

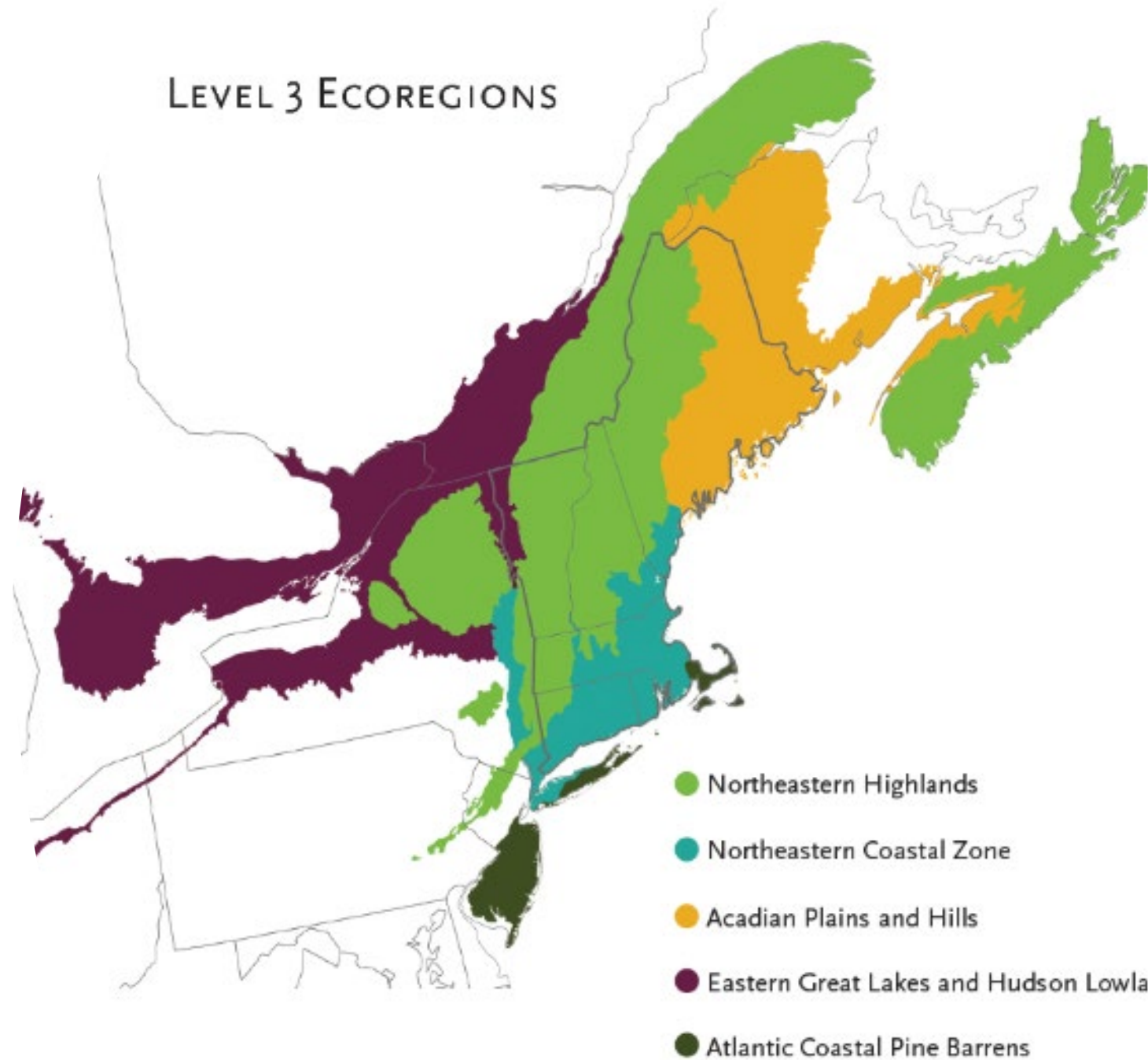


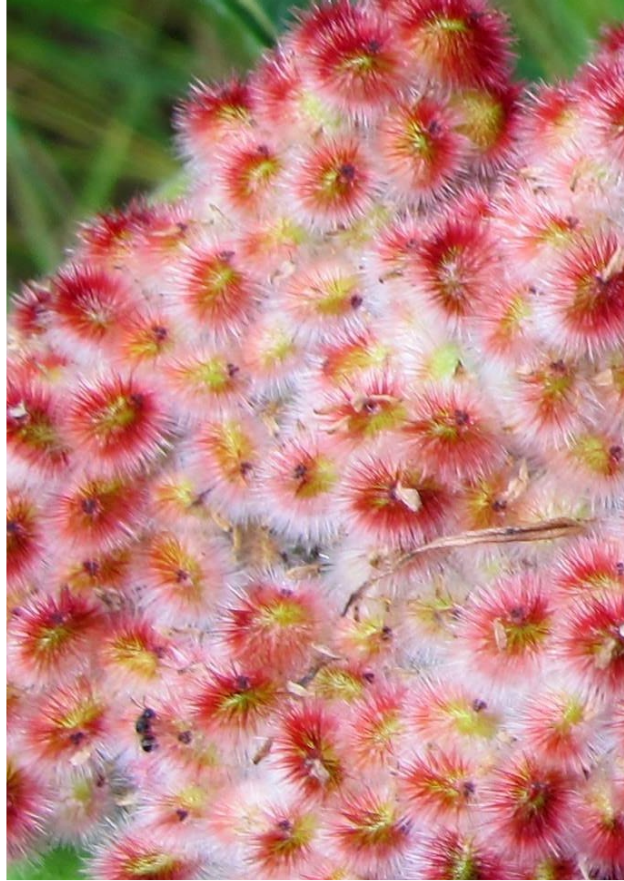
When will it stop?

Slowing the spread of invasive species?

Definition

An "invasive species" is defined as a species that is non-native to the ecoregion; and whose introduction causes or is likely to cause economic or environmental harm or harm to human health.





Native species are NOT invasive species



Why be concerned about
invasive species?

Because we
love Maine!



Invasive
species don't
fit into Maine's
ecological
puzzle



Terrestrial invasive plants

Invasive Plants Prohibited from Sale or Import in Maine What you need to Know



CMR 01-001 Chapter 273: Criteria for Listing Invasive Terrestrial Plants makes it illegal to sell, import, export, buy or intentionally propagate for sale the 33 plant species listed below.

| | |
|--|---|
| <i>Acer ginnala</i> (amur maple) | <i>Impatiens glandulifera</i> (ornamental jewelweed) |
| <i>Acer platanoides</i> (Norway maple) | <i>Iris pseudacorus</i> (yellow iris) |
| <i>Aegopodium podagraria</i> (bishop's weed) | <i>Ligustrum vulgare</i> (common privet) |
| <i>Ailanthus altissima</i> (tree of heaven) | <i>Lonicera japonica</i> (Japanese honeysuckle) |
| <i>Alliaria petiolata</i> (garlic mustard) | <i>Lonicera maackii</i> (amur or bush honeysuckle) |
| <i>Amorpha fruticosa</i> (false indigo bush) | <i>Lonicera morrowii</i> (Morrow's honeysuckle) |
| <i>Ampelopsis glandulosa</i> (porcelain berry) | <i>Lonicera tatarica</i> (Tatarian honeysuckle) |
| <i>Artemisia vulgaris</i> (common mugwort) | <i>Lythrum salicaria</i> (purple loosestrife) |
| <i>Berberis thunbergii</i> (Japanese barberry) | <i>Microstegium vimineum</i> (Japanese stilt grass) |
| <i>Berberis vulgaris</i> (common barberry) | <i>Paulownia tomentosa</i> (paulownia, princess tree) |
| <i>Celastrus orbiculatus</i> (Asiatic bittersweet) | <i>Pericaria perfoliata</i> (mile-a-minute) |
| <i>Elaeagnus umbellata</i> (Autumn olive) | <i>Phellodendron amurense</i> (amur cork tree) |
| <i>Euonymus alatus</i> (winged euonymus) | <i>Populus alba</i> (white cottonwood) |
| <i>Euphorbia cyparissias</i> (cypress spurge) | <i>Robinia pseudoacacia</i> (black locust) |
| <i>Fallopia baldschuanica</i> (Chinese bindweed) | <i>Rosa multiflora</i> (multiflora rose) |
| <i>Fallopia japonica</i> (Japanese knotweed) | |
| <i>Frangula alnus</i> (glossy buckthorn) | |
| <i>Hesperis matronalis</i> (dame's rocket) | |

Quick Facts

- The sale/import ban includes the listed species and all cultivars, varieties and hybrids.
- Variations may be applied for and granted for scientific research and for varieties, cultivars or hybrids that have been shown to not be invasive through peer reviewed scientific research.
- The invasive plant rule and included prohibited plant list will be reviewed every 5 years.
- Recent changes to the rule will prohibit the sale of an additional 30 species starting January 1, 2024 (see back).
- Find more information at www.maine.gov/dacf/np/horticulture/ma-sic-plants.shtml



FOR MORE INFORMATION:
MAINE DEPARTMENT OF AGRICULTURE,
CONSERVATION AND FORESTRY
DIVISION OF ANIMAL AND PLANT HEALTH
28 STATE HOUSE STATION
AUGUSTA, ME 04333
207-287-3891
HORTICULTURE@MAINE.GOV
WWW.MAINE.GOV/HORT

| Scientific name | Common name | Effective Date |
|-----------------------------------|--|----------------|
| <i>Alnus glutinosa</i> | European alder | 1/1/2024 |
| <i>Angelica sylvestris</i> | Woodland angelica | 1/1/2024 |
| <i>Anthriscus sylvestris</i> | Wild chervil, raven's wing | 1/1/2024 |
| <i>Aralia elata</i> | Japanese angelica tree | 1/1/2024 |
| <i>Butomus umbellatus</i> | Flowering rush | 1/1/2024 |
| <i>Elaeagnus angustifolia</i> | Russian olive | 1/1/2024 |
| <i>Euonymus fortunei</i> | Wintercreeper, climbing spindle tree | 1/1/2024 |
| <i>Festuca filiformis</i> | Fine-leaved sheep fescue | 1/1/2024 |
| <i>Ficaria verna</i> | Lesser celandine | 1/1/2024 |
| <i>Glaucium flavum</i> | Yellow hornpoppy | 1/1/2024 |
| <i>Glechoma hederacea</i> | Ground ivy, creeping charlie | 1/1/2024 |
| <i>Glyceria maxima</i> | Great manna grass, reed manna grass | 1/1/2024 |
| <i>Hippophae rhamnoides</i> | Sea buckthorn | 1/1/2024 |
| <i>Ligustrum obtusifolium</i> | Border privet | 1/1/2024 |
| <i>Lonicera xylosteum</i> | Dwarf honeysuckle | 1/1/2024 |
| <i>Lythrum virgatum</i> | European wand loosestrife | 1/1/2024 |
| <i>Miscanthus sacchariflorus</i> | Amur silvergrass | 1/1/2024 |
| <i>Petasites japonicus</i> | Fuki, butterbur, giant butterbur | 1/1/2024 |
| <i>Phalaris arundinacea</i> | Reed canary grass, variegated ribbon grass | 1/1/2024 |
| <i>Photinia villosa</i> | Photinia, Christmas berry | 1/1/2024 |
| <i>Phragmites australis</i> | Common reed | 1/1/2024 |
| <i>Phyllostachys aurea</i> | Golden bamboo | 1/1/2024 |
| <i>Phyllostachys aureosulcata</i> | Yellow groove bamboo | 1/1/2024 |
| <i>Pyrus calleryana</i> | Callery ("Bradford") pear | 1/1/2024 |
| <i>Ranunculus repens</i> | Creeping buttercup | 1/1/2024 |
| <i>Rubus phoenicolasius</i> | Wineberry | 1/1/2024 |
| <i>Silphium perfoliatum</i> | Cup plant | 1/1/2024 |
| <i>Sorbus aucuparia</i> | European mountain-ash | 1/1/2024 |
| <i>Tussilago farfara</i> | Coltsfoot | 1/1/2024 |
| <i>Valeriana officinalis</i> | Common valerian | 1/1/2024 |

