

Arboriculture Integrated Pest Management: Important Pests and Symptoms to Look For

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www.maine.gov/ipm



The diagnostic section is dense, but the PDF is designed for you to use in the future as a quick guide and reference 😊



Arborist Licensing in Maine

- leaving the ground for pruning or trimming,
- installing cabling or bracing,
- diagnosing and evaluating conditions of trees,
- felling or taking down trees in developed areas

Does NOT include:

- planting and fertilizing,
- stump grinding,
- chipping,
- house and wood lot clearing,
- treating for pests and diseases [requires a commercial Pesticide applicator license](#).

Depending on work you do, pesticide licensing could include:

- ✓ **3A Ornamental:** Browntail moth
- ✓ **2 Forest Pest Management:** Working where forest products or Christmas trees are produced
- ✓ **6B General Vegetation Management:** Treatments for invasive plants
- ✓ **6A Right of Way:** Utility arborist responsibilities

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What is integrated pest management? *Research based...*



Identification & Action Thresholds

- Proper identification of pest
- Understanding the system where the pest exists



Prevention, Cultural & Mechanical Control

- Prevent and control through physical means
- Set your location up for success



Monitoring & Recordkeeping

- Scout in a tracked and systematic way
- Make it useful for the future!



Action Thresholds

- What is the population level?
- What methods are needed at this level?



Biological and Pesticide Control

- Dynamic and flexible as methods change

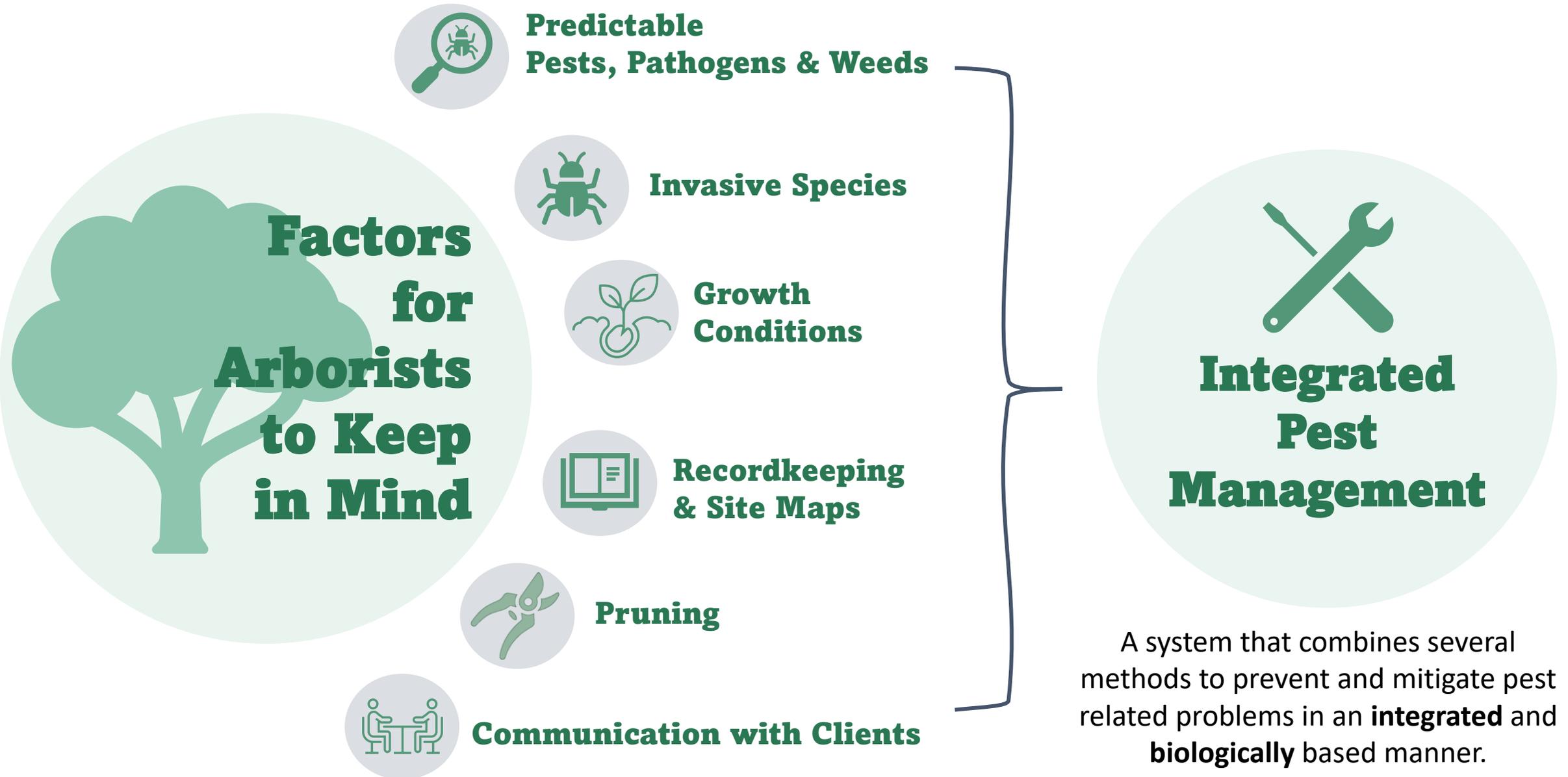
IPM is the standard and many institutions are involved



MAINE DEPARTMENT OF AGRICULTURE CONSERVATION & FORESTRY



THE UNIVERSITY OF MAINE
Cooperative Extension

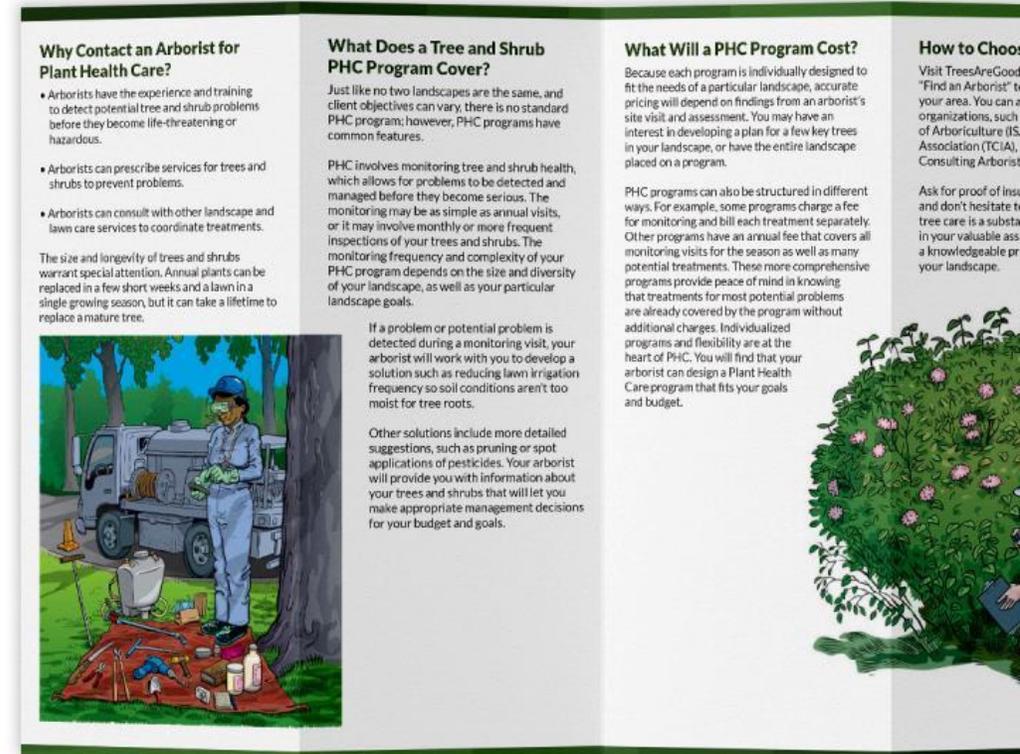


Plant Health Care (PHC) vs. IPM?

- Late 1950's – IPM developed in field crops
- 1980's – IPM advertised by arborists associated with International Society of Arboriculture
- Limited success selling due to a lack of public awareness of the term IPM
- **ISA - Plant Health Care (PHC)**
 - New term
 - Holistic approach to maintaining plant vigor and health



PHC Brochure by the International Society of Arboriculture



Diagnostic – what can be wrong with a tree?

BIOTIC

- Animals – squirrels, voles, deer, etc.
- Insects
- Other Plants
- Disease
 - Fungal
 - Viral



ABIOTIC

- Acute (sudden stress, e.g., frosts, improper pesticide spray)
- Chronic (gradual stress, e.g. low light, wrong soil pH, planted too deep)
- Structure of the tree – weak points lead to more damage susceptibility
- Water – drought, excess water,
- Mechanical – “excavator blight”, soil compaction, root cutting, pruning practices
- Chemical – salt, excess fertilizer, herbicides
- Nursery Stock and Planting Practice

Know the Symptoms, Signs, and Insect ID



If an insect is damaging the plant,
the damaging life stage is not
always present or visible.



Identification: Pests, Pathogens, and Friends, oh my!



Beneficial

Neutral

Incidental Pests

Low Damage

High Damage



Factors:

Context, Perception, Personal Allowance, Understanding, Population Size, Health of Plants, Indoor vs. Outdoor etc.

