Got Pests?
IPM is the "more sustainable" answer

- Gary Fish
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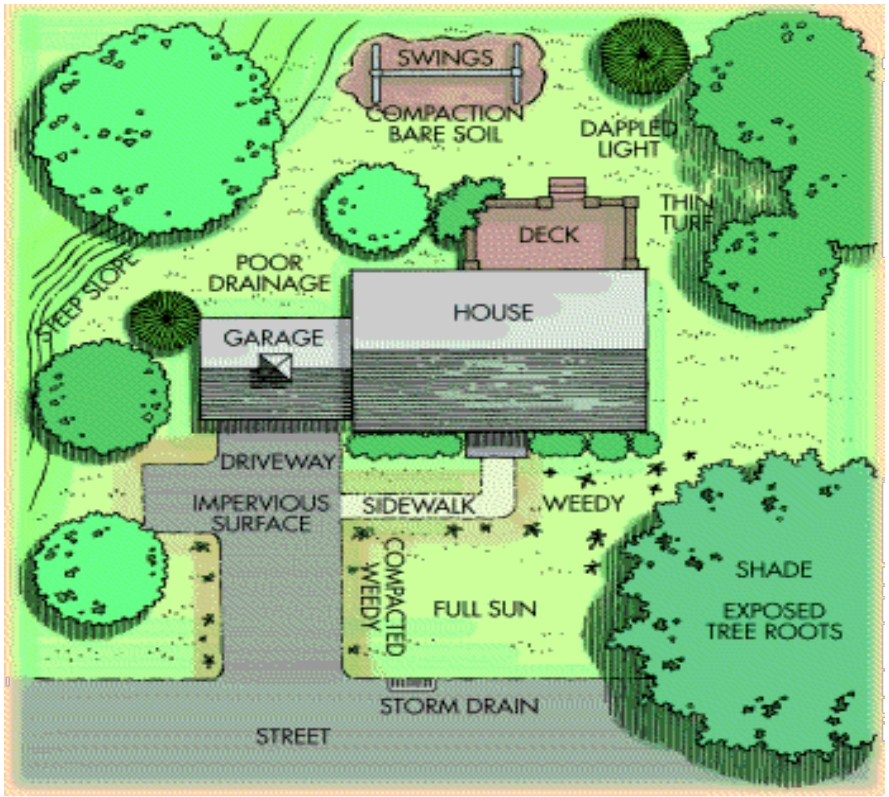
Use IPM!
Integrated Pest Management

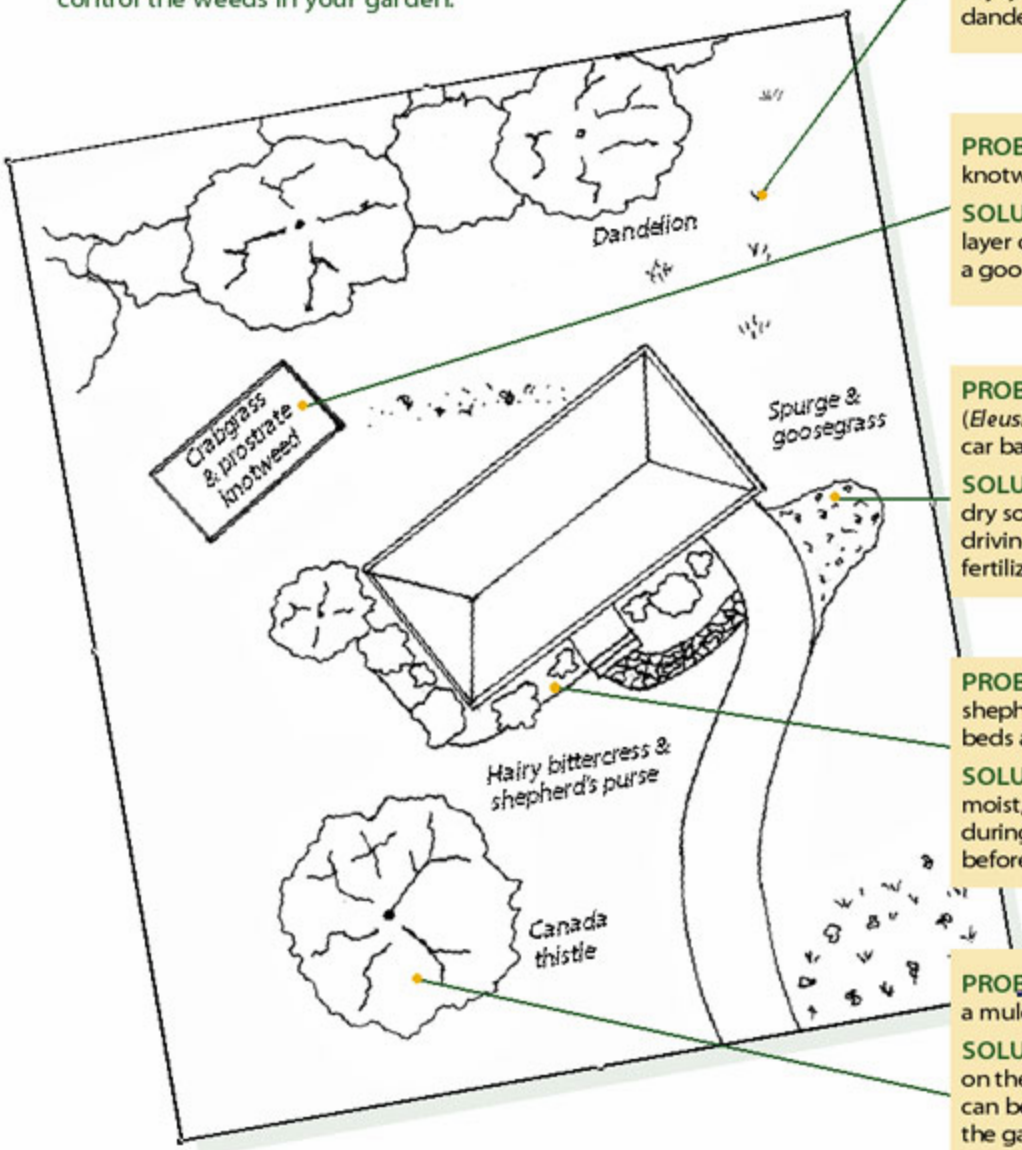
- Good horticultural practices
  - Select right plants for right places
  - Choose pest-resistant, disease-resistant cultivars
  - Provide optimal fertilizer, water
- Discourage pests:
  - row covers, traps, repellents, crop rotation, plant spacing
- Encourage natural enemies
  - Spare the sprays
  - Diverse plantings, including season-long offering of plants with flat, open flowers.
- Know your enemy: identify pests and “good bugs”

Look at the big picture



Make plans to manage specific problems

Begin by sketching a map of your yard. Label it with the names of the weeds you find and their locations. Once you assemble this information, you can do some research and make decisions about how and when to control the weeds in your garden.



PROBLEM: Dandelion (*Taraxacum officinale*) scattered throughout the lawn.

SOLUTION: The best solution for dandelions is to learn to enjoy their presence, or you can hand-pull them using a dandelion weeder.

PROBLEM: Crabgrass (*Digitaria* spp.) and prostrate knotweed (*Polygonum aviculare*) in the children's play area.

SOLUTION: Define the edges of the area and add a deep layer of sand or mulch. It will keep weeds down and provide a good playing surface for children.

PROBLEM: Spurges (*Euphorbia* spp.) and goosegrass (*Eleusine indica*) in the area next to the driveway where the car backs up when leaving the garage.

SOLUTION: These plants are indicators of compacted, dry soil with low fertility. Either pave the area or stop driving over it and turn it back into lawn by aerating, fertilizing, and seeding.

PROBLEM: Hairy bittercress (*Cardamine hirsuta*) and shepherd's purse (*Capsella bursa-pastoris*) in the garden beds around the house.

SOLUTION: These are both winter annuals that prefer moist, shady spots and cool weather, so watch for them during the fall, winter, and spring, and hand-pull them before they set seed.

PROBLEM: Canada thistle (*Circium arvense*) on the edge of a mulch bed at the base of a tree.

SOLUTION: This has probably come over from the meadow on the other side of the driveway. It is an invasive plant that can be hand-pulled when young. Monitor for seedlings in the garden and pull them immediately.

Right plant, right place, right purpose

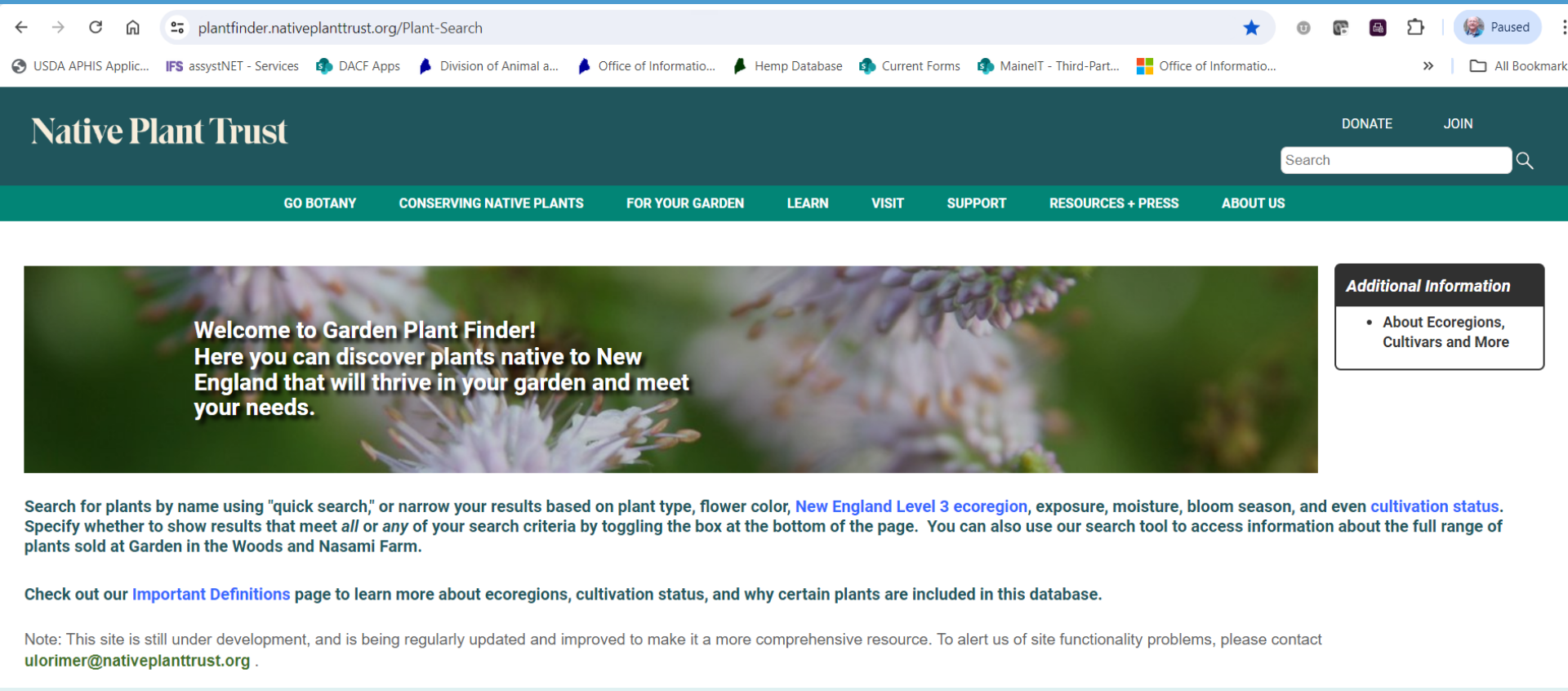
- Choose plants based on the site conditions not just for their color
- Select plants that thrive under existing conditions rather than trying to alter the conditions to meet the needs of a plant
- Minimize disturbance of the existing landscape

Wild Cranberry Bog

Site conditions are key!

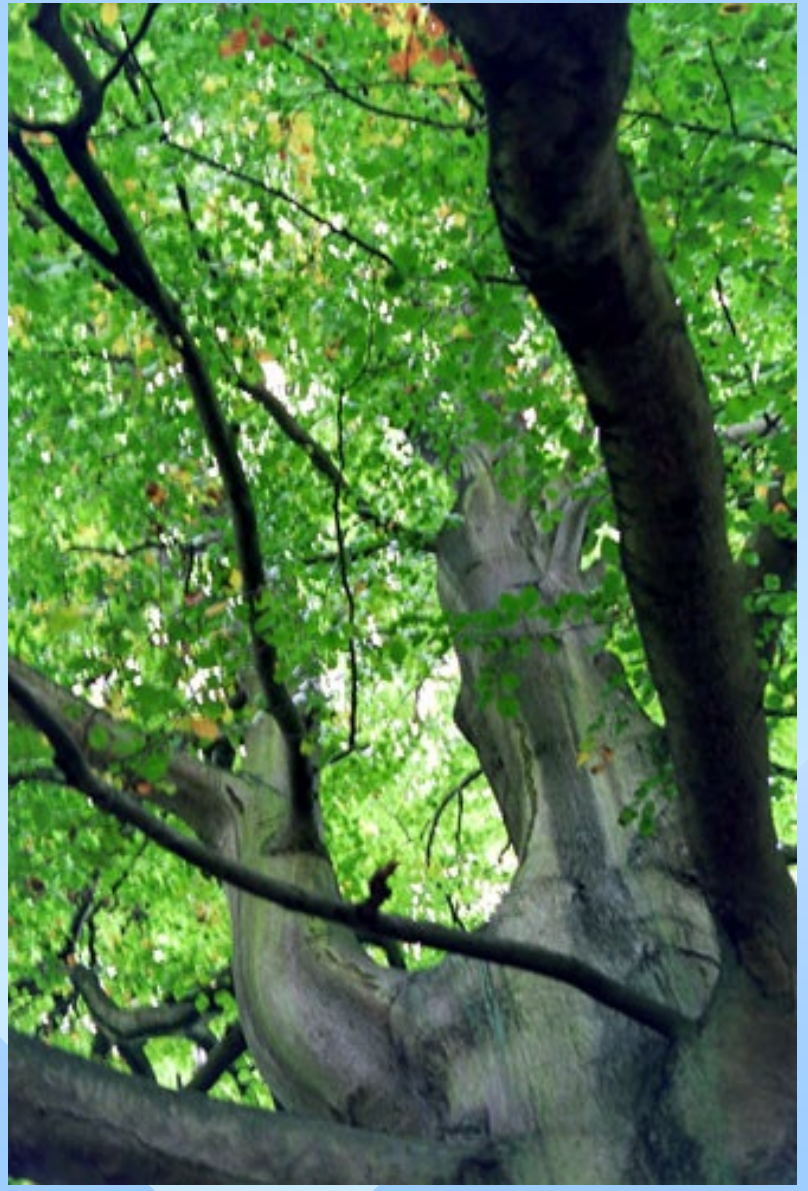
- light availability, intensity and duration (full sun to deep shade)
- water availability, salt water intrusion or spray
- exposure to wind and temperature extremes
- soil type, drainage, compaction
- hardiness zone
- competition from existing vegetation
- below ground conditions in urban sites

An excellent tool to help make successful plant choices



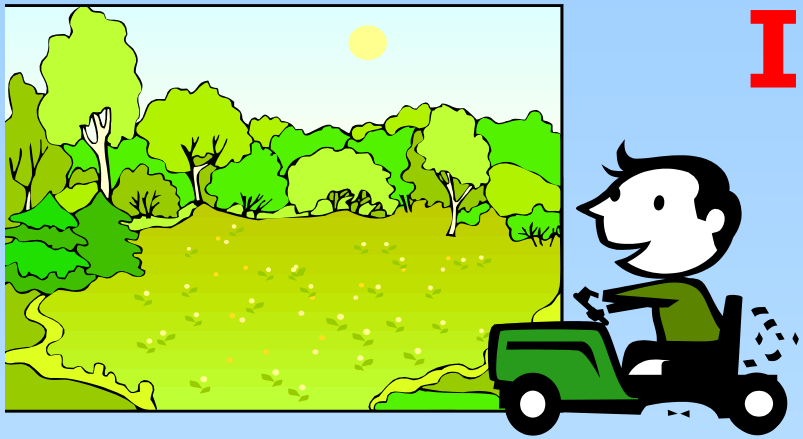
https://plantfinder.nativeplanttrust.org/Plant-Search

#1 Killer of grass



IPM

Turf

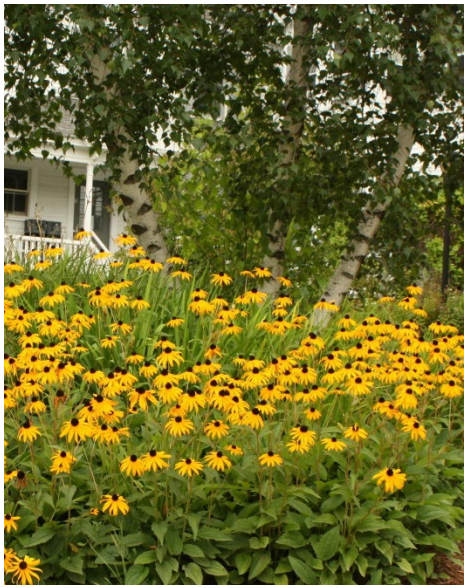


- **According to NASA's Ames Research Center:**
  - 50, 000 square miles of the continental US is covered by lawn
  - There is 3 times as much irrigated grass as irrigated corn.
  - Turf is the most widespread irrigated crop.

Use site appropriate, non-invasive plants

- Native plants are often well adapted
  - Fewer problems, less work, more rewards, **but all are NOT problem free**, e.g., viburnums, birches
- Invasive plants are easy to grow but crowd out native vegetation
  - Our local forest habitats are changing rapidly
  - Invasive plants can ruin wildlife habitat
  - Invasive plants harbor more infected deer ticks

Wild Columbine



Paper Birch

Pretty ornamentals? Or Pests?

Purple Loosestrife

Burning Bush

Glossy Buckthorn

Japanese Barberry

Oriental Bittersweet

Why are invasive plants bad?

- **Ruin wildlife habitat**
- **Prevent forest regeneration**
- **Disrupt recreational activities**
- **Change soil chemistry**
- **Cost billions of dollars to control**

Invasive·Plants·and·Maine's·Ecological·Puzzle¶

¶

What·do·plants·like·'Crimson·King'·Norway·maple,·burning·bush·and·Japanese·barberry·have·in·common?·They·are·long-standing·favorites·in·urban·and·suburban·landscapes;·they·grow·easily·and·they·provide·beautiful·red·or·purple·foliage·all·year·long·or·in·the·fall.·Those·are·their·positive·attributes.·Unfortunately·they·all·have·become·invaders·in·our·forests,·on·our·farms·and·in·our·natural·areas.·Each·has·now·been·classified·as·"invasive."¶

Invasive·plants·are·like·pieces·that·just·don't·fit·right·in·Maine's·ecological·puzzle.·By·crowding·out·native·plants·they·leave·holes·in·the·food·web·and·can·exclude·other·pieces·of·the·puzzle·which·create·even·larger·gaps.·These·gaps·in·the·food·web·can·cascade·and·eliminate·the·food·source·for·other·species·like·caterpillars;·an·essential·food·for·baby·birds.·Maine's·chickadees·depend·upon·caterpillars·to·provide·their·nestlings·with·protein·to·grow·and·develop·into·adulthood.·¶

Yes,·all·this·can·happen·just·because·we·decide·to·plant·an·invasive·species·into·our·landscape.¶

In·some·of·Maine's·forested·areas·the·entire·forest·floor·is·covered·with·plants·like·Japanese·barberry·with·its·many·needle-like·spines.·Although·white-tailed·deer·seem·to·eat·almost·any·plant,·they·do·not·like·Japanese·barberry.·The·barberries·create·a·food·desert·for·deer·and·open·large·holes·in·the·ecological·puzzle.¶

So·what·is·a·gardener·to·do?·¶

There·are·many·alternative·plants·that·provide·equal·or·better·aesthetic·characteristics·in·our·landscapes.·Some·are·Maine·natives·that·fit·perfectly·in·our·ecological·puzzle.·Others·are·non-natives·that·stay·put·and·don't·wreak·havoc·on·the·ecosystem·like·"invasive"·plants·can.¶

- Forgo·planting·a·'Crimson·King'·Norway·maple.·Instead,·appreciate·the·brilliant·fall·color·of·an·'Autumn·Blaze'·Freeman's·maple·or·the·stately·character·of·a·European·copper·beech;·or¶
- Enjoy·the·fruitful·antioxidant·rewards·of·a·highbush·blueberry·or·a·red·chokeberry·in·place·of·the·food·desert·created·by·Japanese·barberry;·or¶
- Make·wreaths·from·winterberry·instead·of·the·tree-choking·Asiatic·bittersweet·whose·berries·can·be·picked·off·wreaths·and·planted·elsewhere·by·birds·and·mice.¶

Planting·well-behaved·non-native·and·native·plants·helps·keep·Maine's·ecological·puzzle·together.·This·complete·picture·is·essential·to·the·survival·of·many·species·we·love·and·depend·upon.·Help·keep·the·puzzle·whole·and·choose·to·exclude·invasive·plants·from·your·garden.¶

Starting·January·1,·2018·Maine·will·prohibit·the·sale·of·33·invasive·terrestrial·plants.··For·the·complete·list·of·prohibited·plants·and·more·information·on·great·alternatives,·go·to·maine.gov/hort·or·scan·the·QR·code·below.¶

Our top 8 invasive plants no longer being sold by nurseries and box stores

* Burning bush
* Japanese barberry
* Asiatic bittersweet
* Norway Maple (including Crimson king)

Burning bush

(*Euonymus alatus*)

INVASIVE!

Burning bush
aka winged euonymus
Euonymous alatus

- Branching shrub can grow to over 10’ tall
- Tolerates sun and full shade
- Opposite leaves
- Moist to wet soils
- Winged twigs

Alternatives

Virginia sweetspire
(***Itea virginica***)

Highbush blueberry
(***Vaccinium corymbosum***)

Japanese barberry

(*Berberis Thunbergii*)

INVASIVE!

Japanese barberry *Berberis thunbergii*

* Arching shrub of forests and edges
* Shade tolerant
* Can grow to 5’ tall x 5’ wide
* Densely thorny twigs (“barbs”)
* Oblong red fruits hang below stems
* Ticks!!! ☹

Alternatives

Red Chokeberry (*Aronia arbutifolia*)

Ninebark (*Physocarpus opulifolius*)

Norway Maple (*Acer platanoides*)

INVASIVE!

Norway maple
Acer platanoides

- Canopy tree
- Widely planted street tree
- Leaves similar to sugar maples
- Broken leaf stem has white, milky sap, unlike native maples

Alternatives

Red Maple (*Acer rubrum*)

Sugar Maple (*Acer saccharum*)

Asiatic Bittersweet

* Identification
  * Bright orange/red fruit borne along the stems
  * Alternate leaves (yellow in fall)
  * Roots are bright orange
* Spread
  * Large # of seeds
  * Bird dispersed
  * Suckers and fragments

Asiatic bittersweet (*Celastrus orbiculatus*)

- Woody vine that climbs
- Can strangle or weigh down a mature tree
- Favors open areas but will survive under forest canopy

INVASIVE!

NATIVE Look-A-Like
American bittersweet (*Celastrus scandens*)

Terminal Inflorescence/Fruit

Alternatives

Trumpet Creeper (***Campsis radicans***)

Winterberry (***Ilex verticillata***)

EddMapS Photo

Euonymus fortunei

Wintercreeper

Alternatives

Virginia creeper (***Parthenocissus quinquefolia***)

Cape May Warbler

Both are great for many bee species

Ruffed grouse

Phish Photography

Partridge berry (***Mitchella repens***)

Phish Photography – Coastal Maine Botanical Gardens

Phalaris arundinacea

Variegated ribbon grass

Alternatives

Silver spotted skipper

Photo by R.M. Gobeil.

Paradoxical grass moth

Copyright © 2011 Richard Wolfert

Cheryl Lowe. Copyright © 2024 New England Wild Flower Society.