Invasive Terrestrial Plant Species of Special Concern

| Scientific Name | Common Name |
|--------------------|-------------------------|
| <i>Rosa rugosa</i> | Rugosa rose, beach rose |



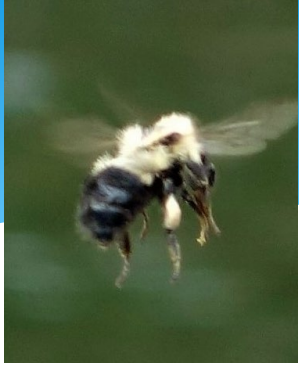
Britt Slattery, US FWS

Commonly
Sold Species
Banned
1/1/2024

Pyrus calleryana

Callery “Bradford” Pear

Alternatives



Bumble bee



Spring azure



Phish Photography

Canada serviceberry (*Amelanchier canadensis*)

Both feed
many birds
and small
mammals



Phish Photography

Pagoda dogwood (*Swida alternifolia*)

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



Lesser Maple Spanworm



Amy Ferriter-www.forestryimages.org

Red maple (*Acer rubrum*)



Cecropia Caterpillar



Paul Wray-Iowa State U

UGA0008379

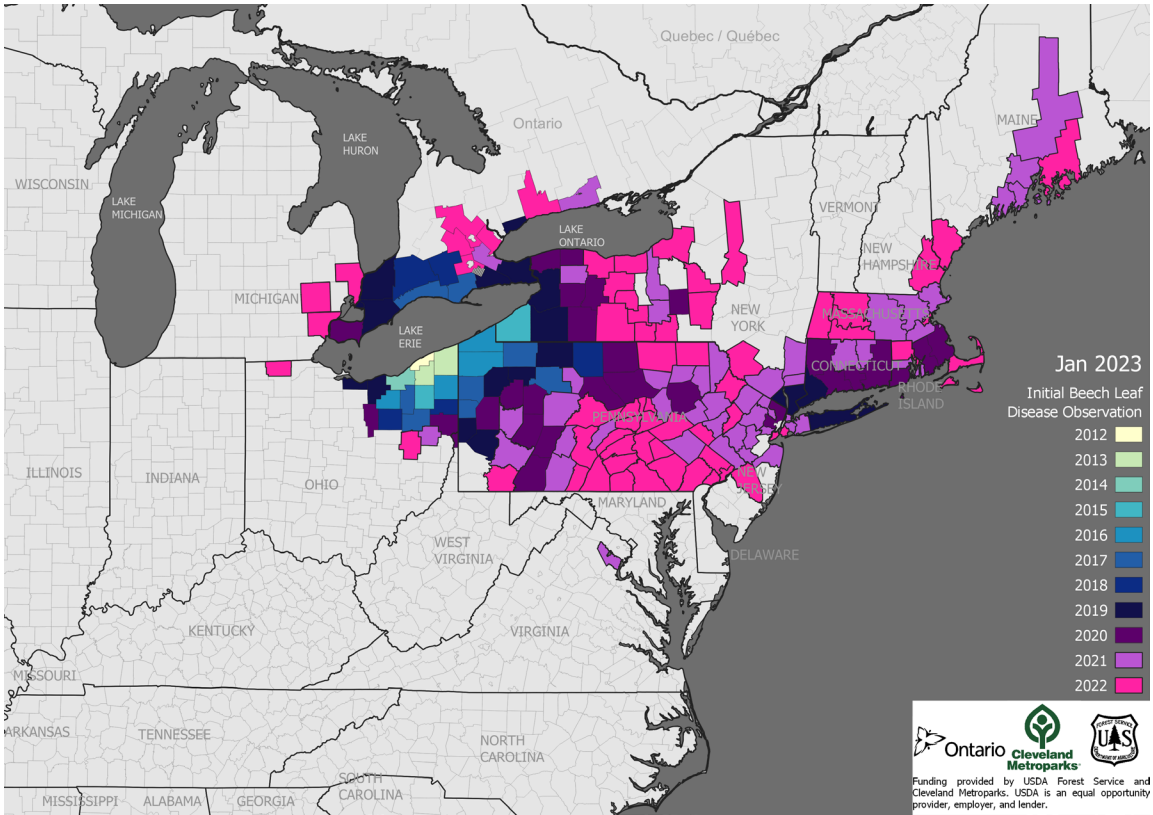
Sugar maple (*Acer saccharum*)