IPM Concepts

- Identification 
- Prevention & Cultural Control 
- Monitoring & Record Keeping 
- Action Thresholds 
- Biological & Chemical Control 

Scouting & Monitoring Tools



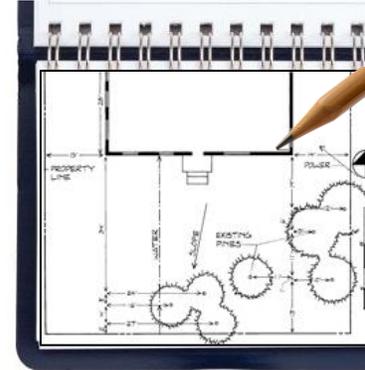
Logbook or System



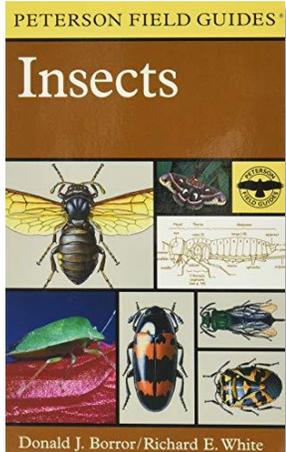
Hand Lens with LED



Pheromone Traps



Map of Landscape



Identification Guides



Stick (seriously!)

+



Clipboard with Paper



Smartphone or Camera

IPM Concepts



Identification

Prevention &
Cultural Control



Monitoring &
Record Keeping

Action
Thresholds



Biological &
Chemical Control

Learn more about scouting
for arboriculture [here](#)

Can anyone guess what caused the damage?



Photos: WVU Extension, OSU Extension, CSU Extension

Abiotic: Winter Desiccation Injury (burn, drying, scorch)

 Identification	 Prevention & Cultural Control	 Monitoring & Record Keeping	 Action Thresholds	 Biological & Chemical Control
<p>Early Spring: Gray-brown to red, dry foliage or needles, cracked bark (especially side exposed to wind or radiated heat)</p> 	<p>Consider windbreaks</p> <p>Prune after new growth has emerged</p> <p>3-6 foot diameter ring of mulch around base</p>	<p>Look for summertime water stress (wilting / drooping) and keep notes</p> <p>Water plants well in the fall until soil freezes</p>	<p>No immediate action should be taken with evergreen plants showing winter injury other than supplemental watering if conditions are dry</p>	 <p>Not applicable! Important to NOT “treat” for unseen “insects or diseases”</p>

New Research & Trends: In a 2022 study in Finland, Norway spruce had the highest risk of winter damage in fall-planted seedlings, and seedlings stored in open trays as opposed to closed packages.

Reminder – full factsheets here! Presentation is a summary of more in-depth information.

Can anyone guess what caused the damage?



Photos: Nebraska Forest Service, Alabama Extension

Abiotic: Herbicide Damage

 Identification	 Prevention & Cultural Control	 Monitoring & Record Keeping	 Action Thresholds	 Biological & Chemical Control
<p>Common symptoms include deformed foliage (cupping, twisting), deformed stems, discolored foliage, leaf scorch, and dieback</p> 	<p>Be aware of drift and root uptake potential</p> <p>Educate clients</p>	<p>Make note of when damage was noticed and determine if surrounding areas were treated with herbicides</p>	<p>Take immediate action to educate clients of the susceptibility of trees to herbicide damage</p>	 <p>Not applicable!</p> <p>Important to NOT “treat” for unseen “insects or diseases”</p>

New Research & Trends: A 2022 study in Alaska found that even basal bark herbicide treatments on invasive trees damaged surrounding vegetation through root exudation.

Can anyone identify what is going on here?



Photos: Maine Forest Service

Browntail Moth (*Euproctis chrysorrhoea*)

 Identification	 Prevention & Cultural Control	 Monitoring & Record Keeping	 Action Thresholds	 Biological & Chemical Control
<p>Sept – April Winter webs</p>  <p>April – June (& Fall) Larvae (tail end red dots)</p>  <p>July – August Adults & Eggs</p> 	<p>Clip winter webs in winter and early spring (MFS has a list of arborists if you are not on it!)</p> <p>Avoid having lights on at night (especially when moths are flying)</p> <p>Restrict access</p>	<p>Return to properties where caterpillars were found in the summer and fall to find and clip winter webs.</p>	<p>One caterpillar or adult seen = return to manually clip every winter web within reach</p> <p>Consider tree removal when vulnerable population (e.g. schools)</p>	<p>Native pathogens in Maine – research being conducted</p> <p>Pesticide application options for licensed applicators</p>

New Research & Trends: 2021 Maine study found that warmer fall temperatures result in more mature caterpillars emerging in the spring, and hypothesized this is why more frequent outbreaks are seen now.

BTM ID Continued

Tent-makers		No Tents	
Browntail Moth	Eastern Tent	Forest Tent	Gypsy Moth
<p>Look for Overall brown color; White tufts along sides; <u>Red-orange dots on tail-end</u></p> <p style="color: red; font-weight: bold; text-align: center;">DANGER!!</p>	<p>Look for <u>White stripe</u> down center of back Blue spots like the "eye" in peacock feather along each side of stripe</p>	<p>Look for White or <u>off-white</u> <u>footprint-shaped</u> <u>marks</u> down the center of the back Blue body coloration in later instars</p>	<p>Look for Prominent knobs with hairs on each side of head capsule. Five pairs of <u>blue-</u> and <u>six pairs of red-</u> spots <u>along back</u> (4th instar and later).</p>
			
<p>Invasive Human & Forest Health Impacts</p>	<p>Native Mostly aesthetic impacts</p>	<p>Native Occasional outbreaks</p>	<p>Invasive Forest Health Impacts Quarantined pest</p>

Can anyone guess what caused the damage?



Photos: UNM Extension, Maine Forest Service

Birch Leaf Miners (Leaf-mining Sawflies)



Identification

Browning birch leaves (damage start as tiny grayish or discolored blotches in leaf tissue)



Prevention & Cultural Control

No information available for prevention.

Monitoring can help detect early populations.



Monitoring & Record Keeping

Observe new leaves developing in spring and note areas with a gray cast. Developing mines translucent spots of a lighter green.



Action Thresholds

Most damaging tree stress and susceptibility to infestation by the bronze birch borer when the species *Messa nana* is present in combination with the birch casebearer



Biological & Chemical Control

Parasitoid –
5 US States
(see below)



Applicators only –
treating early and timely to affect first generation of sawflies and larvae

“New” Research & Trends: A 2009 study determined that five US States (MA, CT, RI, NY, PA) had declined levels of damage from birch leaf miners due to biological control releases of a parasitoid wasp starting in 1976.

Can anyone guess what caused the damage? Who am I?



Bronze Birch Borer (*Agrilus anxius*)



Identification

June – August
Eggs laid and hatch into larva. Two year development. Flat with spines at end.



May – August
Adults emerge. 1" long, deep olive green to bronze.



Prevention & Cultural Control

Larvae may not survive in healthy trees.

Prevent by pruning dead or damaged branches by early May.



Monitoring & Record Keeping

Scout for D-shaped exit holes in May – August. Look for sawdust packed galleries spiraling around the tree trunk or branches and a thin crown.



Action Thresholds

Unfortunately, once a tree is heavily infested, it will likely die.



Biological & Chemical Control



Applicators only – treatment options available, contact Extension for recommendations.

New Research & Trends: New research as it is considered a major potential threat to European Birches. A 2020 study found that tree girdling paired with purple sticky prism traps were attractive to adults.

Can anyone guess what caused the damage? Who am I?



Japanese Beetle (*Popillia japonica*)

 Identification	 Prevention & Cultural Control	 Monitoring & Record Keeping	 Action Thresholds	 Biological & Chemical Control
<p>Grub (larva): ~1 in long, white, C-shaped</p>  <p>Adult: ~1/2 in long; bronze outer wings; six small tufts of white hair (sides and back)</p> 	<p>Educate customers about trees more susceptible to feeding, including Japanese maple, cherry, linden, and more (pg 13 of this guide)</p> <p>Diseased and poorly nourished trees and plants are especially susceptible to attack.</p>	<p>Be prepared for adults to emerge in late June or early July.</p> <p>Recognize and keep track of skeletonization of leaves.</p> <p>Pheromone traps can be useful in <i>some</i> instances to monitor.</p>	<p>Well-established trees and shrubs generally tolerate Japanese beetle damage with little impact on leaf emergence the following season.</p> <p>Pheromone traps can be used to assess the population level (problem = filled in one day)</p>	<p>Biological control: Parasitoids, nematodes, fungi, and others. Covered in depth in this document.</p> <p>Applicators only: trunk injection at first sign of beetle activity; foliar applications only in extreme instances.</p>

New Research & Trends: A 2022 paper summarized research trends since the early 1900's, and determined the most impactful future steps will be further understanding of biological control parasitoid interactions.

Can anyone guess what caused the damage?



White Pine Weevil (*Pissodes strobi*)



Identification

Adults: small brownish weevils, active early spring



Grubs: yellowish white, legless, 7mm



Prevention & Cultural Control

Prune infested leaders and destroy immediately (burning) by mid-July at a point just into healthy tissue below the tunneling grubs.

45-50% shade cover of young pine and spruce with hardwood or conifer.



Monitoring & Record Keeping

Scout in the spring for pitch flowing from feeding punctures

Late June, new growth on infested shoots droops.

Tops die and turn brown.



Action Thresholds



Prune infested leaders immediately.