Switchgrass (***Panicum virgatum***)

Both are great for bird nest material

Phish Photography

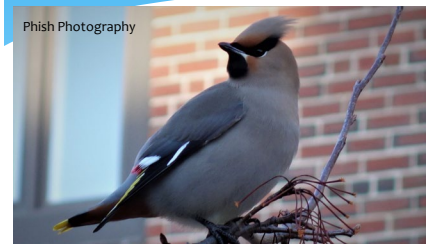
Purple lovegrass (***Eragrostis spectabilis***)

Gary Fish, Maine DACF

Sorbus aucuparia

European Mountain-ash

Alternatives



Bohemian waxwings

Red-banded hairstreak

American mountain ash (***Sorbus americana***)

Both feed many birds and small mammals

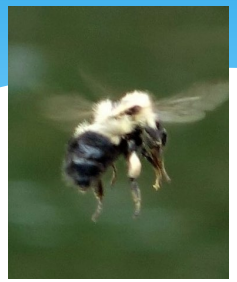
Cockspur hawthorn (***Crataegus crus-galli***)

Britt Slattery, US FWS

Pyrus calleryana

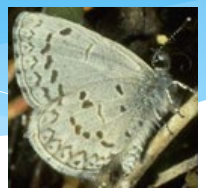
Callery “Bradford” Pear

Alternatives



Bumble bee

Spring azure



Both feed many birds and small mammals

Canada serviceberry (***Amelanchier canadensis***)

Pagoda dogwood (***Swida alternifolia***)

Preventing invasive plants

- **Don’t plant them!**
- **Clean off equipment, clothing and footwear**
- **Minimize soil movement and disturbances**

Don't buy or plant – illegal to import or sell after 1/1/2018

Scientific name	Common name
Acer ginnala	Amur Maple
Acer platanoides	Norway Maple
Aegopodium podagraria	Bishop's Weed
Ailanthus altissima	Tree of Heaven
Alliaria petiolata	Garlic Mustard*
Amorpha fruticosa	False Indigo Bush
Ampelopsis glandulosa	Porcelain Berry
Artemisia vulgaris	Common Mugwort
Berberis thunbergii	Japanese Barberry
Berberis vulgaris	Common Barberry
Celastrus orbiculatus	Asiatic Bittersweet
Elaeagnus umbellata	Autumn Olive
Euonymus alatus	Winged Euonymus
Euphorbia cyparissias	Cypress Spurge
Fallopia baldschuanica	Chinese Bindweed
Fallopia japonica	Japanese Knotweed
Frangula alnus	Glossy buckthorn

Scientific name	Common name
Hesperius matronalis	Dame's Rocket
Impatiens glandulifera	Ornamental Jewelweed
Iris pseudacorus	Yellow Iris
Ligustrum vulgare	Common Privet
Lonicera japonica	Japanese Honeysuckle
Lonicera maackii	Amur or Bush Honeysuckle
Lonicera morrowii	Morrow's Honeysuckle
Lonicera tatarica	Tartarian Honeysuckle
Lythrum salicaria	Purple Loosestrife
Microstegium vimineum	Japanese Stilt Grass*
Paulownia tomentosa	Paulownia
Persicaria perfoliata	Mile a Minute Weed*
Phellodendron amurense	Amur Cork Tree
Populus alba	White Cottonwood
Robinia pseudoacacia	Black Locust
Rosa multiflora	Multiflora Rose

* Horticultural hitchhikers

Don’t buy or plant – illegal to sell or import since 1/1/2024

Scientific name	Common name	Effective Date
Alnus glutinosa	European alder	1/1/2024
Angelica sylvestris	Woodland angelica	1/1/2024
Anthriscus sylvestris	Wild chervil, raven's wing	1/1/2024
Aralia elata	Japanese angelica tree	1/1/2024
Butomus umbellatus	Flowering rush	1/1/2024
Elaeagnus angustifolia	Russian olive	1/1/2024
Euonymus fortunei	Wintercreeper, climbing spindle tree	1/1/2024
Festuca filiformis	Fine-leaved sheep fescue	1/1/2024
Ficaria verna	Lesser celandine	1/1/2024
Glaucium flavum	Yellow hornpoppy	1/1/2024
Glechoma hederacea	Ground ivy, creeping charlie	1/1/2024
Glyceria maxima	Great mannagrass, reed mannagrass	1/1/2024
Hippophae rhamnoides	Sea buckthorn	1/1/2024
Ligustrum obtusifolium	Border privet	1/1/2024
Lonicera xylosteum	Dwarf honeysuckle	1/1/2024

Don’t buy or plant – illegal to sell or import since 1/1/2024

Scientific name	Common name	Effective Date
Lythrum virgatum	European wand loosestrife	1/1/2024
Miscanthus sacchariflorus	Amur silvergrass	1/1/2024
Petasites japonicus	Fuki, butterbur, giant butterbur	1/1/2024
Phalaris arundinacea	Reed canary grass, variegated ribbon grass	1/1/2024
Photinia villosa	Photinia, Christmas berry	1/1/2024
Phragmites australis	Common reed	1/1/2024
Phyllostachys aurea	Golden bamboo	1/1/2024
Phyllostachys aureosulcata	Yellow groove bamboo	1/1/2024
Pyrus calleryana	Callery ("Bradford") pear	1/1/2024
Ranunculus repens	Creeping buttercup	1/1/2024
Rubus phoenicolasius	Wineberry	1/1/2024
Silphium perfoliatum	Cup plant	1/1/2024
Sorbus aucuparia	European mountain-ash	1/1/2024
Tussilago farfara	Coltsfoot	1/1/2024
Valeriana officinalis	Common valerian	1/1/2024

Rosa rugosa – invasive species of special concern starting 1/1/2024

1. Must provide signage or plant tags (next slide)
   A. The plant vendor must provide species specific guidance at the time of sale to notify the purchaser about the invasive potential of the species and what habitat types to avoid when installing the plant.

   B. No person selling or offering for sale an invasive terrestrial plant species of special concern shall conceal, detach, alter, deface, or destroy any label, sign, or notice required under this section.

New requirements for *Rosa rugosa*

Rosa rugosa

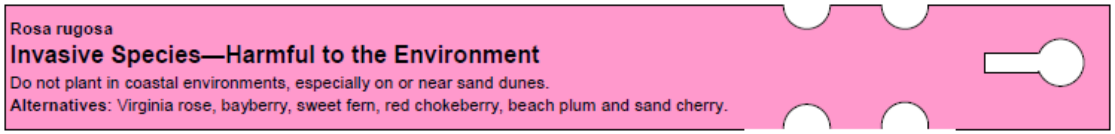
Invasive Species – Harmful to the Environment

Ask About Alternative Plants

Follow Species Specific Instructions Provided by the Vendor

Protect native species; do not plant in coastal areas, especially on or near sand dunes.

Alternative plants include: virginia rose and other roses, bayberry, sweet fern, red chokeberry, beach plum and sand cherry.



Plants on the “Watch List”

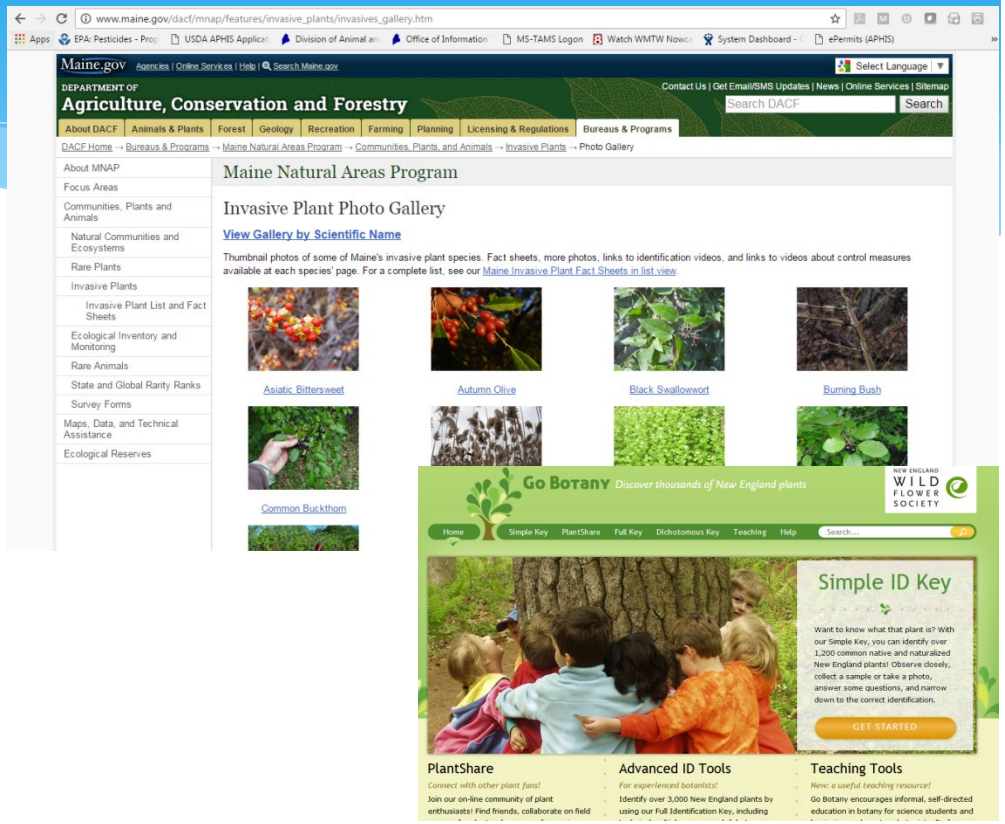
- Hardy kiwi
- Chocolate vine
- Italian arum
- Paper mulberry
- Butterfly bush
- Sweet autumn
- Indian yam
- Chinese yam
- Weeping lovegrass
- Queen of the meadow
- Two-colored bush clover
- California privet
- Honeyberry
- Ragged robin
- White mulberry
- Sawtooth oak

Plants on the “Watch List”

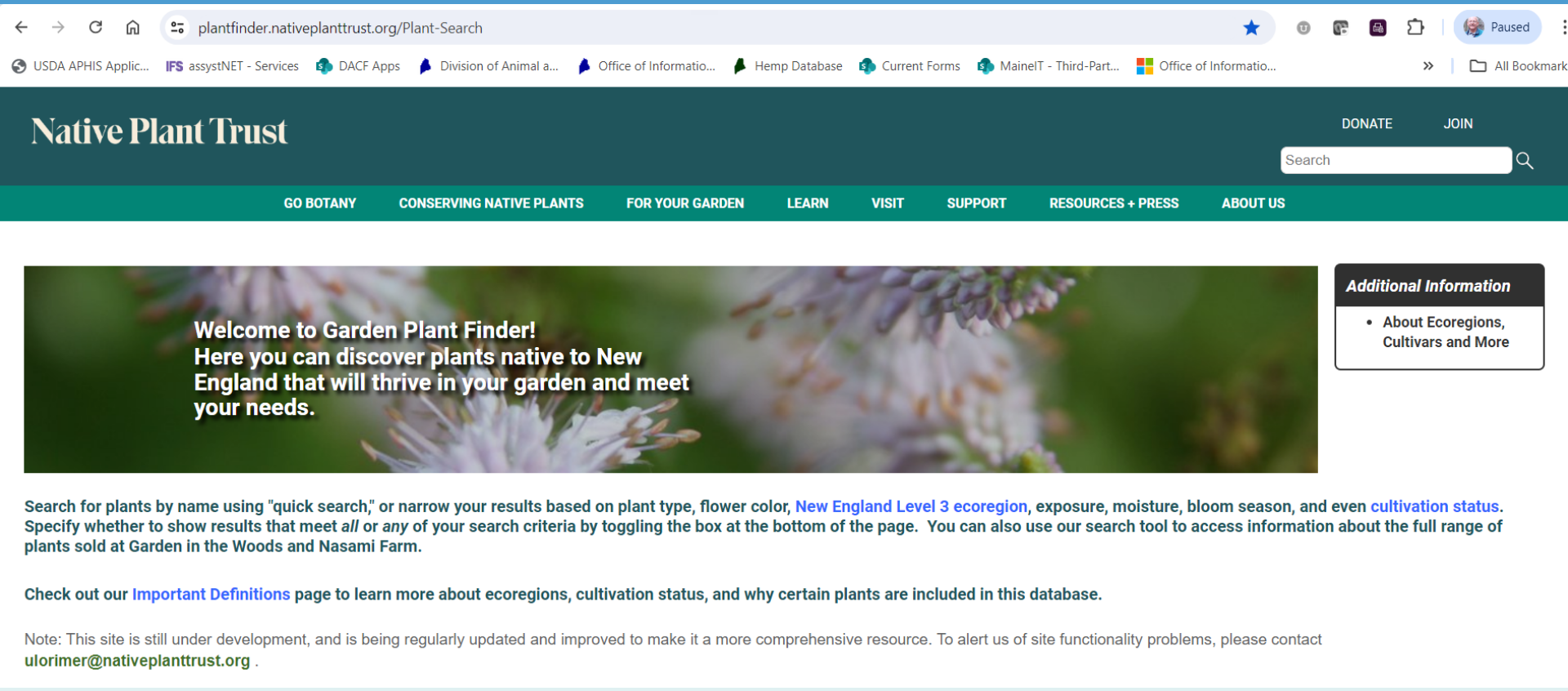
- Rosa rugosa
- Hardy pampas grass
- Sticky sage
- Milk thistle
- Japanese spiraea
- Sapphire-berry
- Japanese tree lilac
- Chinese cedar
- Siberian elm
- Linden arrowwood
- Siebold viburnum
- Japanese wisteria
- Chinese wisteria

Websites/Apps for invasive plant identification

- Maine Natural Areas Program – gallery pages
- GoBotany
- iNaturalist Website and App

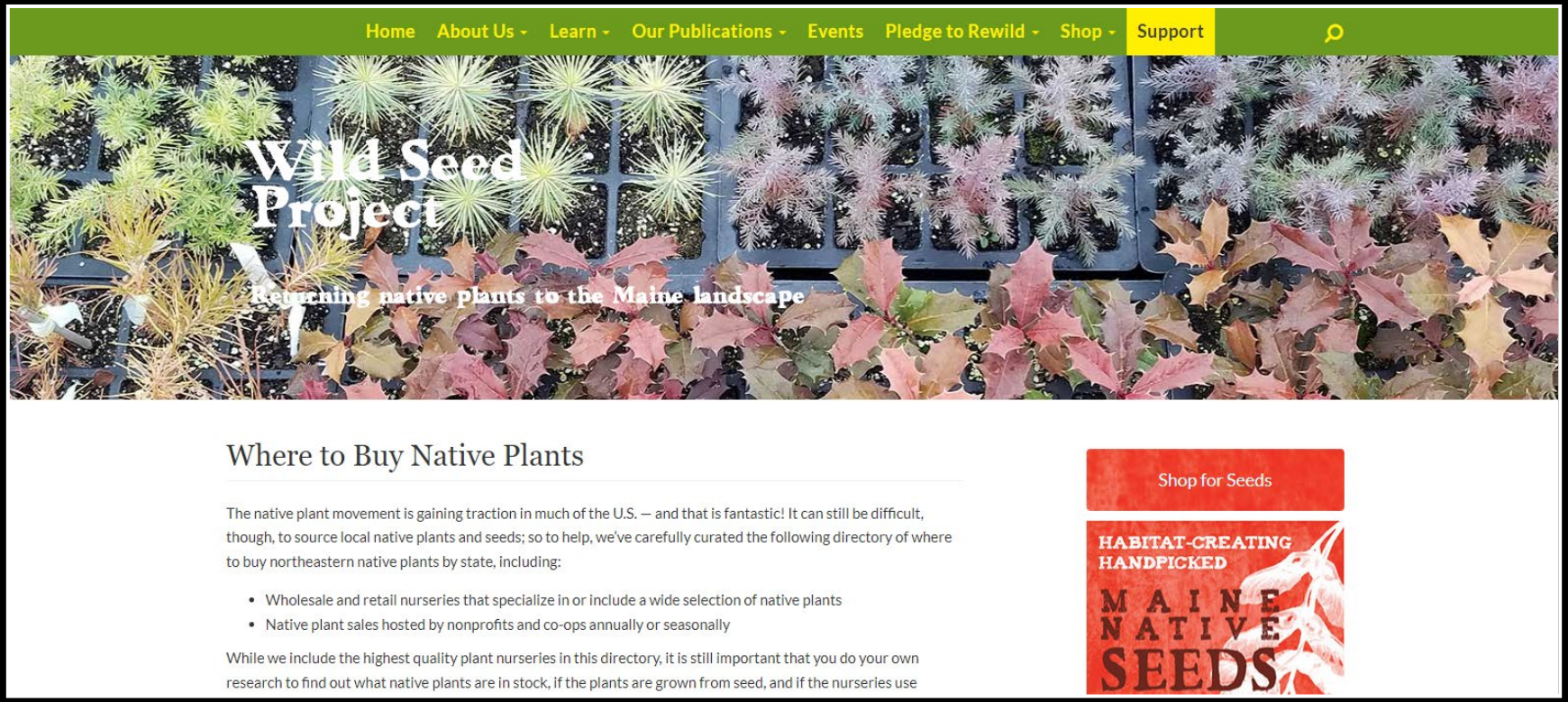


Also an excellent tool for finding alternative plants



https://plantfinder.nativeplanttrust.org/Plant-Search

https://wildseedproject.net/buy-native-plants/



Where to buy native plants

5% of our native plants make 75% of the food that drives food webs

Keystone plants

i.e. some native plants are much better at supporting food webs than others

The question is not whether natives are better than nonnatives.

It's whether ecologically productive plants are better for our ecosystems than unproductive plants.

Ginkgo = 0 species of caterpillars

Oaks = 424 species of caterpillars in southern Maine


Native *Prunus* = 405
species of caterpillars


Zelkova
supports
no caterpillars

Pieris japonica; 2 spp


Blueberries; 289 spp

English Ivy supports nothing

Best Bets: What to Plant

Woody Plants

Common Name	Plant Genus	Butterfly/moth species supported
Oak	Quercus	534
Black cherry	Prunus	456
Willow	Salix	455
Birch	Betula	413
Poplar	Populus	368
Crabapple	Malus	311
Blueberry	Vaccinium	288
Maple	Acer	285
Elm	Ulmus	213
Pine	Pinus	203
Hickory	Carya	200
Hawthorn	Crataegus	159
Spruce	Picea	156
Alder	Alnus	156
Basswood	Tilia	150
Ash	Fraxinus	150
Rose	Rosa	139
Filbert	Corylus	131
Walnut	Juglans	130
Beech	Fagus	126
Chestnut	Castanea	125

Herbaceous Plants

Common Name	Plant Genus	Butterfly/moth species supported
Goldenrod	Solidago	115
Asters	Aster	112
Sunflower	Helianthus	73
Joe pye, Boneset	Eupatorium	42
Morning glory	Ipomoea	39
Sedges	Carex	36
Honeysuckle	Lonicera	36
Lupine	Lupinus	33
Violets	Viola	29
Geraniums	Geranium	23
Black-eyed susan	Rudbeckia	17
Iris	Iris	17
Evening primrose	Oenothera	16
Milkweed	Asclepias	12
Verbena	Verbena	11
Beardtongue	Penstemon	8
Phlox	Phlox	8
Bee balm	Monarda	7
Veronica	Veronica	6
Little bluestem	Schizachyrium	6
Cardinal flower	Lobelia	4

www.bringingnaturehome.net/what-to-plant.html

Some native plants have pest problems too

Viburnum leaf beetle

- Over-winters as egg deposited into holes chewed into twigs, then capped. Twig has rough appearance.
- Eggs hatch in May, larvae feed together in groups on leaves.
- Adults found mid-July to first frost.

Viburnum Leaf Beetle

- Resistant cultivars (www.hort.cornell.edu/vlb/suscept.html)
  - **Some 'resistant' cultivars:**
    - *V. cassinoides, (witherod viburnum) -native*
    - *V. plicatum* var. *tomentosum* (doublefile viburnum),
    - *V. carlesii* (Koreanspice viburnum),
    - *V. burkwoodii* (Burkwood viburnum),
    - *V.* × *juddii* (Judd viburnum),
    - *V. lantanoides* (alnifolium) (Hobblebush) - native
    - *V. lentago* (Nannyberry) - native

Some native plants have pest problems too

- In many landscapes, birch trees begin to decline within a few years, and many trees die well before reaching maturity - Grow and Maintain a Healthy Birch Tree – USDA, FS
- Birch leaf miner, bronze birch borer, root scald

Nine things you can do

1) Cut your lawn in half
2) Avoid senseless mowing
3) Remove invasive species from your property
4) Use keystone plants
5) Preserve your leaf litter and ground covers
6) Put motion sensors on your security lights
7) reduce mosquito spraying
8) Minimize insecticide use
9) Join your Homeowner Association and change from within

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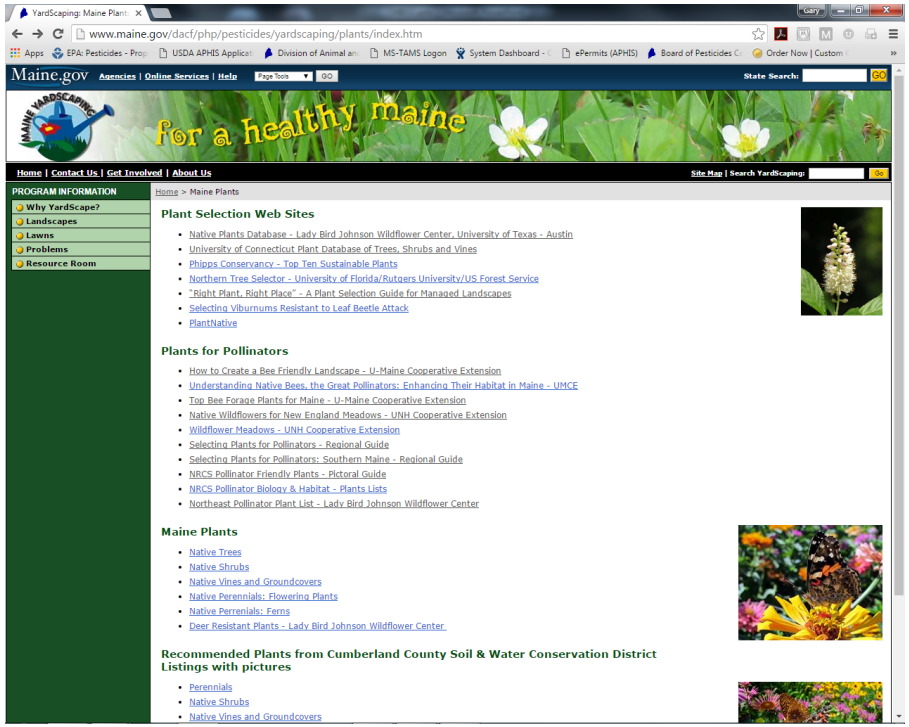
Where to learn more



www.yardscaping.org/plants/index.htm

YardScaping Gardens *at Back Cove*

PLANT CHOICE

Plants thrive in the proper climate, soil and sun exposure.

Plant a plant where its needs and your needs are met:

- plant natives whenever possible
- don't plant invasive alien species
- choose plants that provide homes, food and shelter for wildlife
- put plants in the right climate, soil and sun exposure

Want to get involved or learn more?
Visit www.yardscaping.org

Individual plant selection is key

Proper Planting – starts with selection

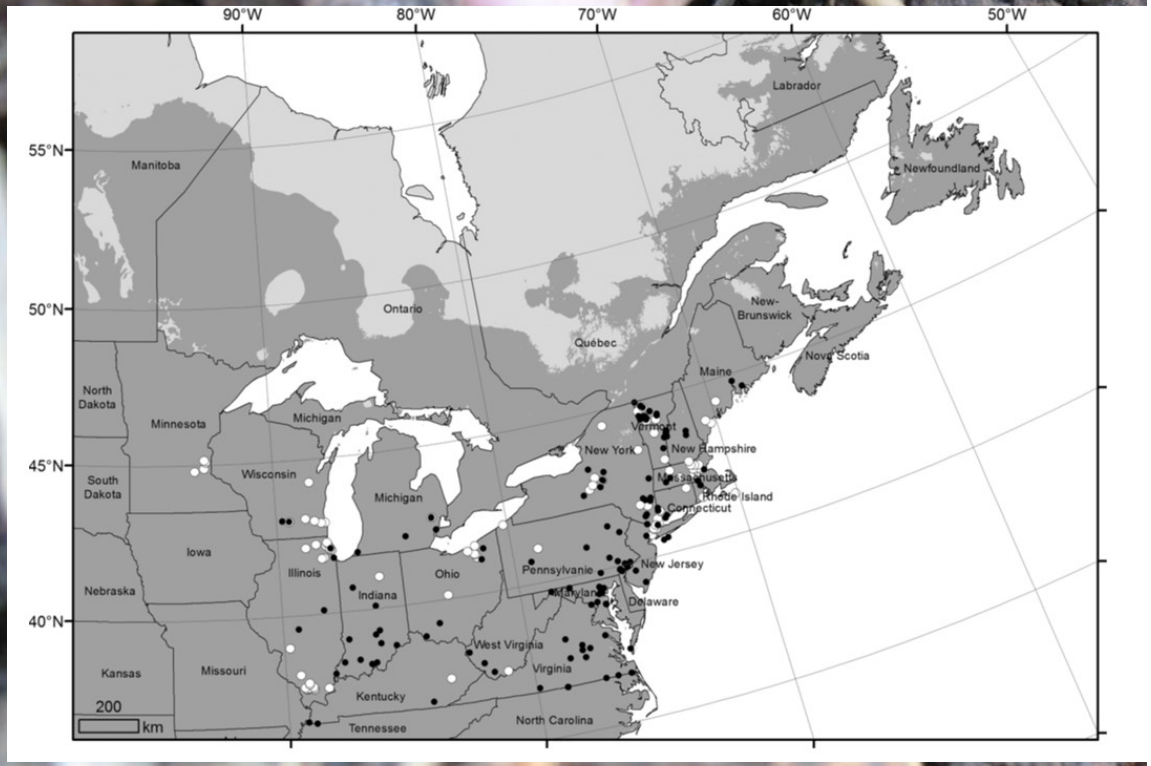
Select high quality plant material

Inspect all new plants carefully for potential pests

- Weeds
- Worms
- Insects
- Diseases
- Wounds
- Location of root flare

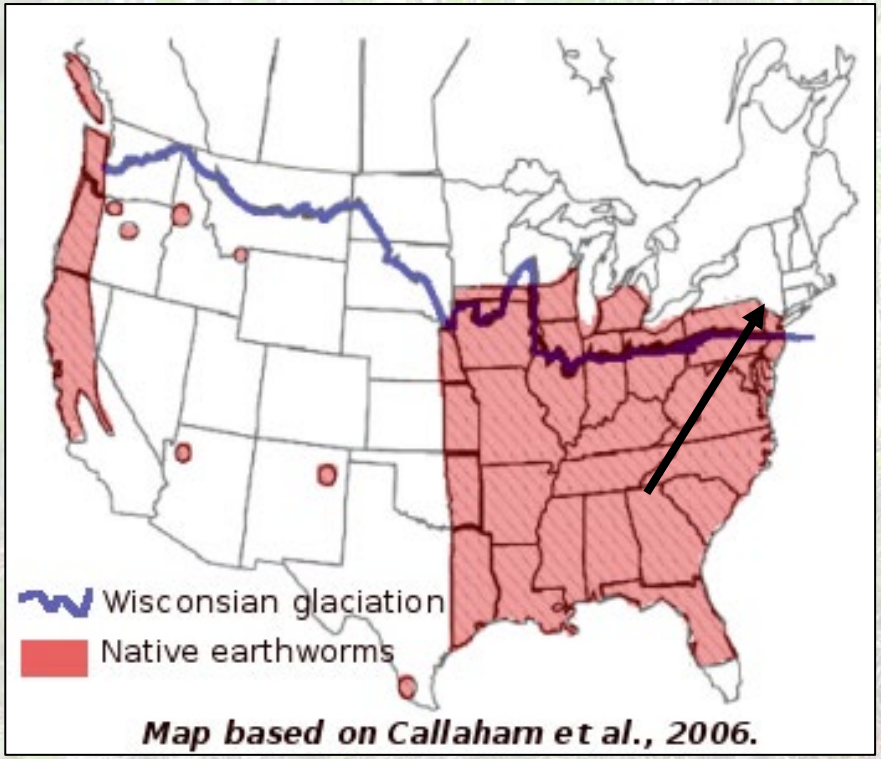
https://3c1703fe8d.site.internapcdn.net/newman/gfx/news/hires/2016/voraciousasi.gif

Jumping worms in the genus Amynthas are currently invading areas around the globe, including North America, Central America, Europe and Maine.



