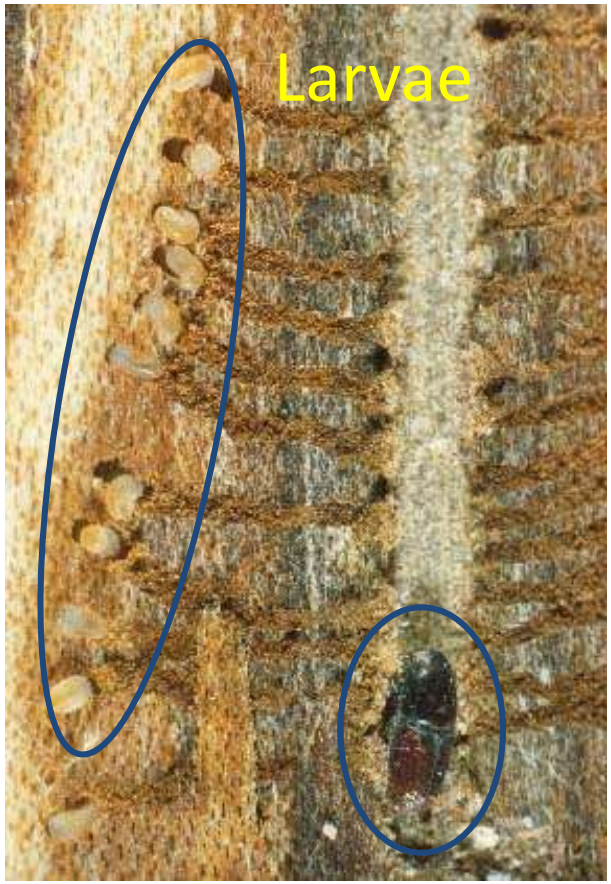
Courtesy of Dr. Dan Herms

THE OHIO STATE UNIVERSITY

Elm Bark Beetles

beetle (Coleoptera)

Native elm bark beetle



Adult female

BORER

Elm Bark Beetles

beetle (Coleoptera)

Adult Damage on Twig

Elm Bark Beetles

beetle (Coleoptera)

- Hosts – Elms
- 2-3 generations/ yr
- European EBB overwinter as larvae in tree
- Native EBB adults bore into bark at base of tree to overwinter
- Adults emerge in April & feed on twigs
- Females bore into bark and lay eggs
- Larvae create tunnels
- When emerge leave ‘shot gun’ holes
- Primary importance is as vector of Dutch Elm Disease