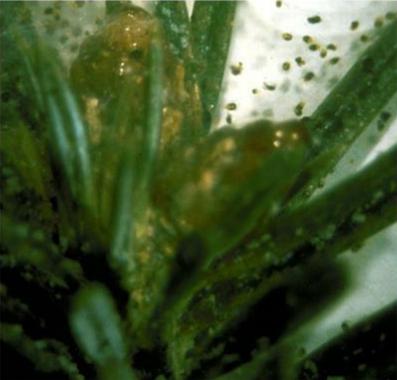
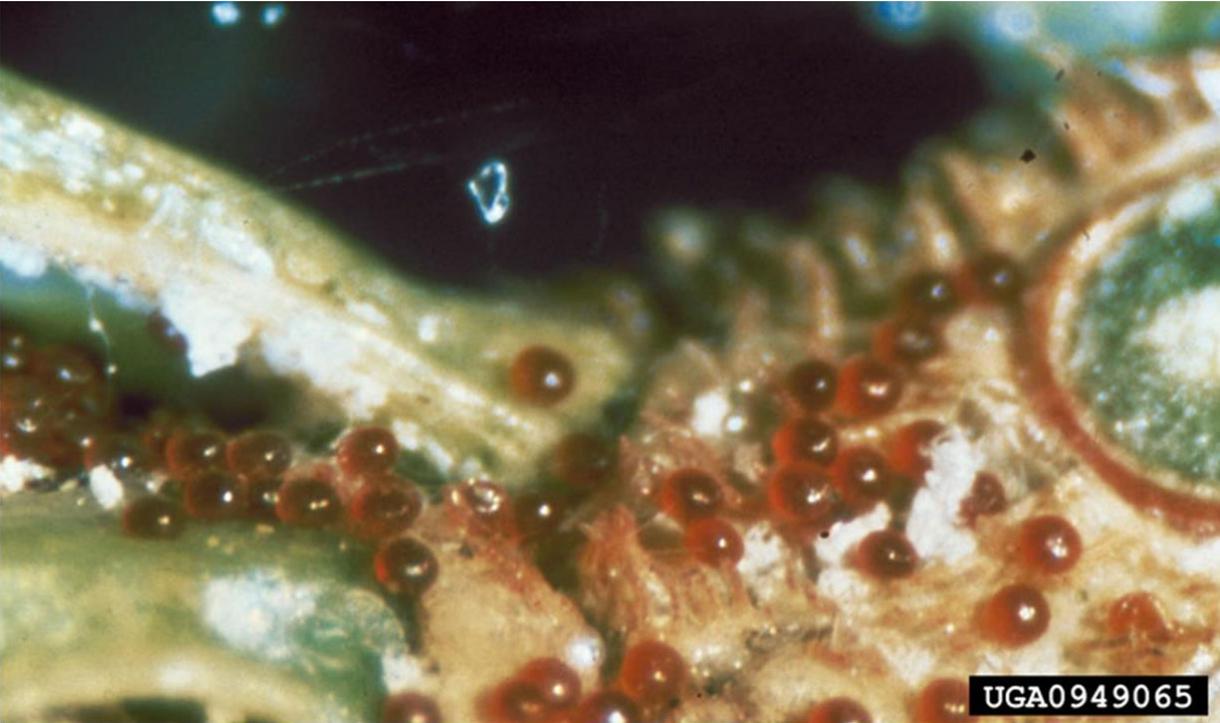
Biological & Chemical Control



Applicators only – Spraying leaders in the spring; [spray recommendations found here](#)

New Research & Trends: A 2022 study found that conifer susceptibility differed depending on genetic factors in a large research plot of trees, uncovering potential ways to select trees for resistance against attack.

Can anyone guess what caused the damage? Who am I?



Spruce Spider Mite (*Oligonychus ununguis*)

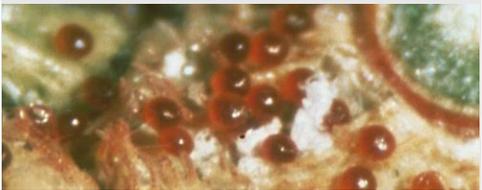


Identification

Adults: ½ mm long; young yellowish green, fully fed mature grayish black



Eggs: Oval to circular and reddish brown.



Prevention & Cultural Control

Educate customers that if infestations involve only a few small trees, washing with a strong stream of water from a garden hose several times will sometimes reduce mite levels.



Monitoring & Record Keeping

Scout for silken webs over foliage, or mottled foliage

Beat suspected foliage over a white sheet of paper



Action Thresholds

Applicators only – Spraying not recommended unless stippling damage exceeds 10% green foliage; >10 spider mites, on the average, are tapped from a tree's branches; and beneficial mites and beetles are not found in all branch samples.



Biological & Chemical Control



Applicators only – You must use a ***MITICIDE!*** Insecticides kill mite predators and make mite problems worse.

New Research & Trends: A 2018 study published new temperature-dependent development models for hatching, and I was even able to dig up a document with a spreadsheet for DIY estimates!

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Forecast models for springtime hatching of three Christmas tree pests

Jean-François Doherty, Jean-Frédéric Guay and Conrad Cloutier
Université Laval, Département de biologie, Québec QC Canada

Highlights
These simple forecast models are adapted for Québec and are meant to help growers and field consultants screen for springtime hatching of the balsam twig

This information was used to follow the accumulation of GDD starting from the 1st of March, according to a variant of the average method:



*What can I say,
I love a good spreadsheet 😊*

3 00

Balsam Twig Aphid **Spruce Spider Mite** Pine Needle Scale

	A	B	C	D	E	F
1	Month	Day	T _{min}	T _{max}	Total accumulated GDD	
2		1			0.0	<p>Instructions</p> <p>1) Enter the minimum and maximum daily temperatures in columns C and D respectively</p> <p>2) Observe when the accumulated growing degree-days in column E reaches 161 growing degree-days</p>
3		2			0.0	
4		3			0.0	
5		4			0.0	
6		5			0.0	
7		6			0.0	
8		7			0.0	
9		8			0.0	
10		9			0.0	
11		10			0.0	
12		11			0.0	
13		12			0.0	
14		13			0.0	
15		14			0.0	
16		15			0.0	
17	March	16			0.0	
18		17			0.0	

Can anyone guess what caused the damage?



Photos: William Jacobi, Colorado State University, Bugwood.org; William Jacobi, Colorado State University, Bugwood.org; Virginia Tech Learning Resources Center, Virginia Polytechnic Institute and State University, Bugwood.org; University of New Hampshire Cooperative Extension; Dr. Wayne Sinclair, Cornell University; Mary Ann Hansen, Virginia Polytechnic Institute and State University, Bugwood.org

Anthracnose



Identification

Anthracnose is a term used to loosely describe a group of related fungal diseases that typically cause dark lesions on leaves.

In severe cases it may also cause sunken lesions and cankers on twigs and stems.



Prevention & Cultural Control

Prune and destroy infected leaves, twigs, branches in fall or winter

Educate customers: for new plantings, select resistant cultivars and space plants for sunlight and air circulation



Monitoring & Record Keeping

It may be advantageous to keep note of trees with this disease, as it can return the following year, and educate customers to remove dead leaves.



Action Thresholds

Although it can cause severe leaf blighting and deformation it is rarely harmful to the tree.



Biological & Chemical Control



Typically not recommended. Since this is a fungus, this is another example of the importance of identification. An insecticide would be a total waste!

New Research & Trends: You may be surprised to learn that researchers are working on AI methods (neural networks) to diagnose and predict anthracnose infections from photos!

Can anyone guess what caused the damage?



White Pine Blister Rust (*Cronartium ribicola*)



Identification

Year Round – Dead needles, stunted growth

Spring – Orange-yellow blisters and fluid which blackens towards summer

Autumn – patches of yellow or brown bark on young growth



Prevention & Cultural Control

Eliminate all currants and gooseberries (*Ribes*) within 900 feet of pines, which are alternate hosts.

Know about *Ribes* [quarantines](#)



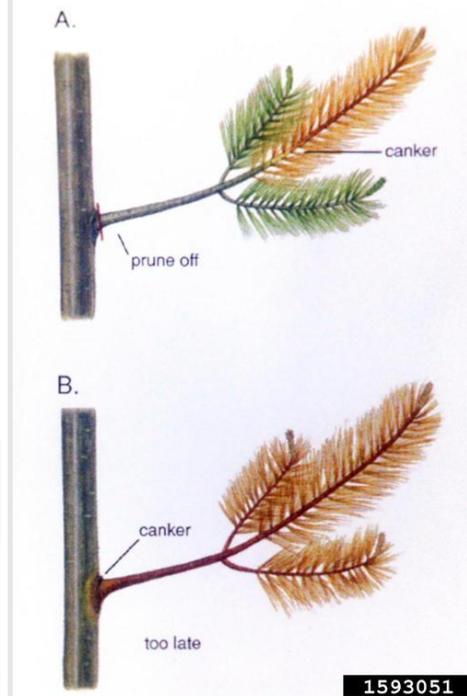
Monitoring & Record Keeping

Scout white pine for cankered areas in tree trunks and branches, and look for orange spores in May.

Scout for infections on *Ribes* sp.



Action Thresholds



Biological & Chemical Control

Applicators only – The most effective way to kill alternate host plants is through use of herbicides, although currants and gooseberries may be physically uprooted instead

New Research & Trends: A 2023 study found that white pines that are more resistant to infection from blister rust had more “waxy” needles, a trait which could be possibly bred for.

Can anyone guess what caused the damage?



Rhizosphaera Needlecast (*Rhizosphaera kalkhoffii*)



Identification

Trees starting with lower canopy needle loss.

Infected needles with rows of tiny black dots on underside



Prevention & Cultural Control

Prune when needles are dry. Sterilize shears with 70% rubbing alcohol.

Educate customers: Norway and red spruce are more resistant, water in drought, mulch to prevent weeds. Don't let sprinklers spray needles!



Monitoring & Record Keeping

Scout in the late summer for needles turning brown to purple

Disease starts in the lower portion of the tree, especially in spruce and white fir.



Action Thresholds

Once needles have been cast, the disease has already been in the tree for at least one year.



Biological & Chemical Control



Applicators only - If applicable, apply a preventative fungicide to the needles when they are one-inch-long and during extended wet period.

New Research & Trends: In 2017, Maine Forest Service provided detailed guidance for treating depending on presence of other needle cast fungi.

