Invasive Agricultural Pests Update for Maine

2023-4

Spotted Wing Drosophila

Small fruit fly ("Vinegar fly")

- Native to northern Asia
  - Like cool, moist conditions
  - Very hardy
  - Overwinters as an adult
  - Broad host range (fruit, etc.)
- Introduced to California in 2008
- First found in Maine in 2011
  - Range continues to expand

Spotted Wing Drosophila

Attacks most soft fruits

- Lays eggs under skin of *unripe* fruit
- Larvae feed on fruit flesh
- Often not noticed until harvest
  - Soft fruit, premature decay

Spotted Wing Drosophila

Crop Hosts:

Raspberries, blackberries

Strawberries

Blueberries

Cherries

Elderberries

Peaches, nectarines

Plums

Grapes

Tomatoes

Wild Hosts:

Chokecherry

Honeysuckle

Brambles

Buckthorn

Pokeweed

Dogwood

Autumn Olive

Japanese Yew

Rose hips

Nightshade

Etc.

Spotted Wing Drosophila

Spotted Wing Drosophila

Maine SWD Trapping

SWD Parasitoid Rearing and Release in Maine

Ganaspis brasiliensis

SWD Parasitoid Guest Star

Photo: W. H. L. Wong

Leptopilina japonica

SWD Parasitoid Rearing and Release in Maine

- Prof. Phil Fanning, UMaine developing rearing techniques and facility
- Permits acquired for release 2022
- Limited releases near wild blueberry fields in 2022
- Survey for successful parasitism and survival 2023
- Expanded releases 2023, Fanning, Handley, Peterson
- Wild blueberries, cultivated raspberries

Photo: W. H. L. Wong

Brown Marmorated Stink Bug

Attacks wide range of hosts

<u>Fruits:</u>

Apples, pears, peach, plum, cherry

<u>Berries:</u>

Raspberry, strawberry, blueberry, grape

<u>Vegetables:</u>

Tomatoes, peppers, beans, corn

Brown Marmorated Stink Bug

Life Cycle:

- Overwinters as adult
- Egg laying: May-June
- Nymphs June-July
  - Undergo 5 molts (instars)

Brown Marmorated Stink Bug

Life Cycle:

- Adults: August – September
- Feed on developing buds and fruits
- Move indoors to overwinter
  - Domestic pest
  - odiferous
- Found in Maine
- Not yet significant crop pest

Brown Marmorated Stink Bug

Management

- No effective traps
- Scouting difficult
- Insecticides
  - Several effective (pyrethroids)
  - Rotate active ingredients

Winter Moth

- From Europe
- Hardwood pest
- Oak, apple, maple, blueberry
- Repeated defoliation
    - High tree mortality

Winter Moth

Life cycle

- One generation/year
- Overwinters as eggs on tree bark
- Larvae emerge early spring
  - Feed on buds, leaves
- Pupate in soil over summer
- Moths emerge Nov.-Dec.
  - Mate, lay eggs
  - Females don’t fly
    - Attract males with pheromone

Winter Moth

Management

- Parasite releases
  - parasitic flies (*Cyzenis albicans*)
  - Appear to have been successful
- Spring oil spray for bud protection
- Bt spray for young larvae May-June

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Leek Moth

- Native to Asia and Europe
- Introduced NY 2009 (Canada 1993), Maine 2017
  - Slowly expanding range in Maine
- Pest of *Allium* crops: onion, garlic, leeks

Photos: Dave Fuller, UMCE

Swede Midge

- Native to Europe
- Introduced 2009, upstate NY, Maine 2017
  - Expanding range in Maine
- Pest of cole crops: cabbage, caulifower broccoli

Photos: Dave Fuller, UMCE

Spotted Lantern Fly

- From China
- Now established in PA, DE, NJ, VA, CN, RI, MA
- Egg masses in So. ME
- Tree hopper
- Threat to fruit, ornamental & woody trees
- Spreads via egg masses on cars, trailers, etc.
- High plant mortality

Spotted Lantern Fly

- Overwinter as eggs
- Nymphs emerge in spring, aggregate on host plants
- Adults lay eggs on smooth surfaces in fall
- Require Tree of Heaven for success?
  - Also invasive, not prevalent in Maine

Spotted Lantern Fly

- Early nymphs black with white spots
- Later nymphs mottled red
- Adults 1’ long, buff with blush & black spots
- Colonized trees “bleed” attracting other insects

CAPS Surveys

- Trapping for potential invasive species of crops
- MDACF & USDA-APHIS
  - Karen Coluzzi

Be ready for 2023

New and Emerging Diseases in Maine

Dr. David Handley
+
Dr. Alicyn Smart
University of Maine
Cooperative Extension

First timers… for diseases

- *Euonymus*- Bacterial crown gall
- *Rhizobium tumorigenes* on Raspberry
- Apple skin scar viroid
- Dahlia mosaic virus ← new test
- Stemphylium on tomato
- *Rosellinia herpotrichoides*
- Beech leaf disease
- *Suspected* Petunia vein clearing virus
- Tomato Brown Rugose virus

Rhizobium tumorigenes on Raspberry

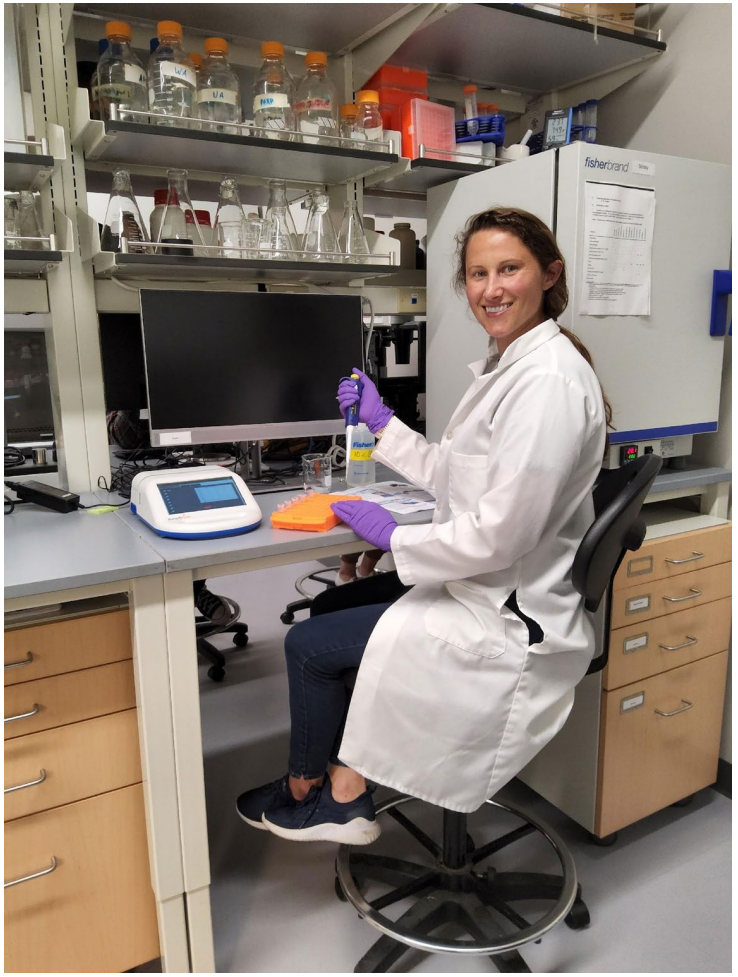
- *Rhizobium tumorigenes* is a relatively recently described pathogen (2018)
- Cultural control strategies for management

Apple skin scar viroid

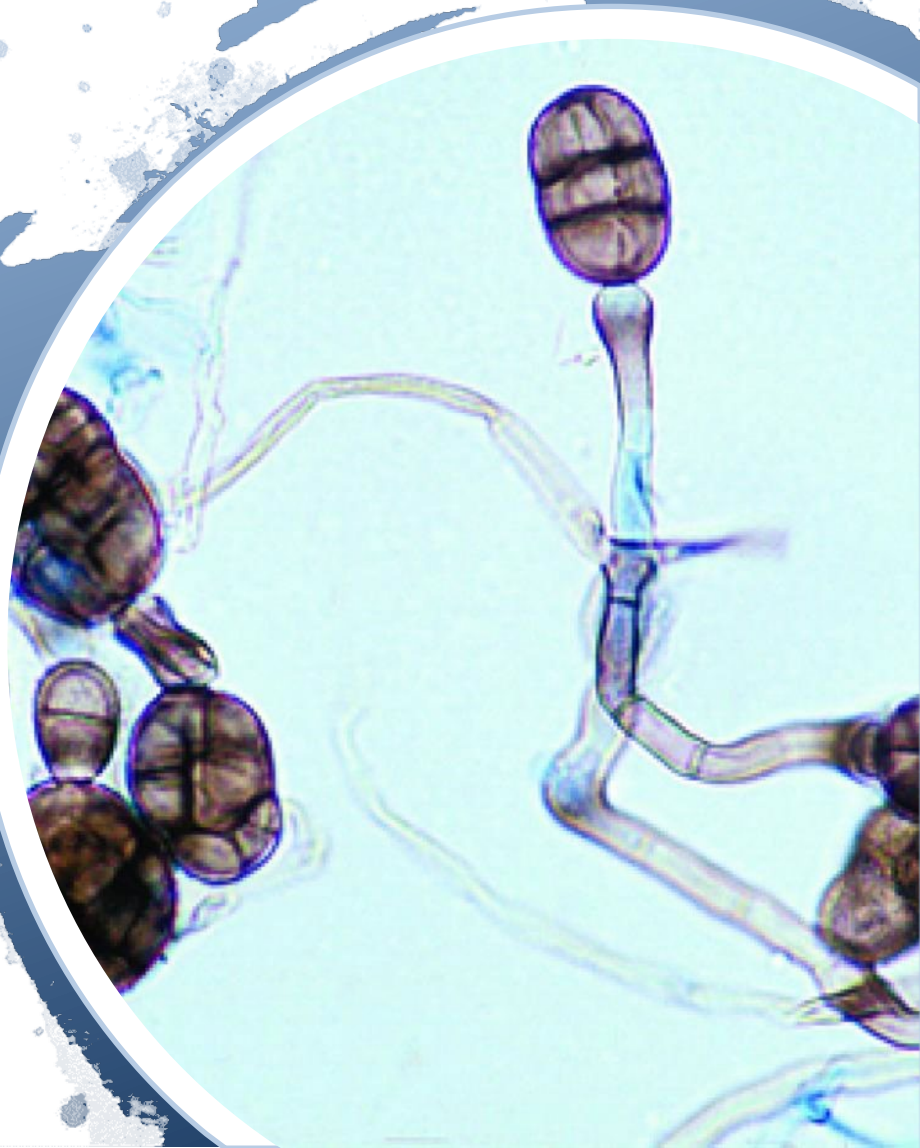
- Previously documented in ME in 1960.
- Tested with molecular diagnostics
- No cure and predominantly spread by grafting
- 2022 identified as a mycoviroid
- Lab wants to sample + test orchards for prevalence
  - Pre-tree fruit conference