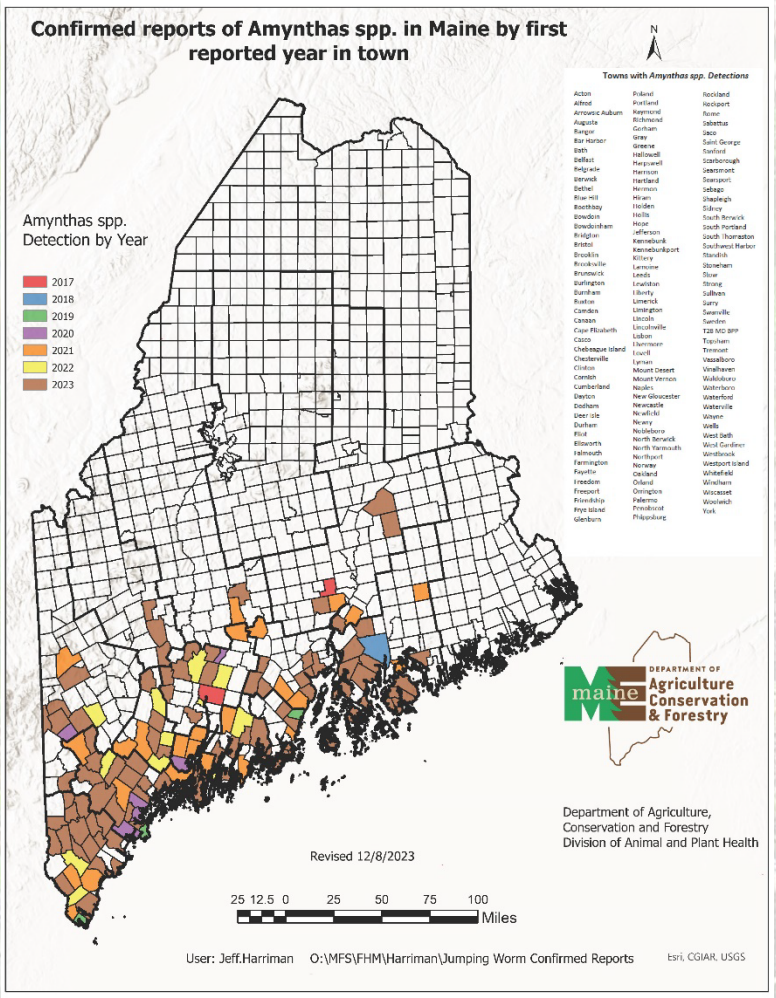
Dark gray shading shows the potential range of Amynthas as defined by climate. there may be other restrictions such as soil acidity, vegetation that may restrict the expansion. Circles indicate where Amynthas has been spotted by researchers. From Moore, J.D., Görres, J.H. and Reynolds, J.W., 2017. Exotic Asian pheretimoid earthworms (Amynthas spp., Metaphire spp.): Potential for colonization of south-eastern Canada and effects on forest ecosystems. *Environmental Reviews*, (999), pp.1-8

There are no native earthworms in Maine



- Native earthworms have expanded northward but not into Maine
- Worms in Maine were introduced from Europe and Asia…

While the invasion of European earthworms into North America is recognized and studied in the United States, the secondary invasion of Asian species have been little realized, detected or studied until recently and currently are not at all well understood.



Where are Jumping Worms in Maine?

- First found in a coastal Maine greenhouse in 1899
- Confirmed in 13 of the 16 counties
- Now considered widespread and seems to be expanding

Amynthas spp.

Jumping Worm, Crazy Worm, Snake Worm, Alabama Jumper

Characteristics

- Darker in color – appearing almost gray
- Glossy smooth skin
- Light milky white clitellum smooth (not raised) to the body
- Very active, thrashing and jumping
- Moves like a snake
- Sheds its tail when handled
- Parthenogenic – asexual reproduction so it only takes one worm to start a family.

Jumping Worms – Worm ID

3. **Check the behavior**
   - ✓ Thrashing, fast-moving, snake-like movements
   - ✓ Serpentine locomotion
   - ✓ Nose to tail

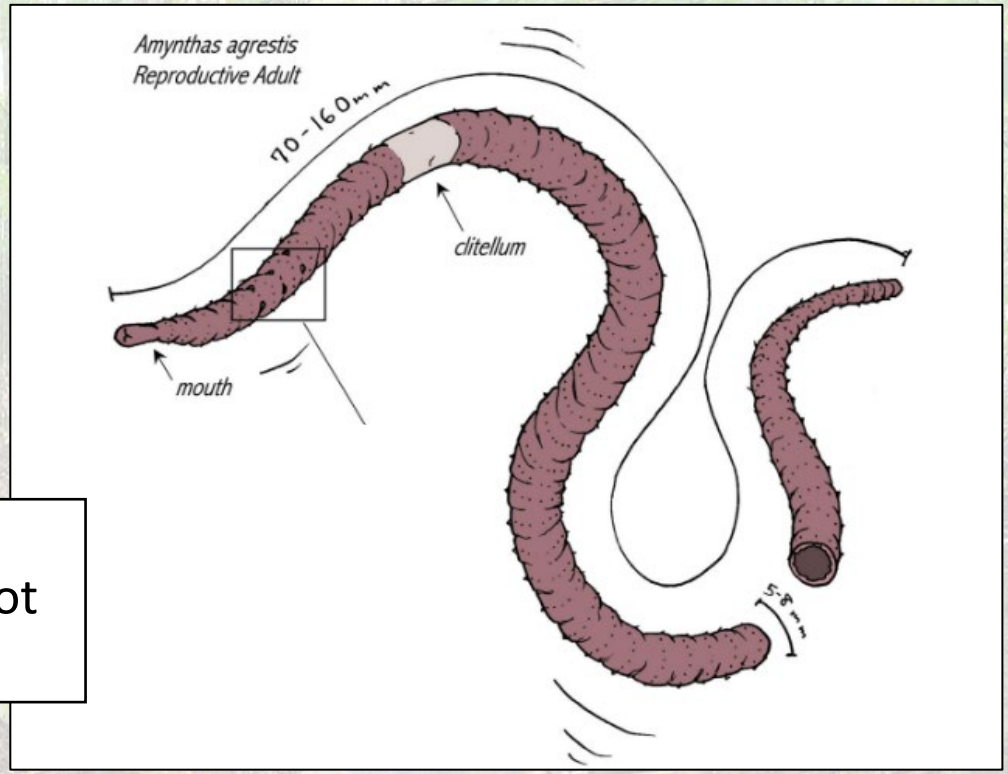


Photo: Portland State University/Oregon State University

Despite the name, jumping worms can not "jump"

Jumping Worms – Worm ID

4. **Check for tail drop**
   - ✓ Other species of common earthworms in Maine often will not drop their tail when threatened

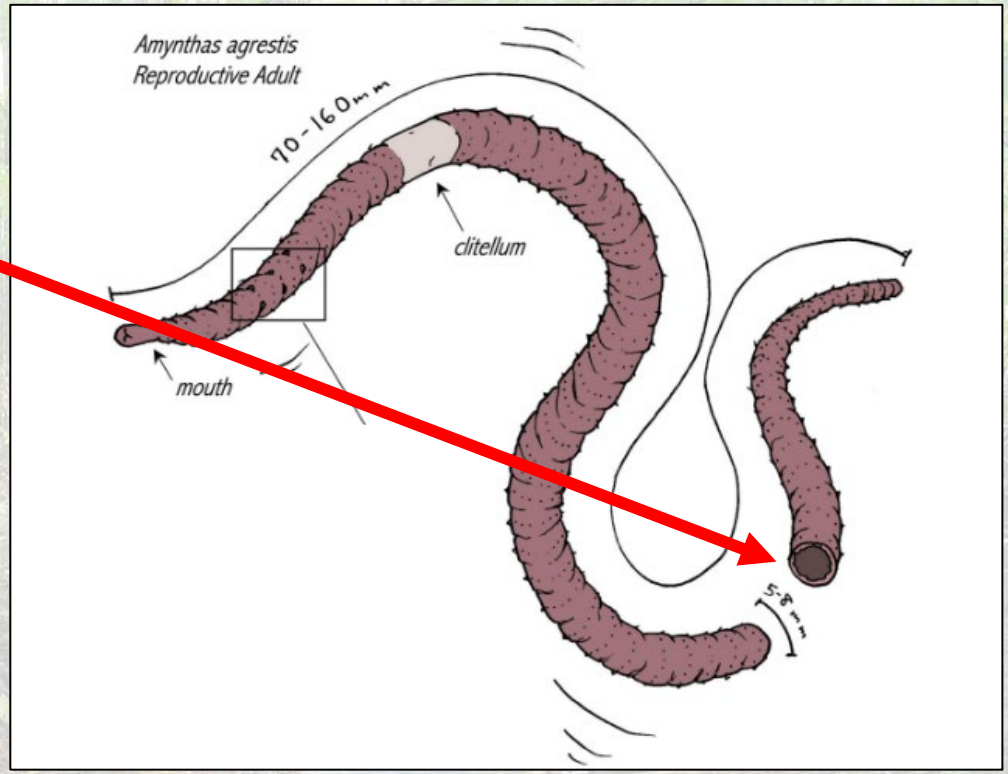
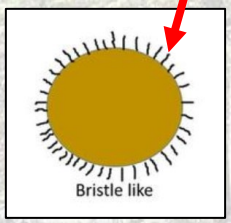


Photo: Portland State University/Oregon State University

Jumping Worms – Worm ID

2. **Check the setae (“hairs”)**
   - ✓ Each segment has many setae



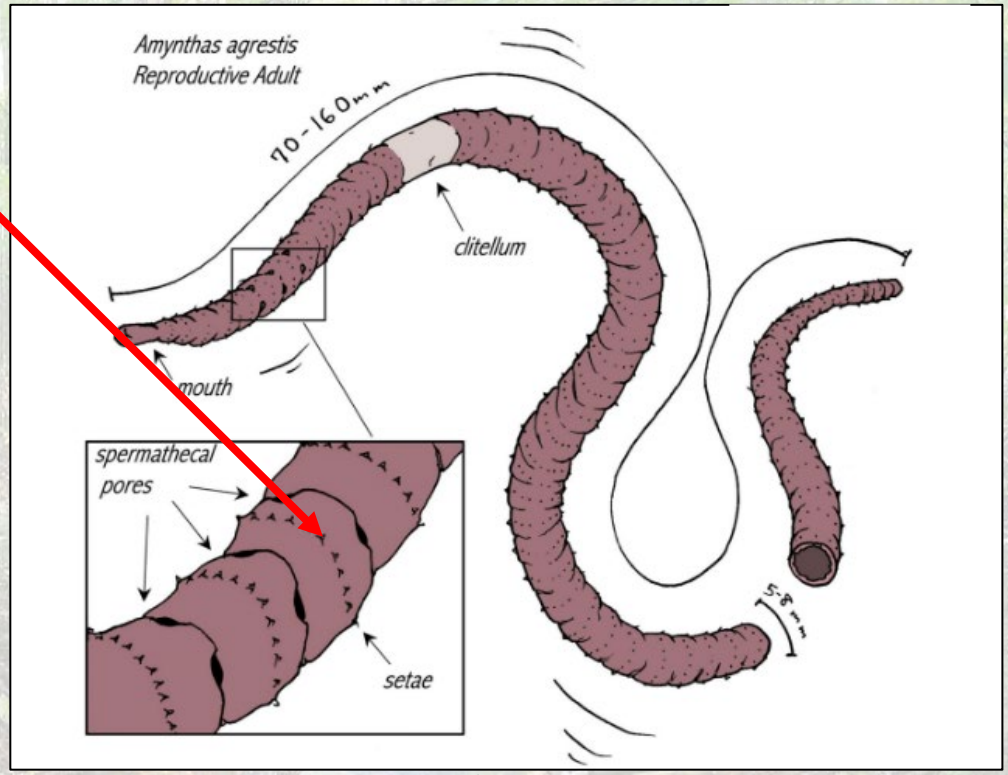
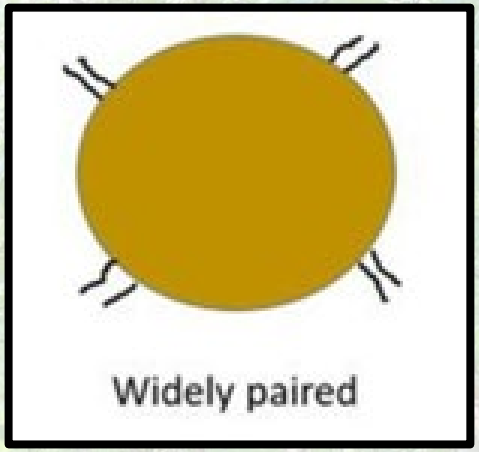
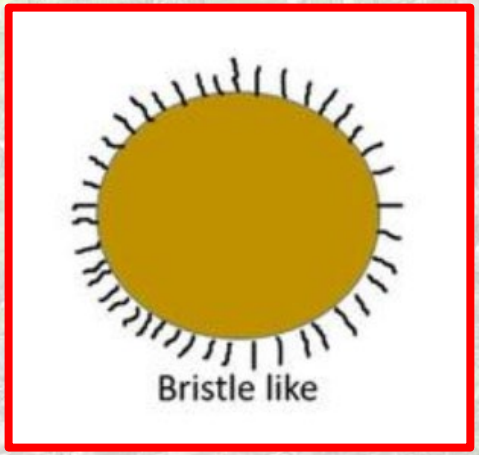


Photo: Portland State University/Oregon State University





Jumping worm


Amynthas tokioensis
Amynthas agrestis

WHY THEY COULD BE A PROBLEM

Biology & Ecology

- Reach maturity in 60 days – thus allowing for 2 hatches a season
- Tolerate soil pH above 5.0
- Voracious appetite
- Highly adaptive to temperature changes
- Cocoons winter over
- Adaptive, not picky about habitat types
- Produce a unique soil signature
- Outcompete /push out, infect, poison? Non-native European species of earthworms

Understory ground cover plants that could be lost due to crazy worm infestations

Trout lily
Trilliums
Solomon's seal

Photos courtesy of Missouri Botanical Gardens

Ovenbird

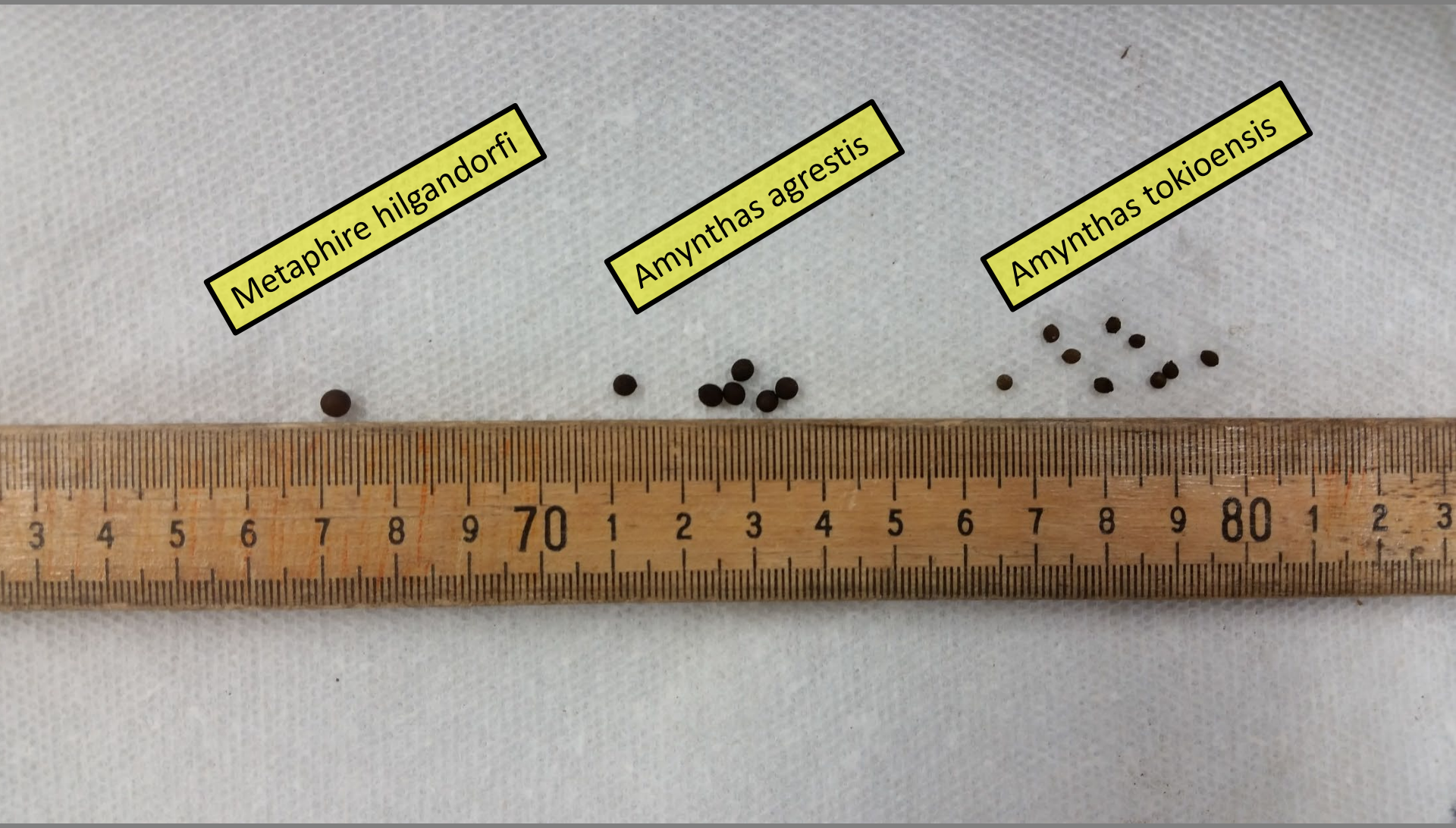
Ground nesting forest birds and amphibians may also be disrupted by crazy worm infestations

Spotted Salamander

Hermit Thrush

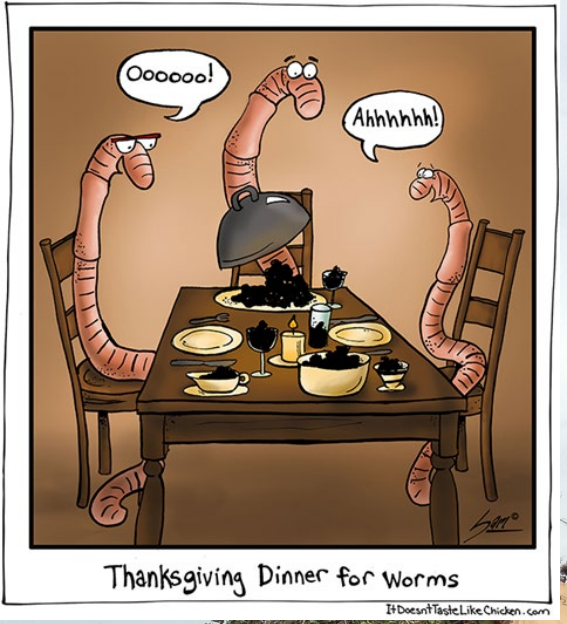
A single Jumping worm or cocoon stowed away in a potted plant you bring home can start a new infestation.

Moving soil, leaves or mulch from one place to another can facilitate the spread of invasive earthworms.


Metaphire hilgandorfi
Amynthas agrestis
Amynthas tokioensis
3 4 5 6 7 8 9 70 1 2 3 4 5 6 7 8 9 80 1 2 3

HOW ARE THEY SPREADING?

Earthworms in the genus Amynthas appear to be closely associated with horticulture.


Ooooooo!
Ahhhhhh!
Thanksgiving Dinner for Worms
ItDoesntTasteLikeChicken.com

Yum!


HARDWOOD MULCH


MACK
2


PLANT
Sale
Rainbow
Swiss
Chard
Hardy & easy to grow!!
Kale
Broccoli
Ball

Start them out right

Proper Planting

Too much mulch

Mulch volcanoes kill…

- **Mulching**
  - **can suppress weeds, conserve moisture, provide habitat for natural enemies**
  - **pull mulch away from the trunk to decrease pest/ disease potential**
  - **keep under 3 – 4 inches**

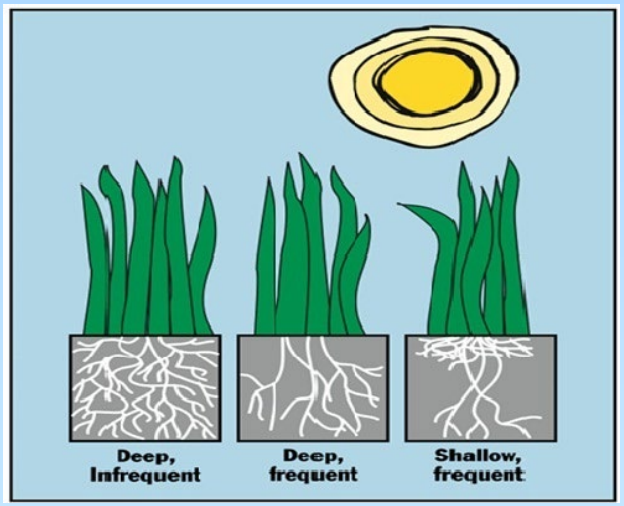
Water during establishment

Proper Aftercare

Treegator Drip Irrigation Bag

Water management is crucial

- **proper irrigation**
  - **water deeply and infrequently**
  - **only water the root system**
  - **water early in the morning**



#1 Killer of house plants

- OVER Watering
  - Plant wilts even though soil is wet
  - Leaf tips turn brown
  - Whole leaves turn brown and wilt
  - Leaf cells rupture (Edema)
  - Leaves turn yellow
  - Leaves start falling off

simplescaping.wordpress.com/

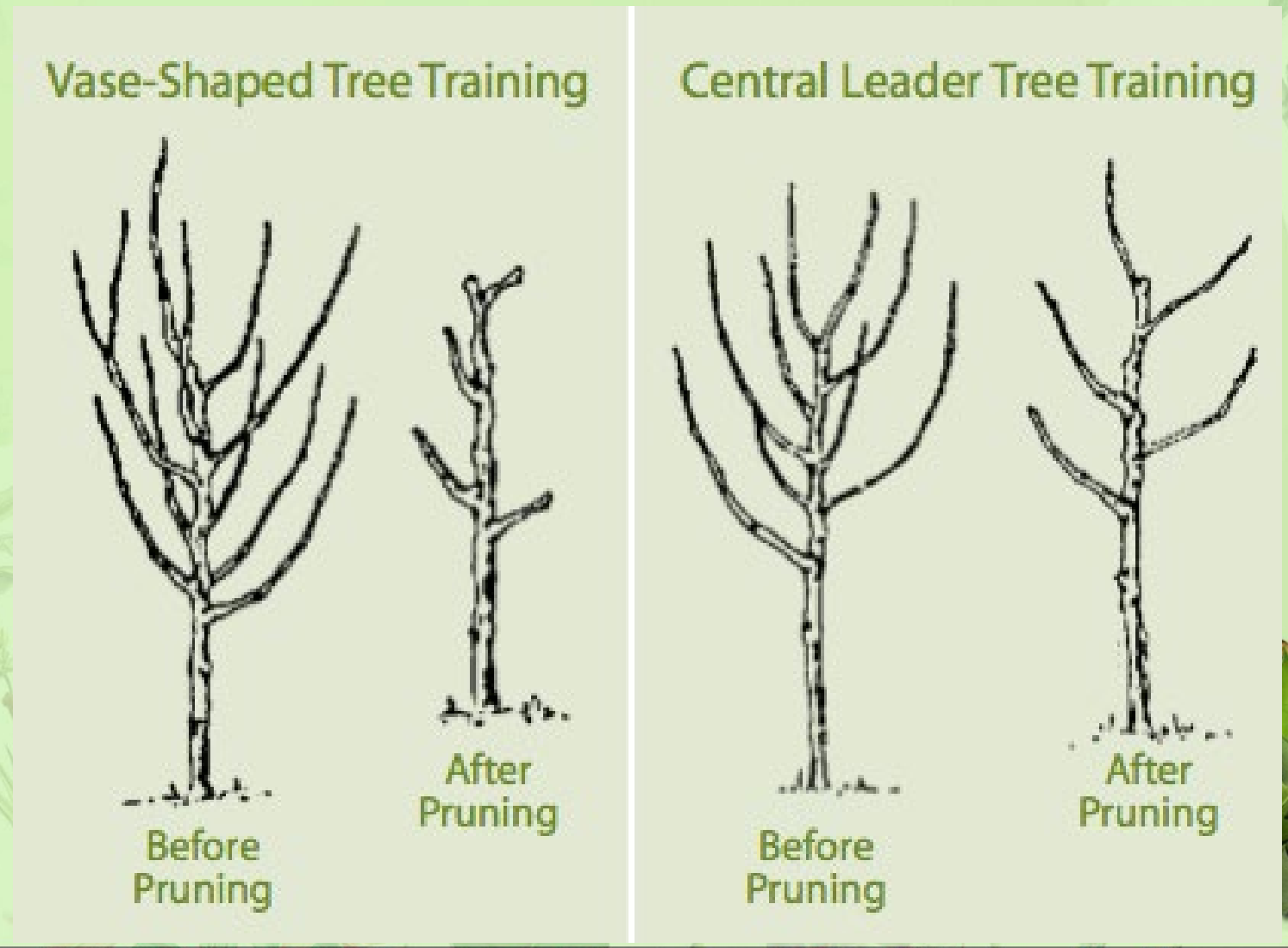
Right plant, right place

Ninebark – dry sunny site

Swamp White Oak – wet sunny site

Sweetgum– salt tolerant – wet sunny site

Air circulation is essential



Cultural controls

- **Landscape design**
  - **replace "susceptible" or chronically pest-prone plants with resistant or non-susceptible plants**
  - **increased plant diversity and habitat complexity can increase natural enemies present (Shrewsbury 1996)**

Cranberry Viburnum

Siebold viburnum

Apple scab

susceptible

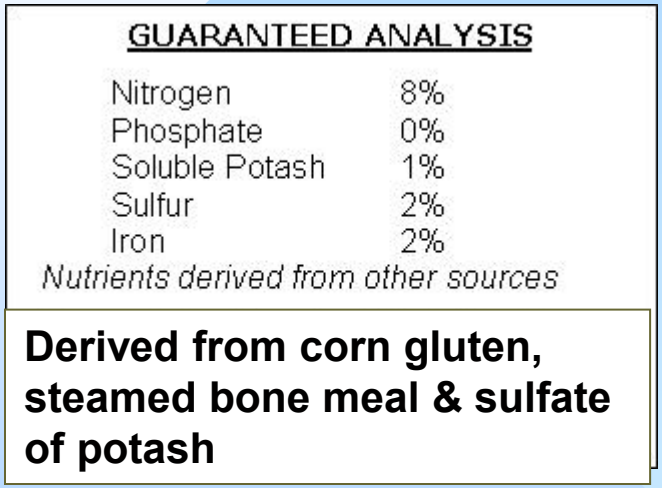
resistant

Cultural controls

- Fertilizer
  - over fertilization can cause the “aphid effect”
  - high nitrogen fertilizers may help the pest more than the plant

No endorsement intended or implied

Select slow release fertilizers



GUARANTEED ANALYSIS

Nitrogen	8%
Phosphate	0%
Soluble Potash	1%
Sulfur	2%
Iron	2%

Nutrients derived from other sources

Derived from corn gluten, steamed bone meal & sulfate of potash

- **GUARANTEED ANALYSIS**
- Total Nitrogen (N).....8.00%
  1.0 % Water Soluble Nitrogen
  7.5 % Water Insoluble Nitrogen
  Available Phosphate (P205).....0.0 %
  Soluble Potash (K20).....1.0 %
- **NON PLANT FOOD INGREDIENTS**
  Bacillus subtilis, Bacillus licheniformis, Bacillus pumulis, Bacillus megaterium, Paenibacillus polymyxa, Paenibacillus durum each @ 275,000 CFU per gram of finished product

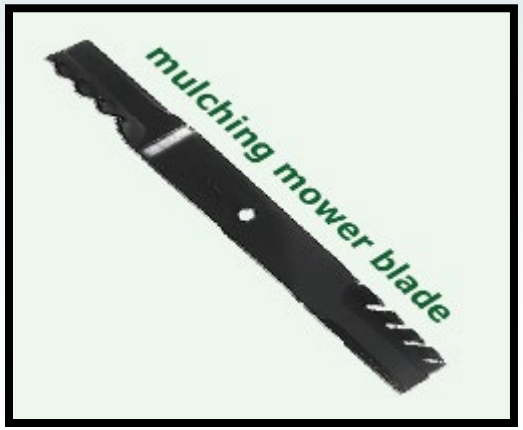
Look for Water Insoluble Nitogen (WIN)

The easy way to feed a lawn

2

Let the clippings lie.