Diagnostic – what can be wrong?

Invasive Species to Recognize & Report!



Is this what the desk of an arborist looks like???

Quick Guide to Reporting Invasive Species

Gather as much evidence as possible:

- Date and time of observation
- Location (detail!)
- Host plant
- Description of the surrounding site
- Description of behavior
- Photo
- Specimen



Is this what the desk of an arborist looks like???

Can anyone guess what caused the damage? Who am I?



Photos: Debbie Miller Steven Katovich, Eric R. Day, Bugwood.org

Emerald Ash Borer (*Agrilus planipennis*)



Identification

June - August
Adult is ½ in, metallic green, narrow and bullet shaped



Year round:
Larva ½ - 1.5 in., creamy white, narrow



Prevention & Cultural Control

DON'T MOVE FIREWOOD

Treat all ash as if it is infested. Grind, chop, burn, or compost ash tree waste materials.

Other recommendations [here](#).



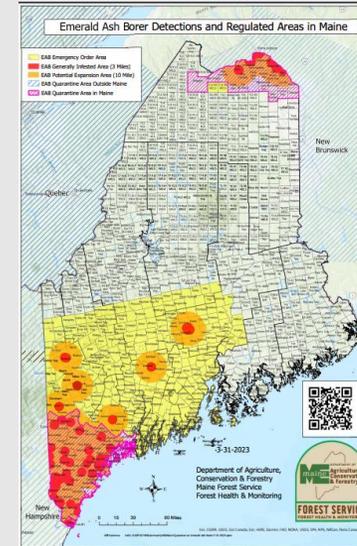
Monitoring & Record Keeping

Scout for S-shaped tunnels under the bark, D-shaped exit holes, blonding from woodpecker activity, epicormic shoots, and bark splits and crown dieback.

[Click here](#) for an excellent guide.



Action Thresholds



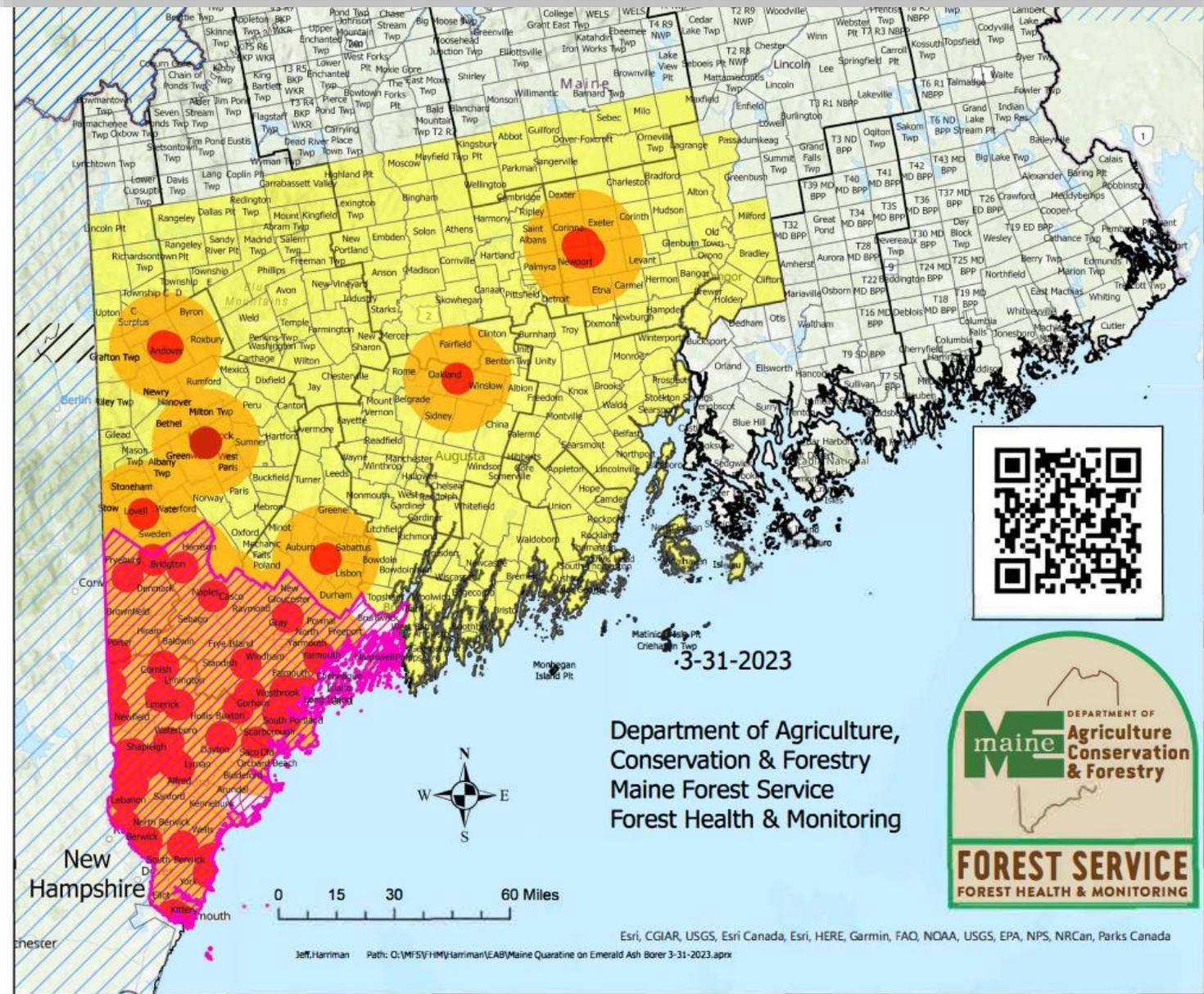
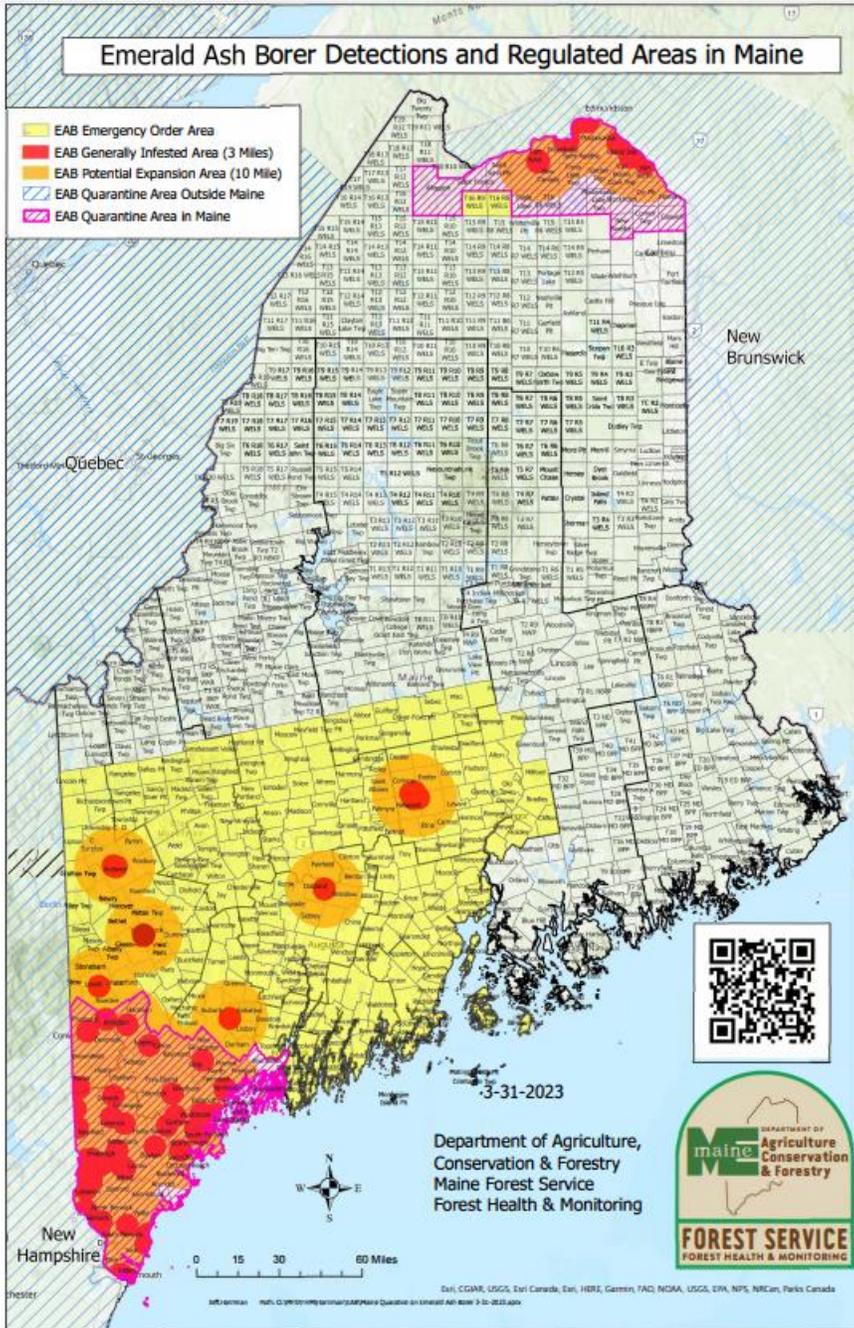
[Report](#) outside of [Quarantine](#) or Emergency Order Areas!



Biological & Chemical Control

Applicators only –
Insecticide treatments only recommended for ash in good health within 10-15 miles of infested areas.
More [here](#).