Dahlia mosaic virus

Fast Molecular Testing

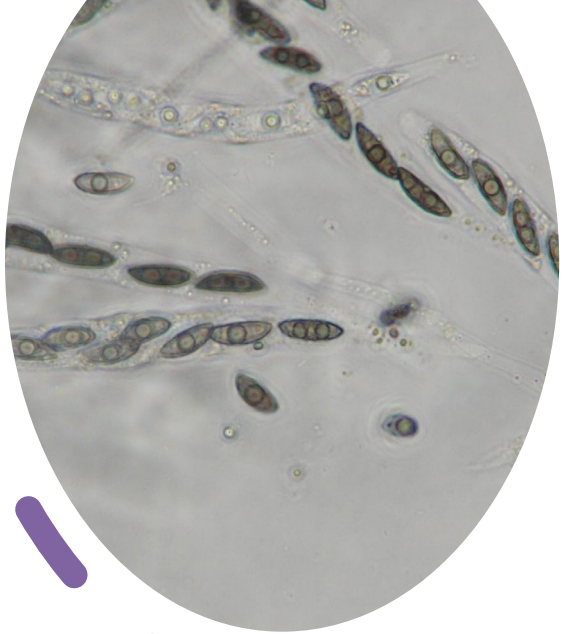


Stemphylium

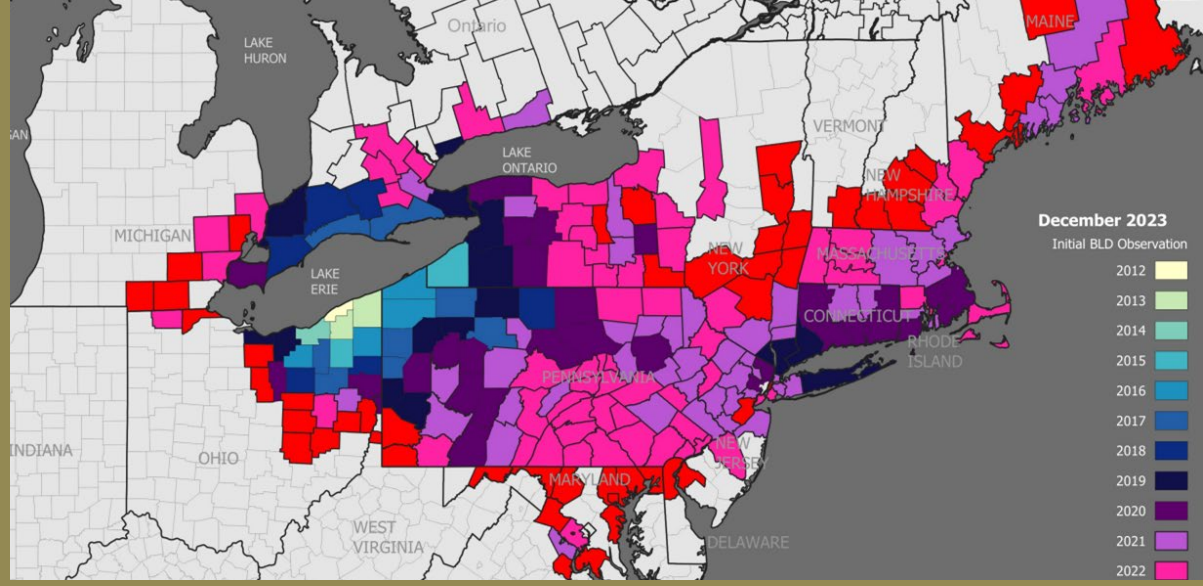


Rosellinia needle blight

- Occurs in cool, wet conditions
- Mostly an issue in younger, crowded groups of trees
- Found in CT for 1st time this year
- Further testing to determine impact



Beech Leaf Disease



- Found in 10 Maine counties
- First reported in Ohio in 2012
- All beech tree species are susceptible to the disease
- Can kill trees and leave them vulnerable to secondary pests
- PDDL only lab in the state that can test for BLD

Petunia vein clearing virus

- It's in virtually ALL petunias, but only some of them will show symptoms when stressed.
- The plants tend to 'grow out of it' - the symptoms stay on those older leaves.
- A negative TMV test is the best way to confirm.
- Because it is a pararetrovirus it is often hiding in the genome.

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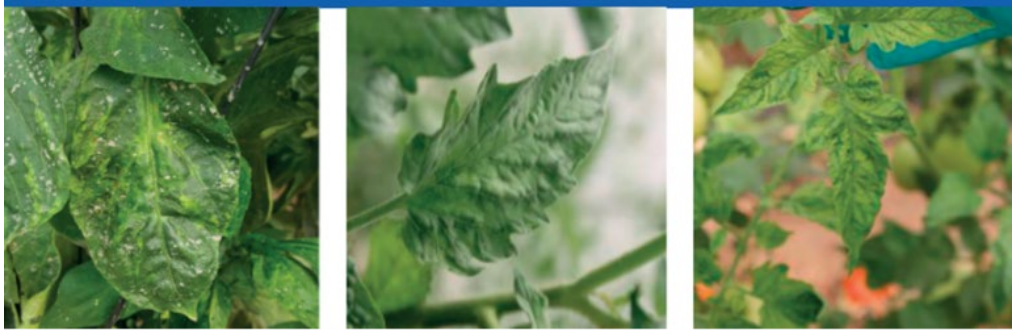
Tomato brown rugose fruit virus (ToBRFV)

- First found in Jordan during an outbreak in 2015, later traced back to Israel in 2014.
- Reported in 35+ countries.
- Naturally infects tomatoes and peppers
- Has been found to infect 40+ different species in some studies.
- Infects cultivars that are resistant to other *tobamoviruses*.
- Transmission can occur mechanically or through seed contamination

LEAF: Symptoms caused by ToBRFV include bubbling and mosaic on leaves of susceptible pepper, and fern leaf and mosaic of tomato.



FRUIT: Fruit on infected tomato plants may be undersized with a rough surface. or complete fruit abortion may occur. Fruit coloration is affected with symptoms such as blotching, pale color and/or brown necrotic spots occurring. The number of fruits produced is reduced and fruits could be unmarketable or reduced in quality. Necrosis can occur on susceptible pepper fruit.

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This summer, we will be performing research to identify the prevalence of ToBRFV in New England, in addition to sampling related species (such as eggplant and potato) to determine whether these can be infected in the wild. ToBRFV has been detected in many species, including but no limited to:

- Periwinkle (*Catharanthus roseus*), 2021
- Jimsonweed (*Datura stramonium*), 2016
- Globe amaranth (*Gomphrena globosa*), 2021
- Tobacco (*Nicotiana tabacum*), 2016
- Galapagos tomatoes (*Solanum cheesmaniae*), 2022
- Field bindweed (*Convolvulus arvensis*), 2023
- Four-leaf allseed (*Polycarpon tetraphyllum*), 2023

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Cooperative Extension

Thank you!

Questions and comments

University of Maine Cooperative Extension
Diagnostic and Research Laboratory

17 Godfrey Drive
Orono, ME 04473

https://extension.umaine.edu/ipm/plant-disease/plant-disease-diagnostic-testing/

State of the State – Invasive Fish & Aquatic Wildlife

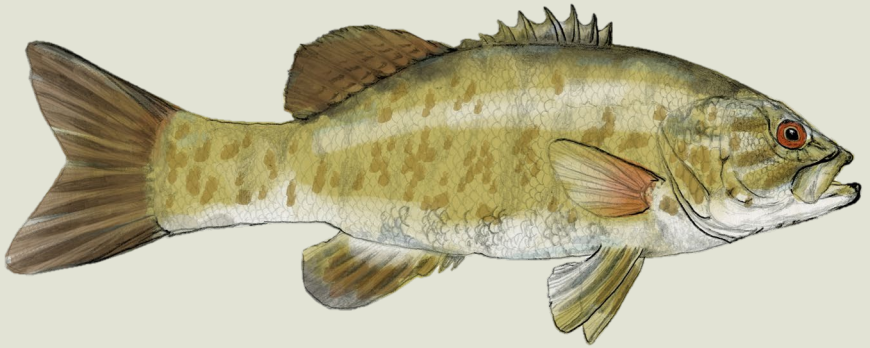
Dakota Stankowski, Aquatic Invasive Species Coordinator

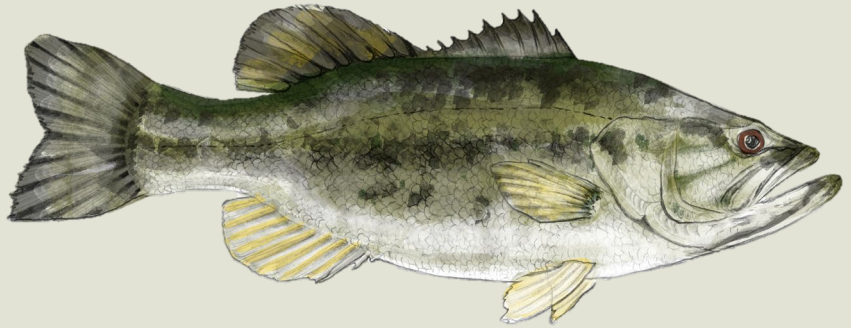
Maine Invasive Species Network, April 11, 2024

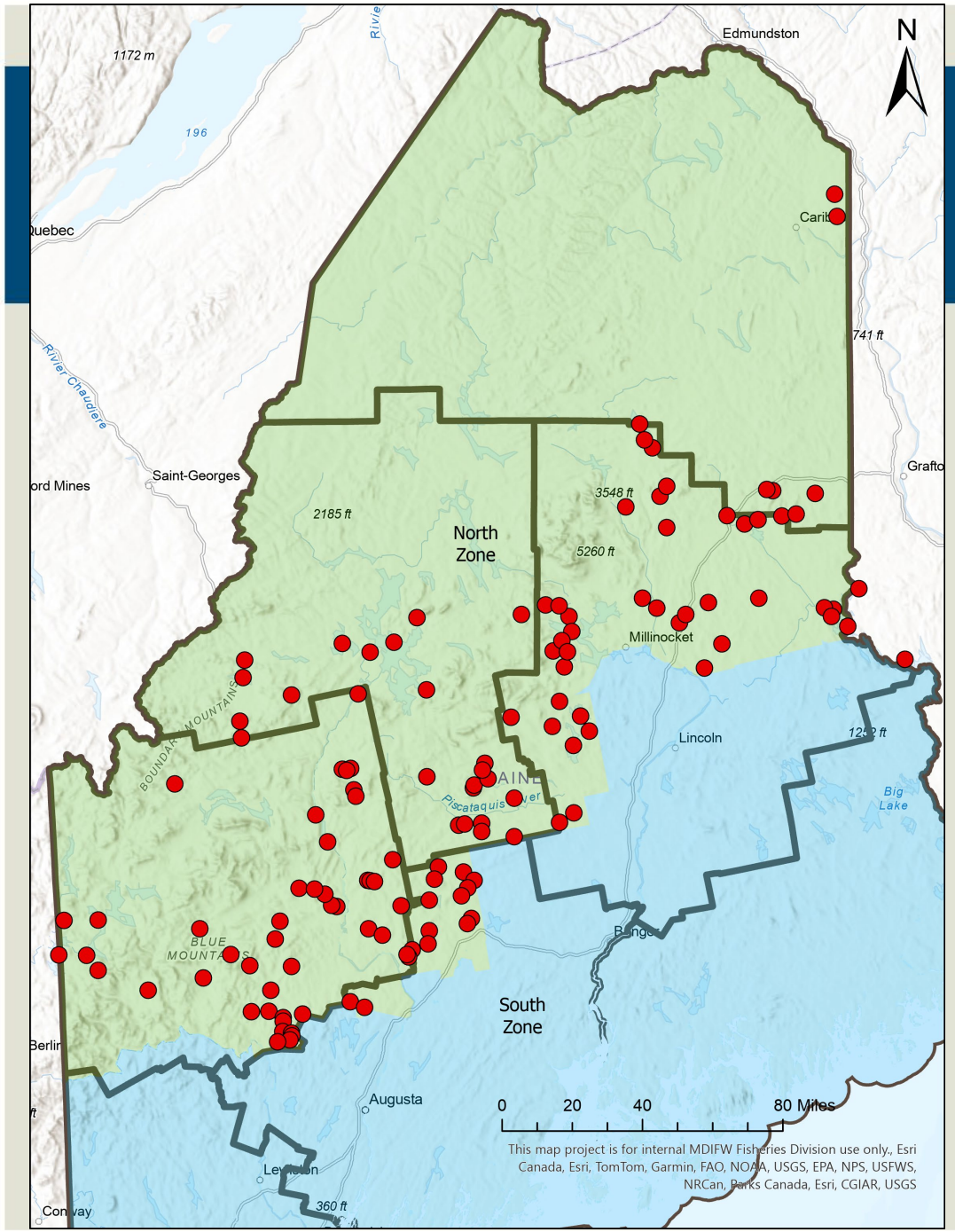
Invasive Fish & Aquatic Wildlife

- What is an invasive species?
- Species highlights
- Upcoming work & program development
- Data & reporting