- **Clippings are high-quality, low-cost fertilizer.**



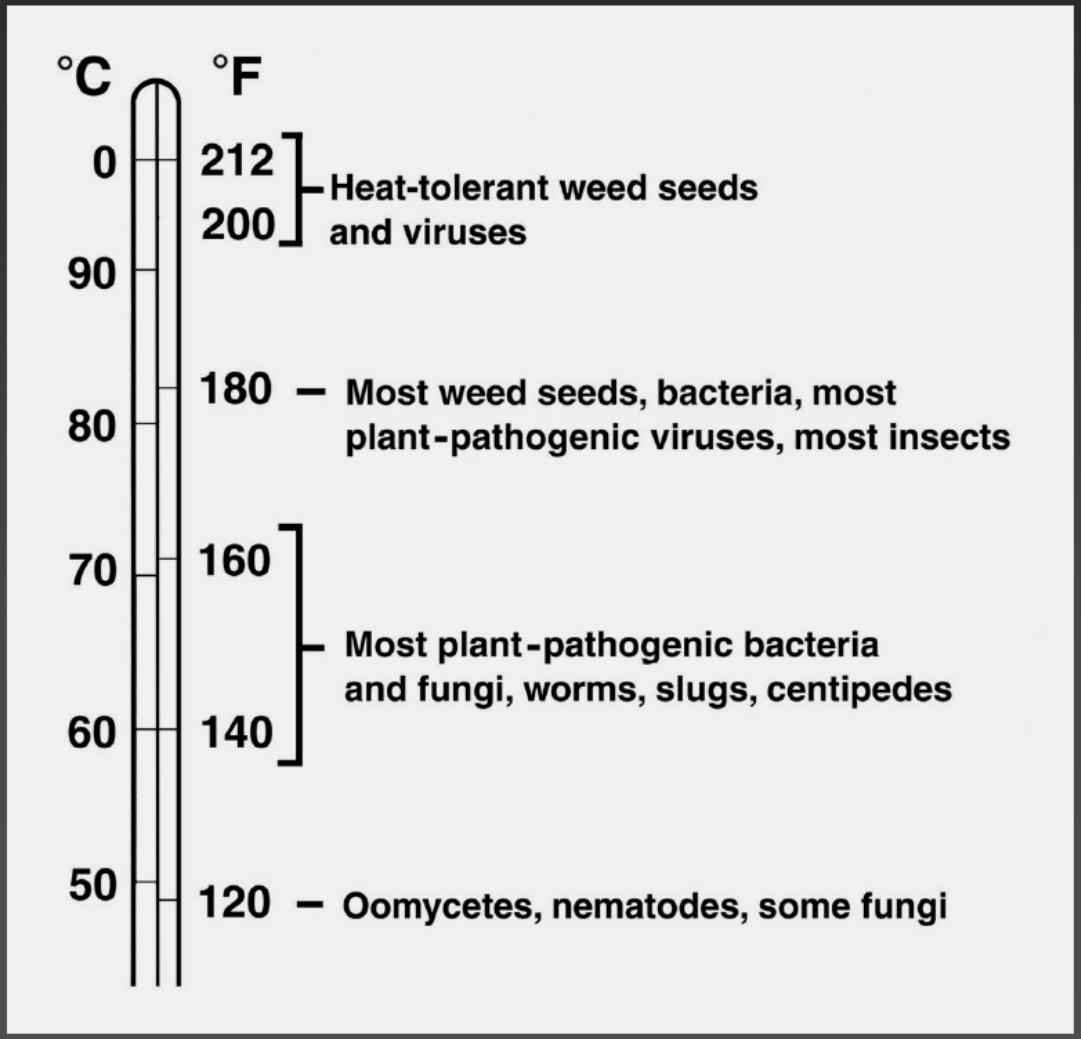
Physical Methods

- Exclusion by screens, barriers (example: bird netting, row covers)
- Pruning infested/infected plants
- Physical removal
  - hand-pick,
  - shake and capture
  - rake or remove infested tissue

Composting?...

NOT diseased material

Temperatures needed to kill plant pests:



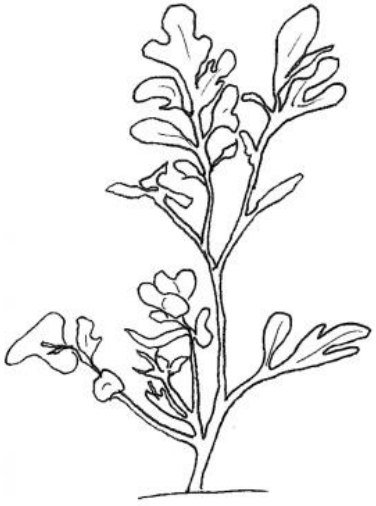
Weed Management

What is a weed? Is this plant a weed?

Introduction and Instruction

Grass-like

Broadleaf



First rule of weed management

- Exclusion!
  - Dense plantings, ground cover plants, taller vegetation
  - Inspect plants before installation
  - Mulch
    - six inches if no plants
    - three – four inches with plants

4

Got weeds?

- Liberally apply perennial ryegrass seed all season long.

Weed & Seed

Change the growing environment

- adjust soil pH
- adjust soil moisture
- adjust sun exposure
- adjust air circulation

Indicator weeds and soil conditions	
Wet, waterlogged, poor drainage Creeping buttercup, Coltsfoot, Ox-eye daisy, Curled dock, Moss, Plantain, Garden sorrel, Perennial sow thistle, Broad-leaved meadowsweet	**Acidic or low lime** Eastern bracken, Silvery cinquefoil, Coltsfoot, Ox-eye daisy, Dandelion, Curled dock, Hawkweed, Field horsetail, Knapweed, Prostrate knotweed, Moss, Common mullein, Nettle, Plantain, Garden sorrel, Sheep sorrel
Hardpan Field bindweed, Quackgrass, Pineappleweed, Stinkweed	**Tilled or cultivated soil** Buttercup, Chickweed, Prostrate knotweed, Lamb's quarters, Prickly lettuce, Mustard, Nettle, Redroot pigweed, Plantain
Alkaline Bladder campion, White mustard, Perennial sow thistle, Foxtail barley	**Heavy clay soil** Chicory, Coltsfoot, Dandelion, Annual sow thistle, Canada thistle
Dry soil Silvery cinquefoil, Field horsetail	**Overgrazed** Perennial bluegrasses, Bentgrasses
Nutrient imbalance Eastern bracken (low K, low P), Yarrow (low K), Stinkweed (high lime)	**Saline soils** Shepherd's purse, Russian thistle
Compacted Velvetleaf, Jimsonweed	

Adapted from a handout by Stuart Hill and Jennifer Ramsey for Ecological Agricultural Projects at MacDonald Campus of McGill and published in ***The Soul of the Soil, A Guide to Ecological Soil Management***, 2nd Edition, by Grace Gershuny and Joseph Smillie.

Common broadleaf weeds

Acidic soil, compacted soil & low fertility

Plantain

Acidic soil

Hawkweed

Encroaching shade & poor drainage

Creeping Charlie/ Ground Ivy

Common grassy weeds

Sod lawns, wet soils

Nutsedge

Thin areas in lawns, scalping of lawns, poor growing conditions

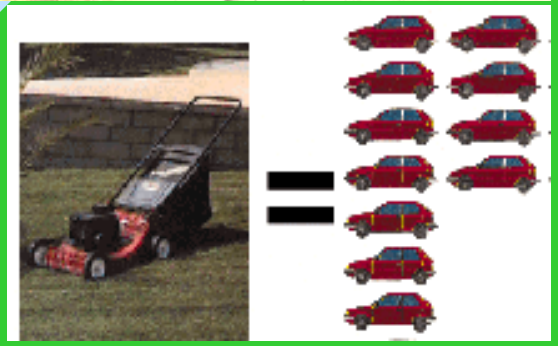
Crabgrass

Adapts to almost any growing condition

Quackgrass

Mechanical methods

- Mow properly
  - Mow high-at least 3 inches
  - Higher is better
  - Mow regularly
  - Keep mower sharp
  - Vary mowing pattern



Mower exhaust = 11 cars' exhaust

One hour of mowing = driving 400 miles

Mowers spew 87 lbs of greenhouse gases and 40 pounds of other pollutants annually

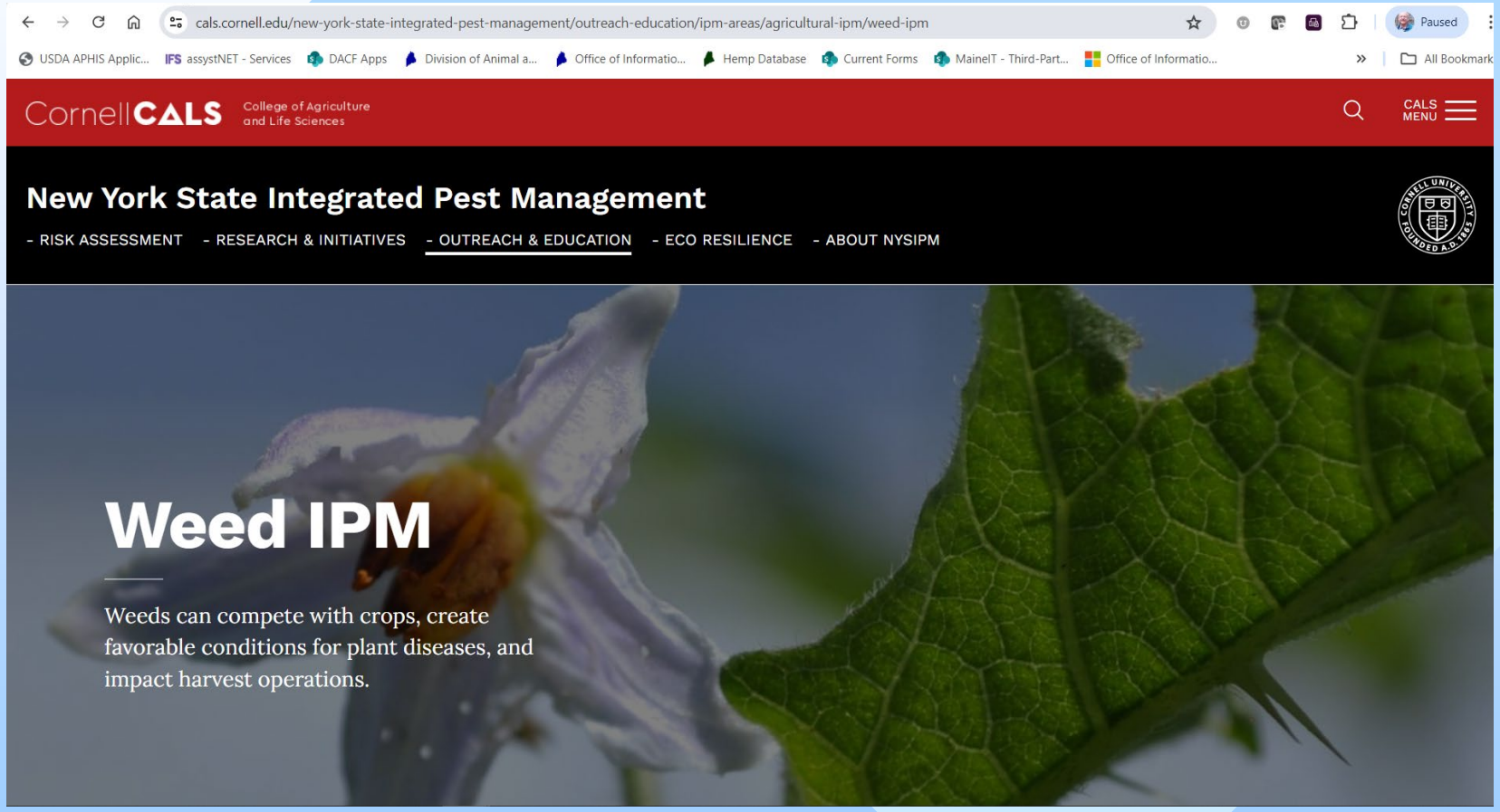
Pulling or weed whacking

- Pull weeds when they are small
- Weed whack or mow before flowering or reproduction
- Know the weeds – Do not fragment stoloniferous or rhizomatous weeds like Japanese knotweed, quackgrass or bentgrass

Quackgrass

Japanese knotweed

Where to learn more



https://cals.cornell.edu/new-york-state-integrated-pest-management/outreach-education/ipm-areas/agricultural-ipm/weed-ipm

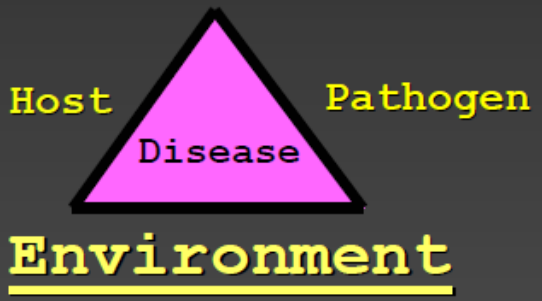
Pathogens:

- Fungi
- Bacteria
- Viruses
- Nematodes

Disease Management

Use multiple techniques to manage pests

- Cultural controls:
  - Modify environment:
    - Improve drainage
    - Avoid low, wet areas
    - Irrigation (early am, drip)
    - Increase air circulation
    - Winter protection



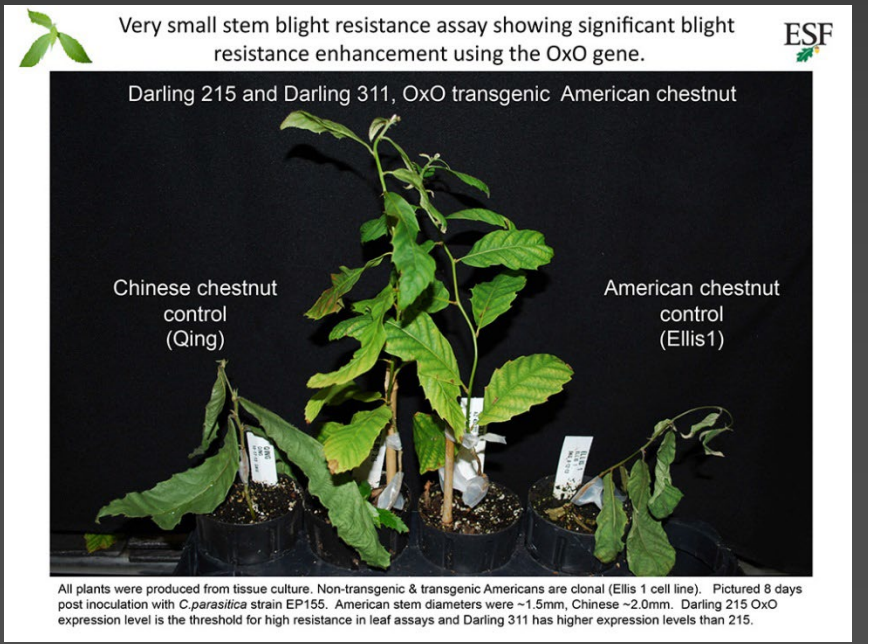
Disease Management

Use multiple techniques to manage pests

- Cultural controls:
  - Resistant varieties
  - Proper planting
  - Proper fertility (test!)
  - Proper pruning

Cultural management
(installation)

- Site preparation
- Match plant to location
- Resistant varieties
- Healthy stock
- Proper planting
- Mulch correctly!



Cultural management (on site)

- Irrigate/water early
- Fertilize carefully (test!)
- Avoid drought stress
- Improve air circulation
- Proper pruning

How pathogens spread

- Wind/air blown
- Splashing (rain overhead irrigation)
- Infected plant material
- Infested soil
- Insects (vectors)
- Tools, equipment

Black knot of Prunus


Tar spot


Apple scab

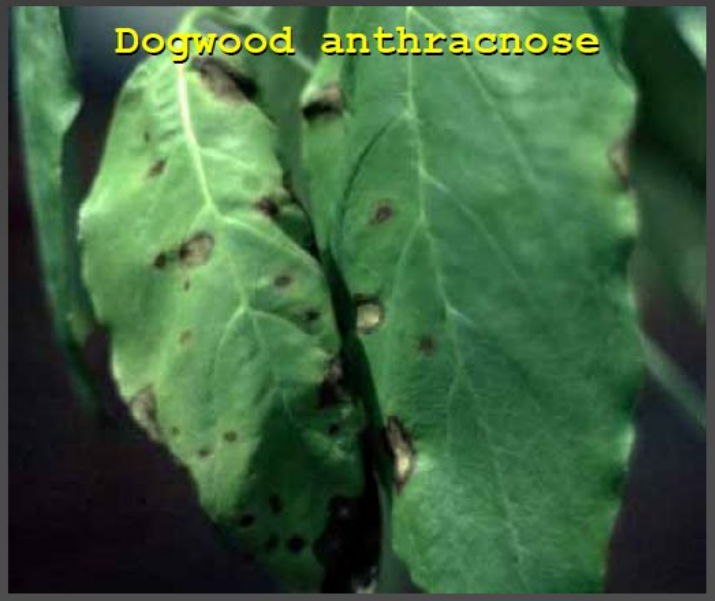

Maple anthracnose


Rhizosphaera needlecast


Black spot on rose


Botrytis blight on peony


Powdery mildew on bee balm


Dogwood anthracnose

Bacteria

Water splash is an important means of dissemination

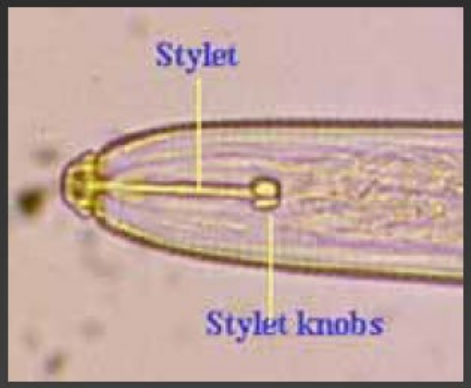
Crown gall

Fire blight

Viruses

Many viruses are spread
by insects, some by seed
& most by vegetative cuttings

Nematodes



Root knot nematode

Most nematodes spread by soil or in plant material

Foliar nematodes

Disease-like problems

- Mushrooms
  - Buried wood
  - Infected soil
- Moss
  - Too wet
  - Too shady
  - Too acid
  - Too compacted
  - Low fertility
  - Scalping

Most insects are not pests

- Beneficial insects: predators and parasites
- Pollinators
- Decomposers
- Aesthetics

- Plant diversity in the landscape enhances diversity and abundance of "good guys"

Know your beneficials

Got Pests?

www.maine.gov/dacf/php/gotpests/BeneficialPage.html

Apps | EPA: Pesticides - Prop | USDA APHIS Applicat | Division of Animal an | MS-TAMS Logon | System Dashboard - | ePermits (APHIS) | Board of Pesticides C

Maine.gov Agencies | Online Services | Help | Page Tools | GO | State

Got Pests?

Maine Integrated Pest Management Council

Home | Contact Us | Site Index | Type the name of your pest here:

GOT PESTS?

- About Got Pests?
- Is It Really a Pest?
- Pest Solutions
- A Word About Pesticides
- Want to Know More?

ASK the EXPERT

Provide Feedback

Home > Is It Really a Pest? > Beneficial Organisms

Beneficial Organisms

The concepts of "beneficial" and "pest" are strictly human defined. All organisms serve a useful purpose in the ecosystem, and are therefore, by default, beneficial. As the term is applied here, however, it means any living thing that benefits the environment around us (humans), including insects, spiders, mites, nematodes, birds, reptiles, mammals, plants, bacteria, fungi, and viruses. The benefits they provide include pest management, pollination, and maintenance of soil health.

The opposite of beneficial organisms are pests. Any organism can be considered a pest, by humans, if it negatively affects those humans (see Is It Really a Pest? for more). These living things can be detrimental to human needs and may damage plants, sting, bite or spread diseases.

More About Beneficial Organisms

Below are pictures of some beneficial bugs that you might see in Maine. Adults are usually pictured, because that is what is most often seen by homeowners; keep in mind, however, that other stages of the insects may be providing the benefit.

Predators

Bugs that feed on nuisance insect or plant species

Assassin Bugs
Info at Univ. of Kentucky
[PDF] Beneficial Insects: True Bugs

Big-eyed Bugs
[PDF] Beneficial Insects: True Bugs

Brown Lacewings
Info at Univ. of Kentucky

Welcome or Unwelcome?

1. Welcome
2. Unwelcome

Tachinid fly (the so-called "winsome fly") laying an egg on a Japanese beetle adult

Istocheta (=*Hyperecteina*) *aldrichi*
Introduced into US from Japan in 1922
Adults emerge Late June/July, feed on honeydew, nectar

- Lay up 100 eggs in two weeks
- Eggs hatch 1 day later, dig into beetle
- Kills beetle in 5-6 days
- Just before death, beetle digs into ground where fly spend winter as pupa

Joshua P. Basham
T.S.U. Otis L. Floyd Nursery Research Center
McMinnville, TN 37110-1367
From Point Sebago Golf Course, Casco, Maine

We love the good “bugs!”

Welcome or Unwelcome?

1. Welcome
2. Unwelcome

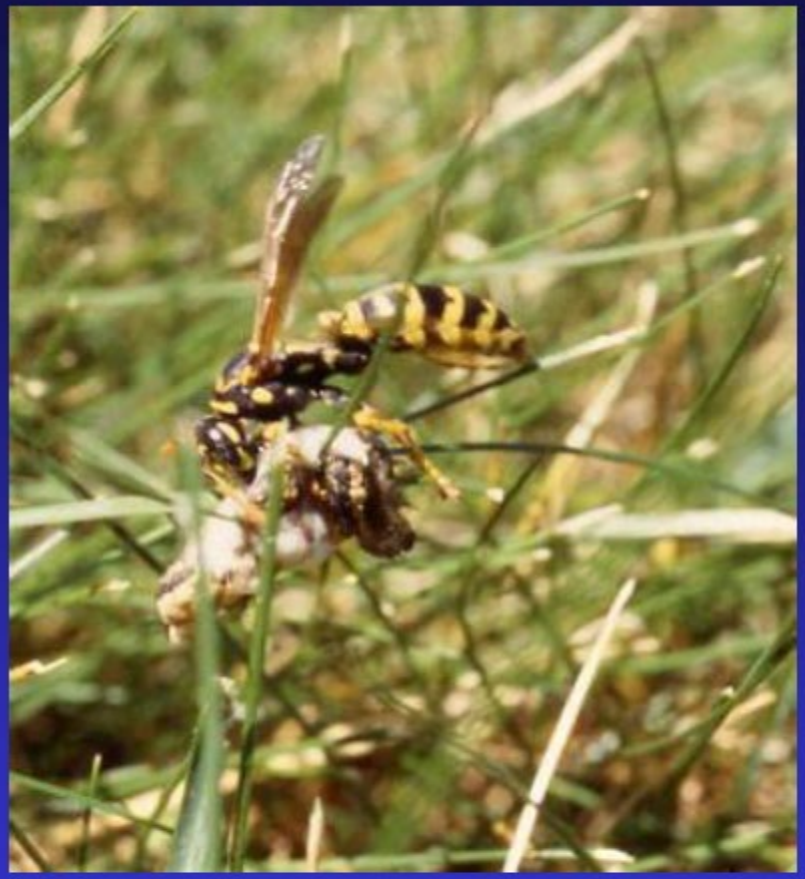
Photo: JHC

Good bug in action

Welcome or Unwelcome?