BORER

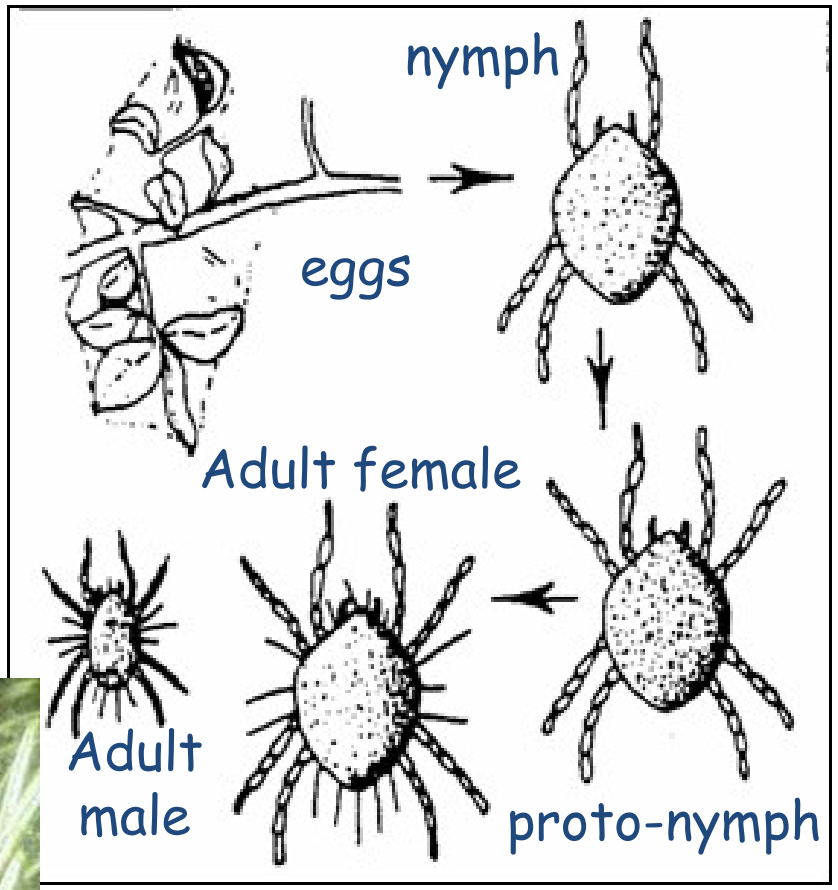
Elm Bark Beetle and Dutch Elm Disease

- Disease is a Fungus
- Fungus is vectored by the beetle
- Most often spread by adult feeding on thin barked branches; so first damage shows on flagged branches
- Can spread between trees via root grafts

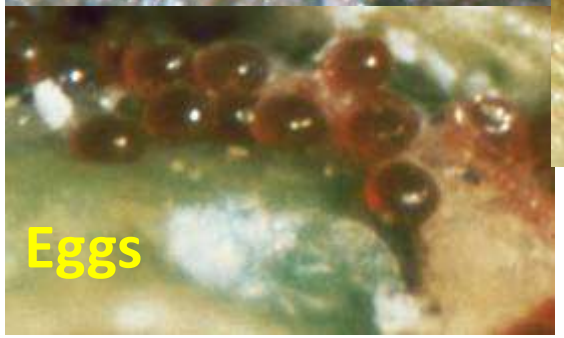
EBB & Dutch Elm Disease Management

- Plant resistant cultivars
- Best management is pruning of infested branches and sanitation/ removed material must be destroyed
- Spray in April to control adults
- Can control over-wintering Native EBB adults by a bark drench spray between late August and mid-September

Spider Mites



Spruce Spider Mite



Webbing

SUCKER

Spruce Spider Mite

Spruce Spider Mite

- Hosts – Spruce, arborvitae, hemlock, pine, juniper, Cedar, Doug. Fir, etc.
- Overwinter as eggs, hatch in April
- Several generations/ year
- Prefer older needles
- Most active in spring and fall

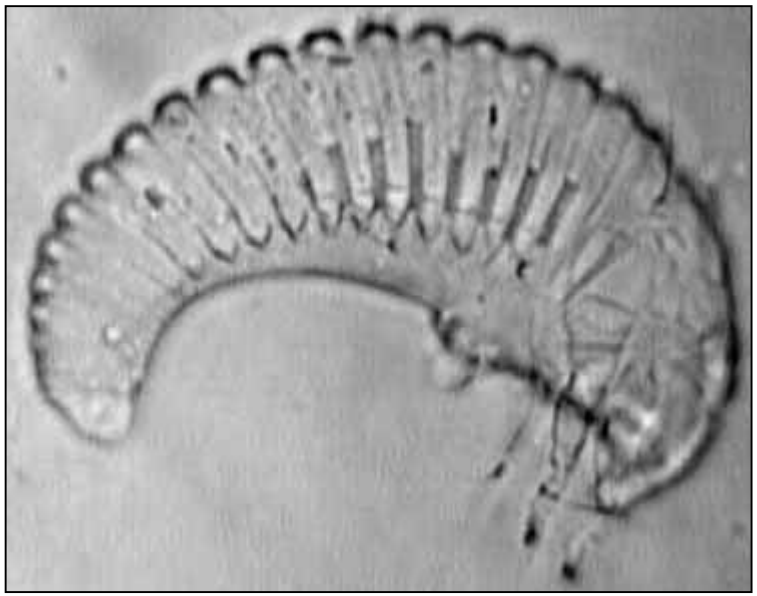
Spruce Spider Mite Management

- Infested plants, dull, lack vigor
- Monitor by looking for eggs in April (or winter), active forms in May & September
- Jar limbs over white surface to dislodge active forms for counting
- If necessary dormant horticultural oil in April, summer oil in summer