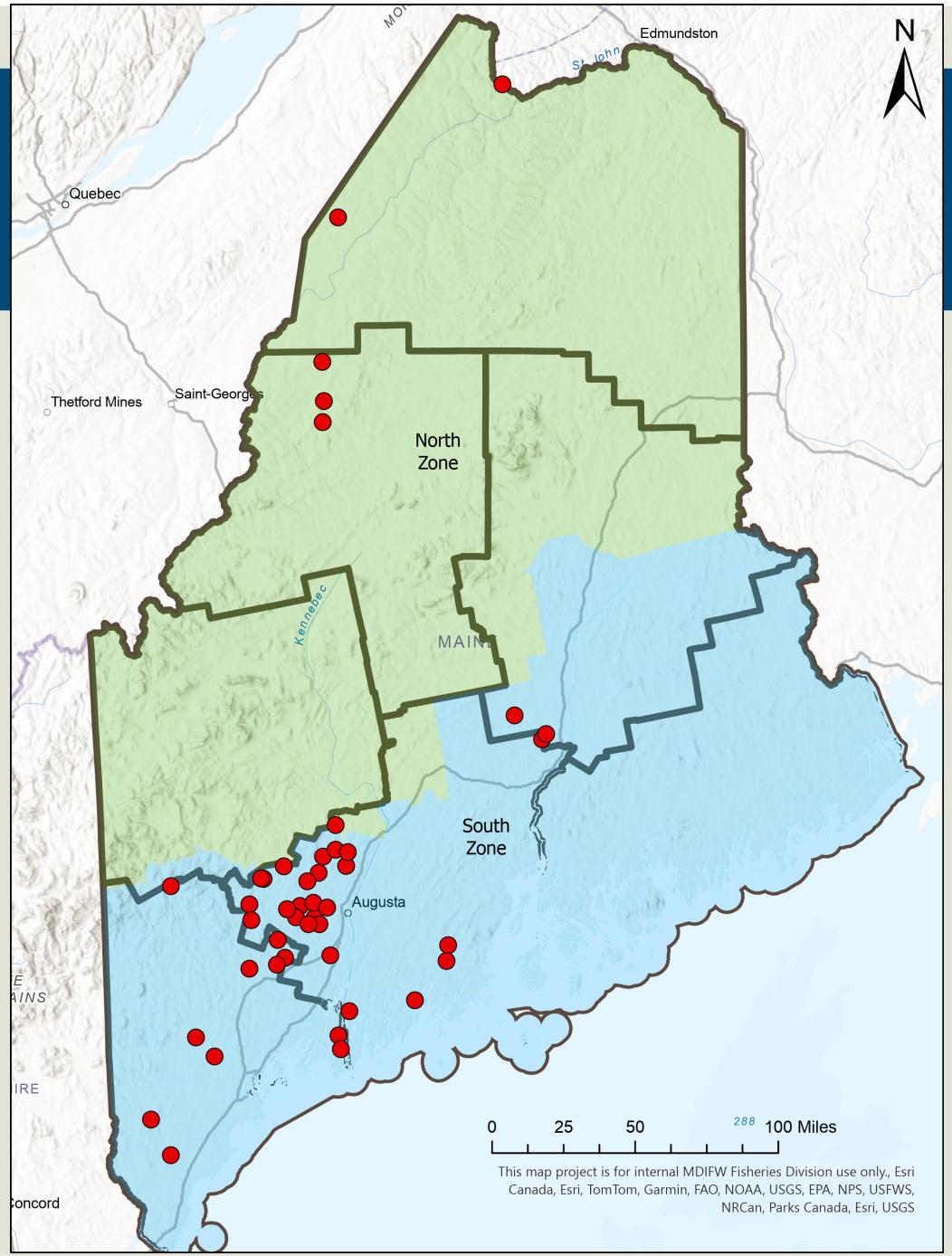
Smallmouth & Largemouth Bass

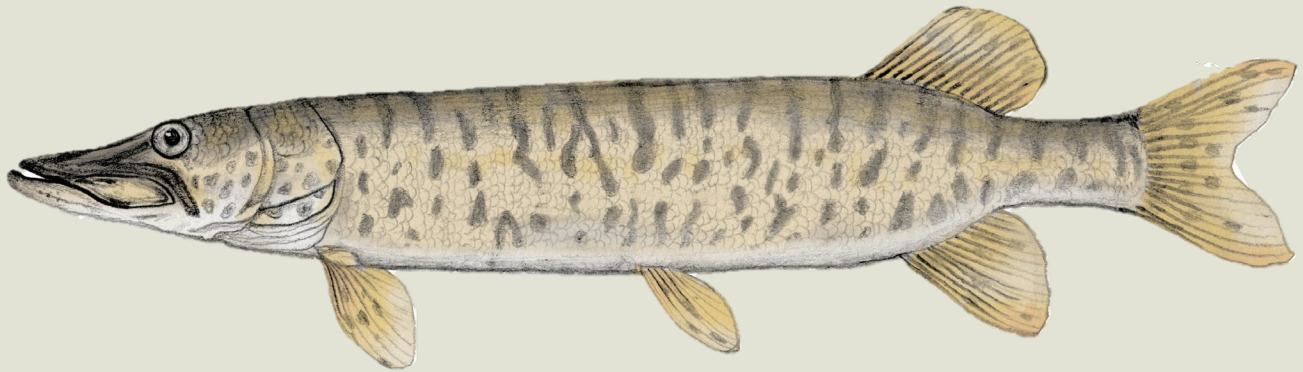




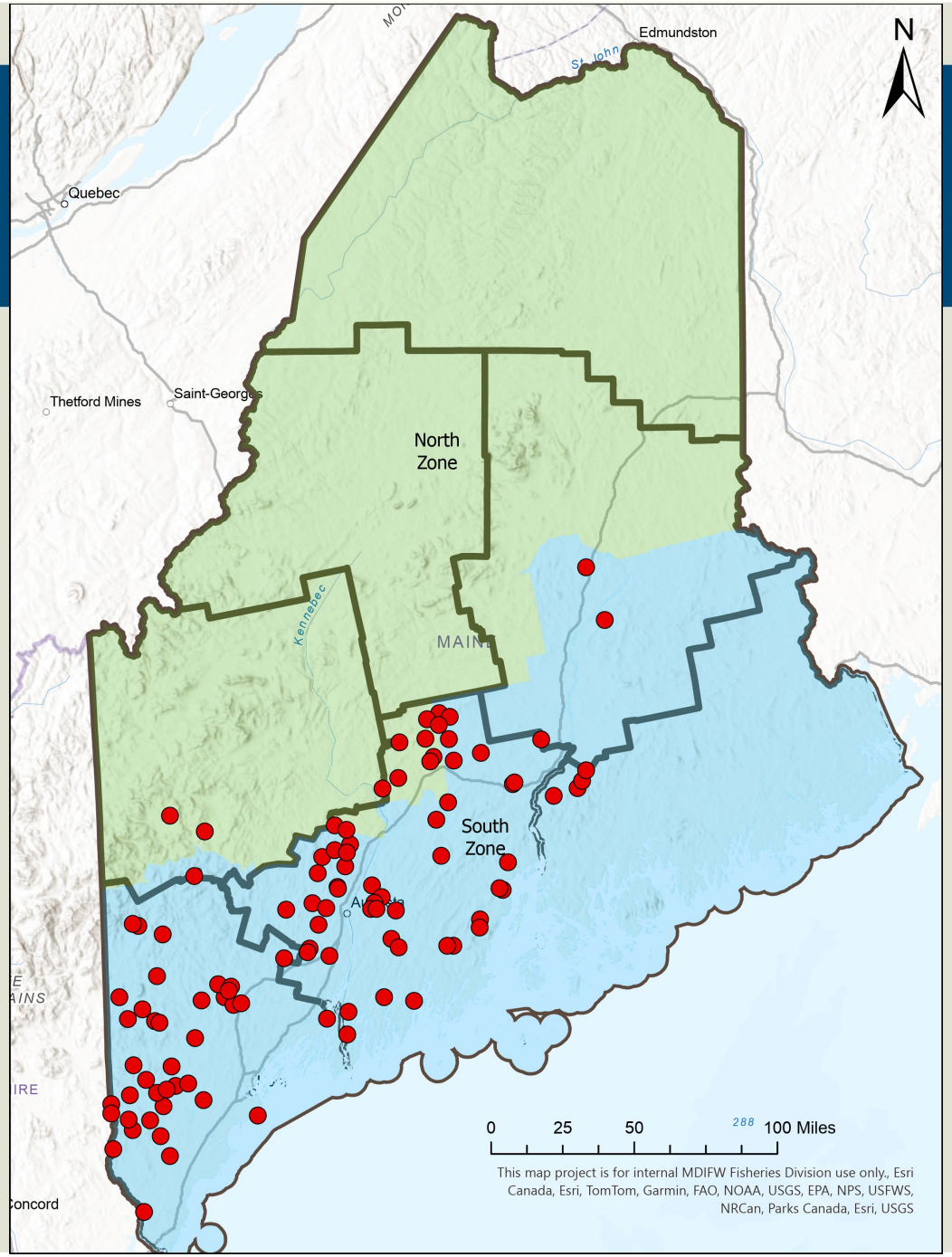


Northern Pike & Muskellunge





Black Crappie & Bluegill



Invasive Aquatic Wildlife

Photo: Trevor Persons

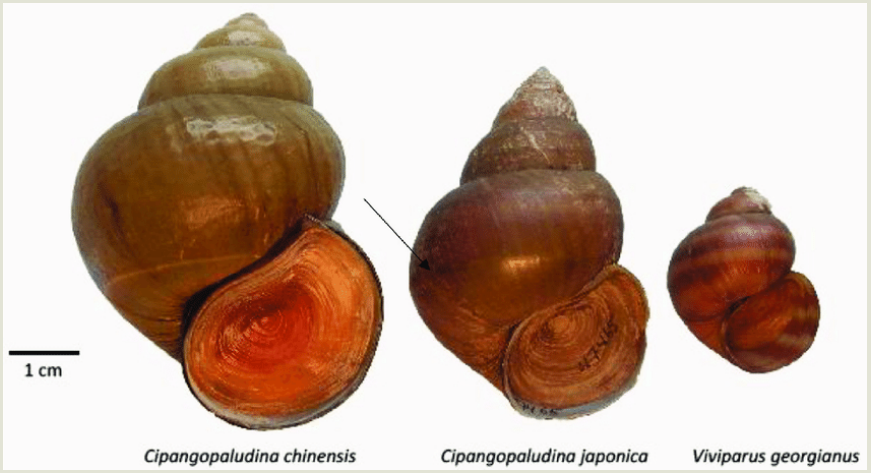
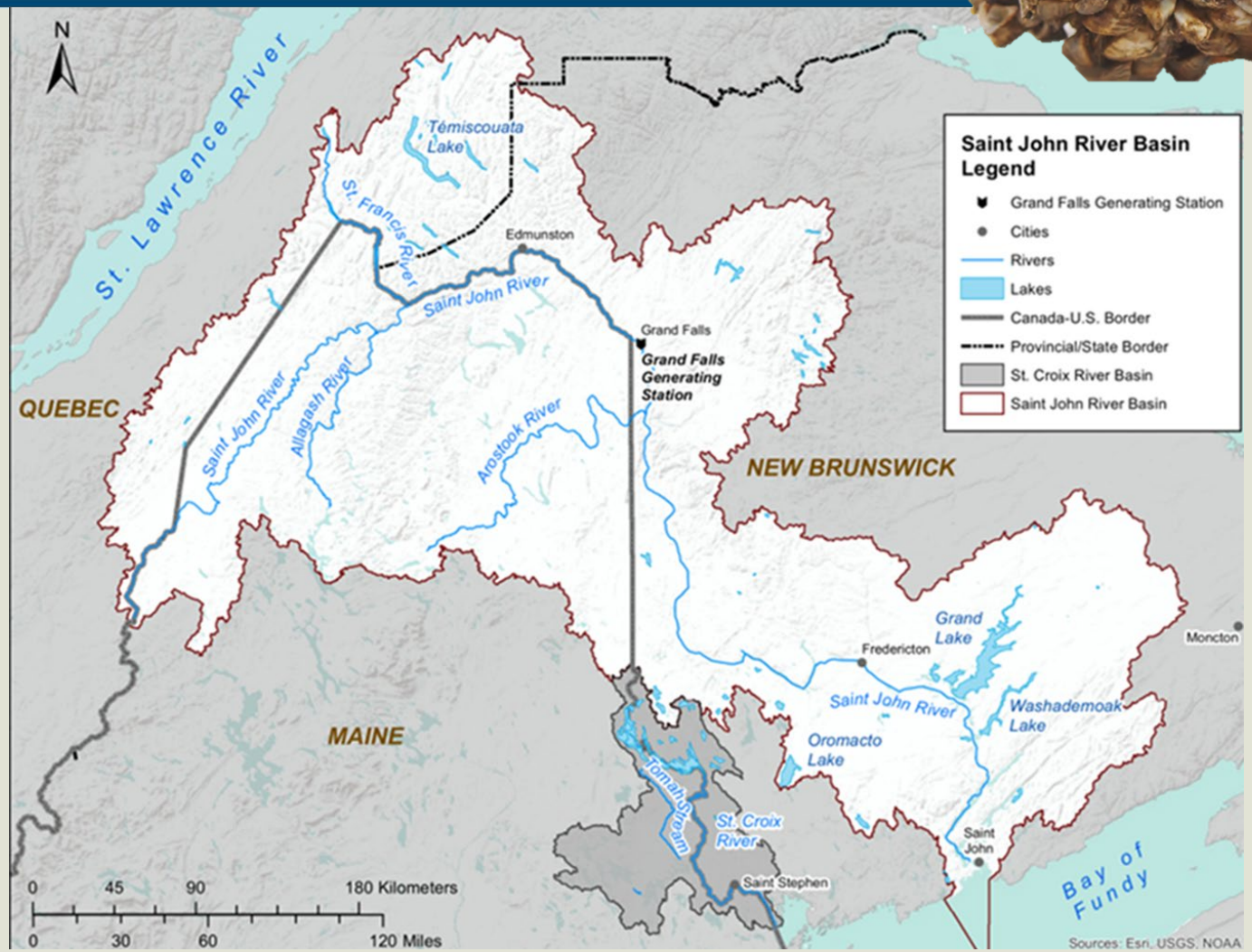
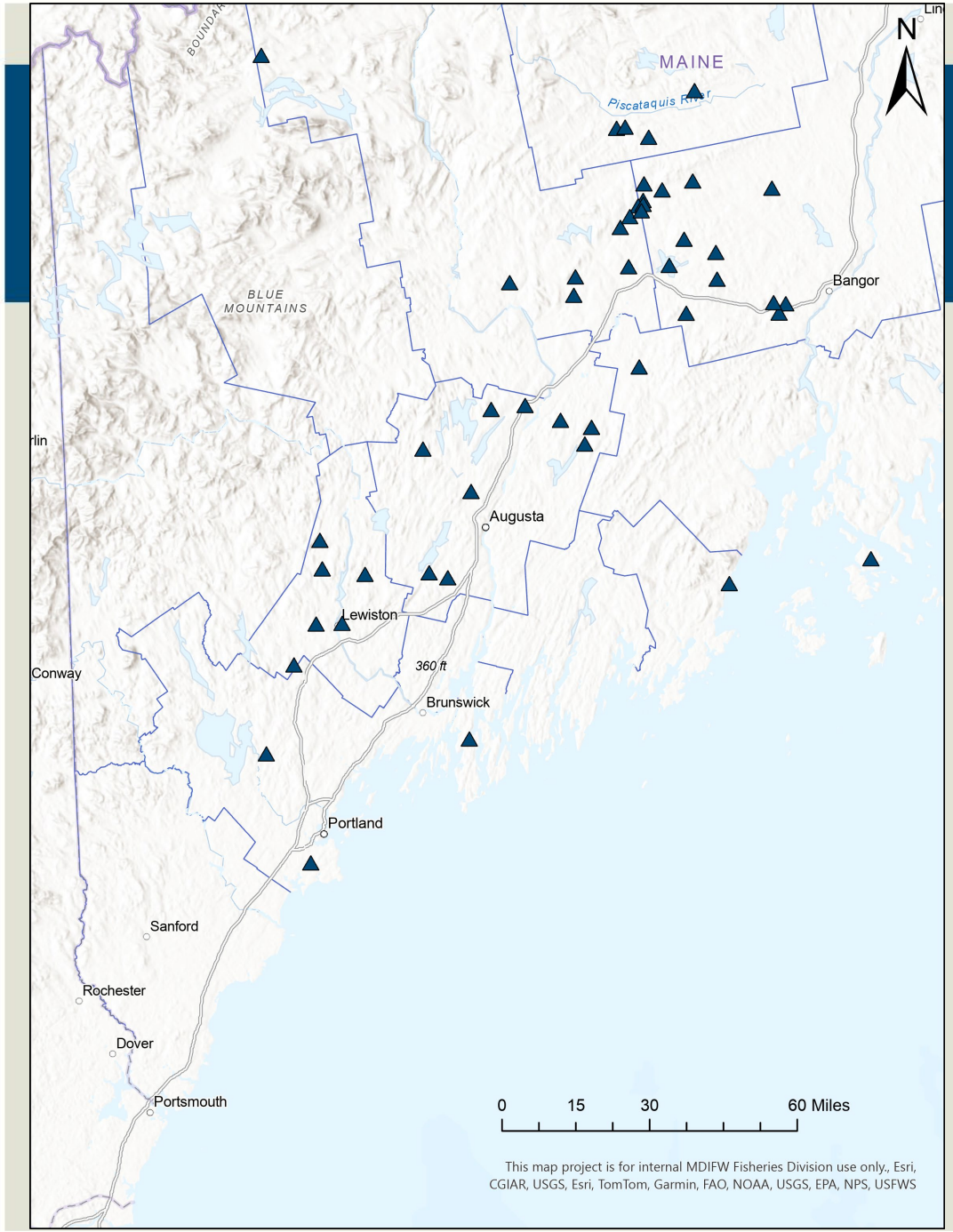