1. Welcome
2. Unwelcome

Flower fly larvae eat aphids!



Vespid wasp attacking an armyworm caterpillar

Syrphid or flower fly.
Larvae are predaceous.

Science fiction monster?

Delicate beauty

Lacewing adult

Green lacewing nymph

Green lacewing eggs, nymphs hatching

Ants are beneficial too, but can also be a problem

Minute pirate bug

Big-eyed bug

Spined soldier bug

Types of Natural Enemies

- **Predators**
  - Kills many prey during its lifetime.
  - Both larvae and adults feed on pest insects & mites.
  - May have to control ants if they are interfering with useful beneficials.

Types of Natural Enemies

- **Parasites**
  - Usually have narrow or extremely specific host range.
  - Females actively search for hosts to lay egg(s) on or in.
  - Each host produces one or more new parasites.

Wasp inserting egg into an aphid

"Aphid Mummies"

Eggs of the Winsome fly parasite

Spare the Sprays to Protect Beneficial Insects

- Dragonflies
- Spiders
- Small parasitic wasps
- Predatory mites
- Syrphid flies
- Ground beetles

Toxicity of Common Organic-Approved Pesticides to Pollinators

Toxicity of Common Organic-Approved Pesticides to Pollinators

PESTICIDE	NON-TOXIC	LOW TOXICITY	HIGHLY TOXIC
Insecticides/Repellants/Pest Barriers			
Bacillus thuringiensis (Bt)			
Beauveria bassiana			
Cydia pomonella granulosis			
Diatomaceous Earth			
Garlic			
Insecticidal Soap			
Kaolin Clay			
Neem			
Horticultural Oil			
Pyrethrins			
Rotenone			
Sabadilla			
Spinosad			
Herbicides/Plant Growth Regulators/Adjuvants			
Adjuvants			
Corn Gluten			
Gibberellic Acid			
Horticultural Vinegar			
Fungicides			
Copper			
Copper Sulfate			
Lime Sulfur			
Sulfur			

Soaps and Oils, only when directly sprayed upon the pollinator

Eric Mader – The Xerces Society for Invertebrate Conservation

Habitat enhancement for beneficials

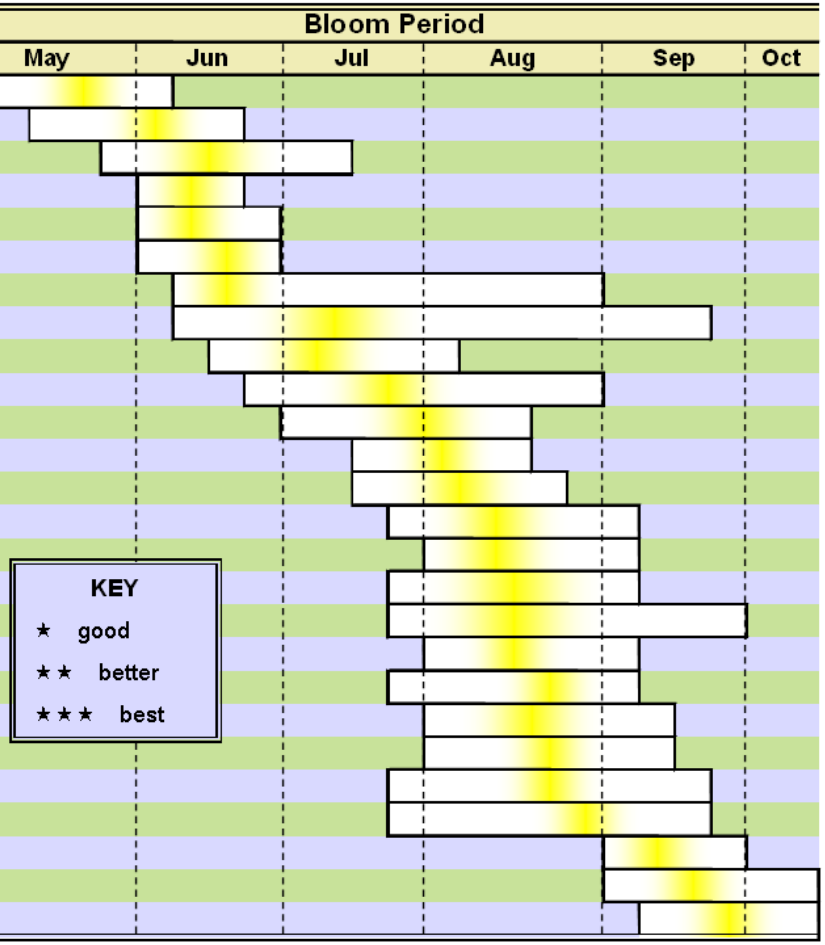
Many beneficials, as adults, larvae, or both, require pollen and/or nectar as dietary supplements

Key is to provide a series of plants that, collectively, provide continuous nectar/pollen supply

Many of the same plants that provide food and habitat for natural enemies also provide resources for pollinators

Bloom Timing of Native Plants Attractive to Beneficial Insects

Native plant	Natural enemies	Bees
wild strawberry	★★	★
golden Alexanders	★★★	★★
Canada anemone	★★★	★
penstemon	★★	★★
angelica	★★★	★
cow parsnip	★★★	★
sand coreopsis	★★★	★
shrubby cinquefoil	★★★	★
Indian hemp	★★★	★
late figwort	★★	★★
swamp milkweed	★★	★★
Culver's root	★★	★★★
yellow coneflower	★★★	★★
nodding wild onion	★	★★
meadowsweet	★★★	★★
yellow giant hyssop	★★	★★★
horsemint	★★★	★★
Missouri ironweed	★★	★★
cup plant	★★★	★★★
pale Indian plantain	★★	★★
boneset	★★★	★★
blue lobelia	★★★	★★★
pale-leaved sunflower	★★★	★★
Riddell's goldenrod	★★★	★★★
New England aster	★★★	★★
smooth aster	★★	★★



MICHIGAN STATE UNIVERSITY

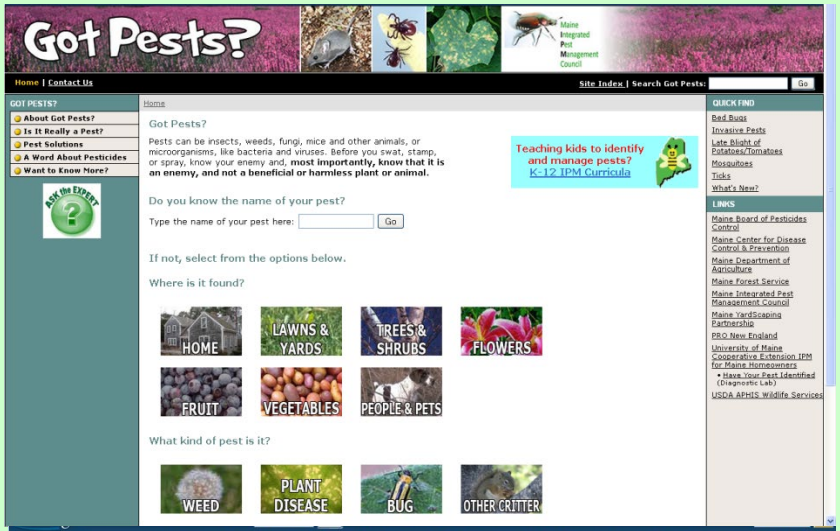
Project GREEEN

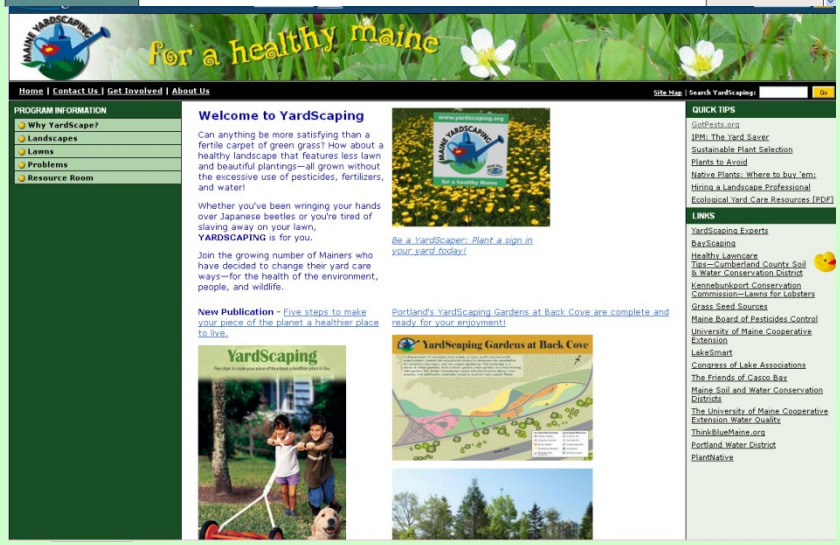
Charles Stewart MOTT FOUNDATION

North Central Region SARE
Sustainable Agriculture Research and Education

Resources

www.GotPests.org





www.YardScaping.org

http://extension.umaine.edu/home-and-garden-ipm/

Use common sense pest management

- Integrated pest management
  - Know your pest
  - Pick it, trap it or exclude it
  - Know the good bugs
  - Mow, prune or water
  - Use pesticides as last resort

YardScaping Gardens *at Back Cove*

MANAGE PESTS WISELY

Weed, insect and disease control products present both risks and benefits.

Follow these simple steps to protect people, pets, plants and watersheds:

- know the pest
- pull, squash or trap it
- use control products as a last resort, *if at all*
- spot treat only
- protect beneficial organisms

Want to get involved or learn more?
Visit www.yardscaping.org

Do you need a pesticide?

- First identify the pest
- Is it *really a problem*

- Try cultural or sanitary controls

- Encourage the “Good bugs”
- Replace with resistant varieties

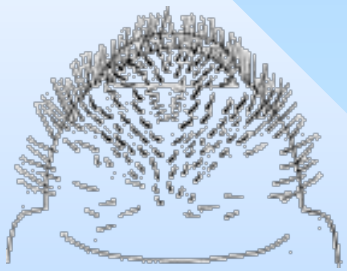
Diagnosis murder??

- Is it a pest problem?
  - Often what's normal for the plant is mistaken for a pest or disease
    - Variegation
    - Reproductive structures

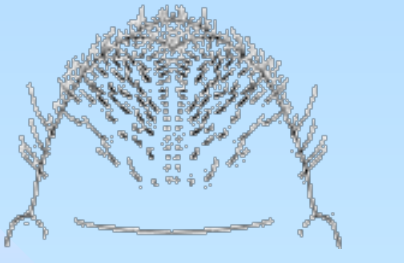
Is this a disease?

Pest Identification is crucial

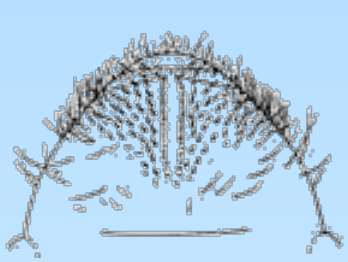
White grub rastral patterns



Japanese beetle



European chafer



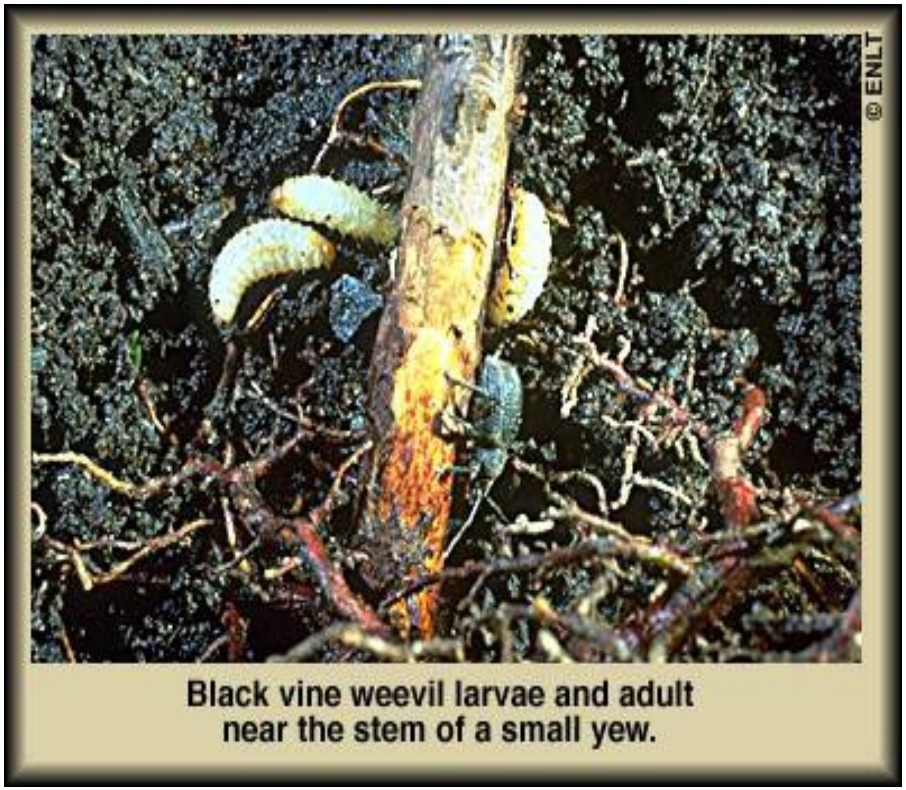
May/June beetle

Rose chafer

Who's been chewing here?

They only come out at night.

The real culprit!



Black vine weevil larvae and adult near the stem of a small yew.

Monitoring

- Plant tapping
  - Aphids
  - Spider mites
  - Beneficials

Pheromone Trap
(For monitoring, not reducing pest populations)

Observations

- Are insects present?
- Are they causing the damage that is seen?

3 Questions to Always Ask:

1. Is the pest really a problem? Or is it just annoying? (*Action Threshold*)
2. What exactly do I have here? Proper identification of the pest and life cycle stage.
3. Can the environmental factors of why the pest is there be altered to make it a less desirable place for the pest to be?

Do you need a pesticide?

- Is the pest in a susceptible stage?
- Application timing is critical
- Is the pest still present?

Is the pest protected?

Birch leafminer

Birch leafminer

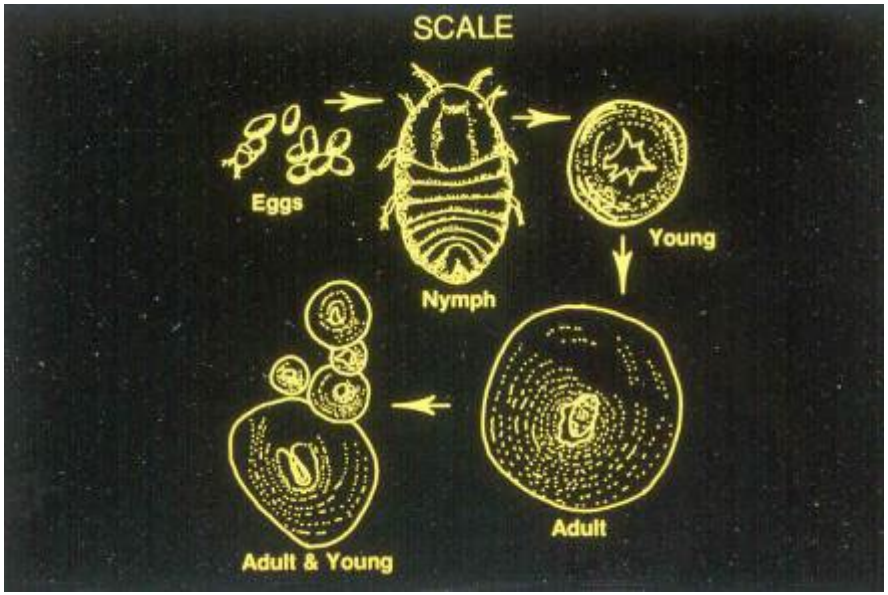
Birch leafminer

Don’t apply when you can’t hit a susceptible target


Colorado potato beetle


Lace bugs

Timing is everything?



Nobody home!

Eriophyid gall mite

Oak apple gall wasp

Lily Leaf Beetle

- Plant daylilies instead of true lilies
- Hand pick beetles and larvae. Squish eggs.
- Space plantings to allow good sunlight penetration.
- Pesticide application only as a last resort

Slugs and Snails

- Control weeds
- Keep grass mown low or consider gravel strip around gardens
- Traps (beer or commercial traps)
- Boards or flat rocks
- Copper foil ribbon around raised beds or pots.
- Hand pick
- Pesticide baits as last resort

Japanese Beetle

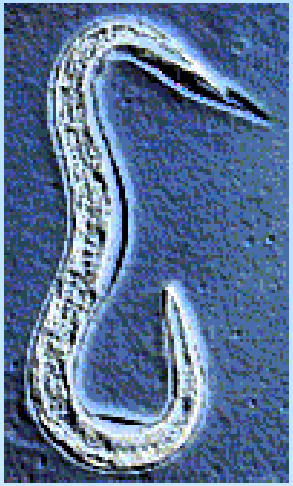
- Select non-preferred shrubs and trees (avoid linden, roses, crabapples, grapes, raspberries, cherries, etc.)
- Cover susceptible plants with protective netting
- Avoid traps
- Use trap plants (Virginia creeper, zinnia, pole beans, etc.)

Kentucky wonder pole beans

Entomopathogenic Nematodes

Steinernema carpocapsae

Ambush Nematodes



S. riobravis

S. scapterisci

Heterorhabditis bacteriophora

Cruiser nematodes

Insects infected with *Steinernema* nematodes are usually light tan in color.

Note the adults (larger nematodes) and the infective juveniles (the tiny nematodes forming a cloud around the grub.

Insects infected with *Heterorhabditis* nematodes are usually a reddish color.

Invasive Pests - Deciduous

In Maine!

Winter Moth

Browntail Moth

In Maine!

Emerald Ash Borer

Asian Longhorned Beetle

NOT in Maine... yet

Winter Moth

Geometrid moth; “inchworm”

Adults emerge late Fall

Tom Murray, BugGuide.net

Nov - Jan

Waltham Services

Eggs overwinter

Gyorgy Csoka, Hungary Forest Research Institute, Bugwood.org

Dec - Apr

Pupa looks like soil

Maine Forest Service

Hannes Lemme, Bugwood.org

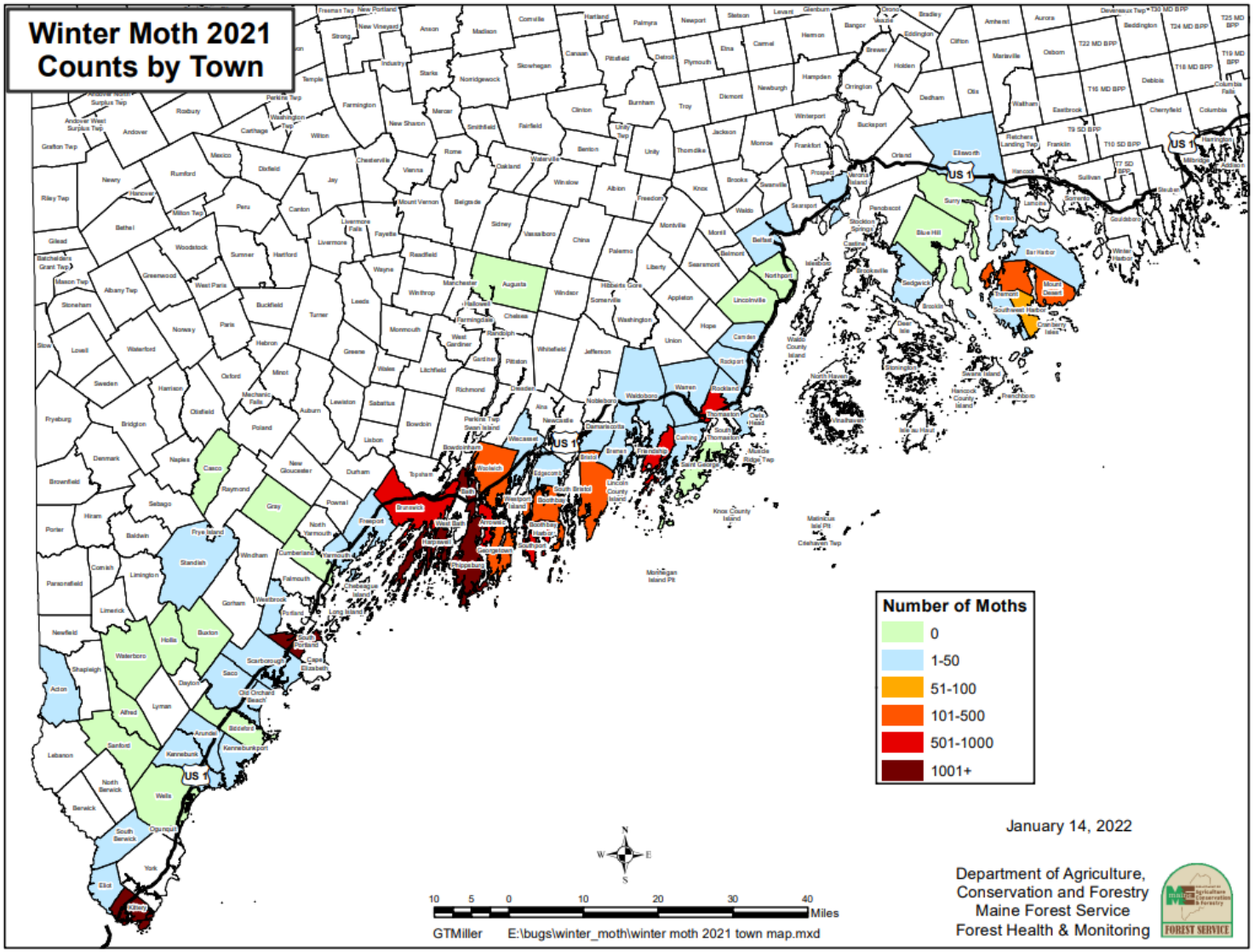
Jun - Nov

Cape Cod Times/Steve Heaslip

Caterpillars chew leaves

Apr - Jun

Winter Moth in Maine



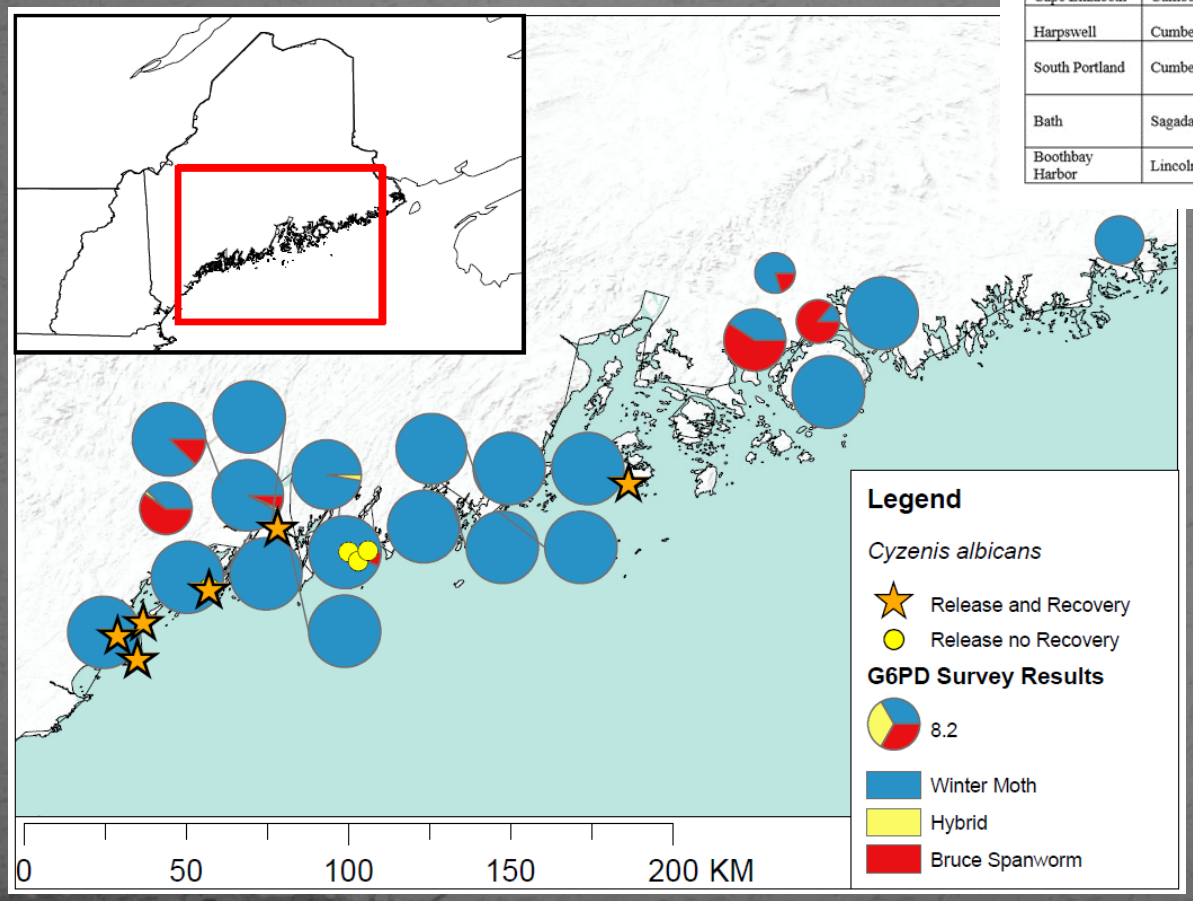
Winter moth

Cyzenis albicans

Biological control for winter moth

Table 3. Release and recovery of parasitic flies, *Cyzenis albicans*, in Maine

Town	County	Dates	Number of *Cyzenis albicans* Released	Comments
Harpswell	Cumberland	1-May-13	2000	Survival not good
Cape Elizabeth	Cumberland	1-May-13	2000	First recovery 2016
Kittery	York	16 & 23-May-14	1200	First recovery 2016
Harpswell	Cumberland	16 & 22-May-14	1200	
Vinalhaven	Knox	21-May-14	2000	First recovery in 2018
Portland	Cumberland	15-May-15	2000	First recovery in 2018
Cape Elizabeth	Cumberland	15-May-15	1000	In 2018 parasitism rates at 20%
Harpswell	Cumberland	15-Nov-16	2000	caged cocoons set out for release in spring 2017
South Portland	Cumberland	29-Nov-17	3000	caged cocoons set out for release in spring 2018
Bath	Sagadahoc	12-Sep-18	500	caged cocoons set out for release in spring 2019
Boothbay Harbor	Lincoln	21-oct-19	500	caged cocoons set out for release in spring 2020