Tree, Forest & Ornamental Insects and Diseases



Beech Leaf Disease – an expanding concern

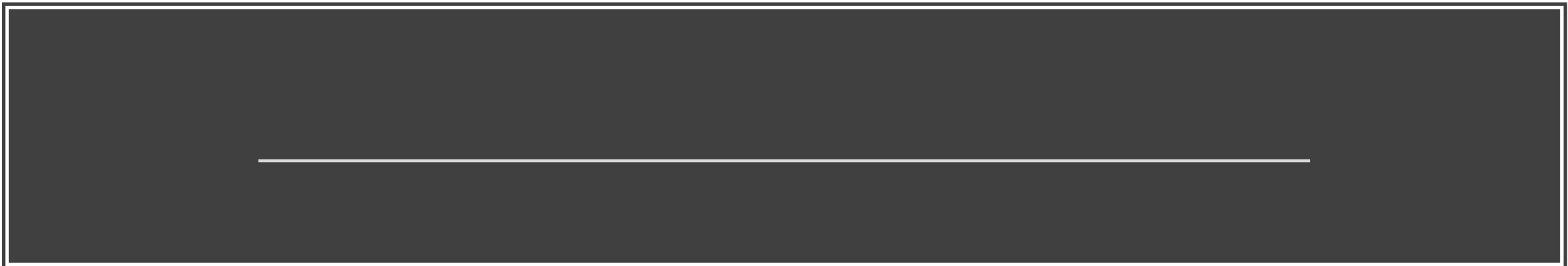


BEECH LEAF DISEASE

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

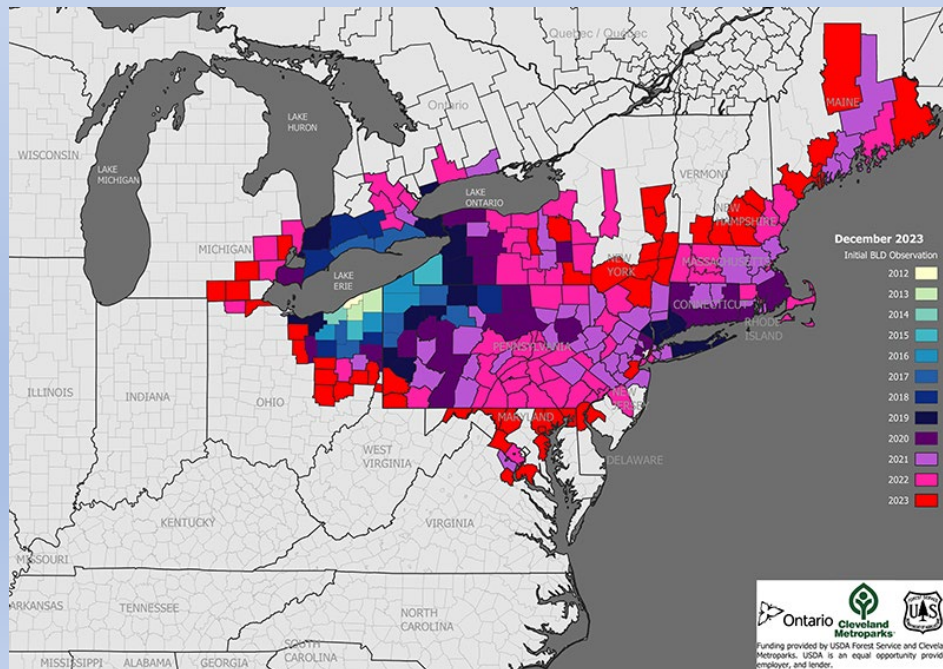


- Perhaps caused by a foliar nematode, *litylenchus crenatae*

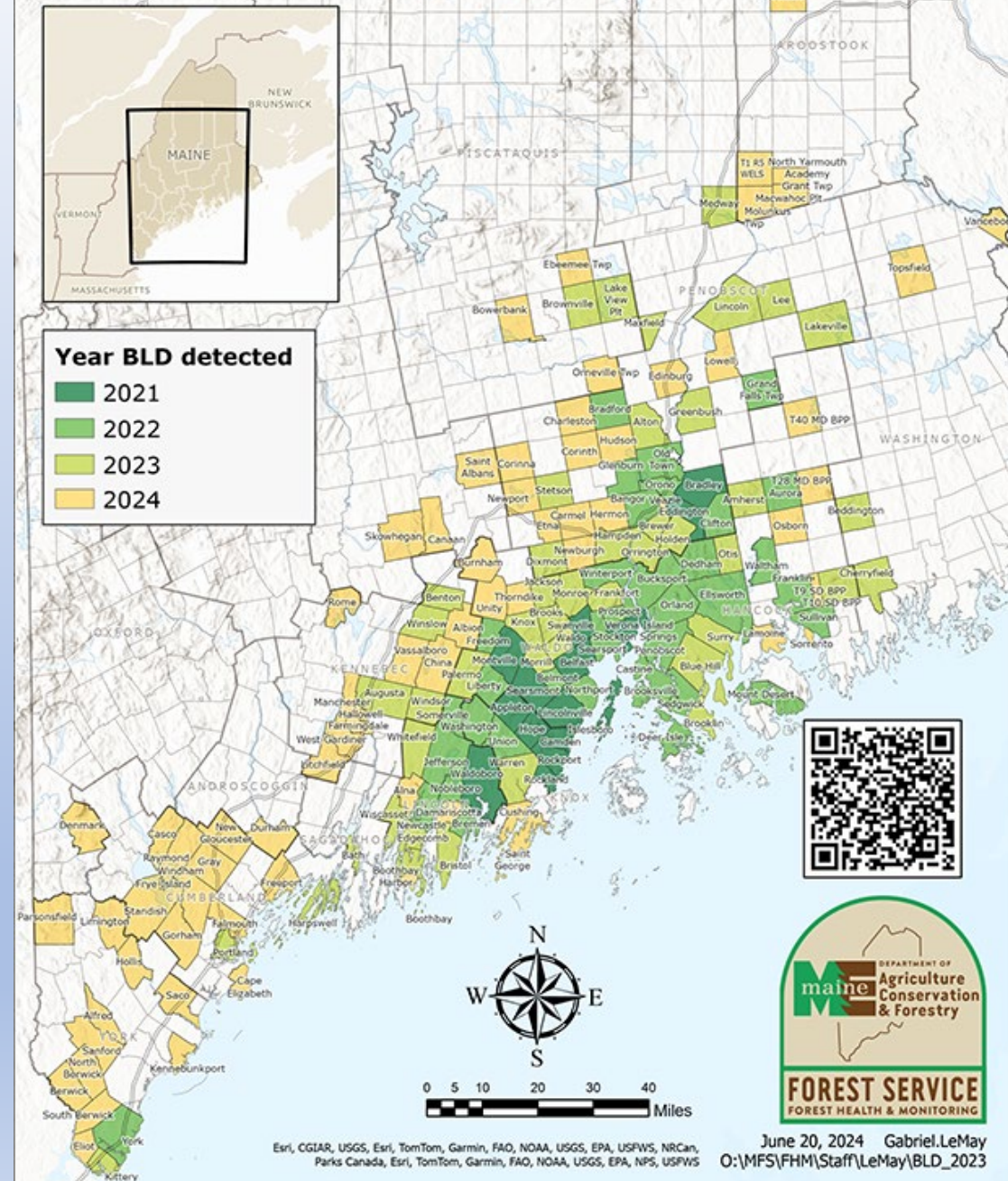


First reported in Maine – June 2021

- In all Counties except **Franklin County**
- **Maybe you could be the first to find it in Franklin County**
- **Where can you report beech leaf disease?**
foresthealth@maine.gov



Beech Leaf Disease (BLD) Known Distribution in Maine





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



Beech leaf
disease
symptoms





Emerald ash borer – new counties infested?

Well over 100 million ash trees killed to date

Recognizing EAB

Up close

Bark splitting

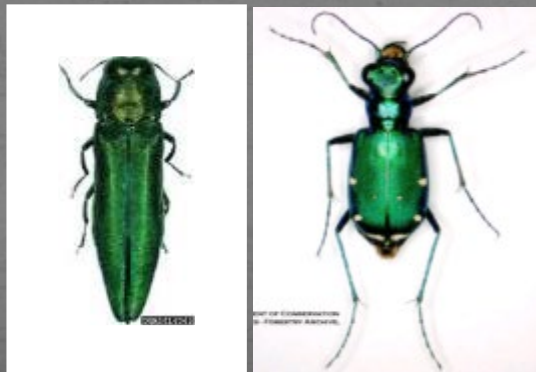


S-shaped galleries under bark



EAB

NOT EAB



D-shaped exit holes

Recognizing EAB

From afar

Woodpecker activity!!!



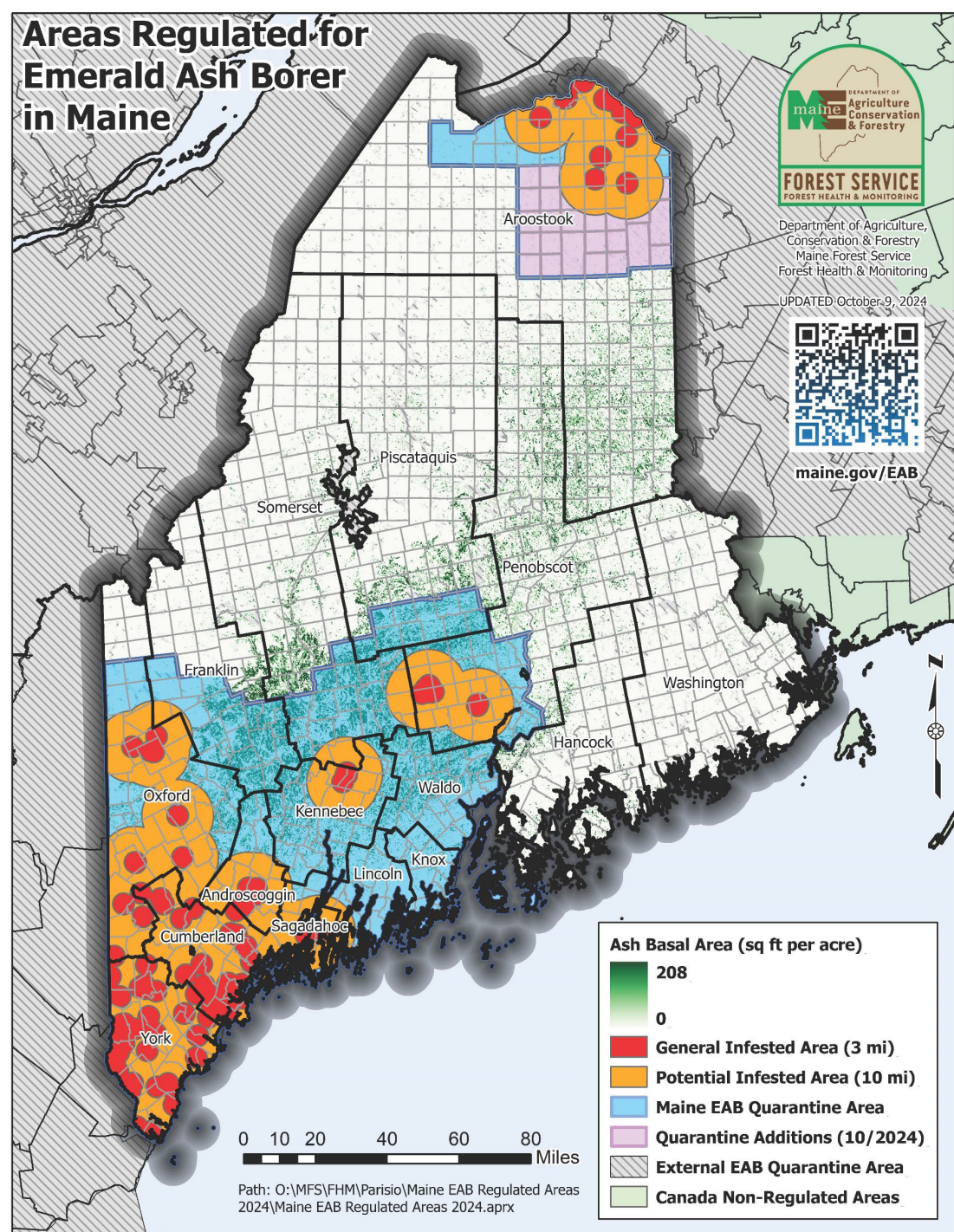
Crown dieback



Bark on snow



Epicormic shoots



Why Quarantine and Monitor?

- ~481,457,542 ash trees over 1" DBH account for ~2% of all trees in Maine
- Most (70%) of Maine's ash trees are still presumed Emerald Ash Borer-free



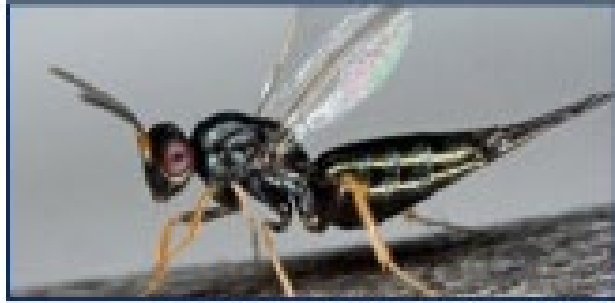
SPATHIUS GALINAE



SPATHIUS AGRILI



OOBIUS AGRILI



TETRASTICHUS PLANIPENNISI

Biological controls may save the next generation of ash

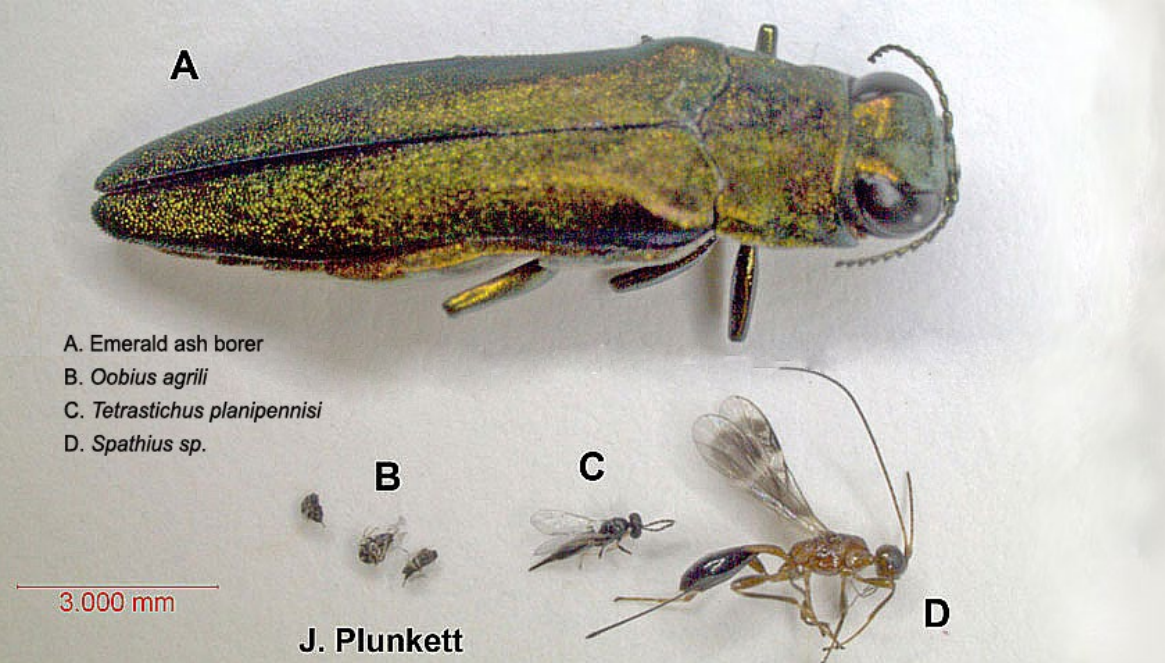
Is it safe to release wasps since they are non-native insects?