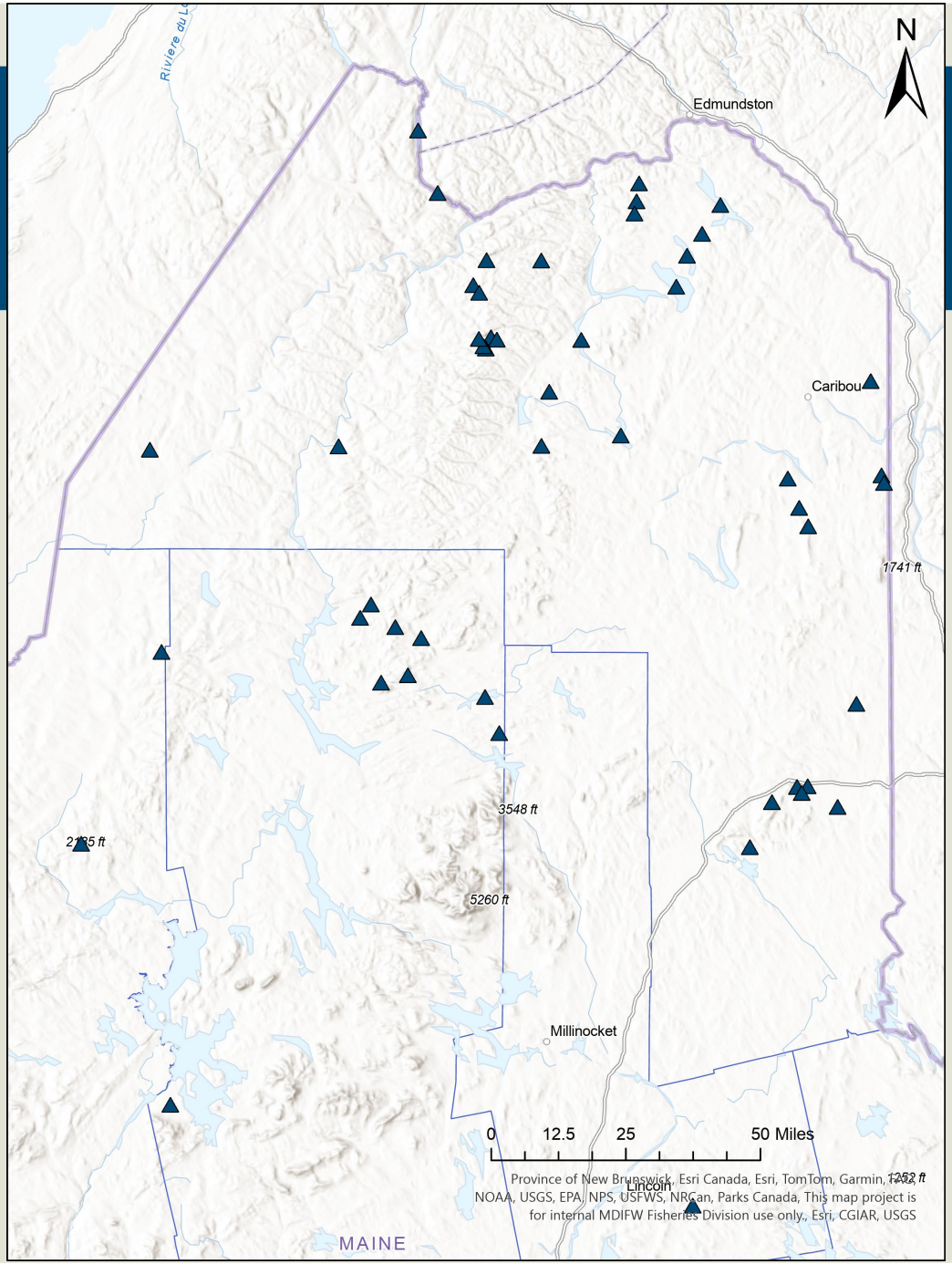
Photo: Donald F. McAlpine

Photo: Minnesota Aquatic Invasive Species Research Center

Zebra Mussels







MAINE DEPT. OF INLAND FISHERIES AND WILDLIFE

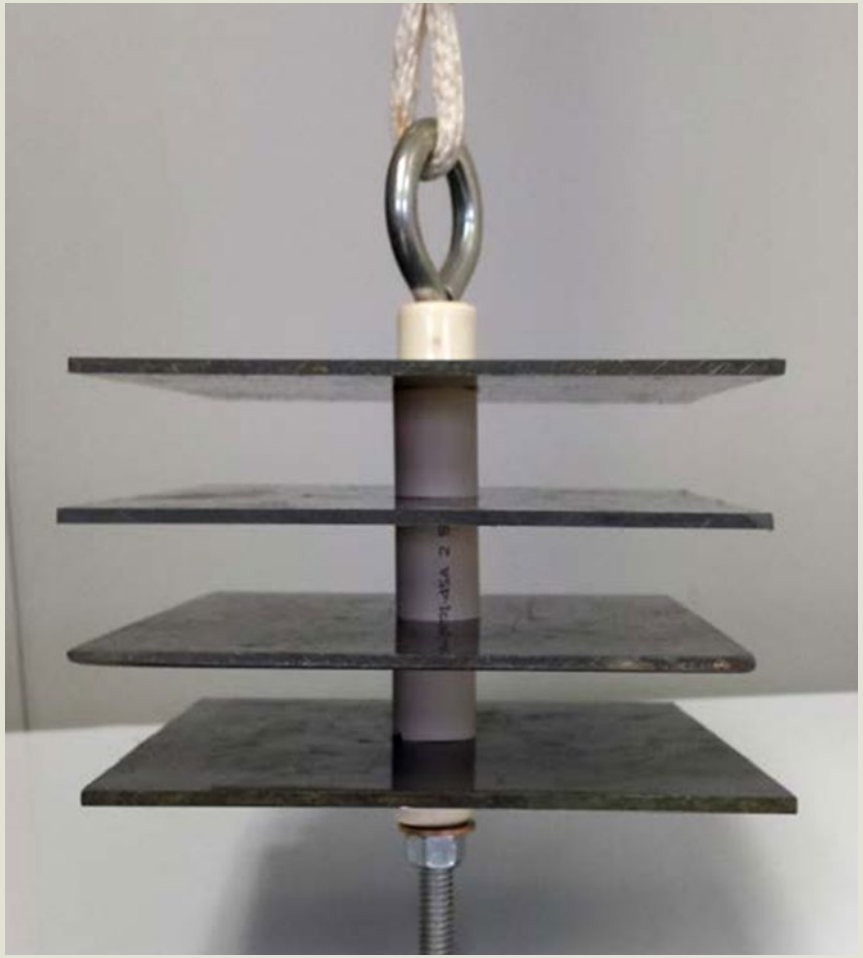
eDNA Program - 2023

- Aroostook River
- Fish River Chain of Lakes
- Deboullie Pond Area
- Nickerson Lake & Arnold Brook Lake