SUCKER

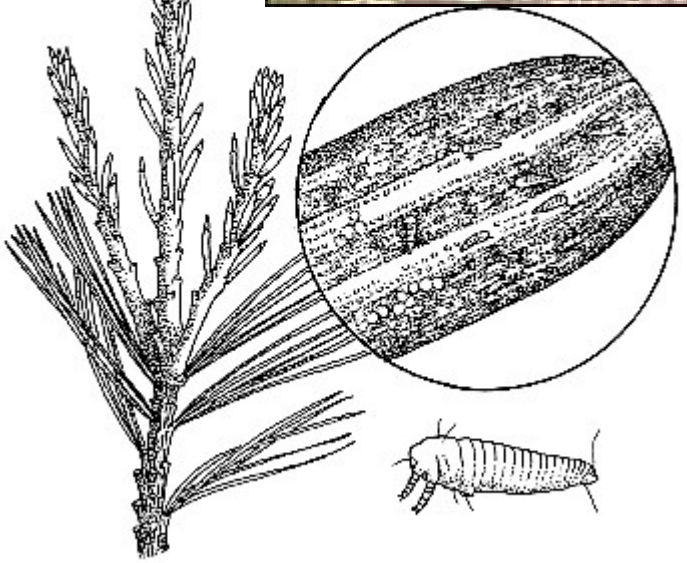
Eriophyid mite

mite



Only 2 legs

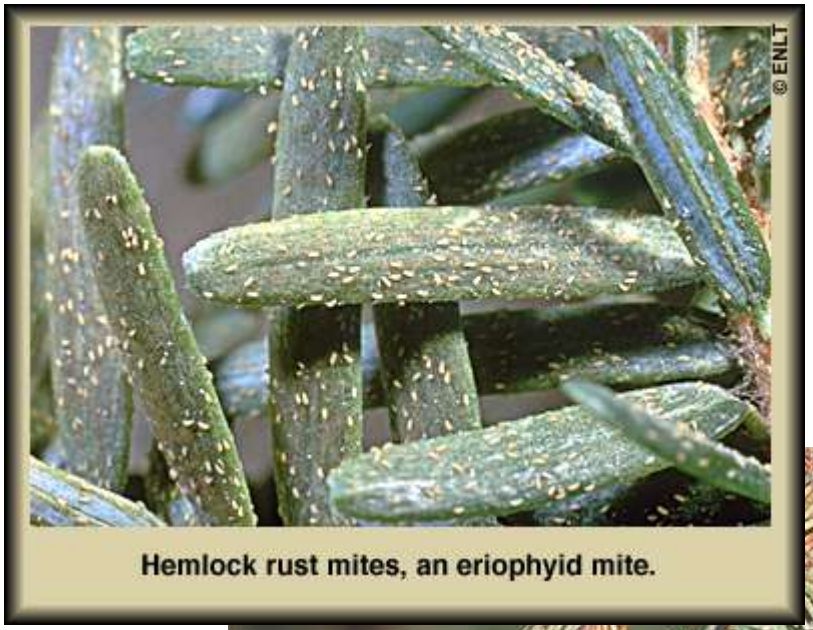
Wedge Shaped



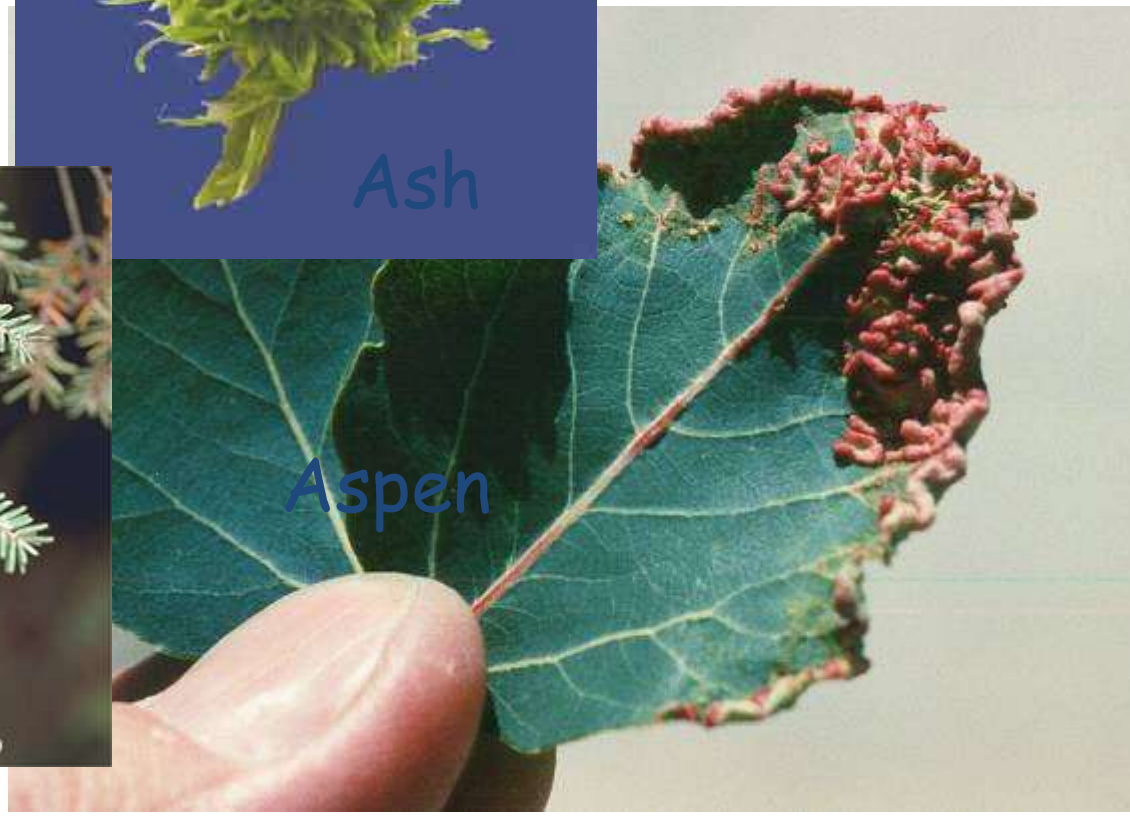
SUCKER

Eriophyid Mite

mite



Hemlock rust mites, an eriophyid mite.



Eriophyid mite

- Hemlock rust mite of most concern – also attacks fir and spruce
- Causes yellow or brown russeting
- Most damage in spring
- Horticultural oil can be used to control

General Rules of Insect Management

- Appropriate tree placement and resistant cultivars
- Maintain tree health! Healthy trees are more able to resist attacks, and to tolerate any damage.
- Monitor trees for pests, visual assessment, counts, traps (sticky traps, band traps, pheromone traps)
- Rely on natural enemies when possible
- If necessary use insecticides. Always use the insecticide with the least potential for damaging natural enemies, people, pets, ground water and the environment.