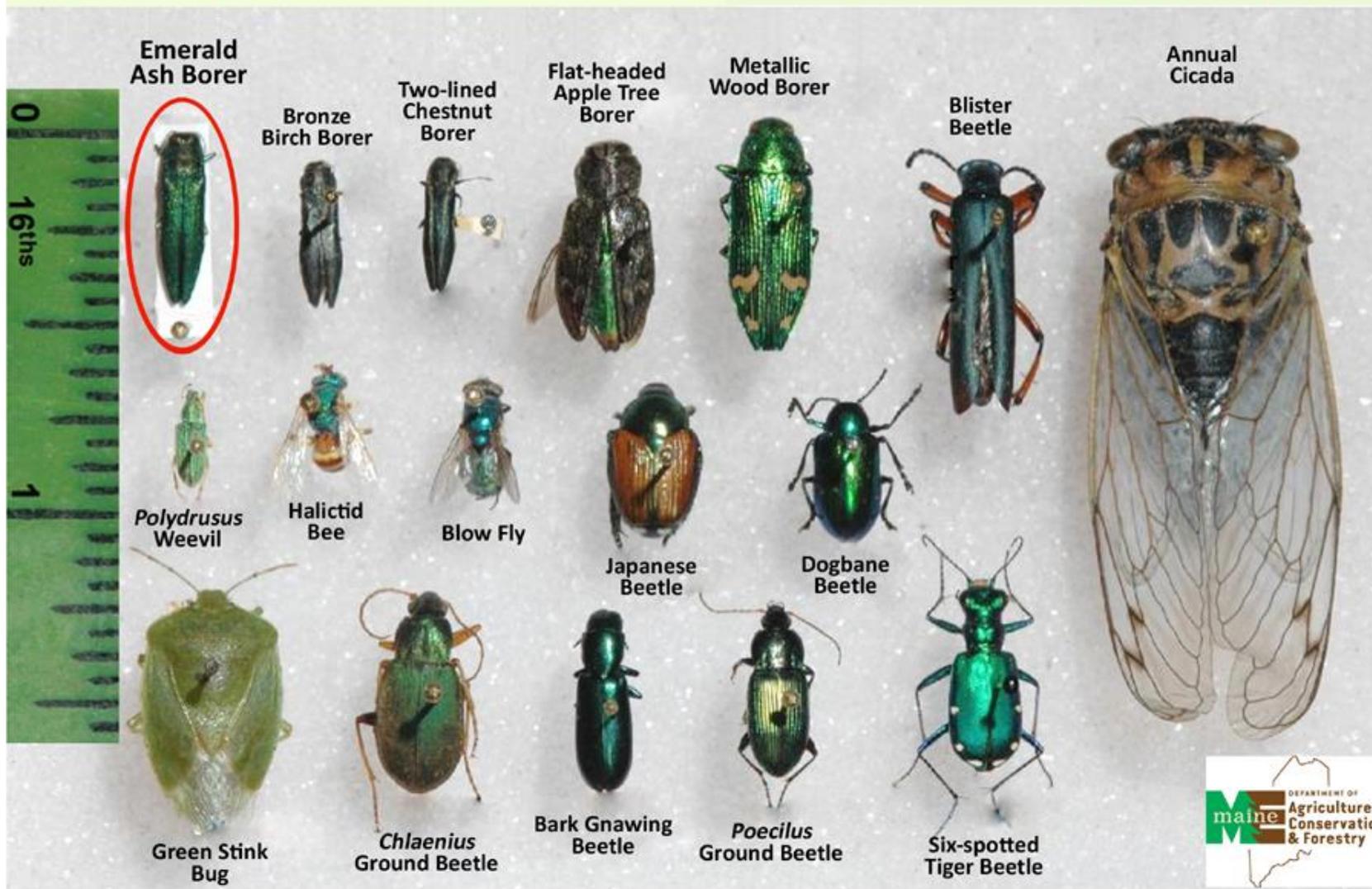
New Research & Trends: In EAB biological control news for 2022, one parasitoid wasp, *Tetrastichus planipennis*, was recovered from a release sites in northern Aroostook County! Other work planned around the state as well.



[Report](#) emerald ash borer outside of [Quarantine](#) or Emergency Order Areas!

Insects in Maine that may be confused with Emerald Ash Borer

Adapted from Jeff Hahn, University of Minnesota Extension and Val Cervenka, Minnesota Dept. of Natural Resources



Can anyone guess what caused the damage? Who am I?

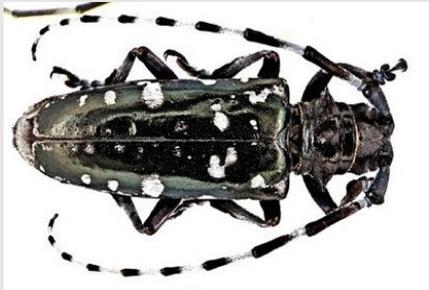


Asian Longhorned Beetle (*Anoplophora glabripennis*)



Identification

July – October – Adult beetles glossy black, white splotches, 1-1.5in, antenna banded black & white and as long or longer than body



Prevention & Cultural Control

**DON'T MOVE
FIREWOOD**



Monitoring & Record Keeping

Scout for exit holes ~3/8 to 1/2 in diameter on the trunk or branches. A pencil can be inserted at least 1 in. Look for sawdust like frass.

Scout split and cut wood for tunnels near the heartwood, larva, and pupa.

[Learn more](#)



Action Thresholds

**REPORT
IMMEDIATELY!**

[Report!](#)



Biological & Chemical Control

**REPORT
IMMEDIATELY!**

New Research & Trends: A 2021 article described how ALB was successfully eradicated from North-Eastern Italy. Over 36,000 trees were surveyed and over 2000 trees were felled.

Asian Longhorned Beetle (*Anoplophora glabripennis*)

Exotic Longhorned Beetle Lookalikes

Do not report insects "Found in Maine"

Citrus longhorned beetle
(*Anoplophora chinensis*) (near R)

Asian longhorned beetle
(*Anoplophora glabripennis*) (far R)

1 - 1 1/2 inch long
Glossy-black with distinct white spots

REPORT IF FOUND



Whitespotted sawyer

(*Monochamus scutellatus*)

3/4 - 1 1/4 inch long

Bronze-black with indistinct white spots

White dot at base of wing covers

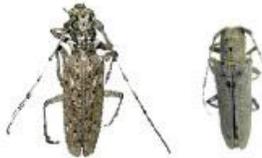
FOUND IN MAINE

Northeastern sawyer
(*Monochamus notatus*)

3/4 - 1 1/2 inch long

Mottled light brown/white, no distinct spots

FOUND IN MAINE



Poplar borer

(*Saperda calcarata*)

About 1 inch long

Bluish-gray with faint yellow splotches

FOUND IN MAINE

Brown prionid
(*Orthosoma brunneus*)

1 - 1 1/2 inch long

Light chestnut brown, no spots

FOUND IN MAINE



Broadnecked root borer

(*Prionus laticollis*)

1 - 1 1/2 inch long

Black with no white markings; solid black antennae

FOUND IN MAINE

A longhorned beetle
(*Graphisurus fasciatus*)

1/3 - 2/3 inch long

Dark with gray to light brown mottling; antennae banded

FOUND IN MAINE



Western conifer seed bug

(*Leptoglossus occidentalis*)

About 3/4 inch long

Various shades of brown with a distinct geometric pattern on wings. Often seen indoors

FOUND IN MAINE

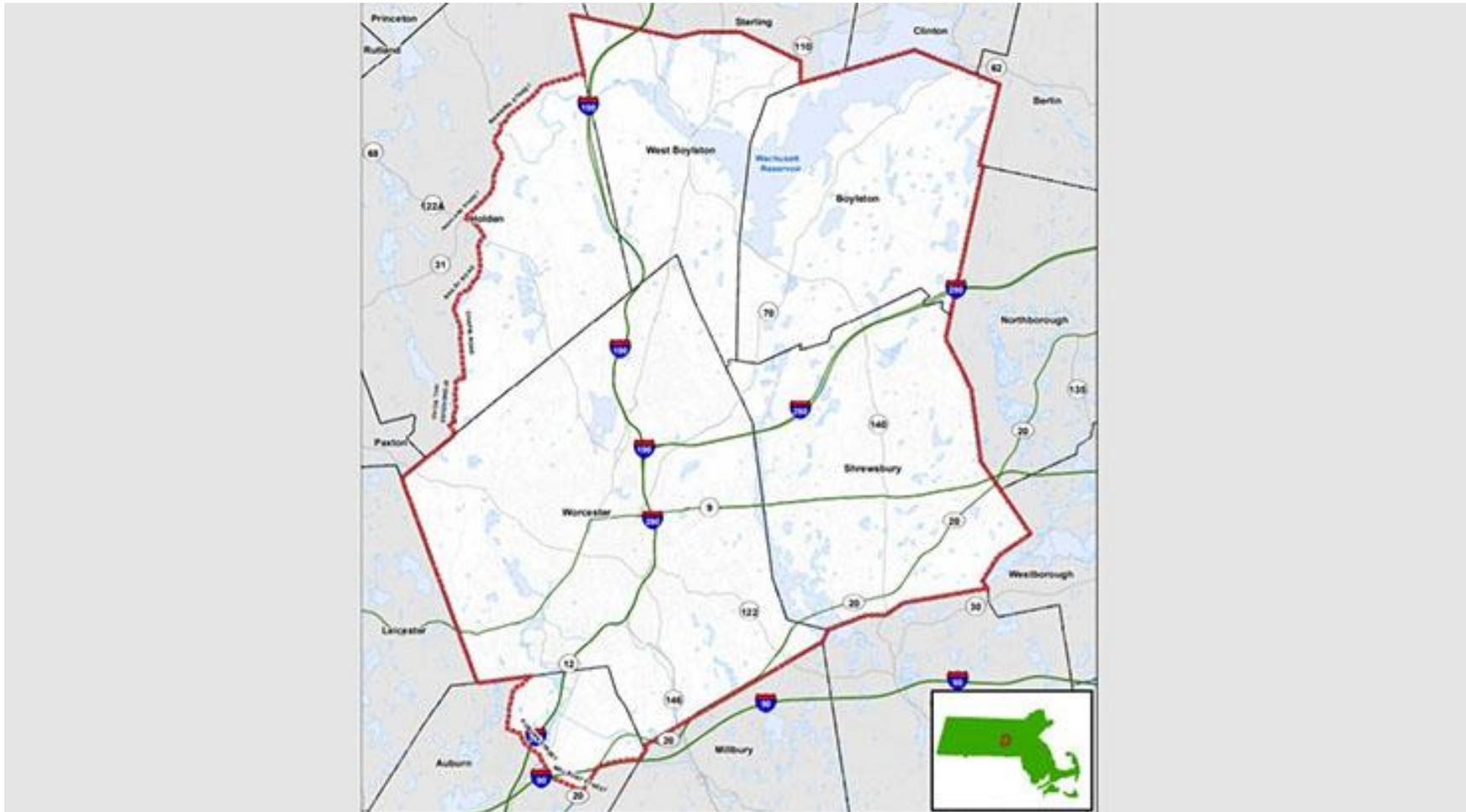


If you see the citrus longhorned beetle or the Asian longhorned beetle in Maine, capture it or take a picture, and report to the Maine Department of Agriculture, Conservation and Forestry...