Monitoring for 2024

- Continued eDNA sample collection
  - Aroostook & Piscataquis counties

- Community science settling plate project

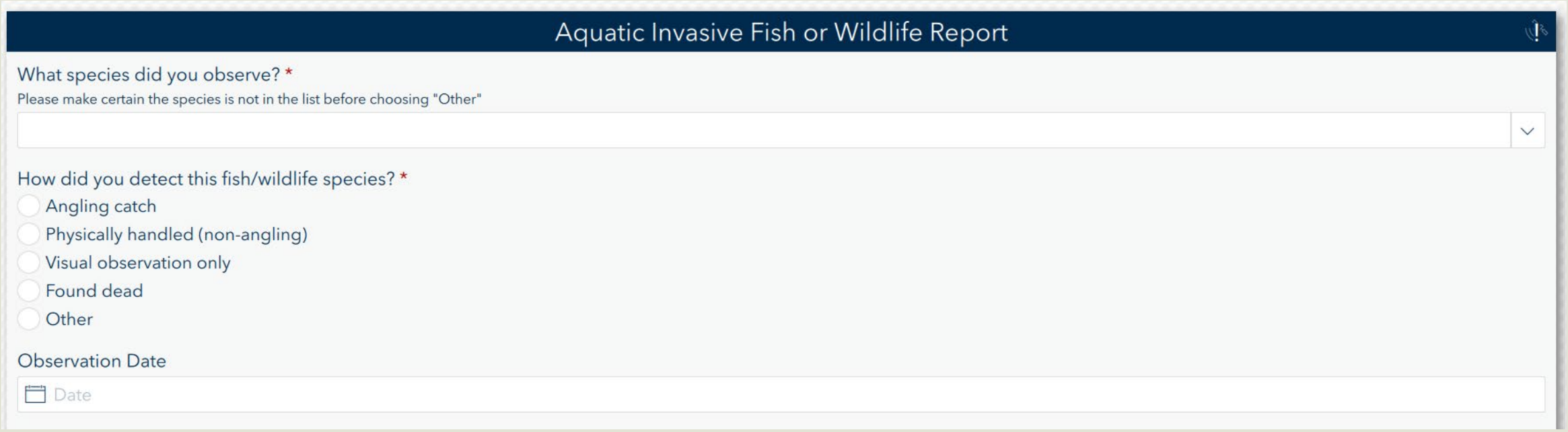


Improved Monitoring & Remediation Tools

- Targeted sampling
- AIS risk assessment tool
- Native fish restoration program

Update Reporting & Tracking Methodology

ArcGIS Survey123



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Marine Invasions in a Rapidly Warming Gulf of Maine:

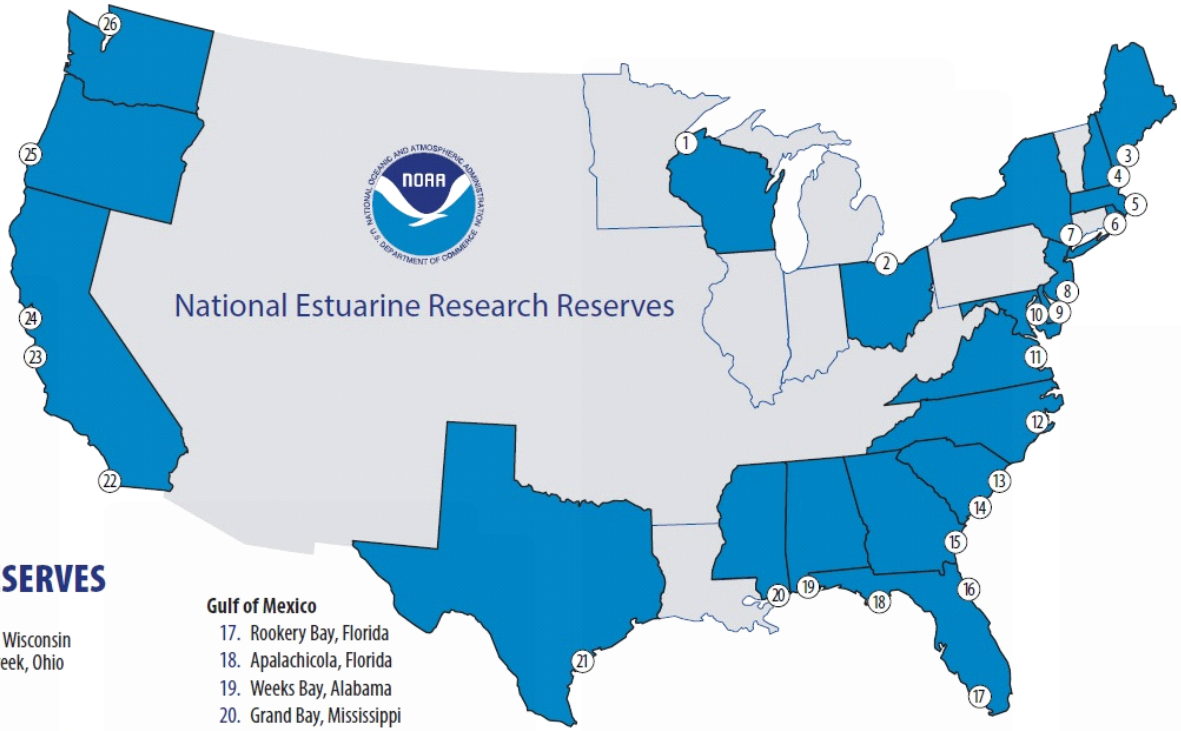
The "State of the State" of Marine Invasive Species in Coastal Maine.

2024 Maine Invasive Species Network Annual Meeting

April 10th 2024 – Umaine, Orono

Jeremy Miller – Monitoring Program Manager
Wells National Estuarine Research Reserve
Wells, ME, USA.
jmiller@wellsnerr.org

NOAA's National Estuarine Research Reserve System (NERRS)



New CT Reserve 2023!

LIST OF RESERVES

Great Lakes
1. Lake Superior, Wisconsin
2. Old Woman Creek, Ohio

Northeast
3. Wells, Maine
4. Great Bay, New Hampshire
5. Waquoit Bay, Massachusetts
6. Narragansett Bay, Rhode Island

Mid-Atlantic
7. Hudson River, New York
8. Jacques Cousteau, New Jersey
9. Delaware
10. Chesapeake Bay, Maryland
11. Chesapeake Bay, Virginia

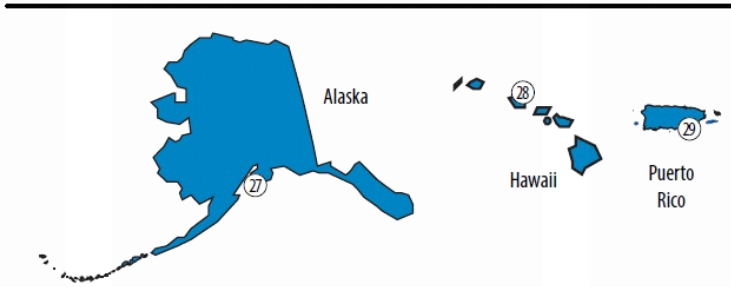
Southeast
12. North Carolina
13. North Inlet-Winyah Bay, South Carolina
14. ACE Basin, South Carolina
15. Sapelo Island, Georgia
16. Guana Tolomato Matanzas, Florida

Gulf of Mexico
17. Rookery Bay, Florida
18. Apalachicola, Florida
19. Weeks Bay, Alabama
20. Grand Bay, Mississippi
21. Mission-Aransas, Texas

West
22. Tijuana River, California
23. Elkhorn Slough, California
24. San Francisco Bay, California
25. South Slough, Oregon
26. Padilla Bay, Washington
27. Kachemak Bay, Alaska

Pacific
28. He'eia, Hawai'i

Caribbean
29. Jobos Bay, Puerto Rico



Wells National Estuarine Research Reserve, Wells, Maine

wellsreserve
at laudholm

Wells National Estuarine Research Reserve
342 Laudholm Farm Road, Wells, Maine
wellsreserve.org 207-646-1555

The Maine Coastal Ecology Center

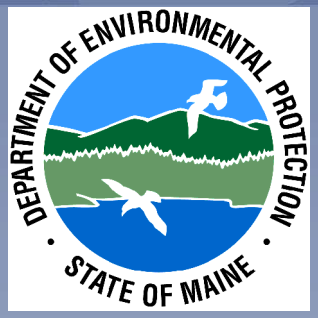
- Fisheries- habitat-monitoring
- Ocean and coastal climate

Mission: To understand, protect, and restore **coastal ecosystems** of the Gulf of Maine through integrated **research, stewardship, environmental learning,** and **community partnerships**.

- Undergraduates
- Graduates
- Post-doctoral
- NOAA 5-Colleges
- NOAA Hollings Scholars
- Volunteers

Dr. Jason Goldstein: Research Director

All About Partnerships!!



Setting the Stage: Marine Invasive Species "101"

- **Estuaries and coasts are most heavily invaded.**
  - Vectors – shipping/aquaculture/etc.
  - Impacts from climate change "extreme effects" on estuaries.

Marine Pollution Bulletin 69 (2013) 7–18

Contents lists available at SciVerse ScienceDirect

Marine Pollution Bulletin

journal homepage: www.elsevier.com/locate/marpolbul

Review

An 'extreme' future for estuaries? Effects of extreme climatic events on estuarine water quality and ecology

Michael S. Wetz [a,*], David W. Yoskowitz [b]

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ARTICLE INFO

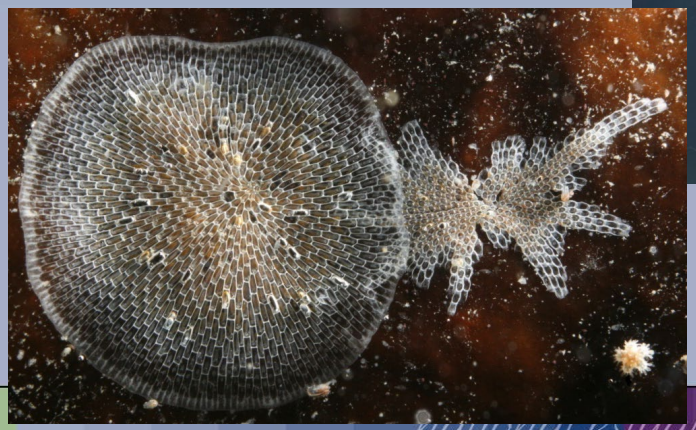
Keywords:
Estuary
Water quality
Climate change
Tropical cyclone