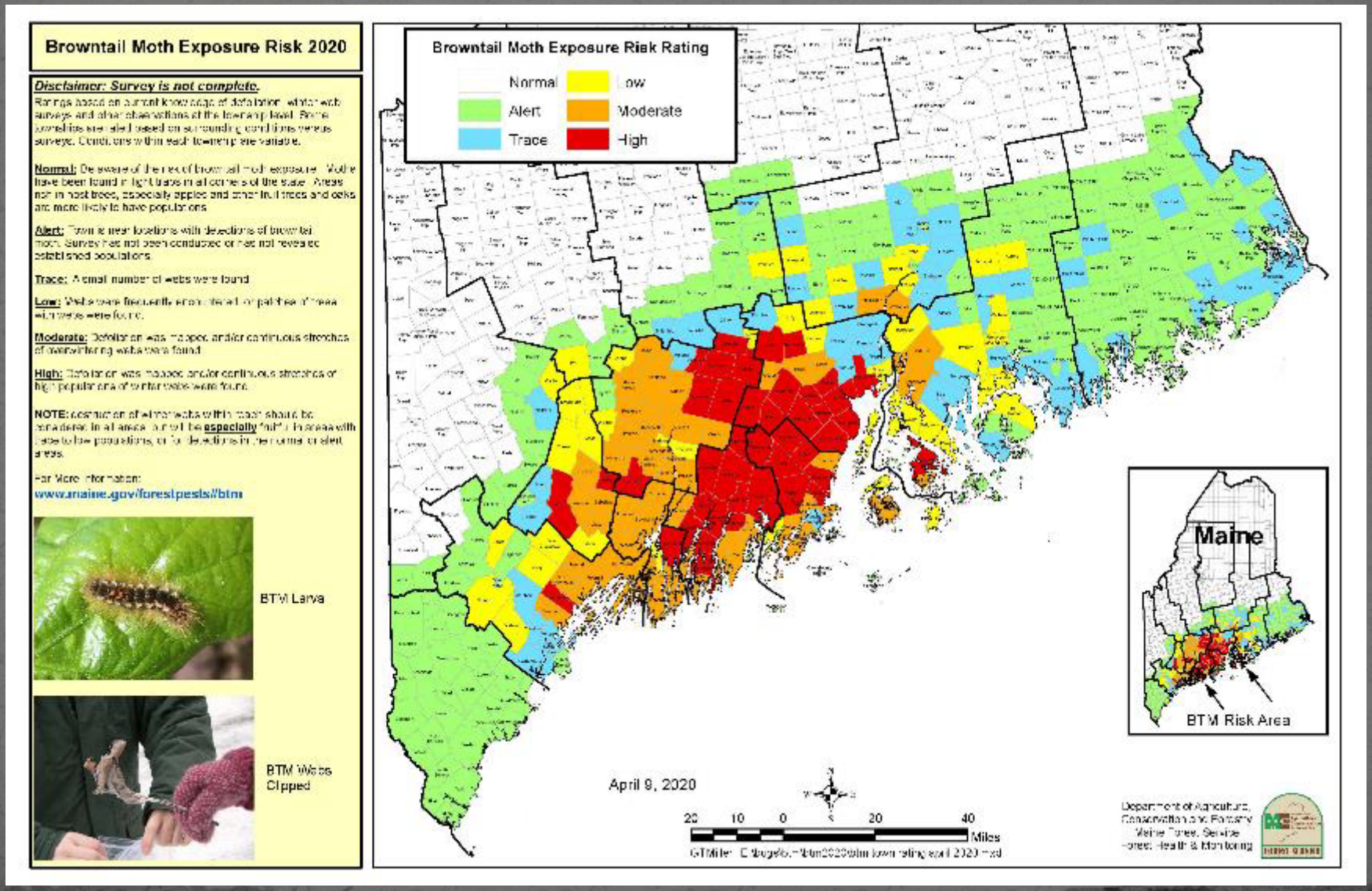


Browntail Moth

Euproctis chrysorrhoea

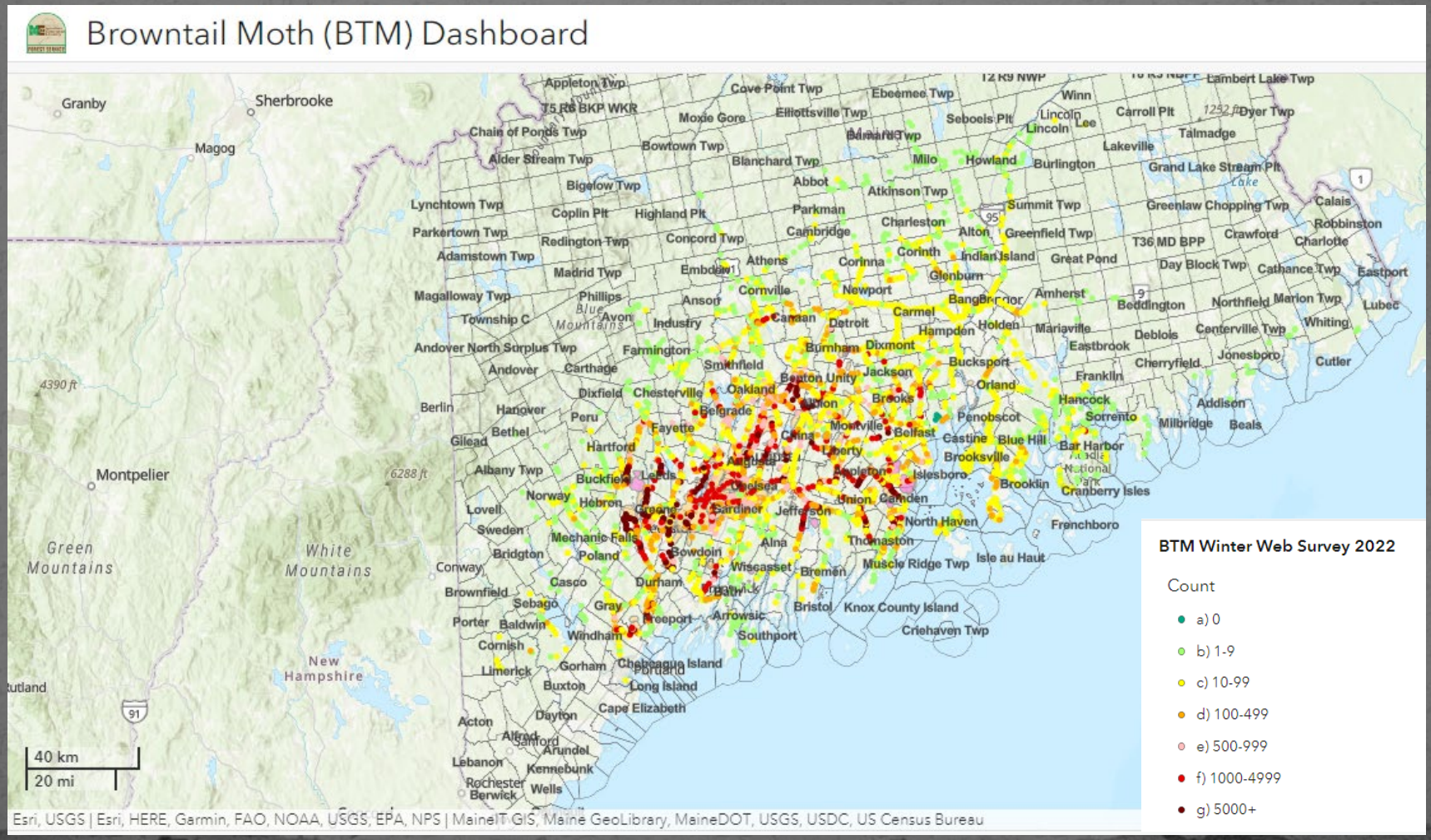
- Invasive insect from Europe
  - Order: Lepidoptera (moths)
  - Family: Lymantriidae
- Caterpillars have toxic hairs

Browntail Moth Risk Map

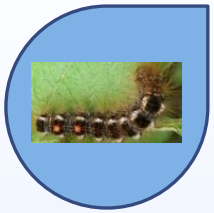


New BTM Dashboard

- https://www.arcgis.com/apps/dashboards/8f2931a691374ac9853636e71cbb1f40



Browntail moth management



IPM Actions

- Keep outside lights off
- Remove host trees near houses
- Trim out webs & destroy nests
  - https://www.maine.gov/dacf/mfs/forest_health/documents/arborists_prune_btm_webs.pdf
- Wet-dry vacuum containing soapy water and fitted with a HEPA filter
- Pesticide application timing -only a few weeks in spring
- Late August application may also work

- oak, apple, crabapple, pear, birch, cherry

Pupils of Farm School, Thompson's Island, destroying winter webs of brown-tail moth, Dec., 1902.

https://www.maine.gov/dacf/mfs/forest_health/invasive_threats/browntail_moth_info.htm

Emerald Ash Borer (EAB)

Agrilus planipennis

David Cappaert, Michigan State University, Bugwood.org

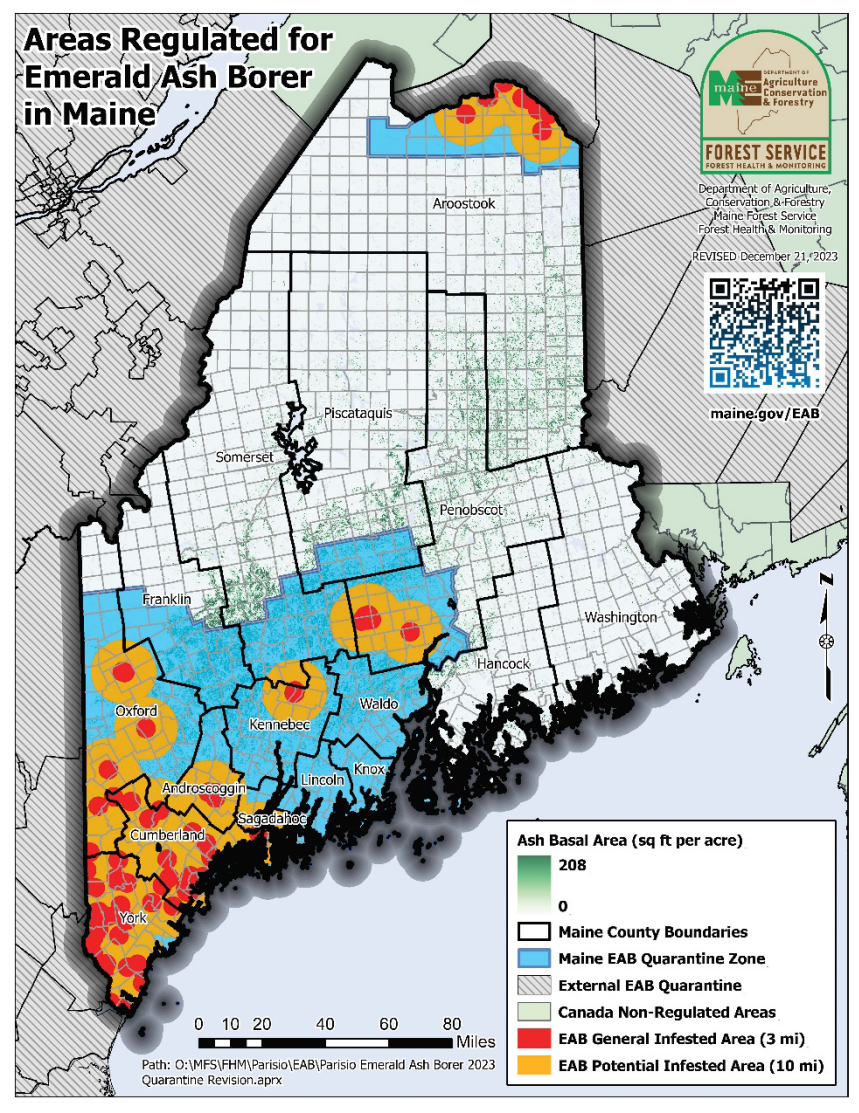
Troy Kimoto, Canadian Food Inspection Agency, Bugwood.org

From: Asia

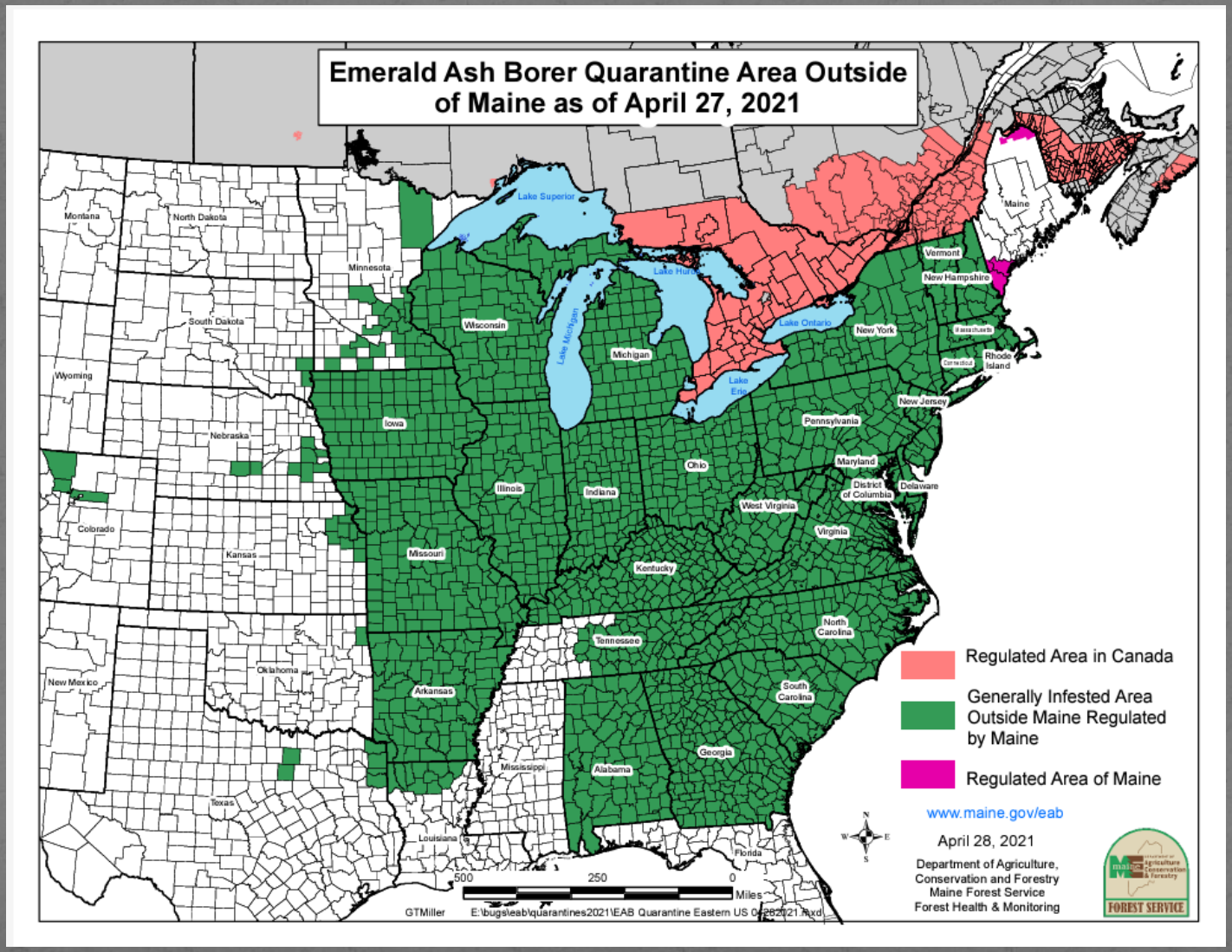
How it Got Here: SWPM

FOUND IN MAINE

Emerald Ash Borer In Maine



Found in 35 states and the Canadian provinces of Ontario, Quebec, New Brunswick, Nova Scotia, and Manitoba



What does EAB do?

Attacks **all species of ash** (*Fraxinus*) in North America.

Now known to attack white fringetree (*Chionanthus virginicus*)

Kills trees in as little as 2 years.

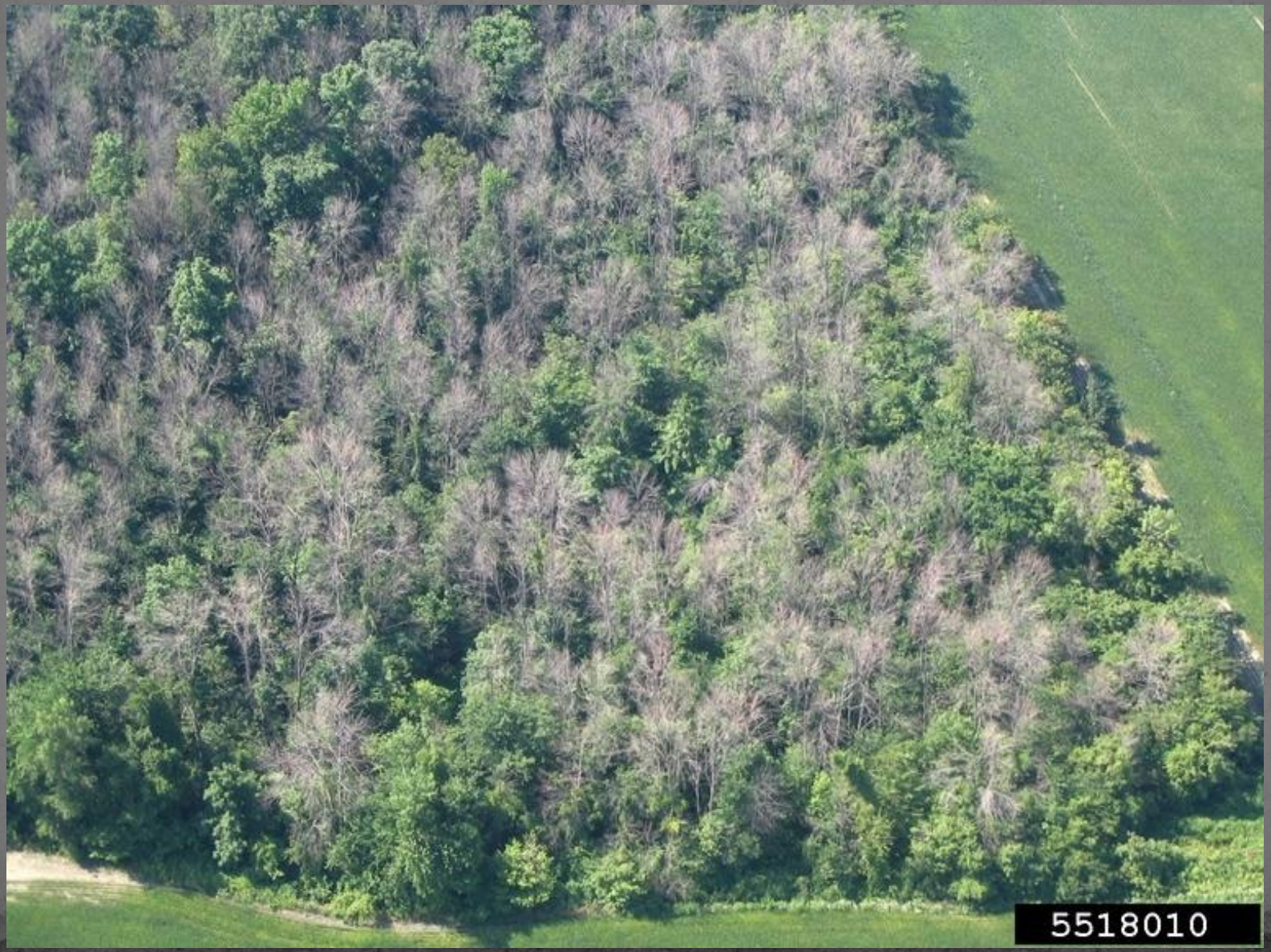
- Girdles the tree by extensive feeding in the cambium layer.

Spreads easily in firewood

- 75% of new infestations due to infested firewood.

Mike Kelley via Flickr

Ash mortality in Ontario



Recognizing EAB

From afar

Woodpecker activity!!!

Crown dieback

Epicormic shoots

Woodpecker Activity

Recognizing EAB

Up close

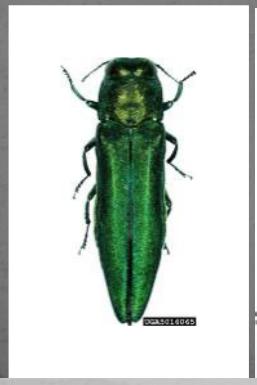
Bark splitting

Michigan Dept. of Agriculture, Bugwood.org

S-shaped galleries under bark

John Obermeyer, Purdue

EAB



NOT EAB

Pennsylvania Dept. of Conservation an Natural Resources

D-shaped exit holes

Accident caused by falling ash in Hudson, NH Image: WMUR

Some Considerations

- Dead/dying ash infested with EAB can pose significant hazards to people/ infrastructure
- MFS does not recommend eliminating ash;
  - High risk ash should be removed before it shows severe dieback
  - Resistance in some white ash seen so don't recommend cutting all forest ash
  - Need male and female trees near each other to provide seed sources

Biocontrol

Species	Type of parasitoid
Tetrastichus planipennisi	Larval endoparasitoid
Spathius galinae	Larval ectoparasitoid
Oobius agrili	Egg parasitoid

Asian Longhorned Beetle (ALB)

Anoplophora glabripennis

City of Bowling Green, OH

USDA Forest Service

MA Dept. of Agricultural Resources

From: Asia

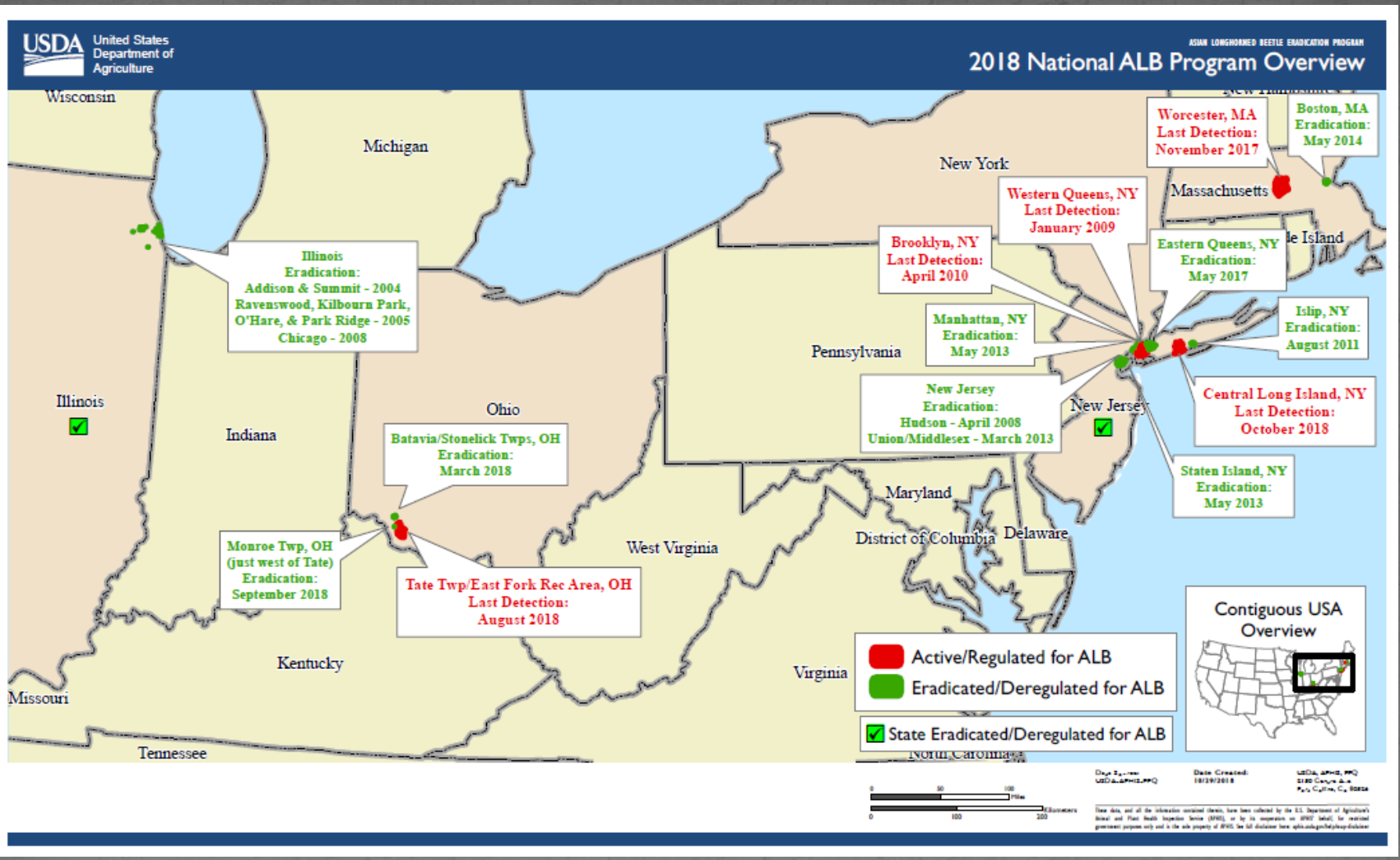
How it Got Here: SWPM

NOT FOUND IN MAINE

Asian Longhorned Beetle

- Found in Worcester & Brookline, MA
- Large, shiny black and white beetle with very long antennae
- Keep an eye out for beetles and characteristic damage
- Favorite hosts: Maples, birch, poplar, willow, elm, horse chestnut

Large round deep exit holes



Currently in,

New York (1996), Massachusetts (2008), Ohio (2011), Ontario, CA

Eradicated from,

Illinois, New Jersey, Boston, MA, Toronto, Canada

What does it do?