Before the wasps were released, research in China and in the United States revealed that the wasps prefer EAB over other insects

No adverse effects were found or raised through the environmental assessment process

You can read the documents and public comments by visiting

<https://www.regulations.gov/docket?D=APHIS2014-0094>

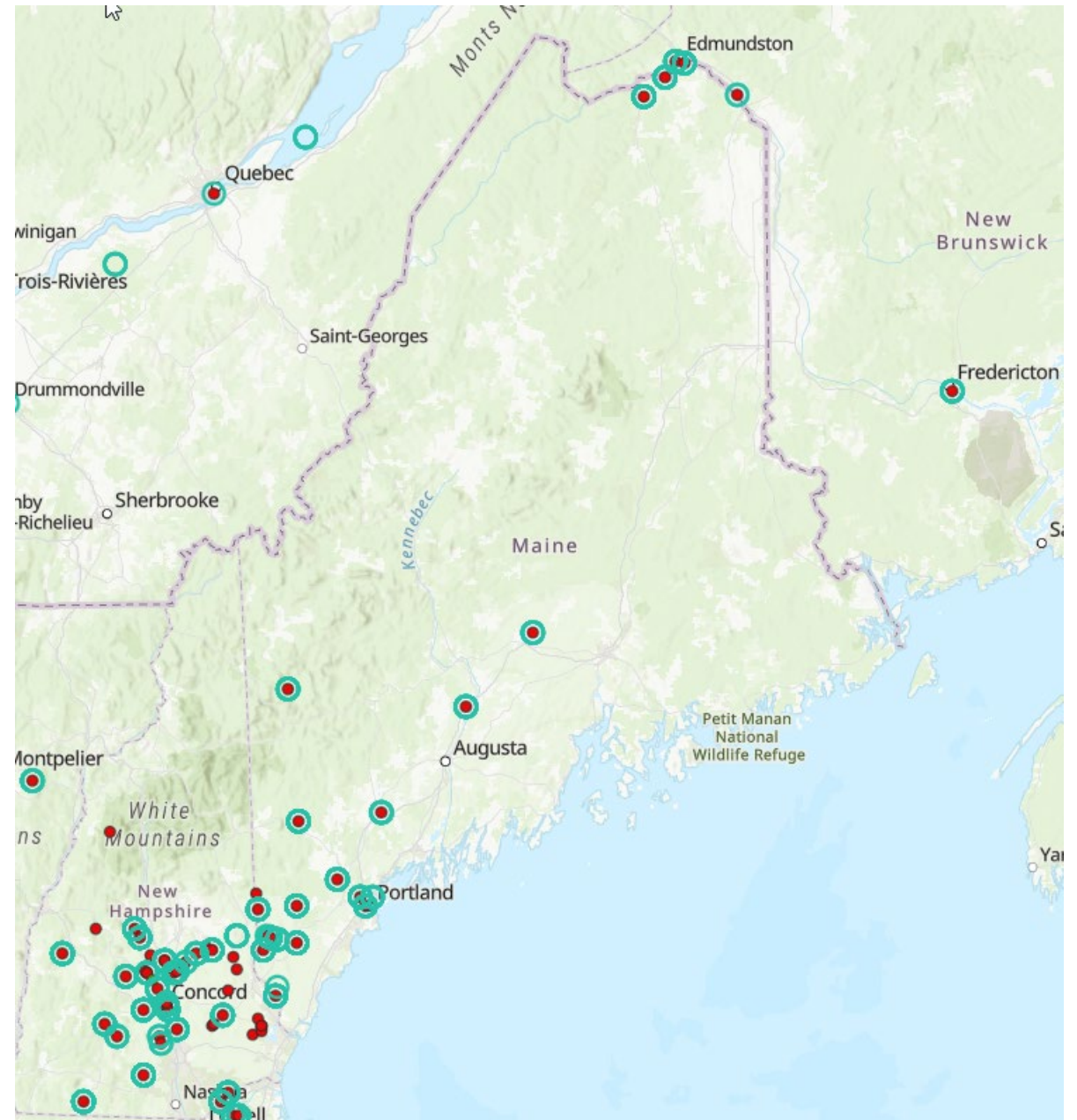


- A. Emerald ash borer
- B. *Oobius agrili*
- C. *Tetrastichus planipennis*
- D. *Spathius sp.*

3.000 mm

J. Plunkett

Parasitoid wasp release sites for control of emerald ash borer



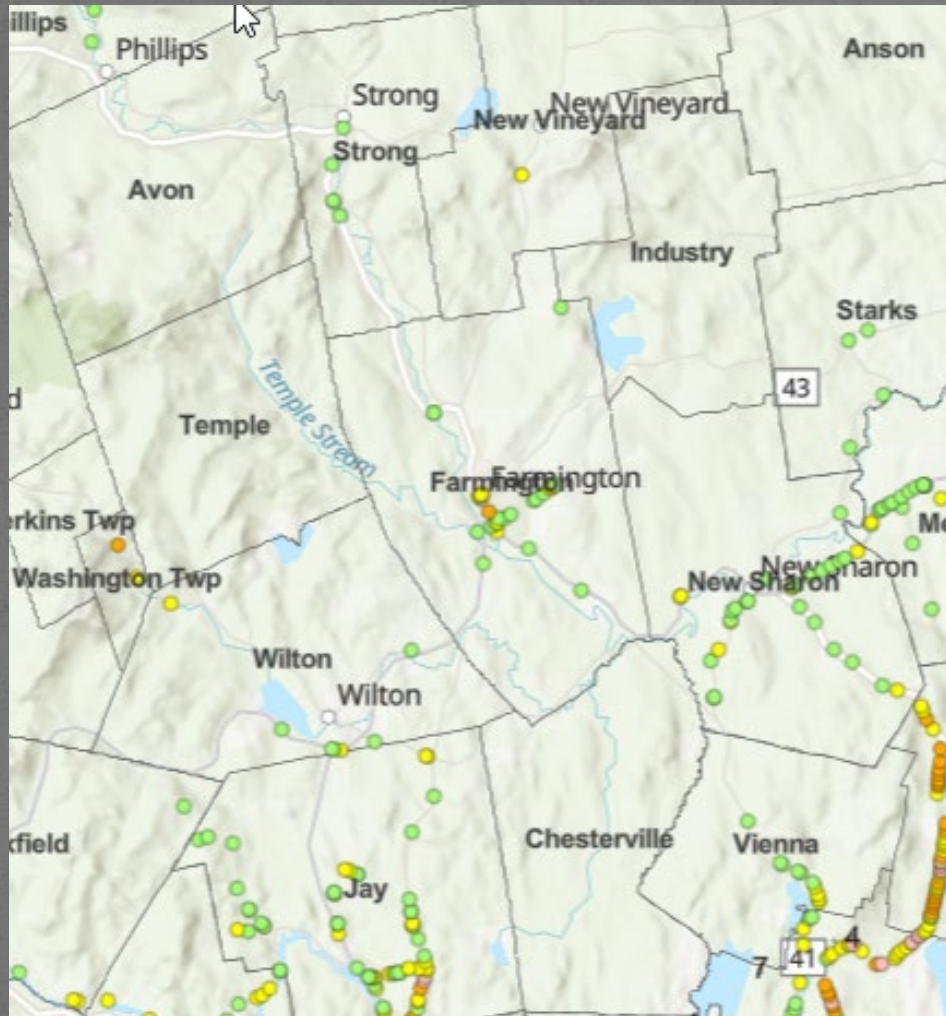
Browntail Moth

Euproctis chrysorrhoea

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

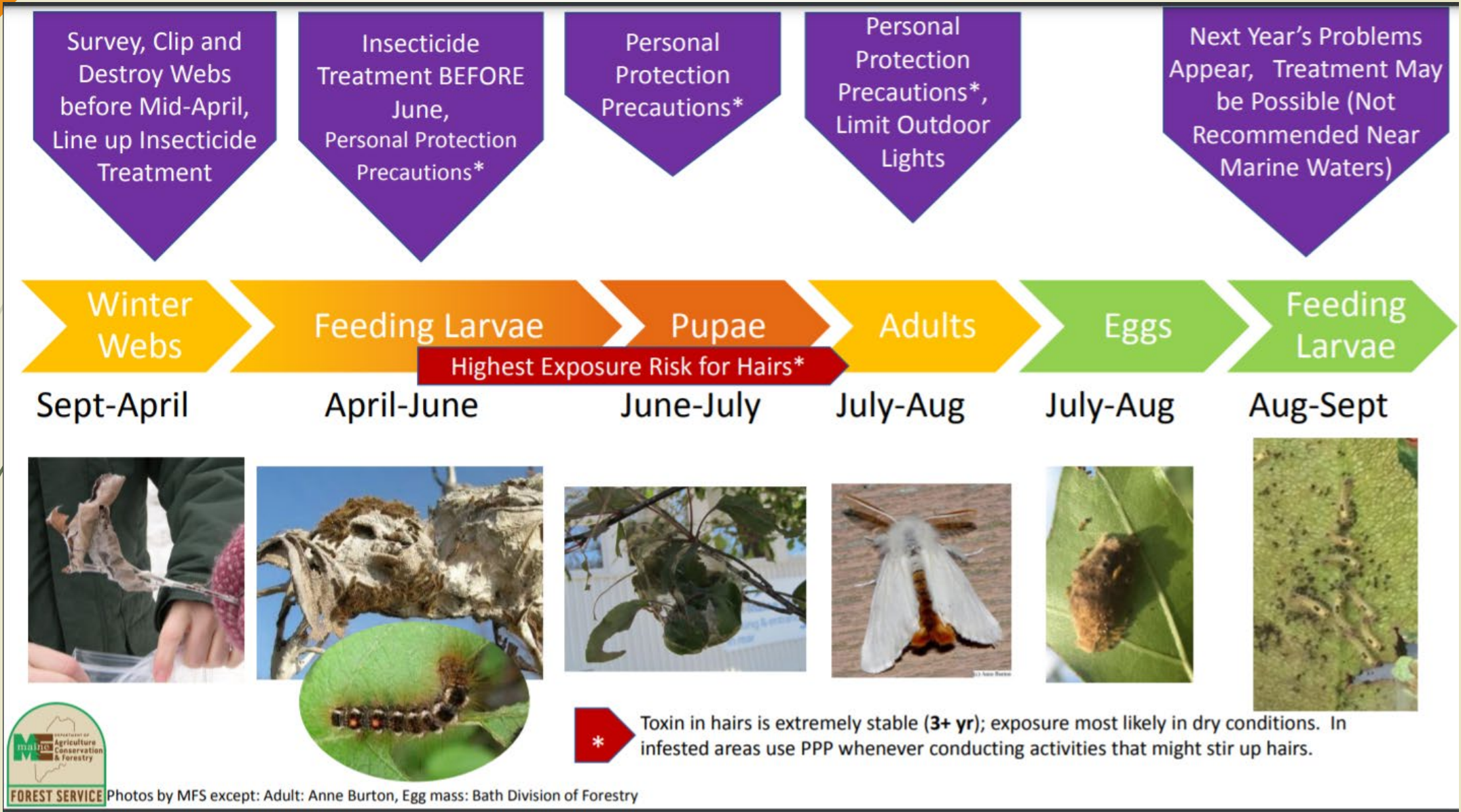


Is Browntail Moth in the Area



- 2023 Winter web survey
- Higher web counts in southern Franklin County

The life stages of browntail moth.



Adult BTMs are attracted to lights!