ABSTRACT

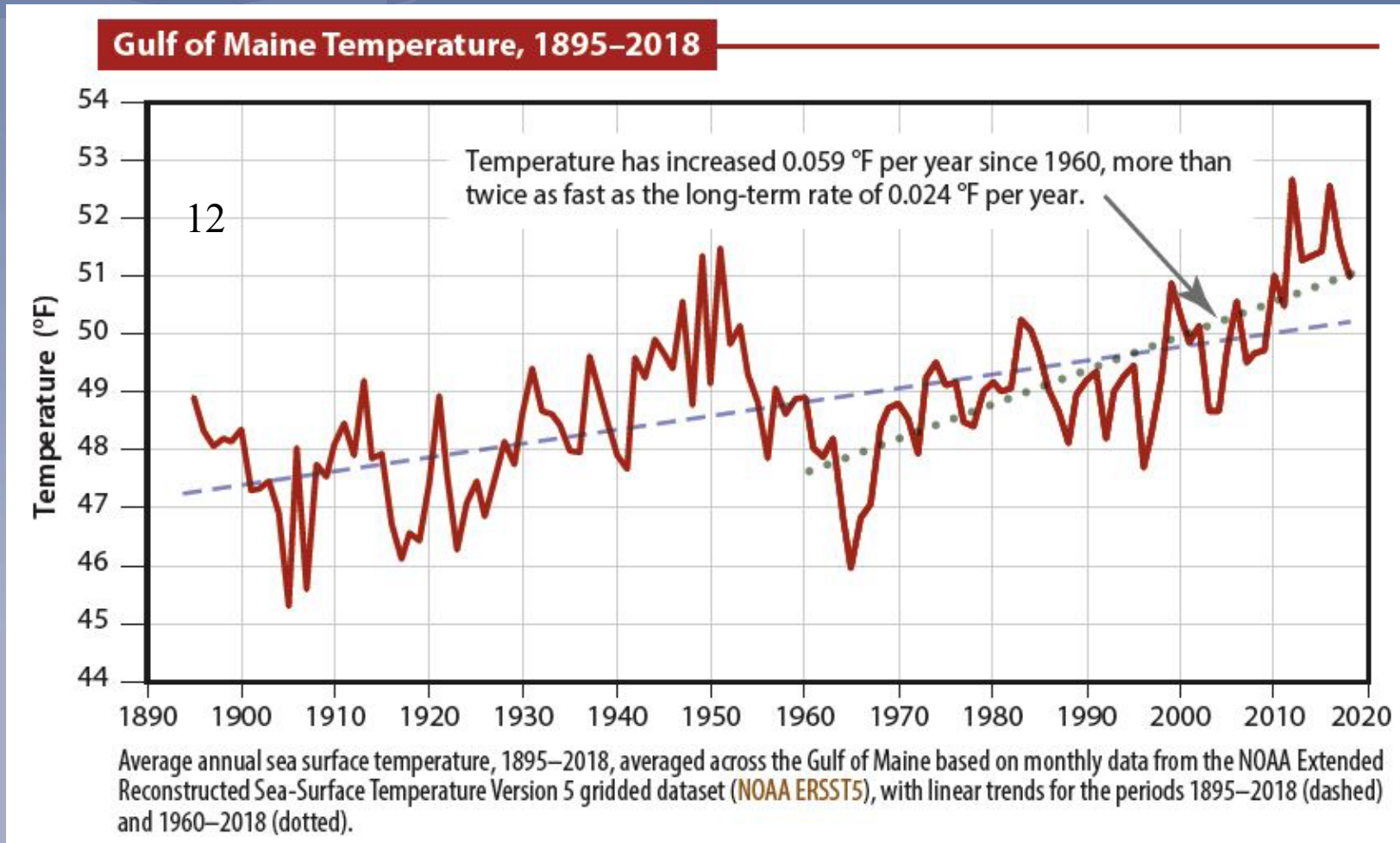
Recent climate observations suggest that extreme climatic events (ECE; droughts, floods, tropical cyclones, heat waves) have increased in frequency and/or intensity in certain world regions, consistent with climate model projections that account for man's influence on the global climate system. A synthesis of existing literature is presented and shows that ECE affect estuarine water quality by altering: (1) the

Setting the Stage: Marine Invasive Species "101"

- **Species represent complex range of taxa and "life histories".**
  - Less known about behavior outside of native range
  - Larval transport
  - Identification can be difficult (Cryptogenic and "hybrid" species)

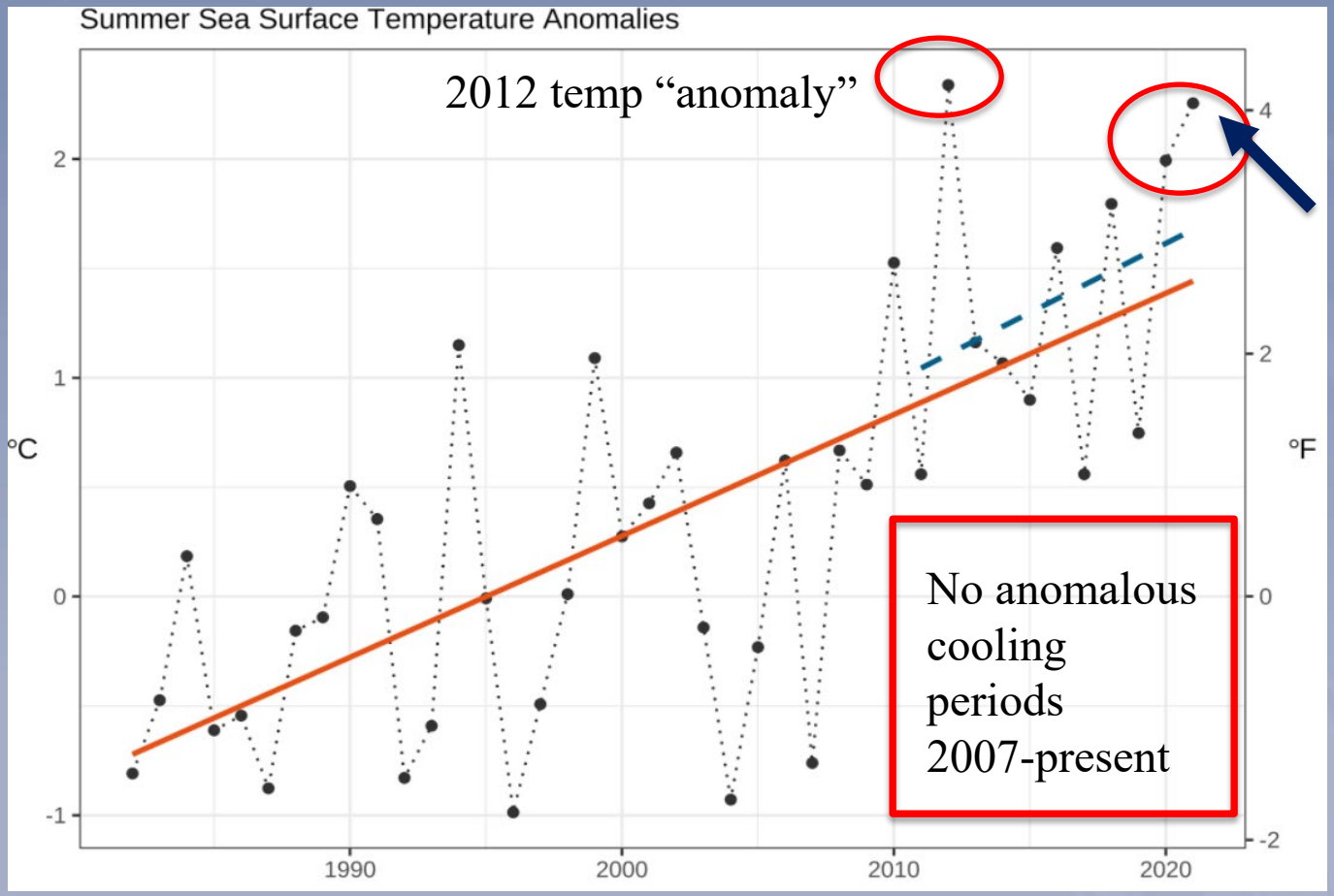


Setting the Stage: A warming Gulf of Maine



In the past three decades, the Gulf of Maine has warmed by 0.06°C (0.11°F) per year, three times faster than the global average. (Pershing, et al. 2018)

Setting the Stage: A warming Gulf of Maine



Fall 2021-
2nd warmest on record for GOM.

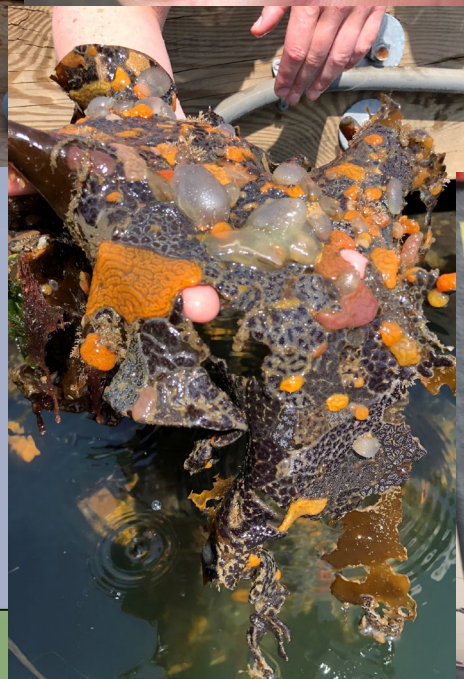
In the past three decades, the Gulf of Maine has warmed by 0.06°C (0.11°F) per year, three times faster than the global average. (Pershing, et al. 2018)

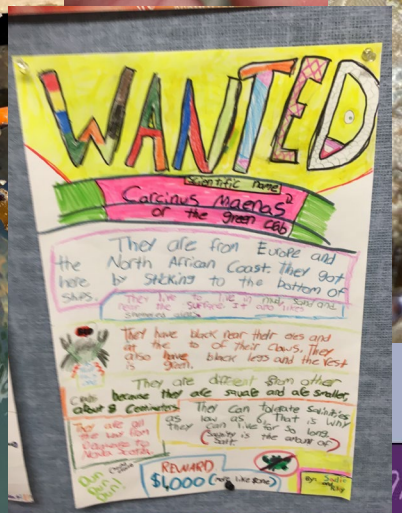
*Graphic courtesy of the Gulf of Maine Research Institute.

"OKAY! Catch your breath Jeremy….Ask the Audience if you're speaking too fast?!"

(is anyone sleeping yet?….you were showing graphs!!)

Using community scientist (volunteers) to monitor for marine invasive species (MIMIC)





What is MIMIC?

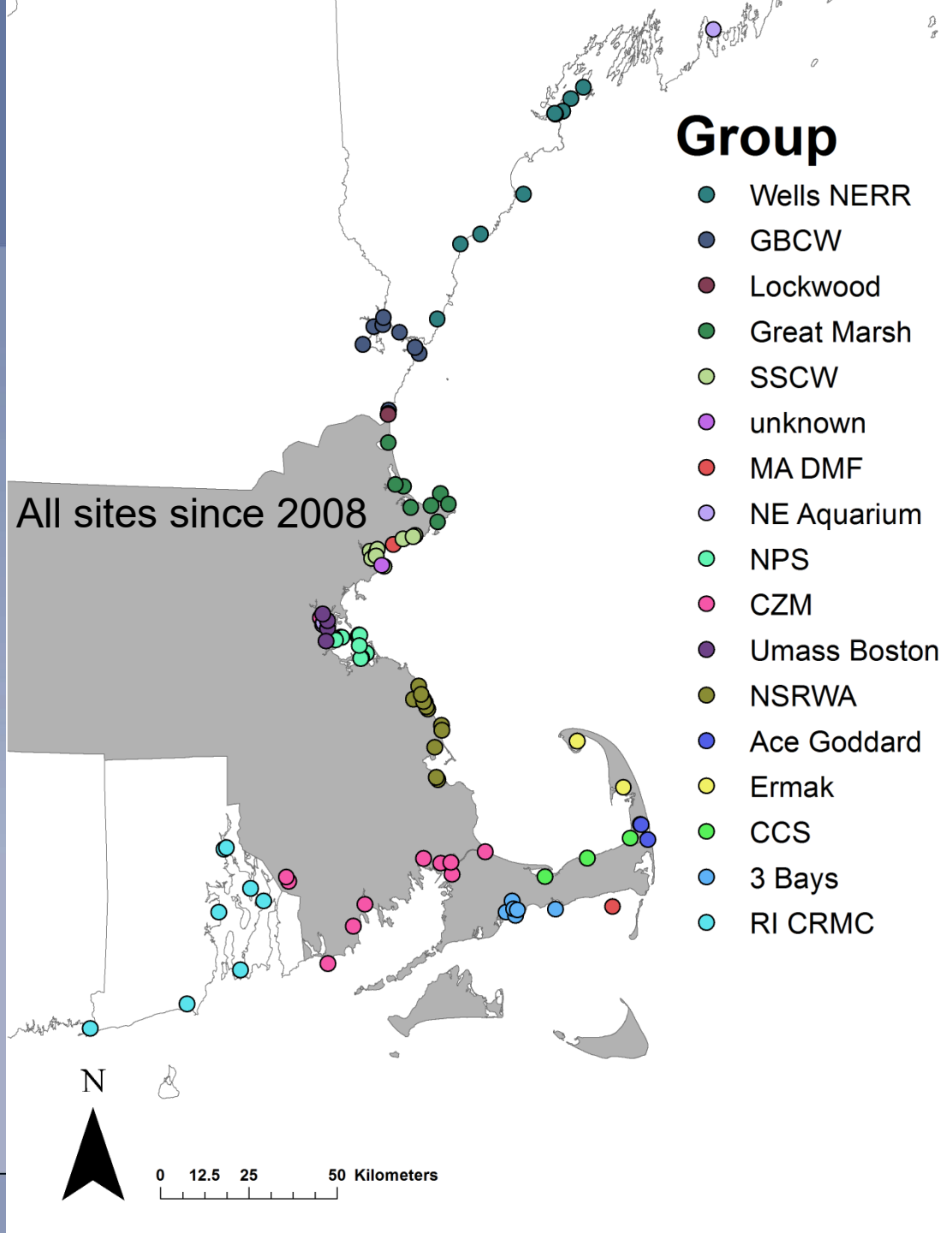
"The Marine Invader Monitoring and Information Collaborative"