www.maine.gov/alb -or- CALL: (207) 287-3891 -or- EMAIL: bugwatch@maine.gov

Asian Longhorned Beetle (*Anoplophora glabripennis*)

ALB was first found in **Massachusetts in August 2008**. Currently, **110 square miles are quarantined** for ALB in Massachusetts, in Worcester County. Quarantined areas include all of Worcester, West Boylston, Boylston, and Shrewsbury, and portions of Holden and Auburn. Eradication was declared for an infestation in Boston.



Can anyone guess what caused the damage? Who am I?



Photos: Eric R. Day, PA Dept. Conservation; Bugwood.org; Maine Forest Service

Elongate Hemlock Scale (*Fiorinia externa*)



Identification

Scales can be seen on the underside of host needles.

Adult Females – brown waxy coating

Adult Males – white, waxy thread-like floss



Prevention & Cultural Control

Culling heavily infested trees

Educate clients – even-aged stands, avoid over-fertilizing with nitrogen, limit use of broad-spectrum insecticides



Monitoring & Record Keeping

Scout conifers with needles yellowing and dropping. Look for yellow spots on upper surface of needles, scales, and waxy deposits. Scout for crawlers and winged males by jarring infested foliage over a piece of petroleum jelly coated dark paper.



Action Thresholds

If you think you have found it, report it! Note the location, take a picture, and:

[Report!](#)



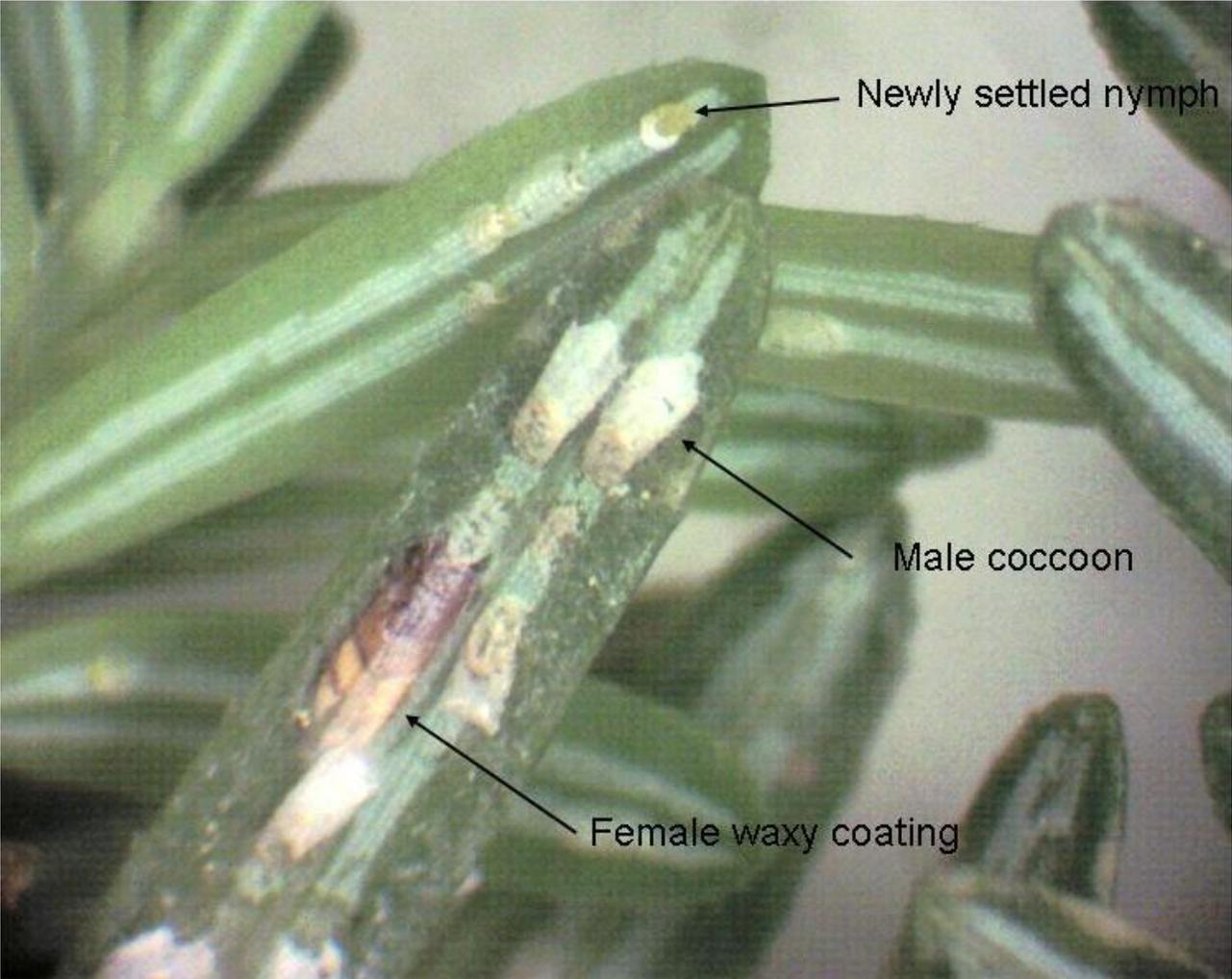
Biological & Chemical Control



Applicators only – treat only when necessary, predators reduce scale populations and multiple insecticide applications are often necessary.

New Research & Trends: A 2022 study determined that an entomopathogenic fungus could be a potentially successful biological control for elongate hemlock scale.

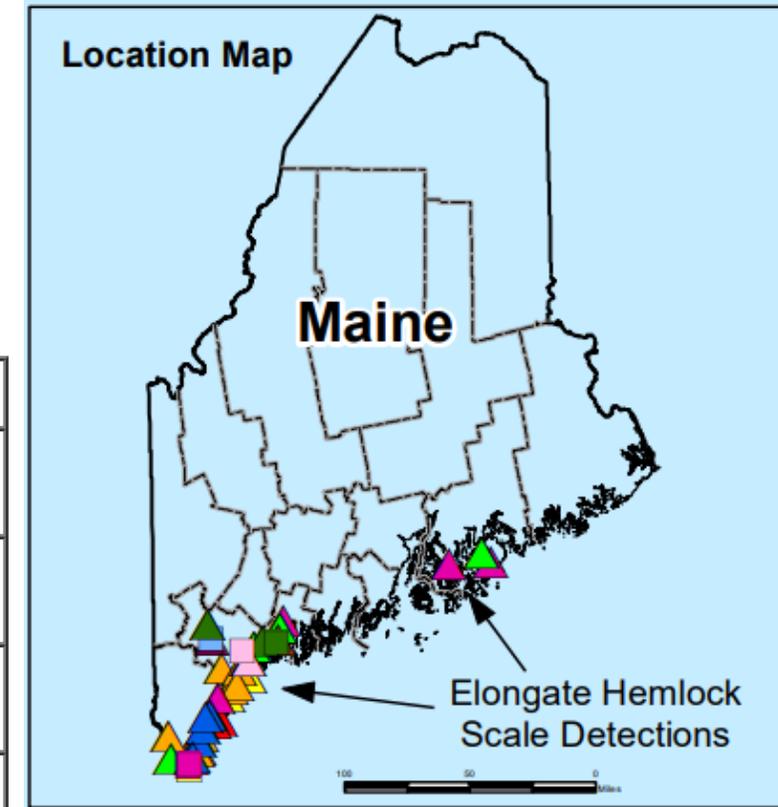
Elongate Hemlock Scale (*Fiorinia externa*)



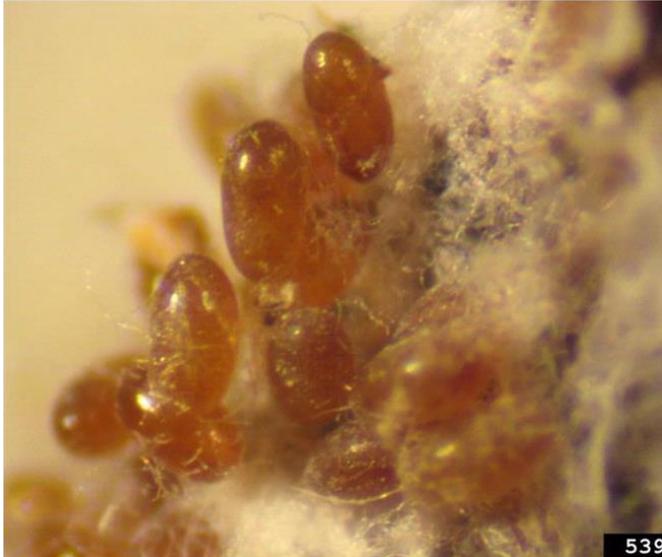
Elongate Hemlock Scale (*Fiorinia externa*)

Towns with known infestations:

County	Town	EHS Status
Cumberland	Cape Elizabeth, Casco, Freeport, Portland, Scarborough, Yarmouth	known on planted trees
Cumberland	Brunswick, Frye Island, Gorham, Falmouth	moved from planted trees, now established in forest
Hancock	Mount Desert	moved from planted trees, now established in forest
Hancock	Sedgwick	known on planted trees
Sagadahoc	Bath, Topsham	known on planted trees
York	Kittery	widely established in forest
York	Berwick, Kennebunk, Kennebunkport, Ogunquit, Old Orchard Beach, Saco, Wells, York	known on planted trees



Can anyone guess what caused the damage? Who am I?