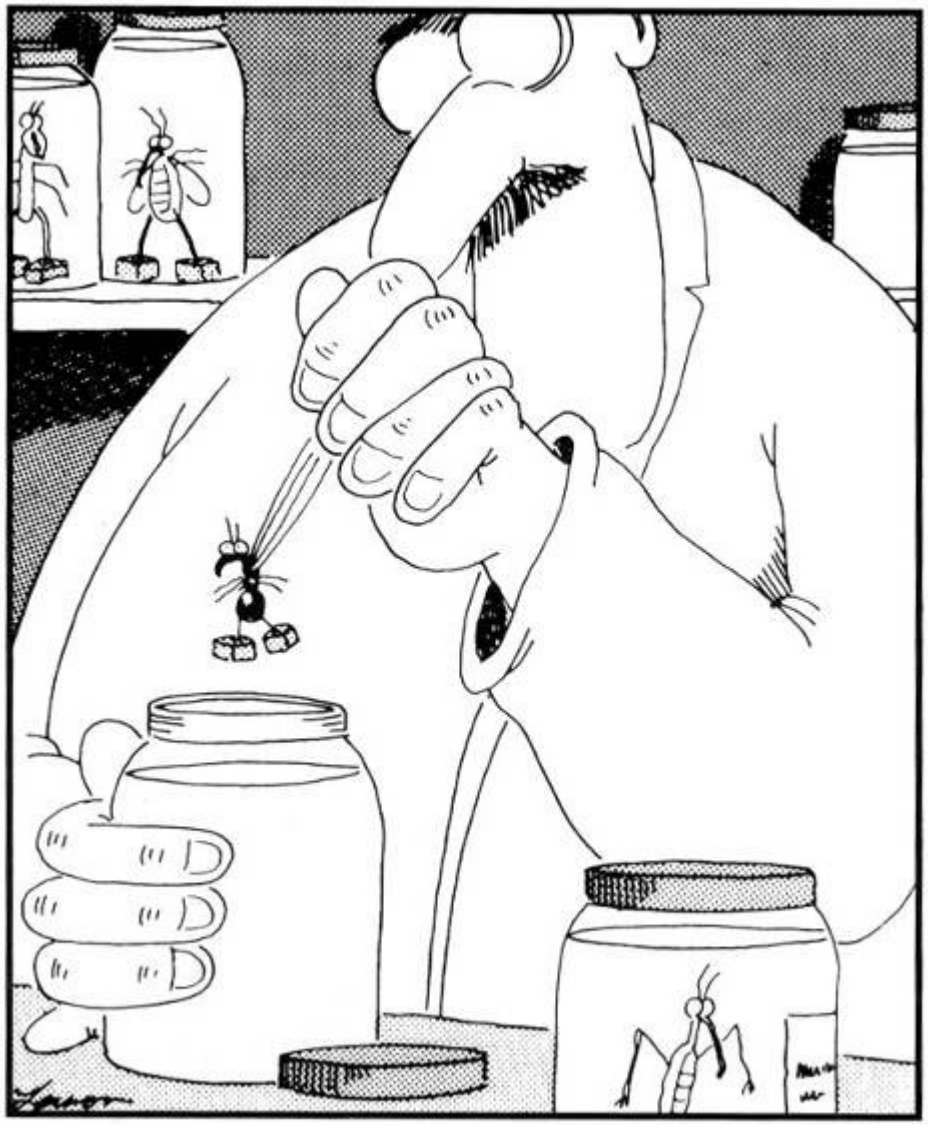
Complete List of Insects for Test

https://portal.ct.gov/DEEP/Pesticides/Arborist/Commercial-Arborist-License

Category	Species to Know
Aphids and Adelgids	• Cooley spruce gall adelgid • Eastern spruce gall adelgid • Hemlock Woolly adelgid • Pine bark aphid • Woolly beech aphid
Bark Beetles and Borers	• Black vine weevil • Bronze birch borer • Dogwood borer • Elm bark beetle • European pine shoot moth • Pine root collar weevil • Two-lined chestnut borer • White pine weevil
Caterpillars and Loopers	• Cankerworms • Eastern tent caterpillar • Fall webworm • Forest Tent Caterpillar • Spongy (Gypsy) moth • Oak leaf tier • Oak leaf roller
Leaf Miners	• Arborvitae leaf miner • Birch leaf miner • Holly leaf miner
Mites	• Spruce spider mite • Two-spotted spider mite
Sawflies	• European sawfly • Mountain ash sawfly • Pine false webworm • Pine sawflies • Redheaded sawfly
Scales	• Beech bark scale • Euonymous scale • European elm scale • Elongate hemlock scale • Magnolia scale • Oystershell scale • Pine needle scale • Tulip tree scale • White prunicola scale
Skeletonizers	• Birch skeletonizer • Elm leaf beetle • Oak leaf skeletonizer

Additional Resources

- Insects that Feed on Trees and Shrubs. Johnson and Lyon. Cornell University Press
- The ‘Blue Books’ Guide to Management for CT Insects and Diseases.
- Integrated Pest management for insects and related pests on ornamental plants: a guide for arborists and grounds keepers. UConn, Cooperative Extension Service



Scenes from the entomology underworld

The End