- Network of (well) trained volunteers, working with state/university/Fed staff.
- Monitor for marine invasive species along the New England coastline monthly
- Docks, Tidepools, and Cobble Shore

MIMIC Sites:

Since 2008

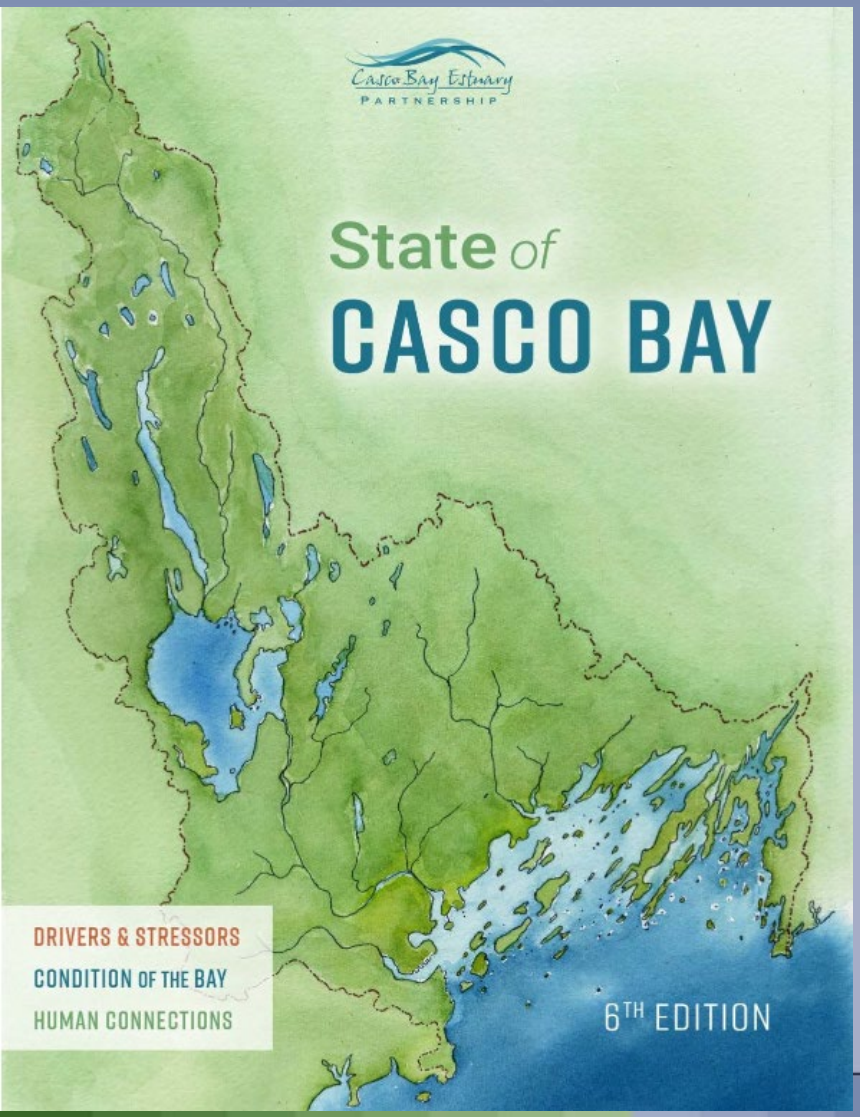
- 114 sites have been monitored
- 15 non-profits/state/university partners
- Over 1300 monitoring events
- Used to “fill gaps” between larger “Rapid Assessment Surveys”



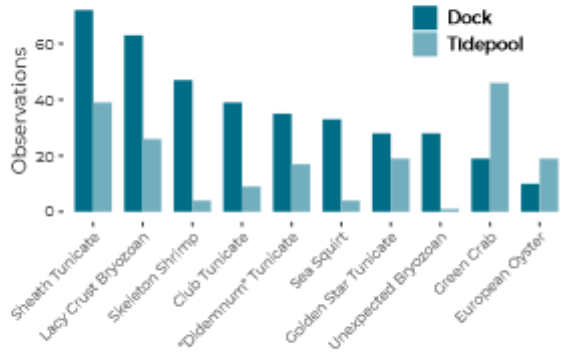
Goals of the MIMIC Program

- **Early Detection**: Find non-native species before they spread and/or become established in the ecosystem.
- **Education:** Educate about marine invasive species and how to reduce their spread.
- **Data:** provide data to scientist and public via online database and collaborations.

Data informing our partners!

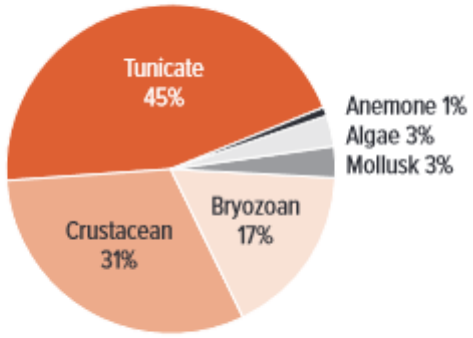


Number of Observations by Major Taxon



Green crabs were found mostly in tidepools, where they are the most frequently observed non-native species. Docks and piers were dominated by tunicates and bryozoans. Data based on observations from 2016 to 2020 at all Casco Bay sites.

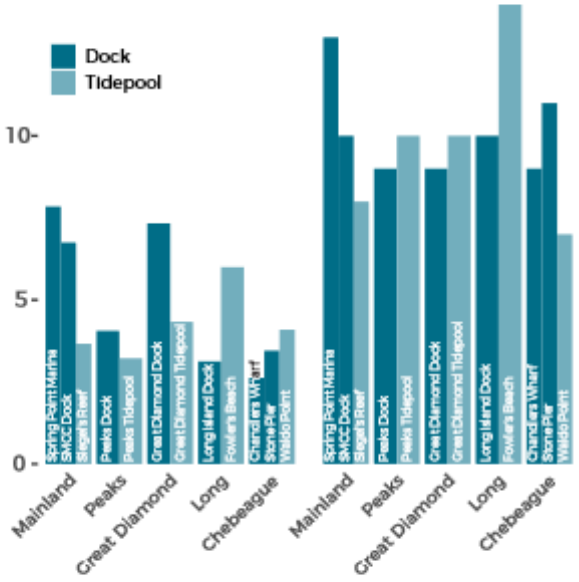
Percentage of Observations by Major Taxon



Of the 23 invasive species targeted by the MIMIC program, tunicates, which here includes six different species, are the most frequently observed invasives. This graph is based on 1,500 observations from 2016 to 2020.

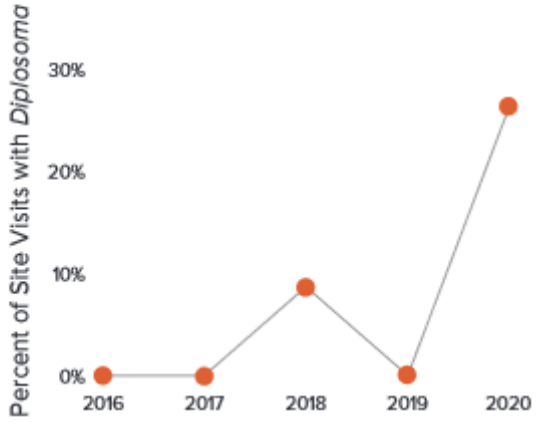
Average Invasives per Site Visit

Total Invasives Observed at Sites



Almost every site visit identified at least one invasive species. From 2016 through 2020, typically two to eight invasive species were observed on

Colonial Tunicate Now Firmly Established



Although rarely seen in the past, Diplosoma listerianum, *a colonial tunicate, increased dramatically in 2020. Before 2016,* Diplosoma *had only been observed once, in 2014. It was observed three times in 2018 and then eleven times in 2020. Observed in rocky intertidal communities since 2010 (MA CZM 2013), it now*

RAPID ASSESSMENT SURVEY (RAS)

The Gulf of Maine Rapid Assessment Survey (RAS) is a regional survey of invasive species conducted every three to five years and led by the Massachusetts Office of Coastal Zone Management and MIT Sea Grant College Program. Since 2000, scientists have sampled dozens of sites from Maine to New York in July or August. Taxonomic experts identify native and non-native macroalgae and invertebrates on floating docks and related structures, such as pilings, ropes, and boat fenders.

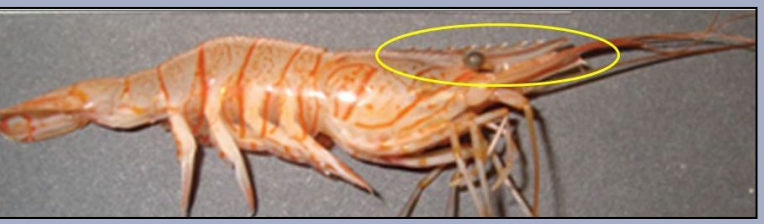
From Massachusetts to Maine, the teams found that the percentage of invasive species has remained relatively stable, with less than a quarter of all species observed in both 2013 and 2018 known to be invasive.

Several species, however, have expanded their range. For example, the colonial tunicate *Didemnum vexillum* and the bryozoan *Tricellaria inopinata* were observed more frequently in Maine, and the ranges for the algae *Colpomenia peregrina* (moving southward) and *Grateloupia turuturu* (moving northward) expanded. *Dasysiphonia japonica*, a red alga, was observed for the first time in 2018 at both sites surveyed in Casco Bay—Port Harbor Marine (Portland) and

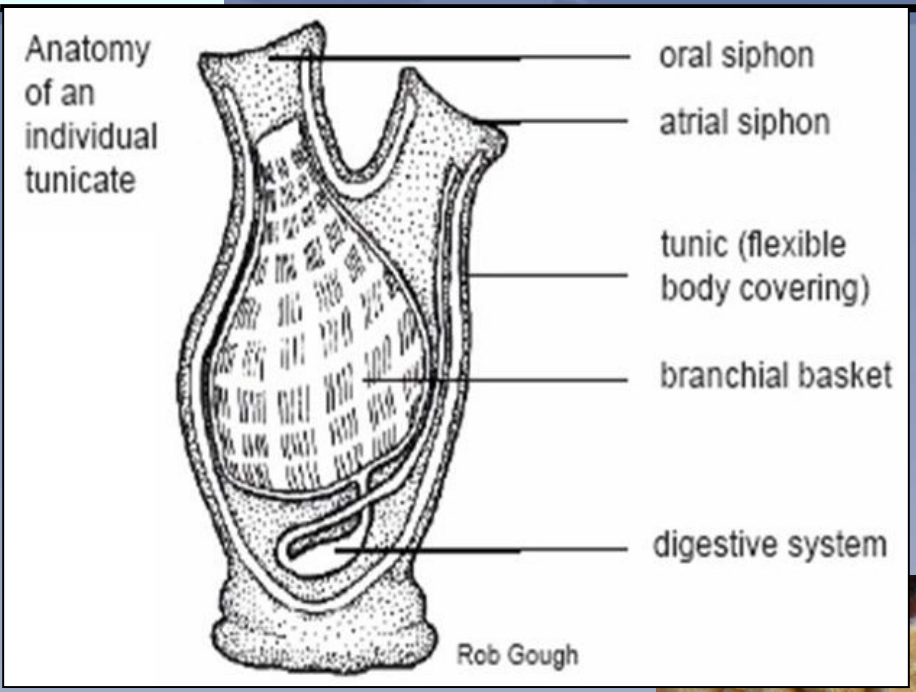
18 Species we monitor for…

Crustaceans

- Crabs, shrimp, and Amphipod



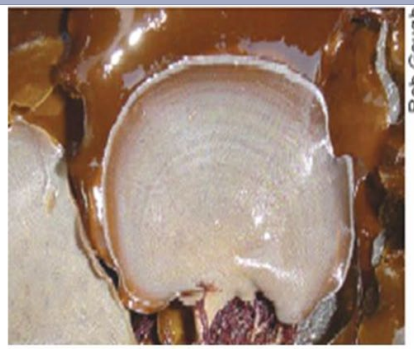
Tunicates

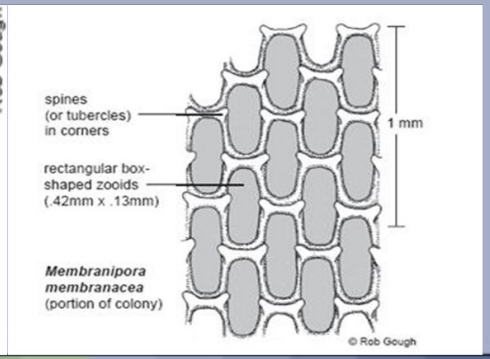

Anatomy of an individual tunicate
oral siphon
atrial siphon
tunic (flexible body covering)
branchial basket
digestive system
Rob Gough