Hemlock Woolly Adelgid (*Adelges tsugae*)



Identification



Really too tiny to identify without a microscope – see next sections



Prevention & Cultural Control

Prune live hemlock twigs and branches along edges (e.g. driveways) to minimize their role in the spread of adelgid.

Educate Customers: Do not move hemlock from infested areas. Remove bird feeders when eggs and crawlers are present.



Monitoring & Record Keeping

Inspect newer growth for discrete white cotton ball-like masses on the undersides of the twigs, usually attached at the bases of needles and up to 1/8th" in diameter.



Action Thresholds

Several options depending on various factors – see:

[Silvicultural Options for Managing Hemlock Forests Threatened by Hemlock Woolly Adelgid](#)

[Report!](#)



Biological & Chemical Control

Biocontrol: The predator beetles *Laricobius osakensis* and *Sasajiscymnus tsugae* have been [released](#) in some locations in Maine.



New Research & Trends: Entomology is a fantastic field – recent developments from the most simple (Velcro balls) to the most technologically advanced (eDNA) techniques for sampling!

Hemlock Woolly Adelgid (*Adelges tsugae*)



“One sampling technique for hemlock woolly adelgid is to launch a Velcro-covered ball into a tree with a slingshot, retrieve it when it falls, and examine it for adelgids or their woolly covering. The technique was developed by Jeffrey Fidgen of the Canadian Forest Service.”

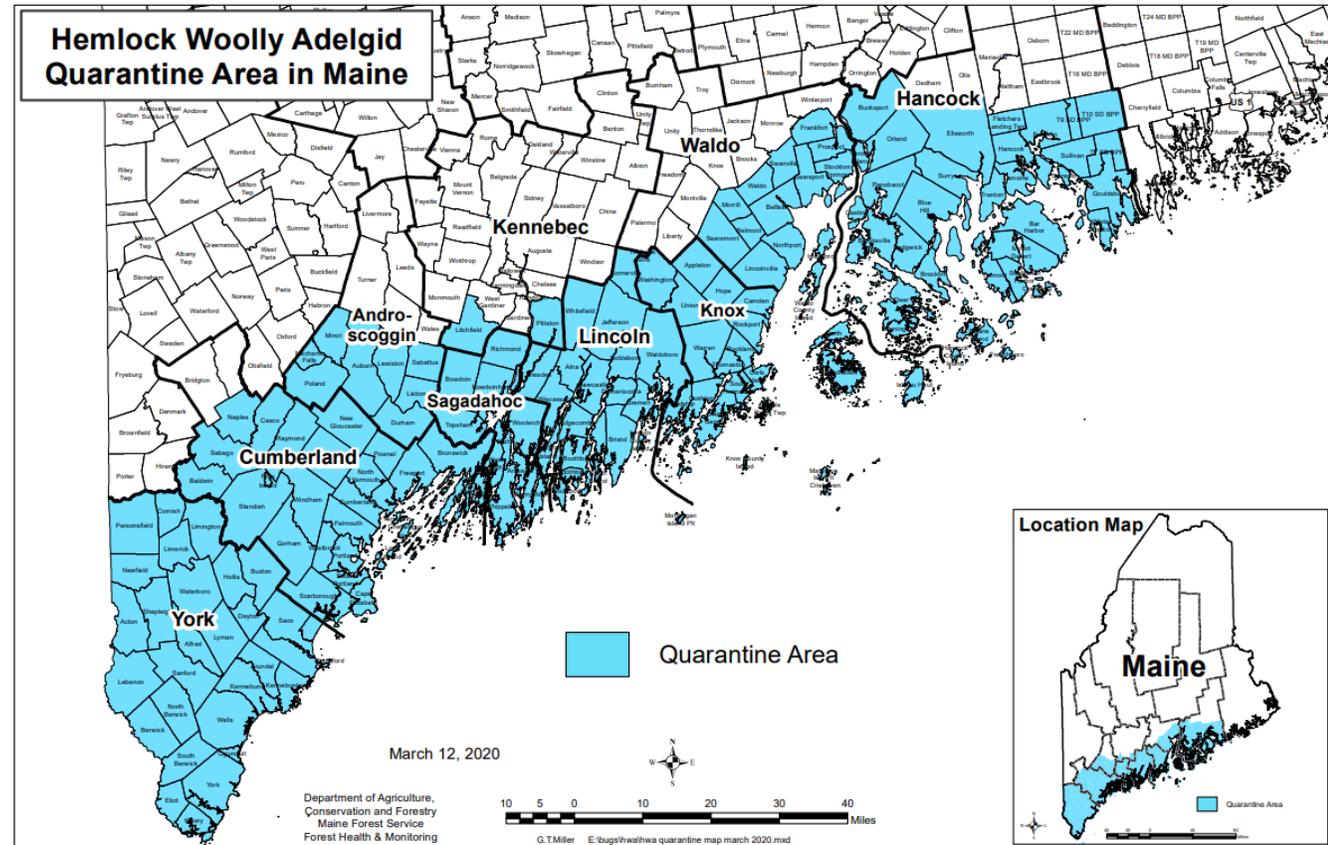
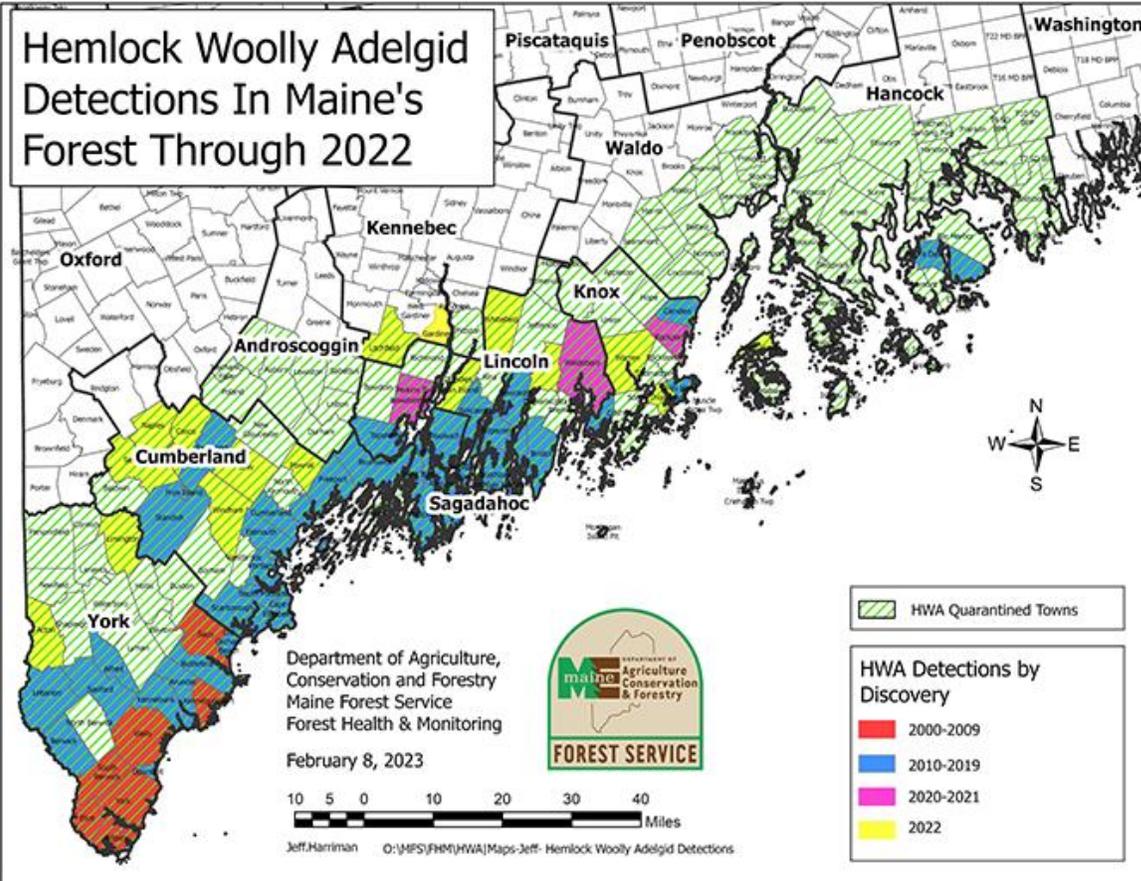
Read more: [Entomology Today](#)

Hemlock Woolly Adelgid (*Adelges tsugae*)

Don't be Fooled by These Imposters – They are not Hemlock Woolly Adelgid



Hemlock Woolly Adelgid (*Adelges tsugae*)



Can anyone guess what caused the damage? Who am I?