- ▶ Reduce outdoor lighting
- ▶ Use a hose to wash large infestations of moths off plants and buildings then vacuum them up with a wet/dry shop vac with a HEPA filter

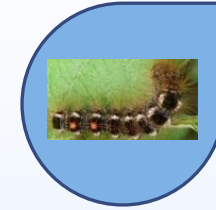


<https://www.pinestatepest.com/blog/post/adult-browntail-moths-in-maine>

Identifying
browntail
moth winter
webs



Browntail moth management



IPM Actions

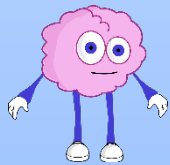
- ▶ Keep outside lights off
- ▶ Remove host trees near houses
- ▶ Trim out webs & destroy nests
 - ▶ https://www.maine.gov/dacf/mfs/forest_health/documents/arborists_prune_btm_webs.pdf
- ▶ Wet-dry vacuum containing soapy water and fitted with a HEPA filter
- ▶ Pesticide application timing -only a few 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. From photo kindly loaned by Chas. Bradley, Supt.

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





Arion vulgaris (from Dänisch Nienhof, Germany: photo courtesy I. Richling)

CREEPY CRAWLIES

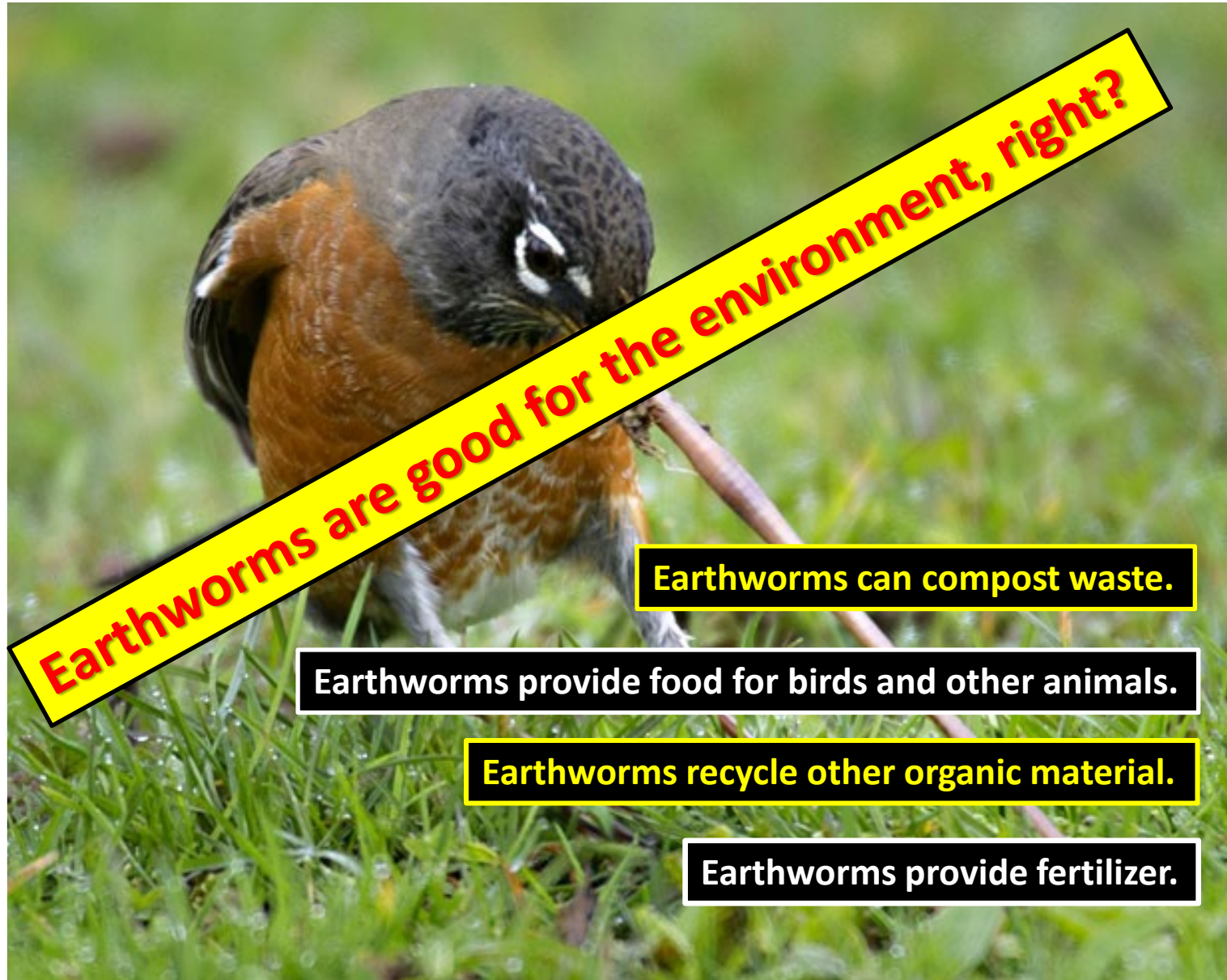
Amyntas worm spp.

Jumping Worm, Crazy Worm, Snake Worm, Alabama Jumper

Characteristics

- Darker in color – appearing almost gray
- Glossy smooth skin
- Light milky white clitellum smooth 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.

Earthworms - Good for the environment?



Earthworms are good for the environment, right?

Earthworms can compost waste.

Earthworms provide food for birds and other animals.

Earthworms recycle other organic material.

Earthworms provide fertilizer.

Why you might want to reconsider how you feel about earthworms.

Earthworms are an invasive species.

Earthworms upset soil chemistry.

Earthworms make it more difficult for native plants and insects to thrive.

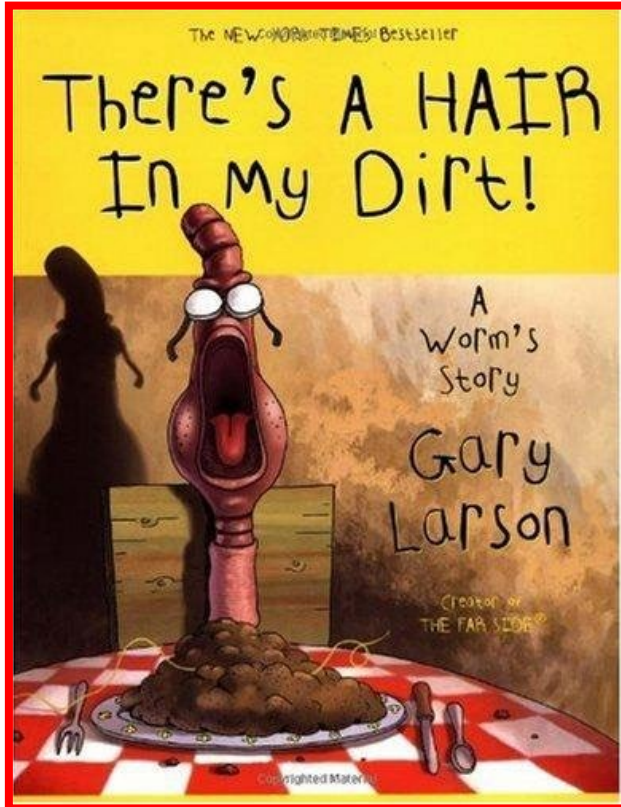
Earthworms can damage forests.

WHO OPENED THE CAN?





Earthworm Ecology



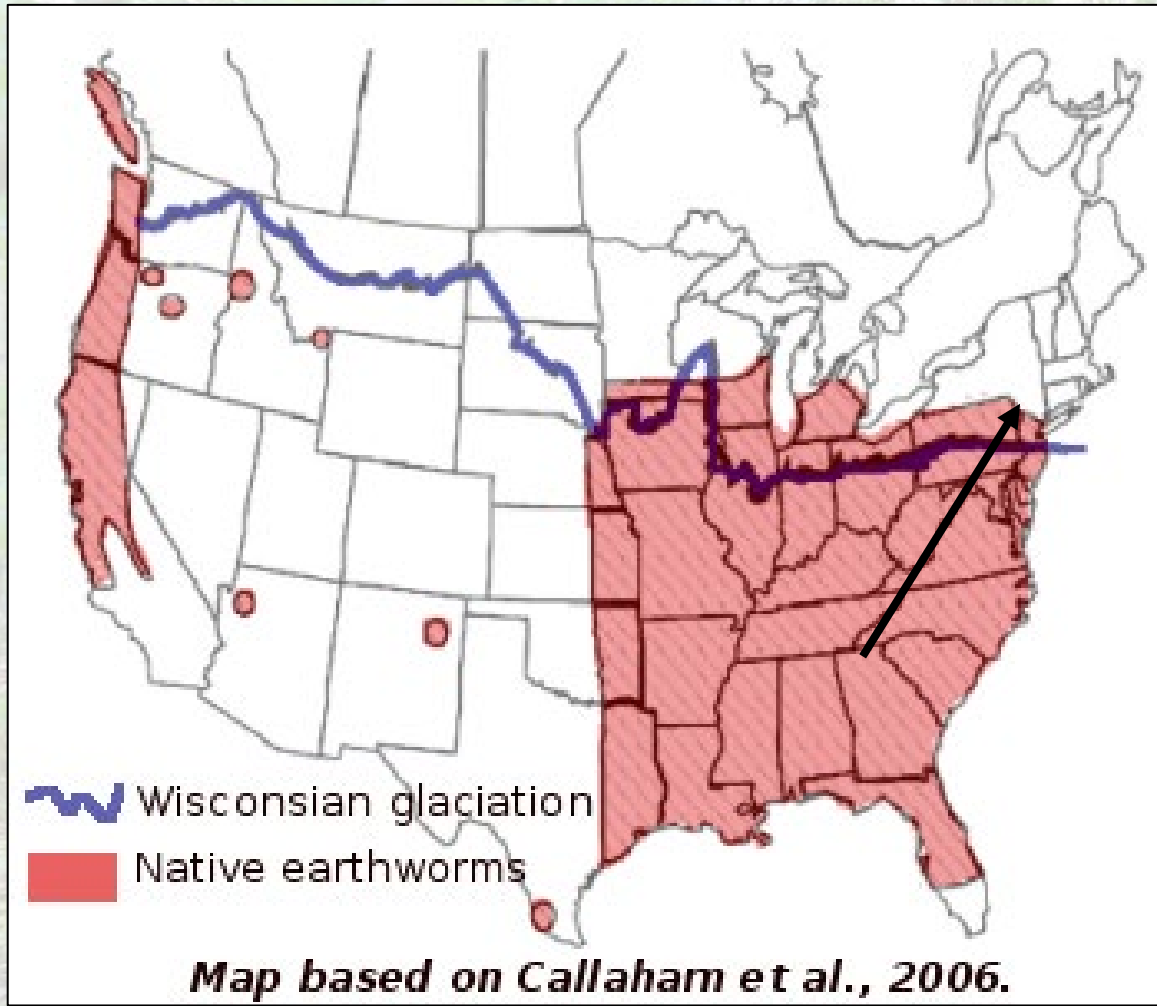
Worms eat dirt. They are detritivorous where they feed on decaying organic matter (leaf litter) and geophagous (dirt) and feed mainly in the soil layers.

There are no native earthworms in Maine



- Few native earthworms in northern US
- Glaciation event killed northern worms ~10,000 years ago

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...