Attacks **healthy hardwood trees**

- Preferably maple
- But also elm, willow, birch, horsechestnut...

Weakens, eventually killing, trees

- Girdles the tree by young larvae feeding in the cambium layer
- Compromises structure by older larvae boring into heartwood

Can spread in firewood

- Some Ohio and Long Island infestations

Bark Problems

Cracks

Missing

Oviposition Sites (egg niches)

Jenn Forman Orth, Mass. Department of Agricultural Resources

Jenn Forman Orth, Mass. Department of Agricultural Resources

Oviposition Sites (egg niches)

Exit (emergence) Holes

Adult Feeding Damage

Frass

Robert A. Haack, USDA Forest Service, Bugwood.org

Michael Bohne, US Forest Service

ALB vs. Native Longhorned Beetle

Asian longhorned beetle

Hardwoods

ELYTRA	ELYTRA
Shiny black	Dull black
ANENNAE	ANTENNAE
Stark B/W contrasting bands	Dim B/W contrasting bands
SPOTS	SPOTS
Distinct white	indistinct off-white or none
LEGS	LEGS
Blue tinge	no tinge

White spotted sawyer

Conifers

Don’t Move Firewood!

Signs at border crossings & visitor centers

BEECH LEAF DISEASE

- First reported in OH, 2012
- American, European, and Oriental beech are susceptible

- Perhaps caused by a foliar nematode, *litylenchus crenatae*

BLD SYMPTOMS

- Early symptoms - dark bands between lateral veins of leaves
  - Evident when leaves emerge (spring)
- Later stages – leaves become thickened, shriveled and curled
- Reduced bud and leaf production
- Mortality
  - 2-5 years – saplings
  - ~6 years – mature trees

May be 2 years in Maine for both

BLD LOOK-ALIKES

Anthracnose


Eriopyid mites

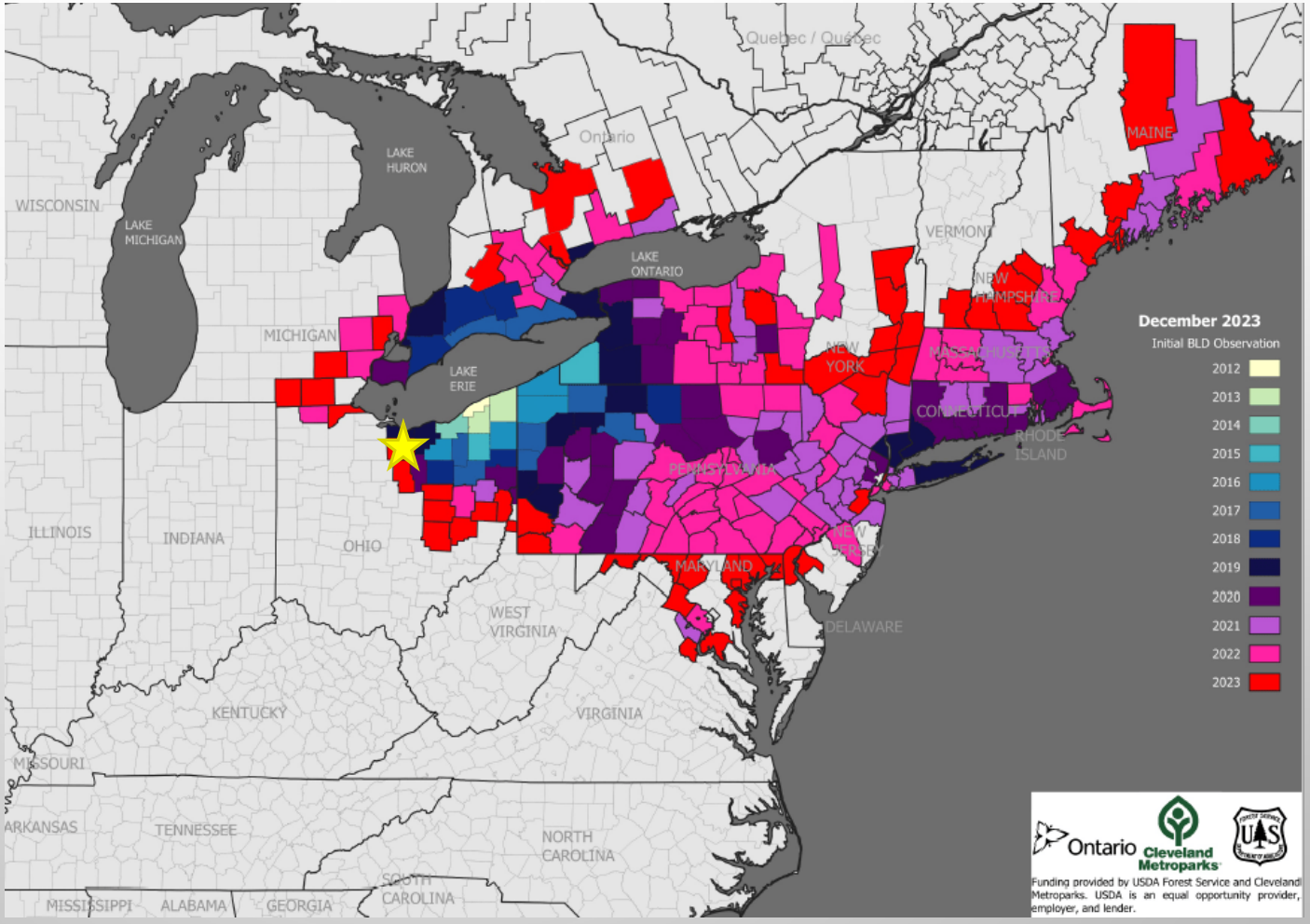

Aphid leaf rolling

https://vtinvasives.org/invasive/beech-leaf-disease

BEECH LEAF DISEASE

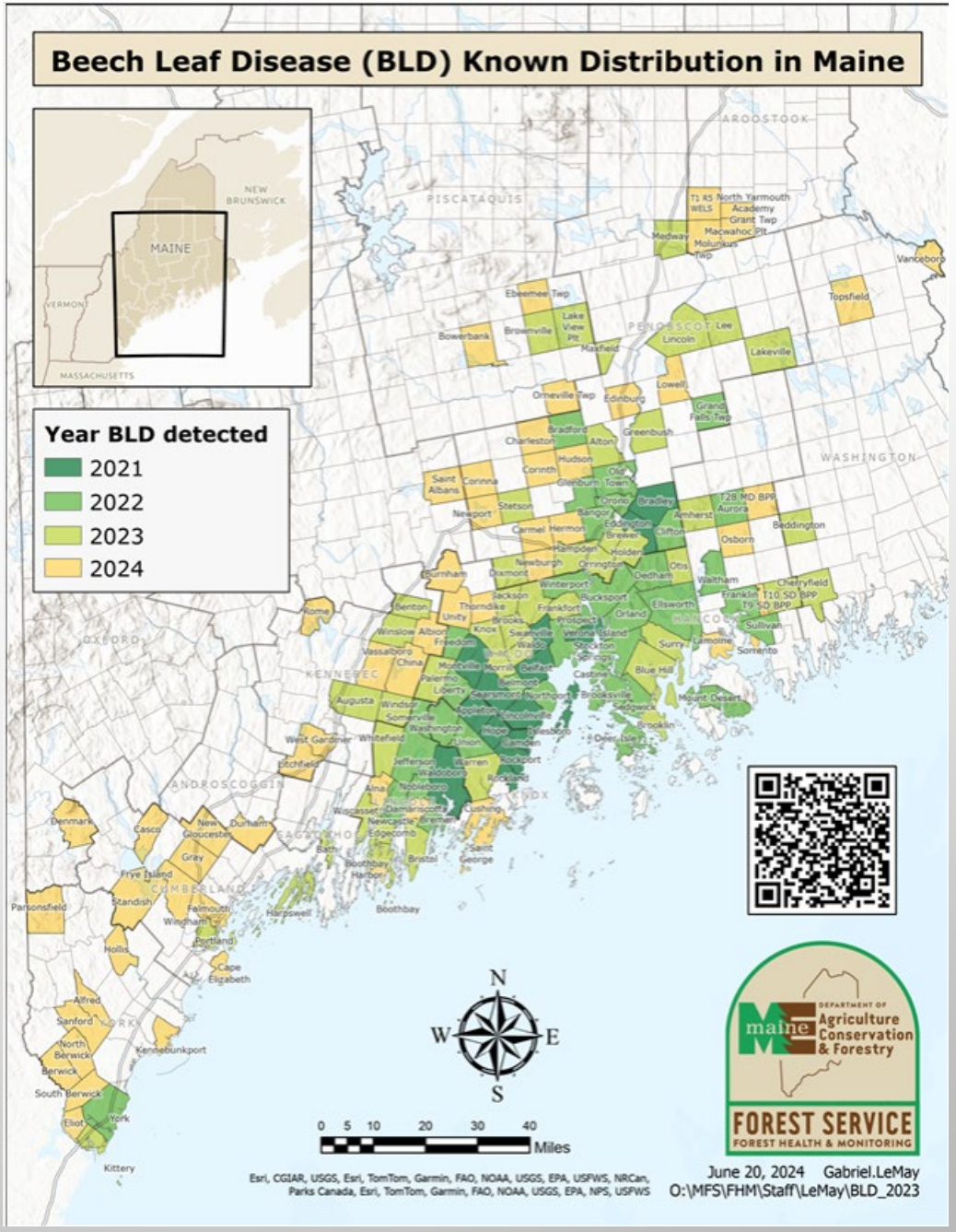
First discovered in 2012 (Ohio)

Currently known in:
Connecticut, Delaware, Massachusetts, Maine, Maryland, Michigan, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia and West Virginia.
Ontario, Canada.



First reported in Maine – June 2021

- Now in every county except Franklin

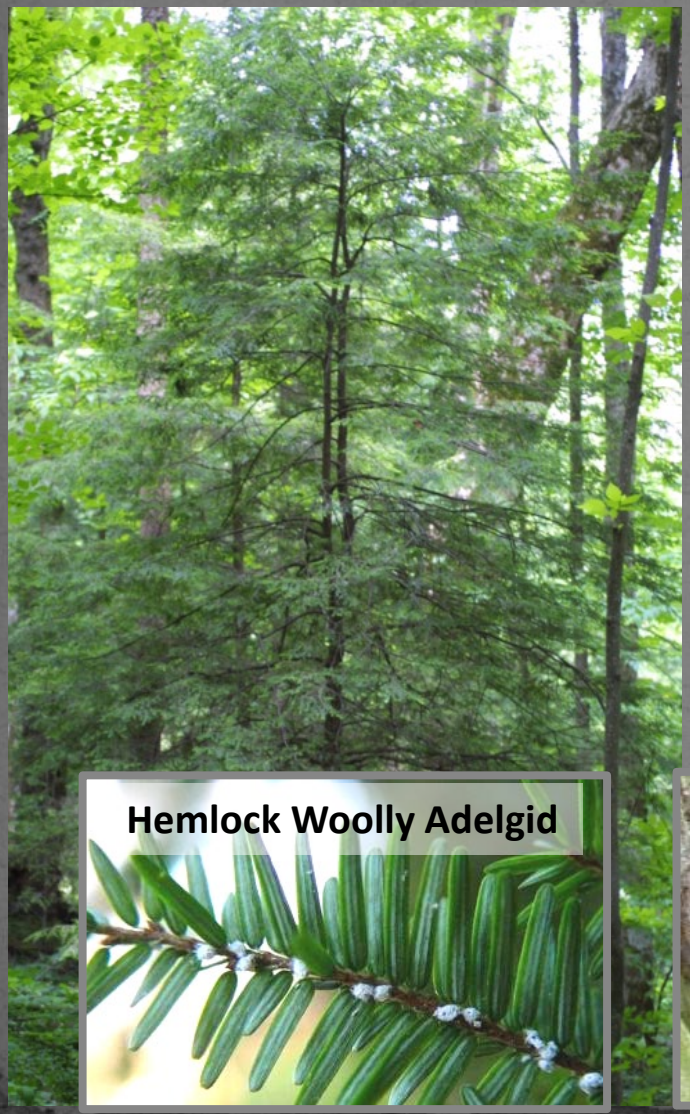


New Invasive Pests - Conifers

Hemlock

Fir

Spruce



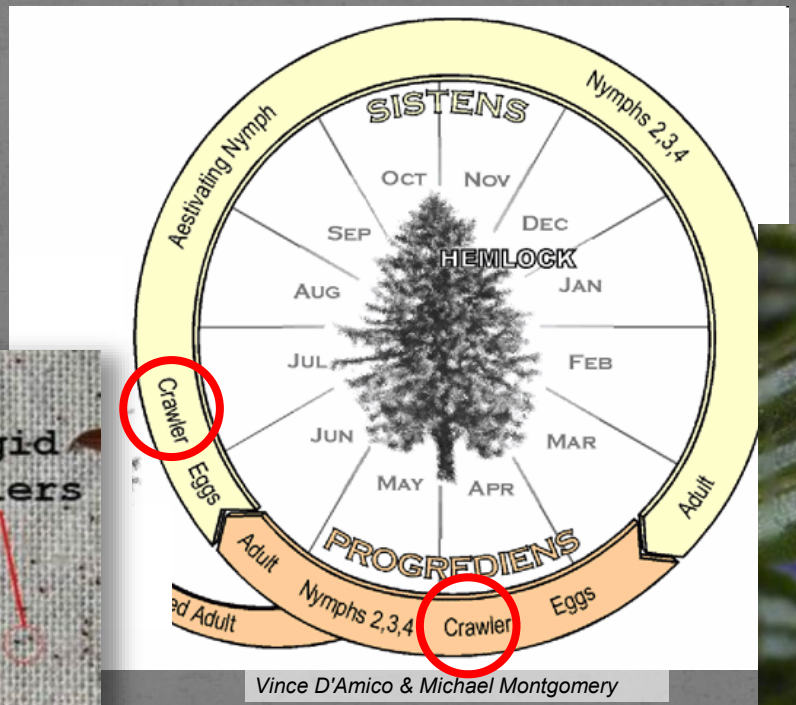
What is HWA

An aphid-like, sap-sucking insect

Feeding nymph

Older nymphs/adults produce "woolen" balls (fall/winter)

Dormant in summer



Vince D'Amico & Michael Montgomery

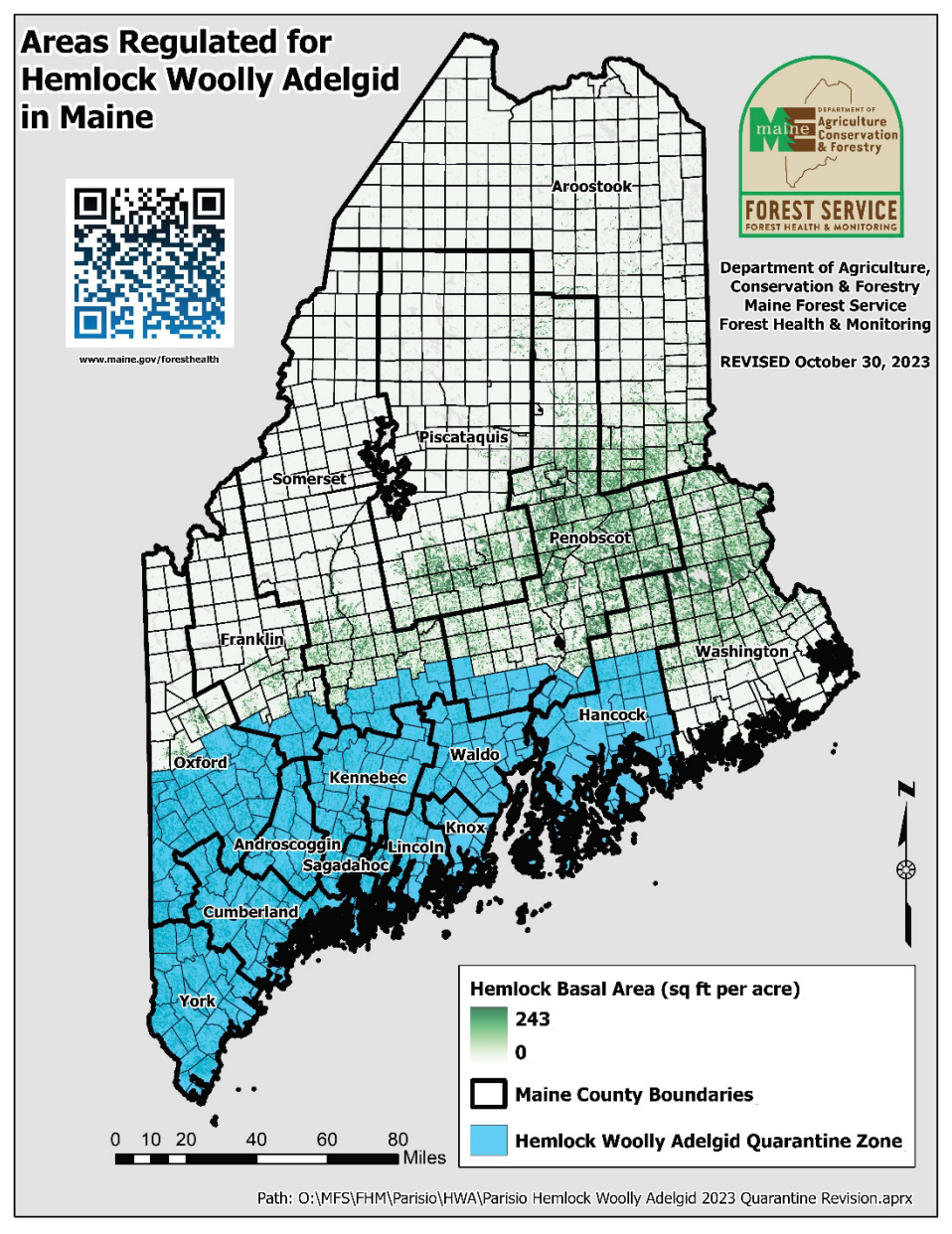
Maine Dept. of Agriculture, Conservation & Forestry

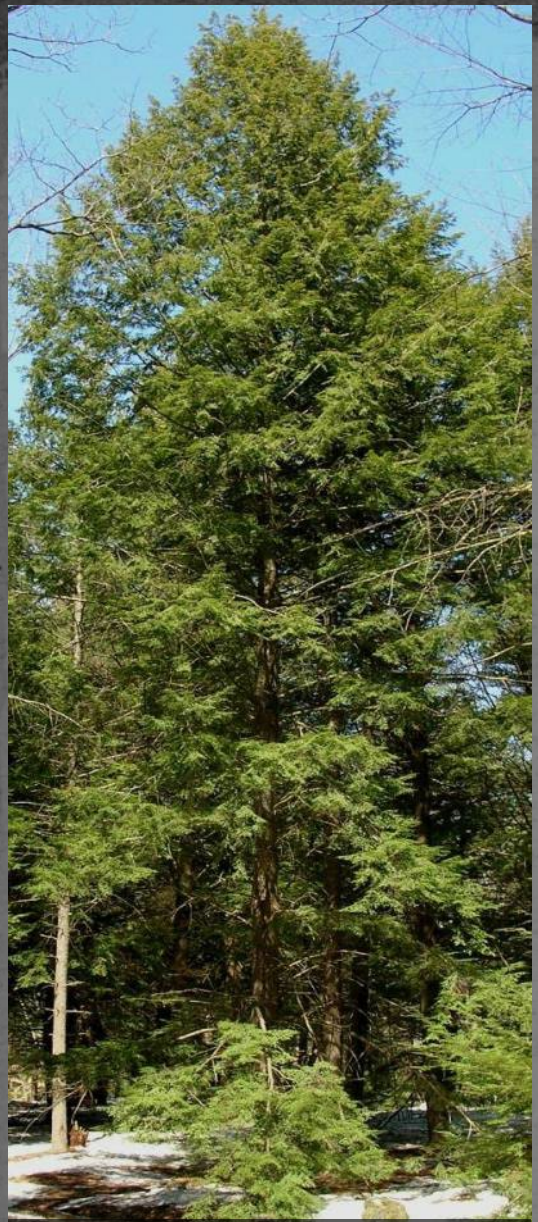
2 generations / year

spreads more easily during crawler stage

Quarantine Updated in 2023

- HWA is moving inland due to warming winter temperatures

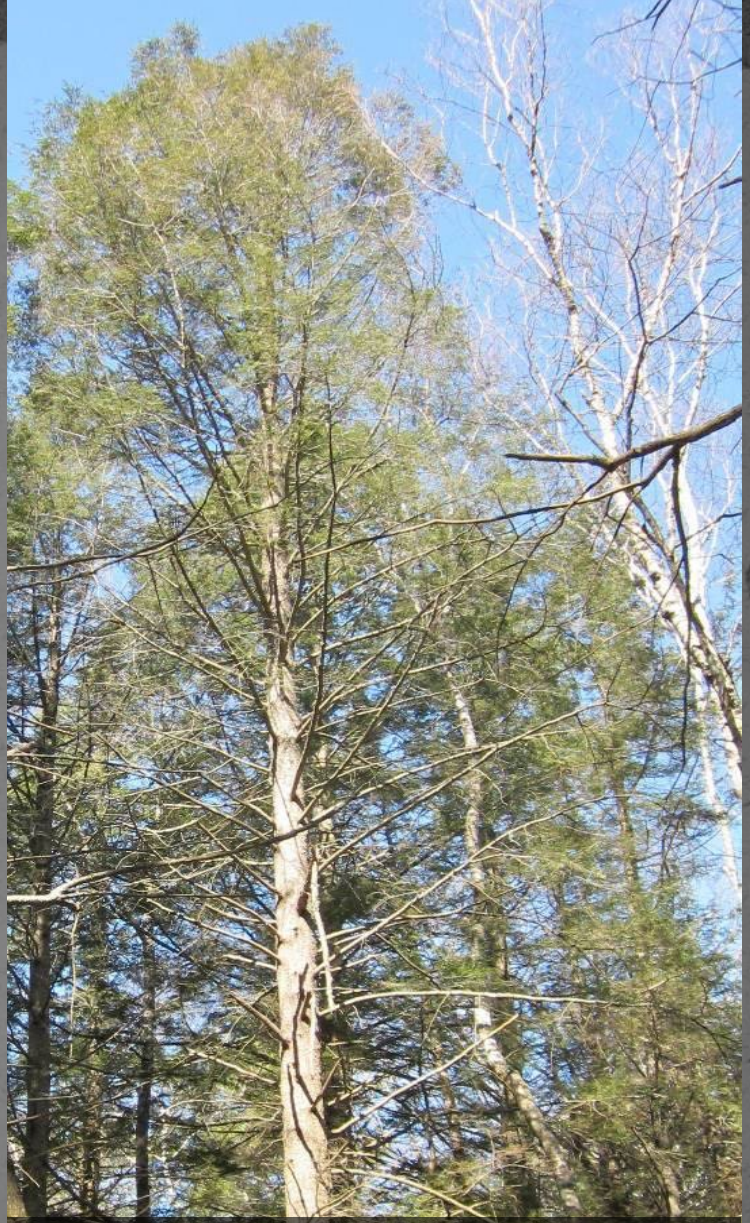




Westbrook ME
(Uninfested)
April 2008

Healthy hemlock
(no HWA)

HWA infested
hemlock



Wolfe Neck Woods
State Park
March 2012

Recognizing HWA

Look at undersides of HEMLOCK twigs

- Discrete white cottony balls at BASE of needles
- found in <u>newer growth</u>
- most visible November thru July

Recognizing HWA

From Afar

- premature needle drop
- lack of new growth
- lush green color fades
- branch dieback
- dead tree

And, while you are looking at hemlocks . . .