Photos: Milan Zubrik, Dimitrios Avtzis; Bugwood.org

Winter Moth (*Operophtera brumata*)



Identification

Larva – light to brownish-green inchworms with longitudinal white stripes.



Prevention & Cultural Control

Heavy weight paper strips that are covered with a sticky substance can be put on the tree to snare the climbing moth or caterpillar.



Monitoring & Record Keeping

Scout in the early spring for caterpillars feeding on first leaf or flower buds, then deciduous leaves.



Action Thresholds

No established action thresholds. Determine need at site locations.

[Report!](#)



Biological & Chemical Control



Biocontrol: MFS has been releasing a parasitoid fly, *Cyzenis albicans*, since 2013. [In 2023](#) parasitism rates ranged from **0%-21%** at seven release locations.



Young caterpillar on a blueberry bud that was pulled open during scouting.

New Research & Trends: The *Cyzenis albicans* biocontrol program started in 2005 in Massachusetts has been a successful biocontrol program (rare!) with established biocontrol flies *and* consistent lowered WM populations.

Can anyone guess what caused the damage? Who am I?

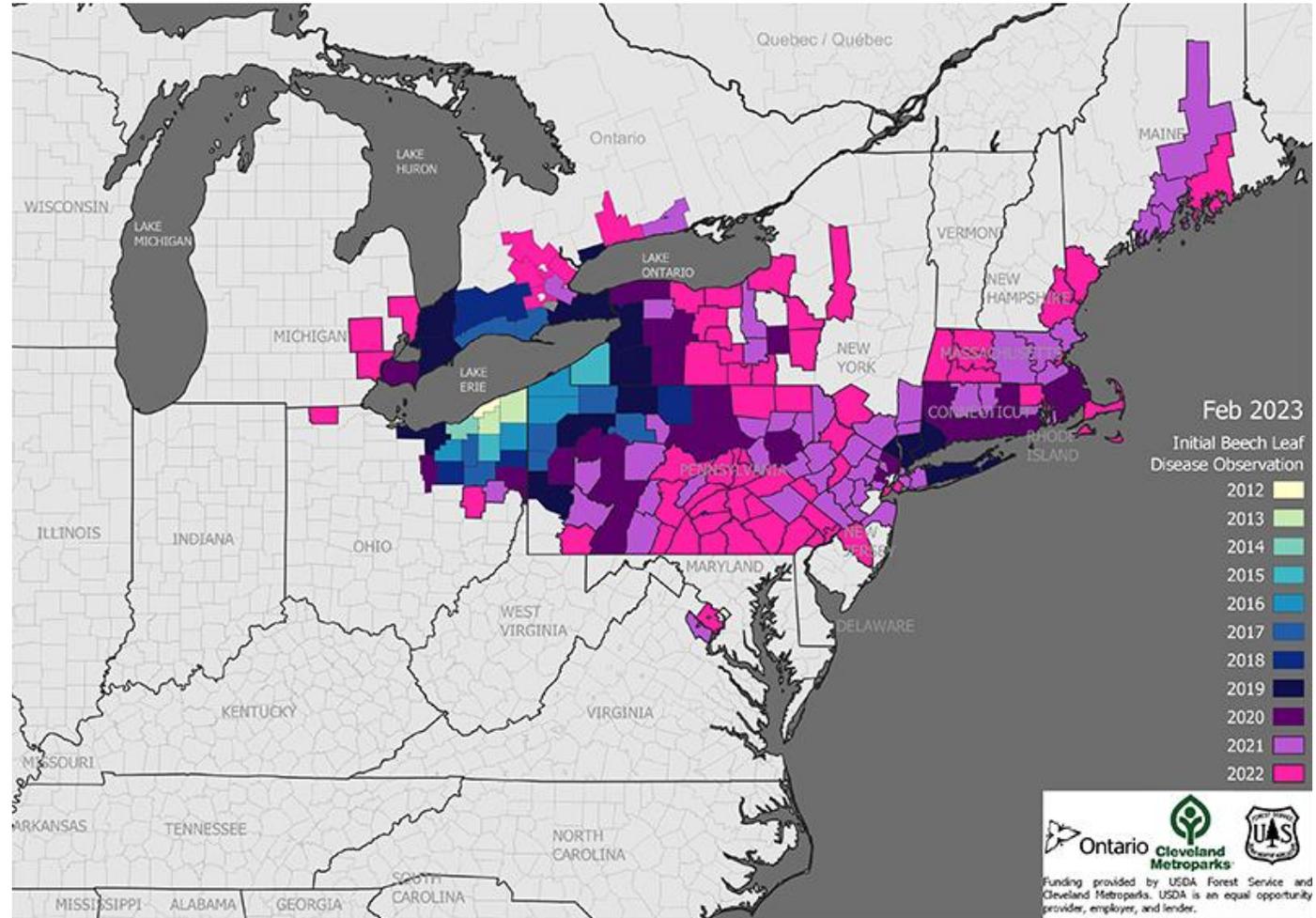
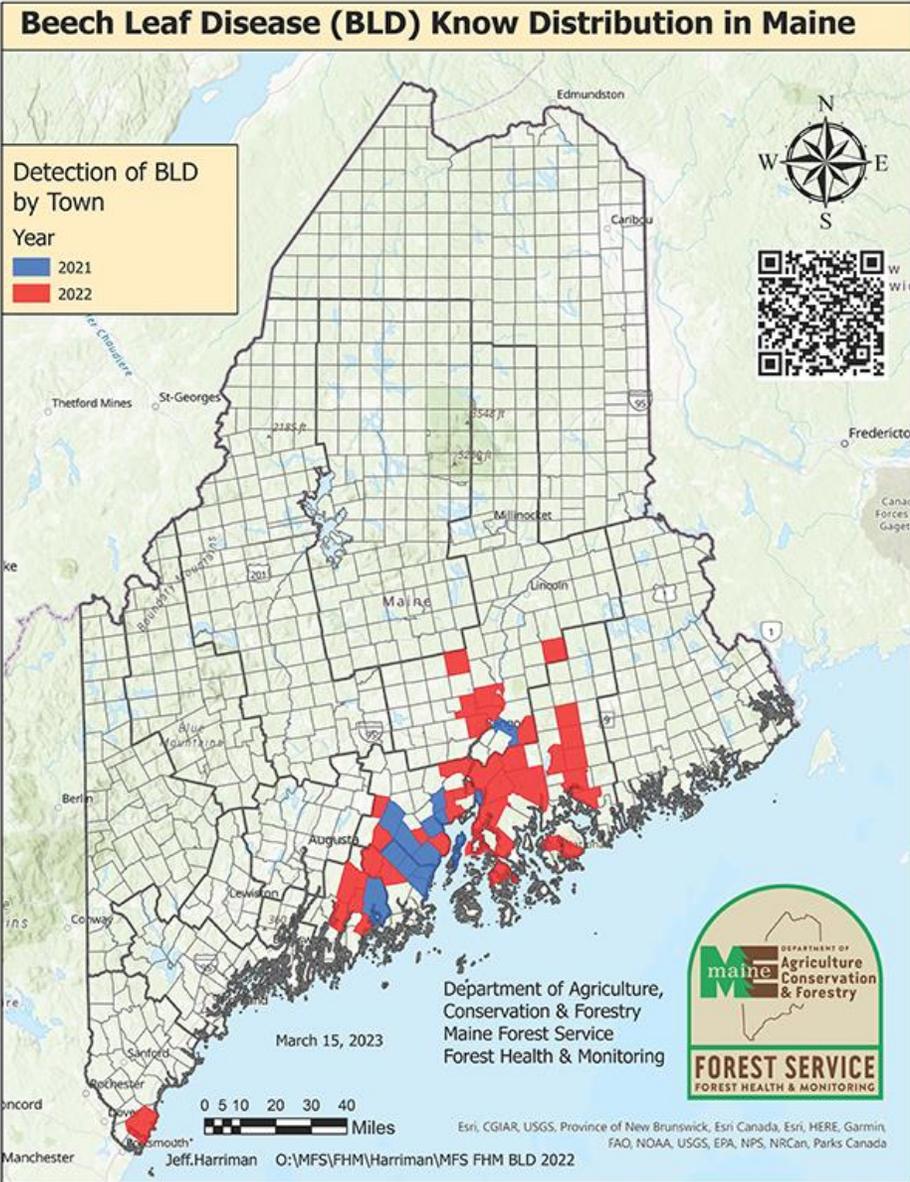


Beech Leaf Disease

 Identification	 Prevention & Cultural Control	 Monitoring & Record Keeping	 Action Thresholds	 Biological & Chemical Control
<p>Symptoms: Dark bands between veins, cupped or deformed leaves, which can be thick or leathery, premature leaf drop, aborted buds, sparse leaf cover, and a thinning canopy.</p> <p>See here for look-alikes.</p>	<p>Pruning infected landscape trees may decrease foliar surface moisture and thus BLD symptom severity.</p> <p>Avoid moving beech tree material.</p>	<p>Scout all beech tree species for symptoms</p> <p>Disease symptoms tend to begin in smaller beech trees in the understory</p>	<p>Report if seen! <i>When in doubt – report!</i></p> <p>Detected for the first time in Maine in 2021</p> <p>Report!</p>	<p>Applicators only – trials of a soil drench have shown preliminary results.</p> <p>More info here.</p>

New Research & Trends: A 2022 study explored the use of near-infrared spectroscopy and machine learning to detect beech leaf disease in the field. Results were promising for developing practical tools in the future.

Beech Leaf Disease



Considerations – Working with the Public

IPM IS WORTH IT!

- People develop strong emotional attachments to favorite trees
- The general public does not always understand the biology of plants, and interactions between plants-insects-animals-soil health-fungi as we do
- Customers may not see the long term perspective and want the cheapest but not best solution first