Earthworm Biology



Jumping Worms

Found on the top 2 inches of soil layer

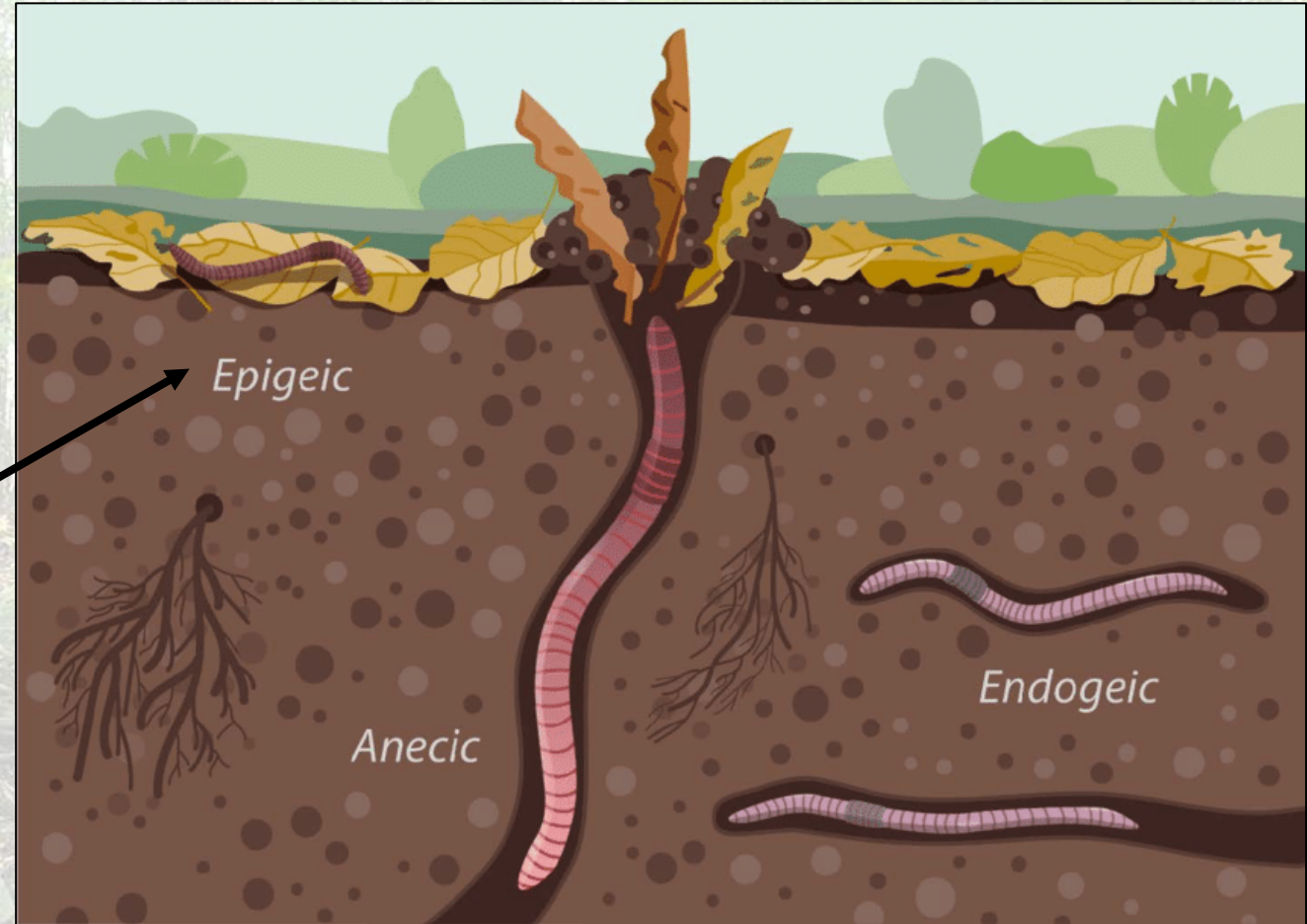


Image: Eisenhauer, N., and E. Eisenhauer. 2020. The intestines of the soil: the taxonomic and functional diversity of earthworms." DOI: 10.32942.

Jumping Worms Life Cycle

- Only live 1 year
- Grow fast, all energy into reproduction
- Parthenogenetic = can reproduce on their own

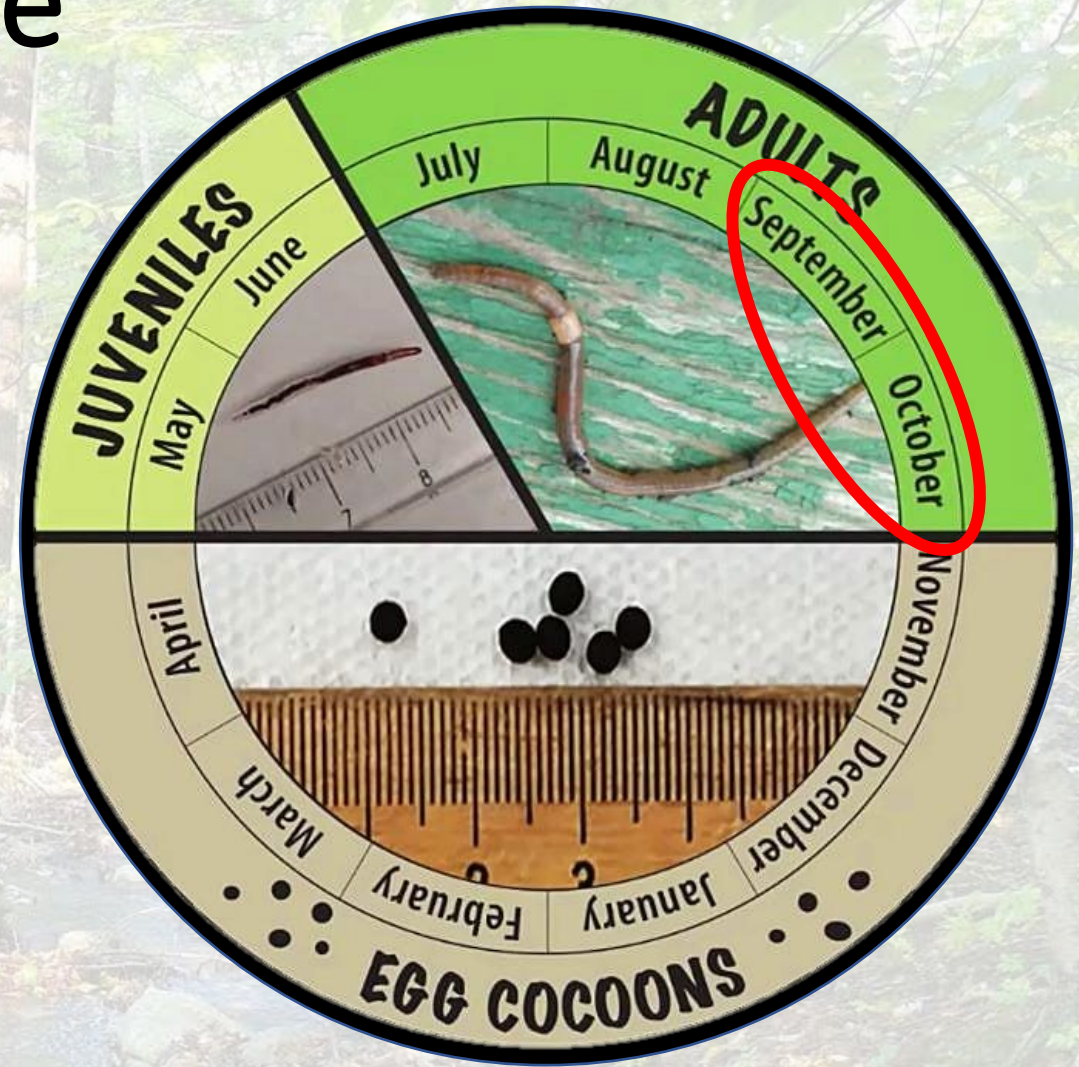


Image: K. Johnson, Wisconsin

Jumping Worms Life Cycle

- Overwinter as eggs inside small cocoons
- Silk cocoons protect them from cold and drought
- Cocoons are hard to detect and easy to spread

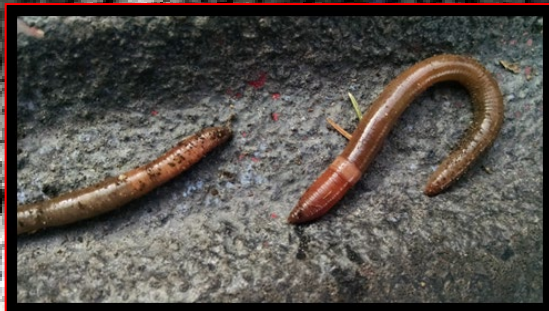


Photo: Wisconsin DNR

Biology & Ecology

WHY THEY COULD BE A PROBLEM

- Reach maturity in 60 days – thus allowing for 2 hatches a season
- Tolerate soil pH above 5.0
- Voracious appetites
- Highly adaptive to temperature changes
- Cocoons winter over
- Adaptive, non-particular to habitat types
- Produces a unique soil signature
- Outcompetes /pushes out, infects, poisons?
Non-native European species of earthworms





A single Jumping worm or cocoon stowed away in a potted plant can go home with a customer and start a new infestation.

Moving soil from one place to another, the horticultural trade can facilitate the passive spread of invasive earthworms.

How can I identify Jumping Worms?



Photo: Brittany Schappach, Maine Forest Service

Jumping Worms – Worm ID

1. Check the clitellum (Sept - Oct):

- ✓ Smooth and flat
- ✓ Milky white or gray
- ✓ Fully encircles worm
- ✓ Found on segments 14-16