Elongate Hemlock Scale

(Fiorinia externa)

-Hemlock and Fir

-Spruce

-*Other Conifers*

Elongate Hemlock Scale

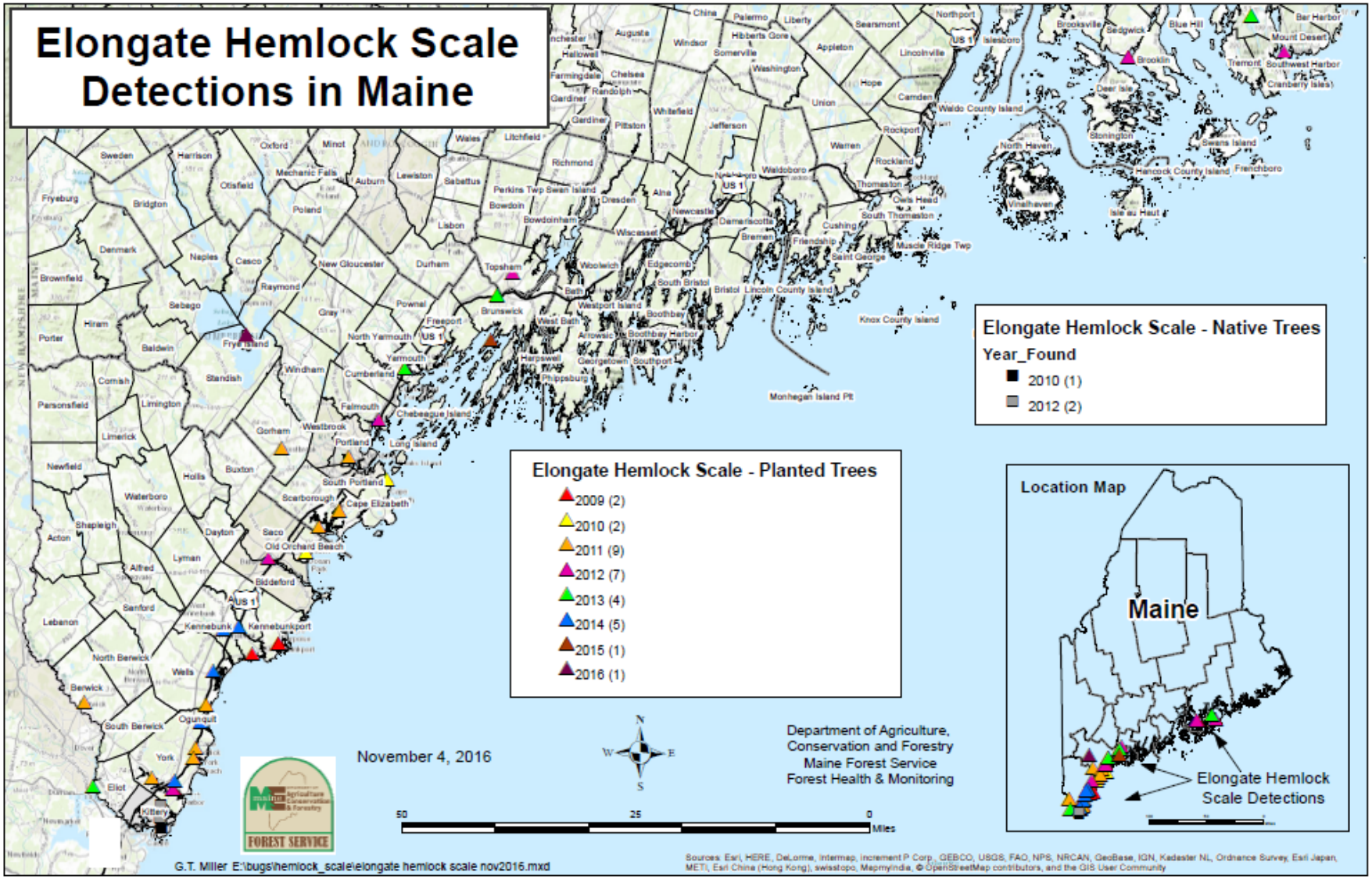
- Armored scale insect
- Found on **hemlock**, **fir**, sometimes other conifers
- First U.S. detection - 1908 (NY)
- First Maine detection – 2009
- Appearance:
  - Female: yellow/brown waxy coating, immobile adult
  - Male, white waxy "cocoon"
  - Threadlike "floss"
  - Along the length of needle

Elongate Hemlock Scale

- **What to look for**
  - Waxy deposits – “gray” colored needles on upper surface
  - Thinning foliage
  - Scale coverings/floss undersurface
- **Where to look**
  - Hemlock and Fir
  - Older branches
  - Planted trees
  - Forests infested w/HWA

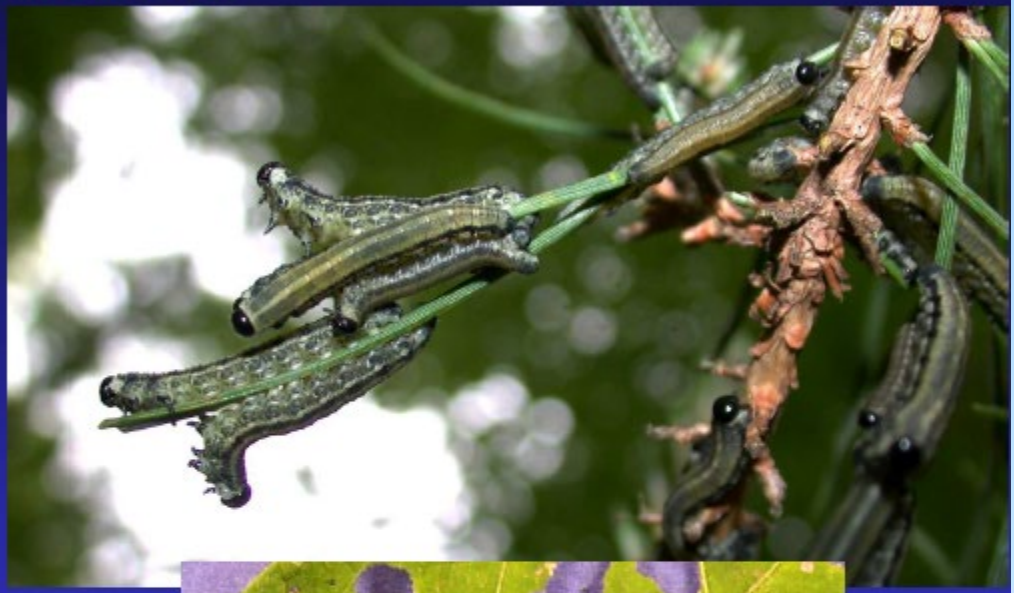
On trees with HWA…

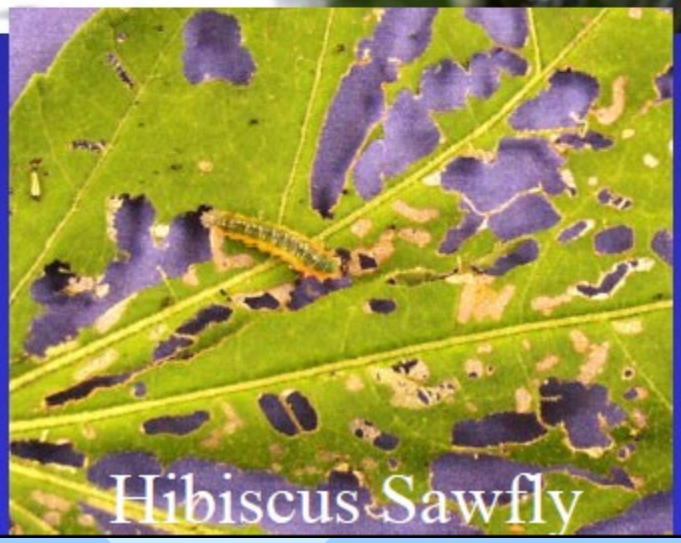
See the sneaky scales?


Elongate Hemlock Scale Detections in Maine
Elongate Hemlock Scale - Native Trees
Year_Found
2010 (1)
2012 (2)
Elongate Hemlock Scale - Planted Trees
2009 (2)
2010 (2)
2011 (9)
2012 (7)
2013 (4)
2014 (5)
2015 (1)
2016 (1)
Location Map
Maine
Elongate Hemlock Scale Detections
November 4, 2016
Department of Agriculture, Conservation and Forestry
Maine Forest Service
Forest Health & Monitoring
50
25
0
Miles
G.T. Miller E:\bugs\hemlock_scale\elongate hemlock scale nov2016.mxd
Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Sawflies

European pine sawfly





Leafminers

Spot Treatments

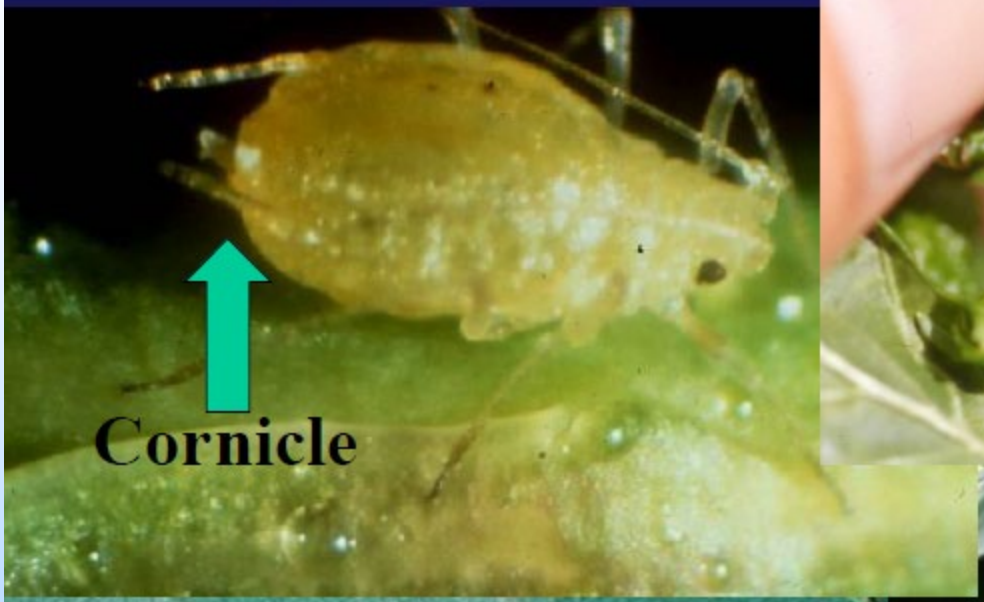
White pine weevil

Other borers

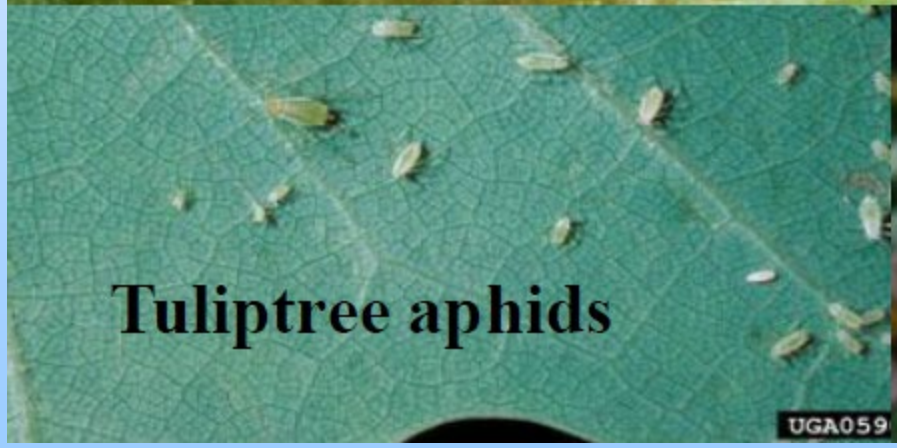
Piercing-Sucking Insects

Photos: Bob Childs

Aphids


Cornicle


Shed skins (exoskeletons)


Tuliptree aphids
UGA059


Sooty Mold

Hemlock Woolly Adelgid

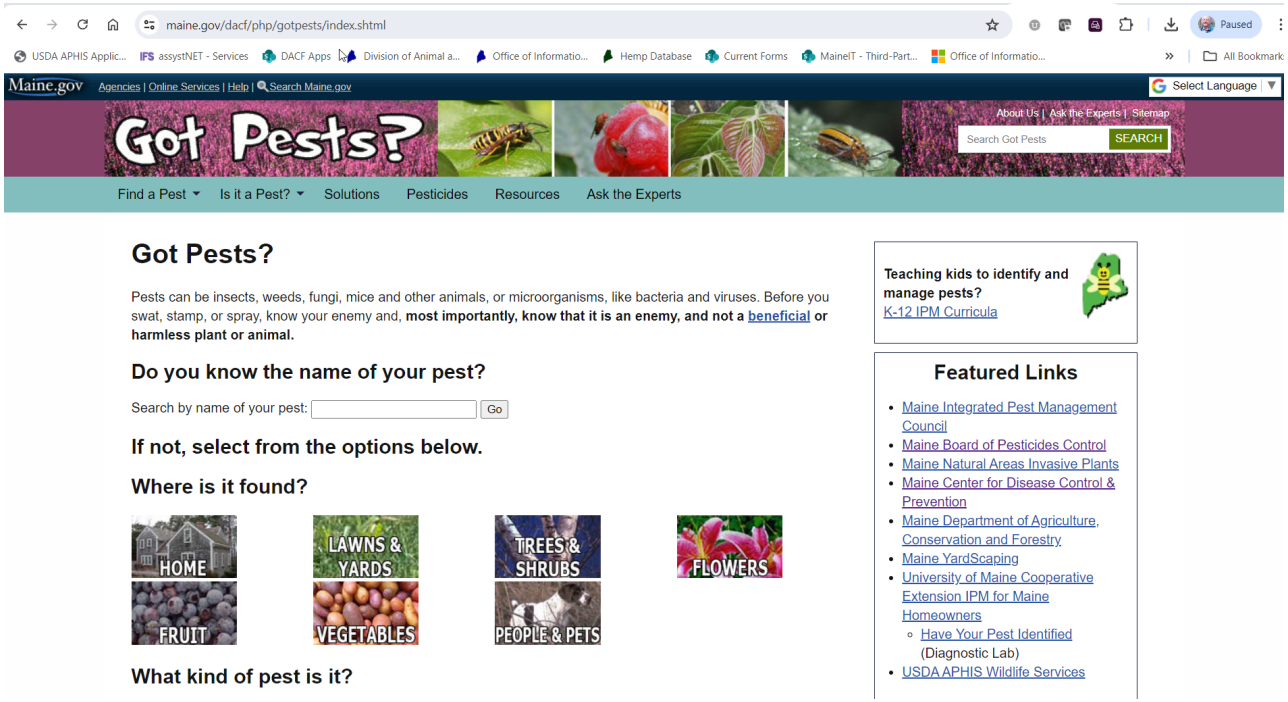
Oystershell Scale

Crawlers

Spruce Spider Mites

Twospotted Spider Mites

Sustainable landscapes cost less long term



www.gotpests.org

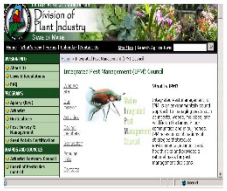
Maine Integrated Pest Management Council

Protecting Maine's Future through Reduced Reliance on Pesticides

- **Established by state legislature in 2002** to 'promote and enhance implementation of IPM practices that reduce or minimize harmful environmental and human health risks.'
- **Promotes public education** about the need, benefit, and practices of IPM.
- **Identifies priorities** for integrated pest management research, education, demonstration and implementation;
- Serves as a **communication** link among researchers, educators, regulators, policymakers and integrated pest management users;
- **Sets goals** for expanding, advancing and implementing integrated pest management;
- Establishes protocols for **measuring and documenting** IPM adoption.

Membership:

The 11 members plus 2 coordinators represent a broad range of IPM and environmental interests

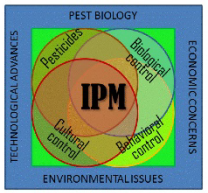


Find out more at www.maine.gov/IPMcouncil

Smarter Ways to Deal with Pests
From mice to mildew, crabgrass to cockroaches – whenever nature becomes a pest, Integrated Pest Management (IPM) offers least-risk solutions.

What is Integrated Pest Management?

- IPM is a **common sense and sustainable method** anyone can use to protect against pests. Every time you swat a fly, pull a weed, or select disease-resistant plants for your garden, you're using IPM tactics that reduce the need for pesticides.
- IPM methods include:
  - **Cultural practices** such as mowing higher to favor grass instead of weeds
  - **Physical methods** such as pruning or installing deer fencing)
  - **Biological controls** such as attracting or conserving beneficial insects and spiders
  - **Chemical methods** such as selective and careful use of organic, natural and/or conventional **pesticides only as needed**.



On the Farm...
Maine farmers use IPM to produce healthy crops, protect the environment and save money. Shop for Maine-grown food and ask your farmer-neighbors about their IPM practices.

Find IPM answers to common pest issues at www.gotpests.org

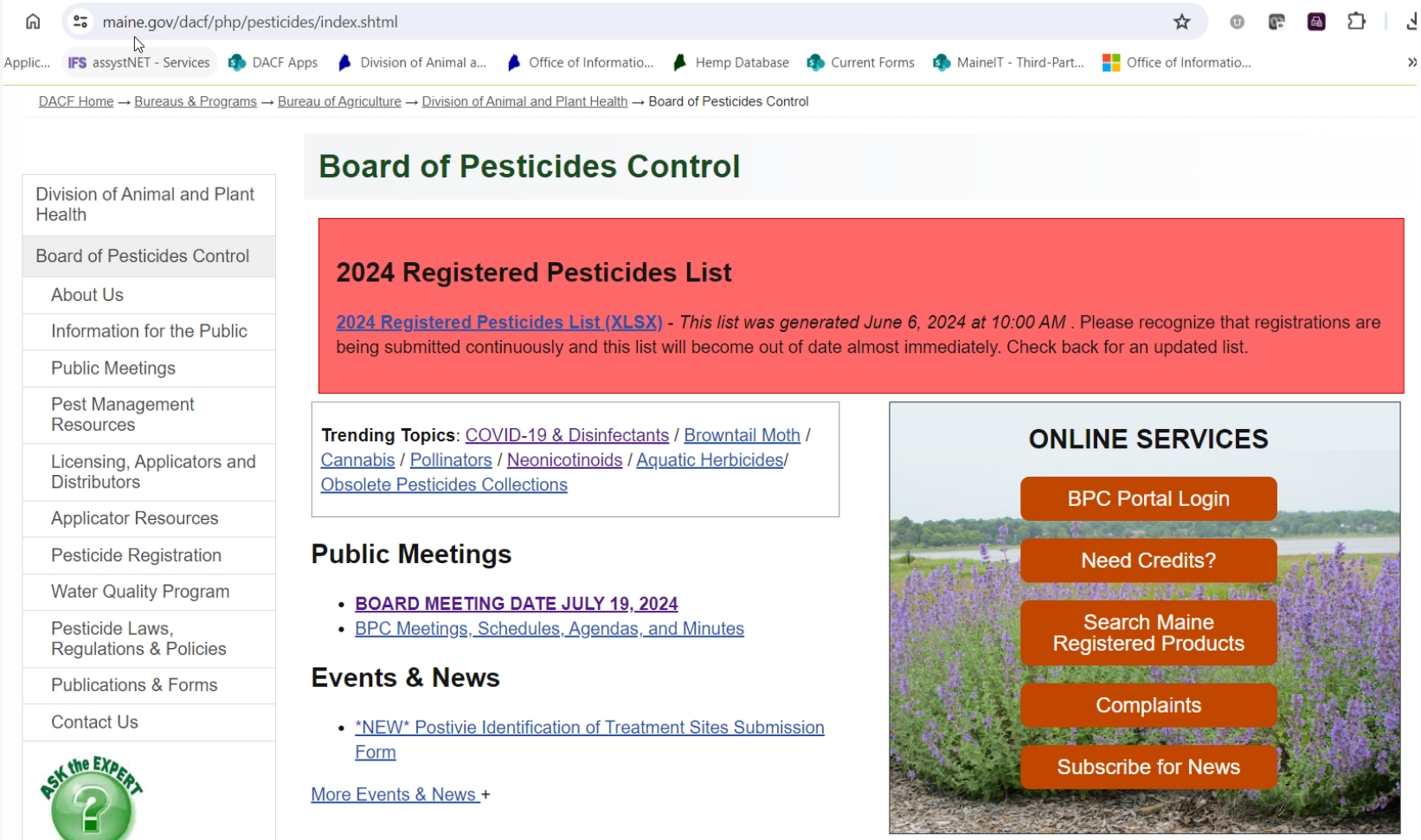
Our Mission

The Integrated Pest Management Council will define, promote and enhance implementation of IPM practices that reduce or minimize harmful environmental and human health impacts of pesticides and other pest management practices. The Council will promote the education of the public regarding the need, benefit, and practices of IPM.

Specifically, the council is directed to:

- Identify long-term and short-term priorities for integrated pest management research, education, demonstration and implementation; Priority Needs for IPM (updated 2017)
- Serve as a communication link for the development of coordinated multidisciplinary partnerships among researchers, educators, regulators, policymakers and integrated pest management users;
- Identify funding sources and cooperate on obtaining new funding for on-site trials, education and training programs and other efforts to meet identified goals for expanding, advancing and implementing integrated pest management;
- Establish measurable goals for expansion of integrated pest management into new sectors and advancing the level of integrated pest management adoption in sectors where integrated pest management is already practiced; and
- Cooperate with appropriate organizations to establish protocols for measuring and documenting integrated pest management adoption in the State.

Maine Board of Pesticides Control



www.thinkfirstspraylast.org

Resources

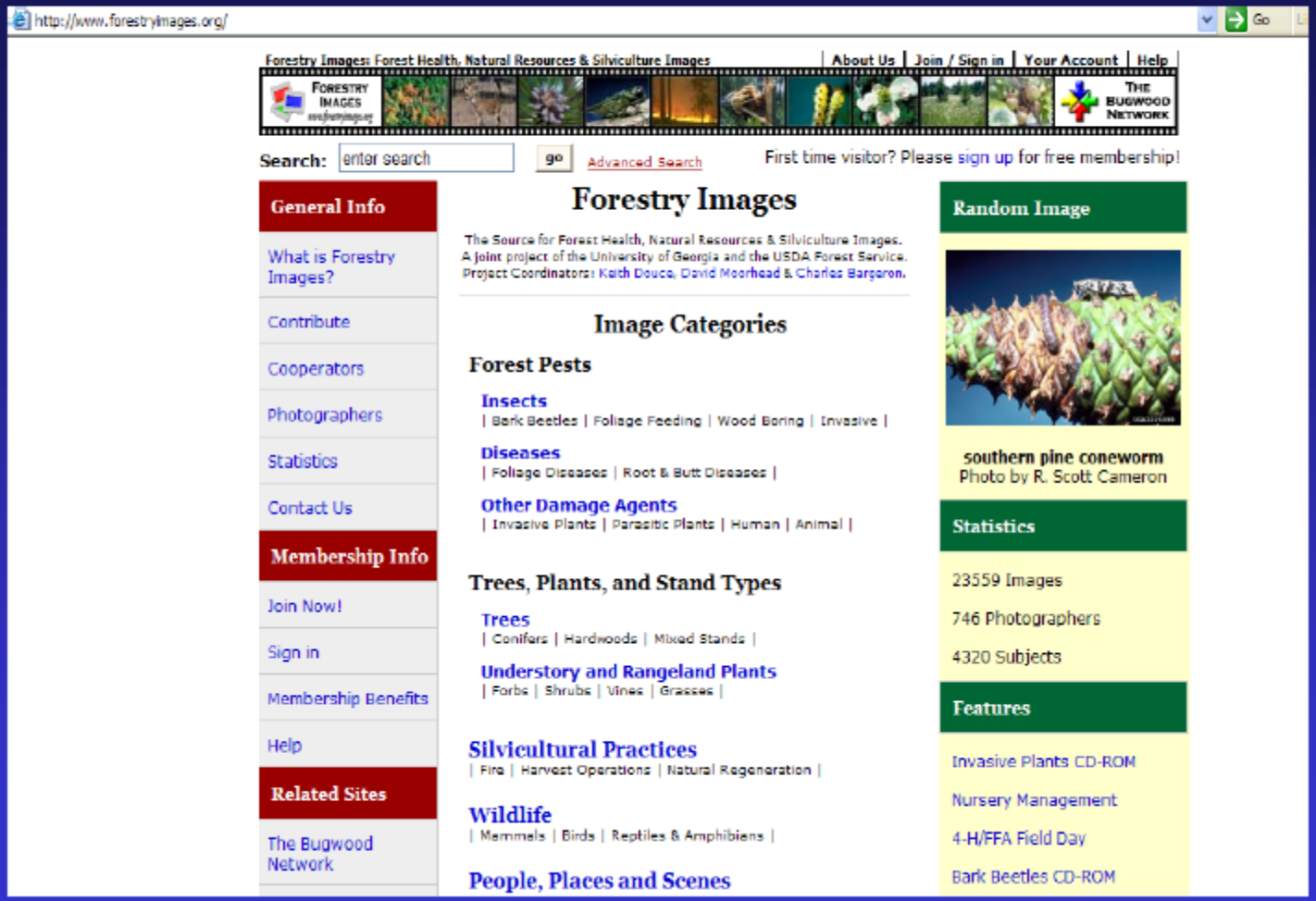
- **Maine Department of Agriculture, Conservation and Forestry Plant Health Division**
  - **Apiary • Arborist • Ginseng • Horticulture • Hemp • IPM - Programs**
    207-287-3891
  - https://www.maine.gov/dacf/php/index.shtml
  - **Cooperative Extension: Insect Pests, Ticks, and Plant Diseases**
  - 207.581.3880 or 800.287.0279 (in Maine)
  - extension.diagnosticlab@maine.edu

Who you gonna call?

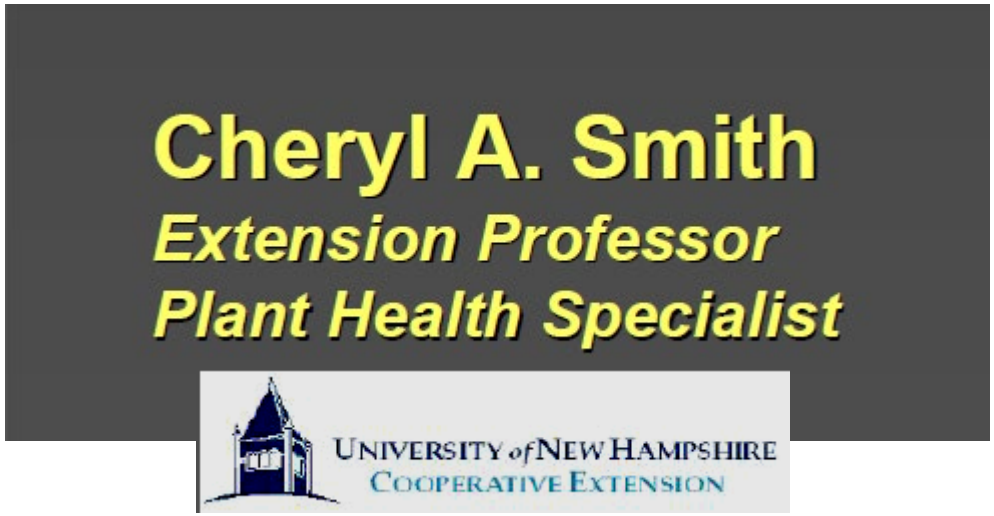
Bringing Nature Home Slides

- Courtesy of Doug Tallamy

Photo credits: www.forestryimages.org/



Many disease slides courtesy of:



Some slides courtesy of CAES

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Additional photos by Jillian Cowles (JHC)

Questions?