Photo: Brittany Schappach, Maine Forest Service



Young worms are more difficult to identify

September



October



October

Jumping Worms – Worm ID

2. Check the setae (“hairs”)

- ✓ Each segment has many setae

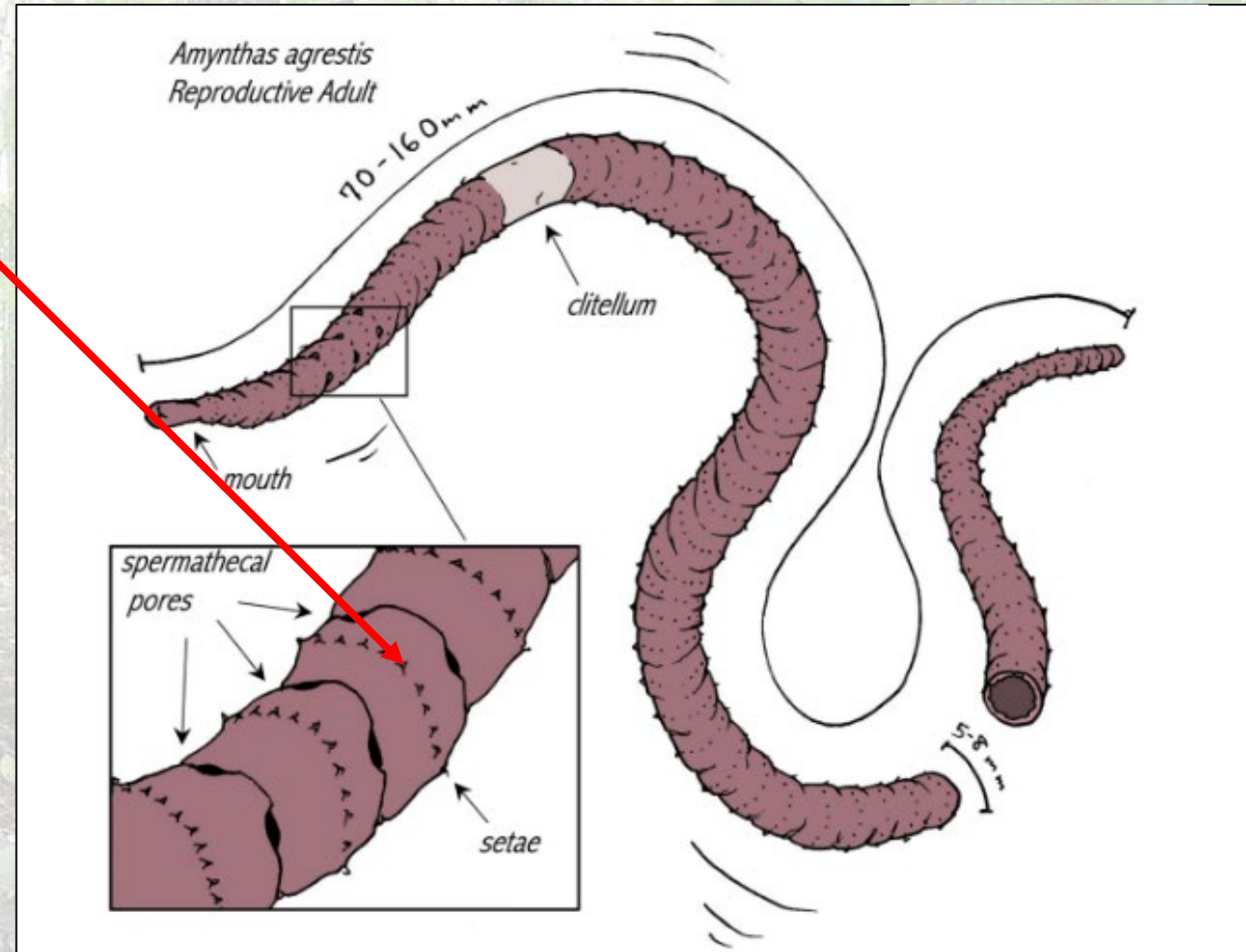
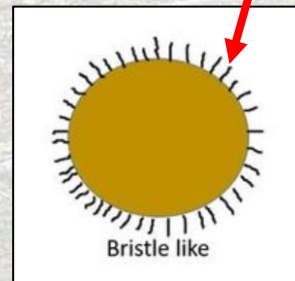
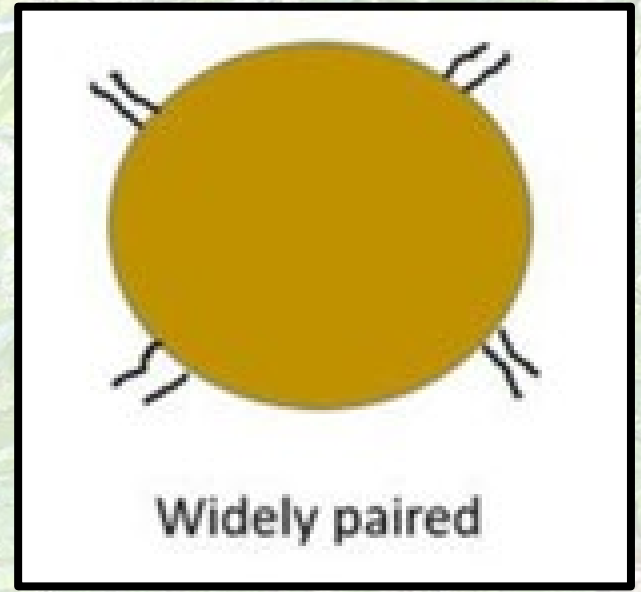


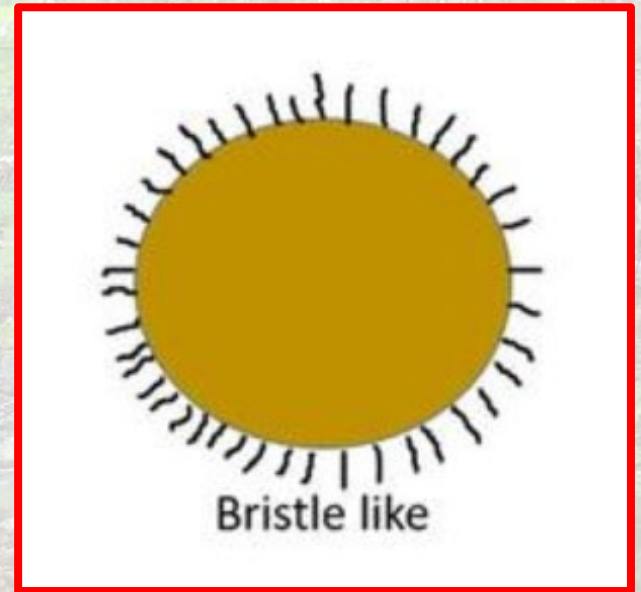
Photo: Portland State University/Oregon State University



©Oodles of organisms



Widely paired



Bristle like

Jumping worm

Jumping Worms – Worm ID

3. Check the behavior

- ✓ Thrashing, fast-moving, snake-like movements
- ✓ Serpentine locomotion
- ✓ Nose to tail

Despite the name, jumping worms can not “jump”

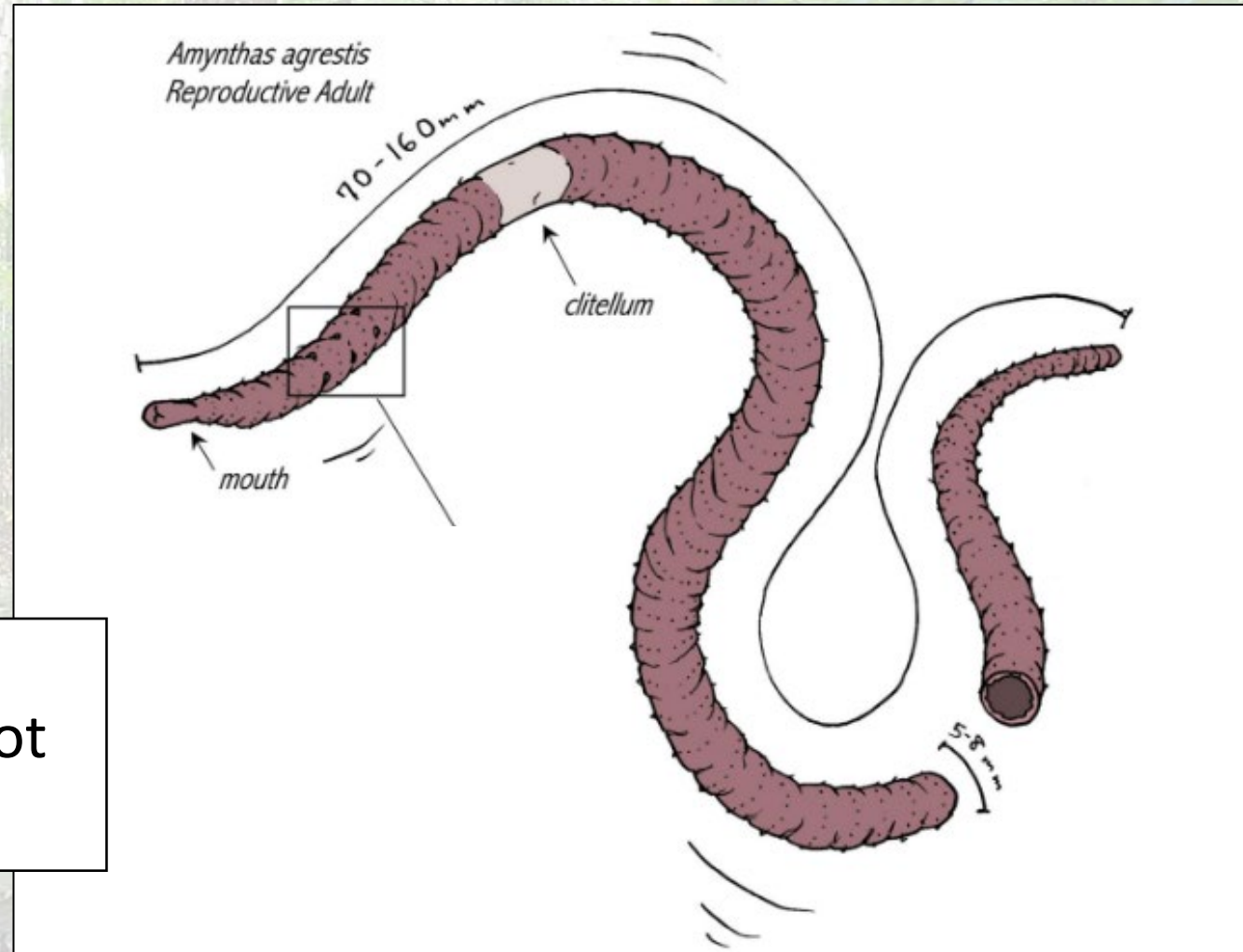


Photo: Portland State University/Oregon State University

Jumping Worms – Worm ID

4. Check for tail drop

- ✓ Other species of common earthworms in Maine often will not drop their tail when threatened

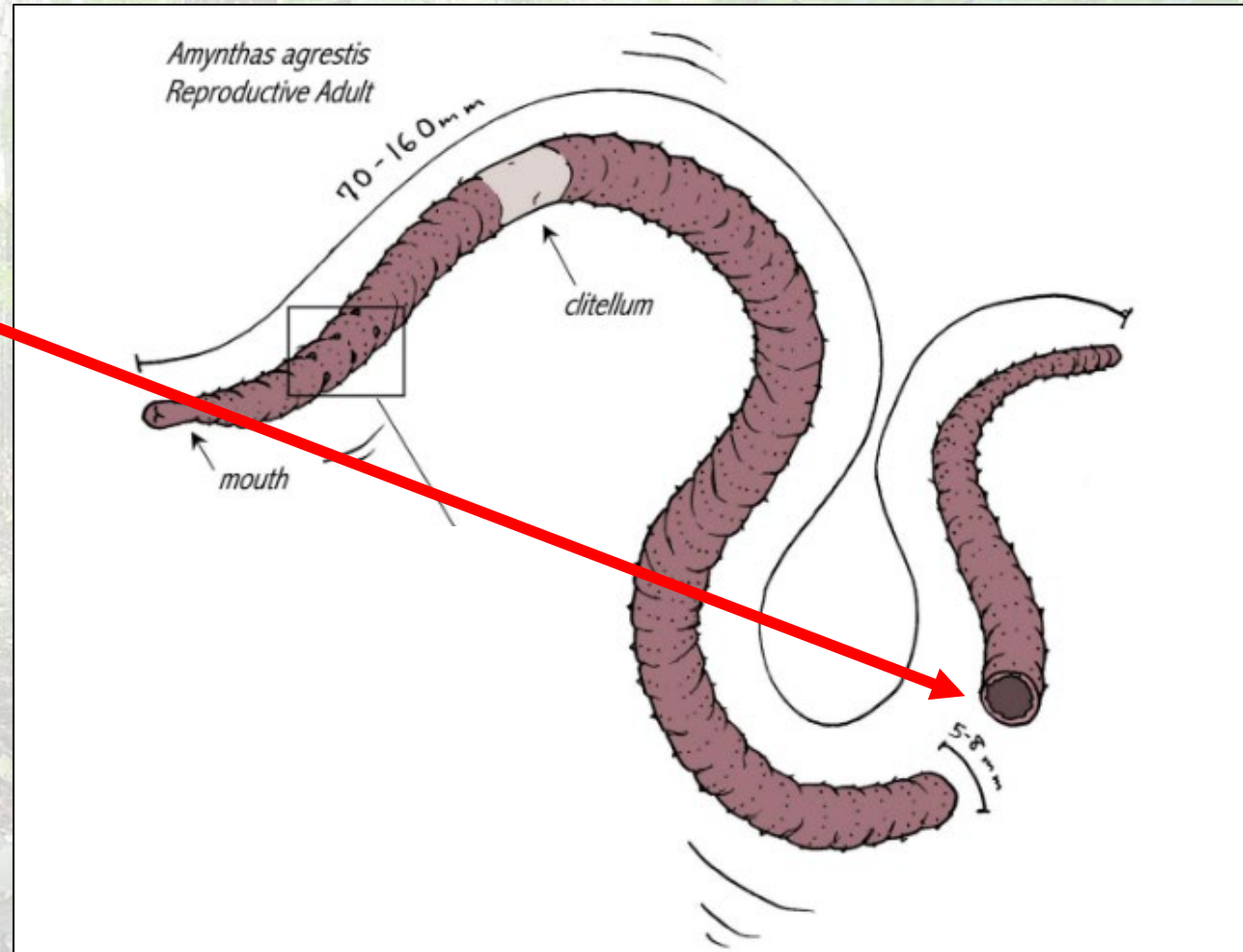
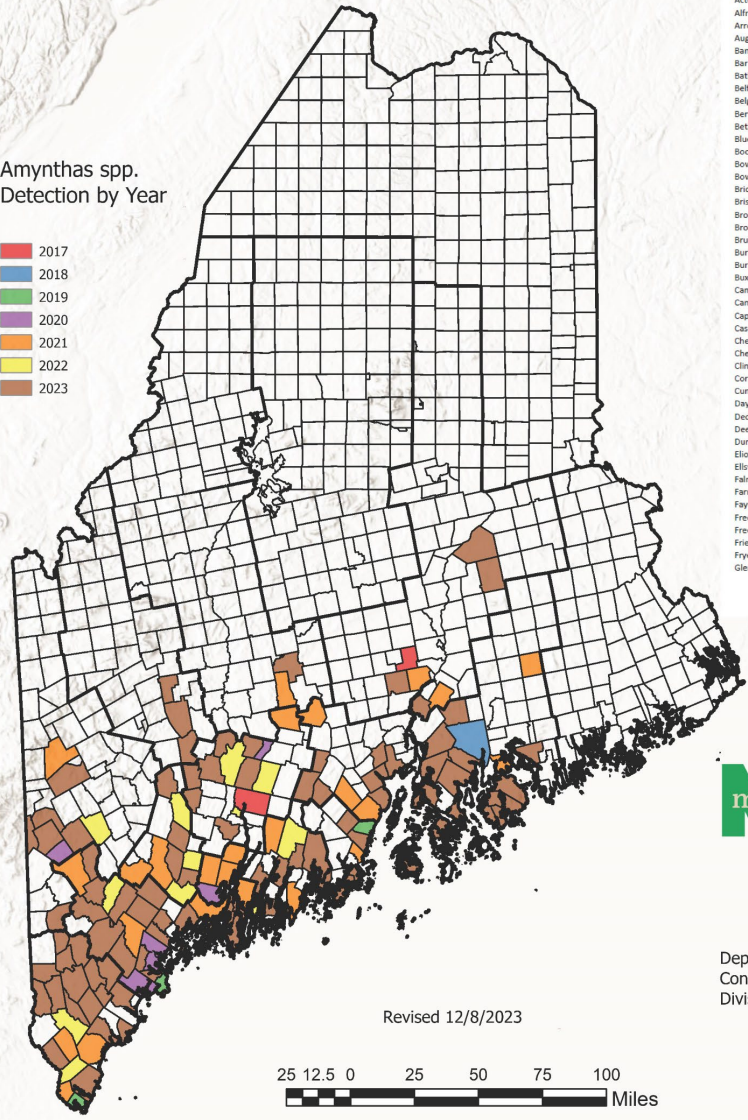


Photo: Portland State University/Oregon State University

Confirmed reports of *Amyntas* spp. in Maine by first reported year in town

Amyntas spp.
Detection by Year



Towns with *Amyntas* spp. Detections

| | | |
|------------------|----------------|------------------|
| Acton | Poland | Rockland |
| Alfred | Portland | Rockport |
| Arrowsic Auburn | Raymond | Rome |
| Augusta | Richmond | Sabbatus |
| Bangor | Goatham | Saco |
| Bar Harbor | Gray | Saint George |
| Bath | Greene | Sanford |
| Belfast | Hallowell | Scarborough |
| Belgrade | Harperswell | Searsport |
| Berwick | Harrison | Sebang |
| Bethel | Hartland | Shapleigh |
| Blue Hill | Hemron | Sidney |
| Boothbay | Hiram | South Berwick |
| Bowdoin | Holden | South Portland |
| Bowdoinham | Hollis | South Thomaston |
| Bridgton | Hope | Southwest Harbor |
| Bristol | Jefferson | Standish |
| Brooklin | Kennebunk | Stoneham |
| Brooksville | Kennebunkport | Stow |
| Brunswick | Kittery | Strong |
| Burlington | Lamoine | Sullivan |
| Burnham | Leads | Surry |
| Burton | Lewiston | Swinville |
| Camden | Liberty | Sweden |
| Canaan | Limerick | T28 MD BPP |
| Cape Elizabeth | Limington | Topsham |
| Casco | Lincoln | Tremont |
| Chebeague Island | Lincolnville | Vassalboro |
| Chesterville | Lisbon | Vinalhaven |
| Clinton | Livermore | Waldoboro |
| Cornish | Lovell | Waterboro |
| Cumberland | Lyman | Waterford |
| Dayton | Mount Desert | Waterville |
| DeLam | Mount Vernon | Wayne |
| Deer Isle | Naples | Wells |
| Durham | New Gloucester | West Bath |
| Eliot | Newcastle | West Gardiner |
| Ellsworth | Newfield | Westbrook |
| Falmouth | Newry | Westport Island |
| Farmington | Nobleboro | Whitefield |
| Fayette | North Berwick | Windham |
| Freedom | North Yarmouth | Wiscasset |
| Fresport | Northport | Woolwich |
| Friendship | Norway | York |
| Frye Island | Oakland | |
| Glenburn | Orland | |
| | Orrington | |
| | Palermo | |
| | Penobscot | |
| | Phippsburg | |



Department of Agriculture,
Conservation and Forestry
Division of Animal and Plant Health

Revised 12/8/2023



User: Jeff.Harriman O:\MFS\FHM\Harriman\Jumping Worm Confirmed Reports Esri, CGIAR, USGS

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

BOLO for slugs

- ❖ *Arion vulgaris* – in Quebec City and Toronto
- ❖ *Arion ater* – only on Vinalhaven
- ❖ *Vulgaris* – considered a severe vegetable pest
- ❖ *Ater* – Appears to mainly feed on dead vegetation in the forest
- ❖ *Vulgaris* and *ater* – known to hybridize



Arion vulgaris (from Dänisch Nienhof, Germany: photo courtesy I. Richling)



Arion ater - Photo by Karen Coluzzi

Arion vulgaris



- ❖ It has spread widely in Europe
- ❖ May be partially due to its hybridization with the two other members of the *Arion ater/rufus/vulgaris* complex (ARVC)
- ❖ The hybrids are aggressive and highly adaptable to new environments
- ❖ It should be emphasized that “pure” *Arion vulgaris* is a serious pest; hybridization with *A. ater* and *A. rufus* just increases its potential to spread to new environments

Invasive Species Investigators

WE NEED YOU

Exotic Snail & Slug Scavenger Hunt

You Found It!

- How Many Were There?

- What Did You Find It On (e.g. plant, soil)?

- What Was It Doing (e.g. eating, crawling)?

- Where Did You Find It? (address? coordinates?)

PLACE
STAMP
HERE

To:

Maine Bug Watch
28 State House Station
Augusta, ME 04333



Please email a photo to bugwatch@maine.gov, or collect one and let us know!

Black slugs & other exotic mollusks



These invasive species are considered major agricultural threats.



Black slugs (*Arion ater*, *Arion rufus*, and *Arion vulgaris*). LARGE (adults > 3"). Color may be black, brown, orange, or yellow. Prefer cool, moist habitats. Often found near campgrounds, parks, trails, and roads.



Other invasive mollusks (L to R): Chinese slug (*Meghimatium pictum*), hygromiid snails (*Cernuella spp.* and *Monacha spp.*), cochlicellid snails (*Cochlicella spp.*).

Have you seen any of these in Maine? Please take photos, record the exact location, and email Bugwatch@maine.gov!



Photo credits: (1) © A.J. Silverside, lastdragon.org; (2) © J. Herder, www.digitalnature.org; (3) Paulo Lenhard, Project AM, <http://terrsnails.lifedesks.org/pages/31164>; (4) © L. Kolouch, www.biolib.cz; (5) Vmenkov, Wikipedia; (6) L. Poggiani, HU www.lavalle.delmatauro.it; (7) © Dr. Roy Anderson, MolluscIreland; (8) <https://www.maine.gov/dacf/php/caps/Arion/index.shtml>

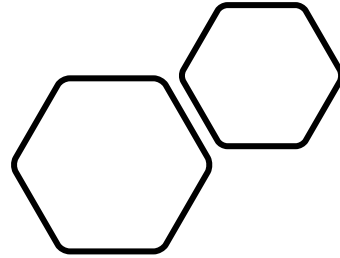
Firewood
is a major
source of
deadly
forest
insects &
diseases

Don't
Move
Firewood!

Signs at border crossings
& visitor centers



What you can
do!



Report invasive species

- bugwatch@maine.gov
- <https://appengine.egov.com/apps/me/dacf/mfs-tree-ailment>
- invasives.mnap@maine.gov
- milfoil@maine.gov
- <https://survey123.arcgis.com/share/da099be43ba642799f9c359345257b2f>

Questions?

Gary Fish

Maine State Horticulturist

gary.fish@maine.gov

207-287-7545