Bryozoans

Purple Bushy Bryozoan (*Bugula neritina*)

Membranipora membranacea, (lacy crust bryozoan)

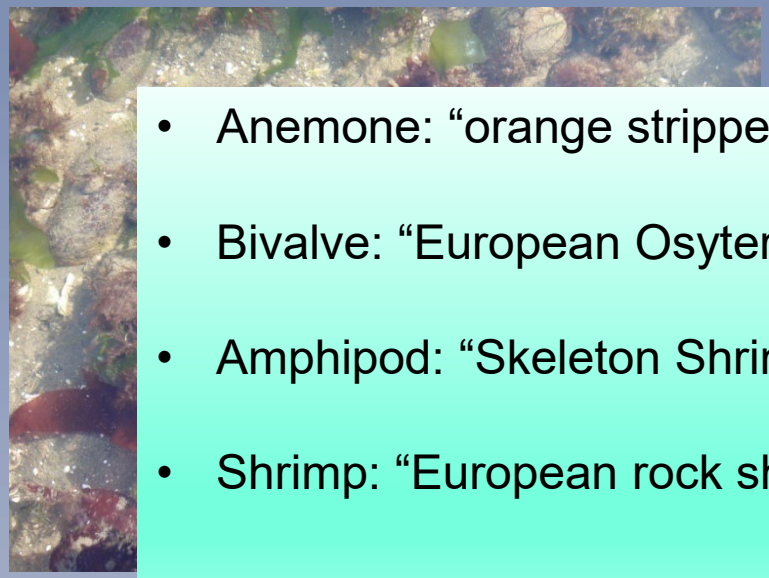


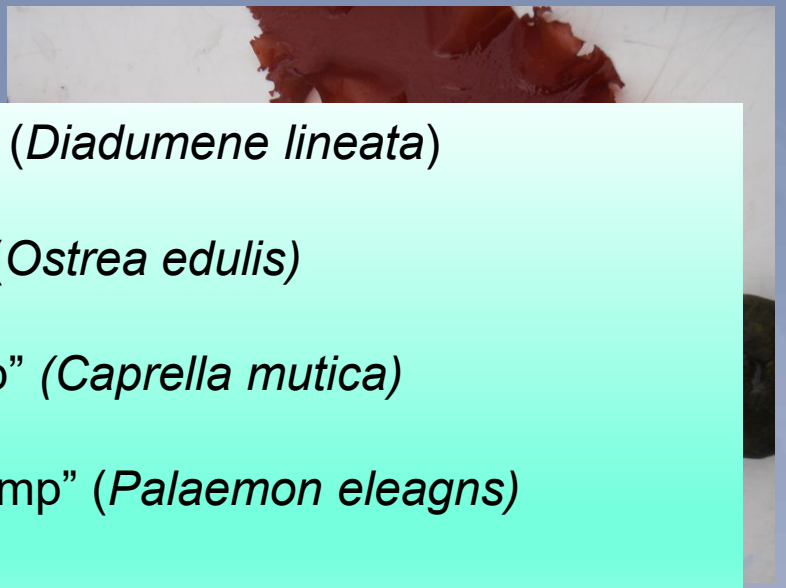


Rob Gough

Algae

- Usually most difficult to ID (for ME at least!)





- Anemone: “orange stripped” (*Diadumene lineata*)
- Bivalve: “European Osyter” (*Ostrea edulis)*
- Amphipod: “Skeleton Shrimp” *(Caprella mutica)*
- Shrimp: “European rock shrimp” (*Palaemon eleagns)*

Undaria pinnatifida, wakame

Steve Lonhart

© NoE Marine Genomics Europe

SO….. WHAT ARE WE SEEING?!

2023 New England Rapid Assessment!!

New England RAS

2000 2003 2007 2010 2013 2018 **2023**

Slides courtesy of Alexis Nefflinger: MA CZM

RAS in New England

7 surveys since 2000
+ additional surveys in southern NE

Taxonomists, students, and regional experts

ID all invertebrate and algae species encountered

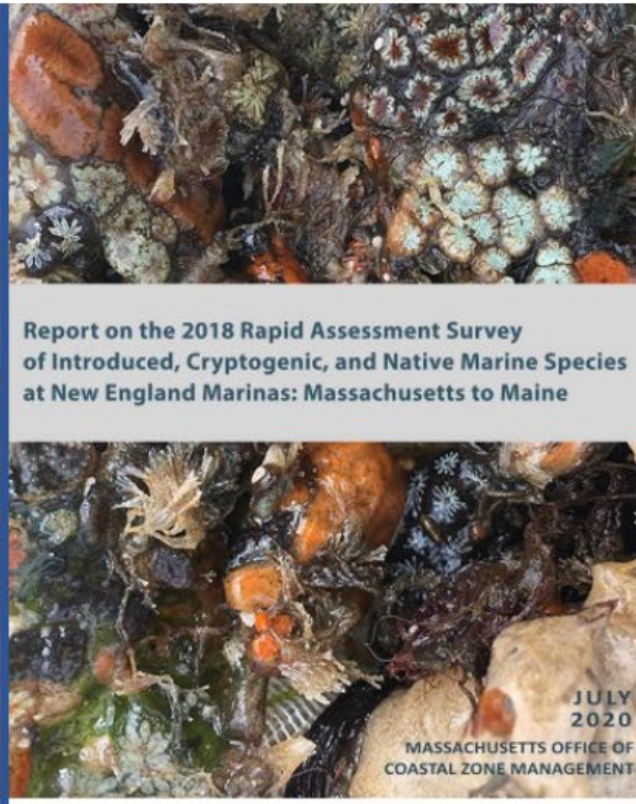
Long-term database of fouling communities

Slides courtesy of Alexis Nefflinger: MA CZM

RAS Methodology

One Hour Search

Laboratory Identifications

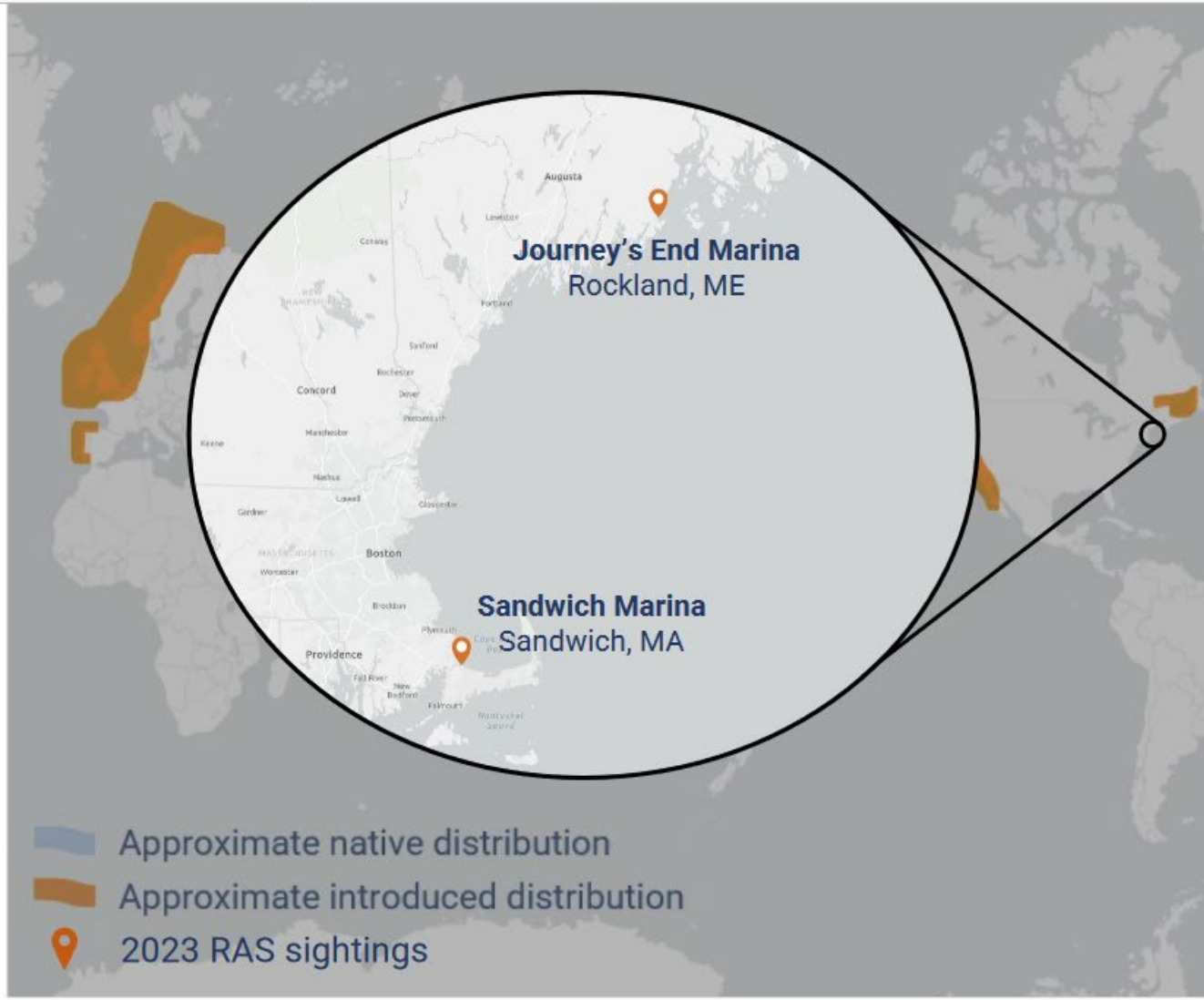


RAS Report on CZM Website

Slides courtesy of Alexis Nefflinger: MA CZM

New Invader?

Schizoporella japonica



Automatic Zoom

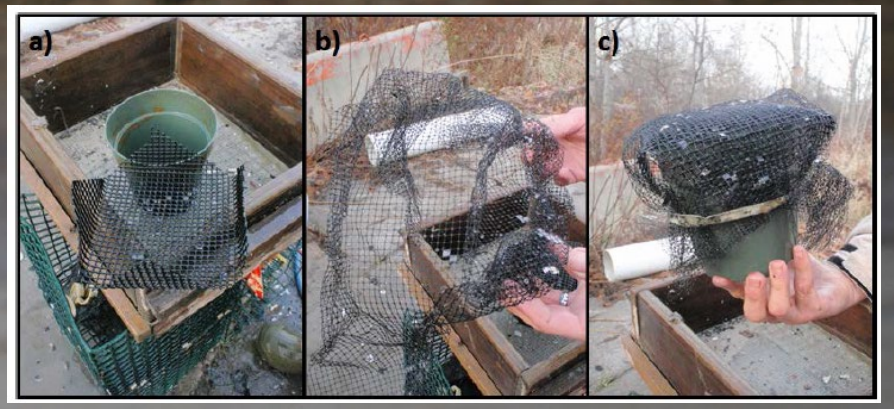
RAS Impacts

- Comprehensive, long-term dataset of fouling communities
- Identify new species introductions
- Track range expansions of introduced species over time
- Reclassification of species previously assumed to be native
- Inform CZM's volunteer monitoring program, MIMIC

Slides courtesy of Alexis Nefflinger: MA CZM

Work Around the State!

(by no means, a complete list…)



BIOLOGICAL IMPACTS

Dr. Brian Beal

DOWNEAST INSTITUTE

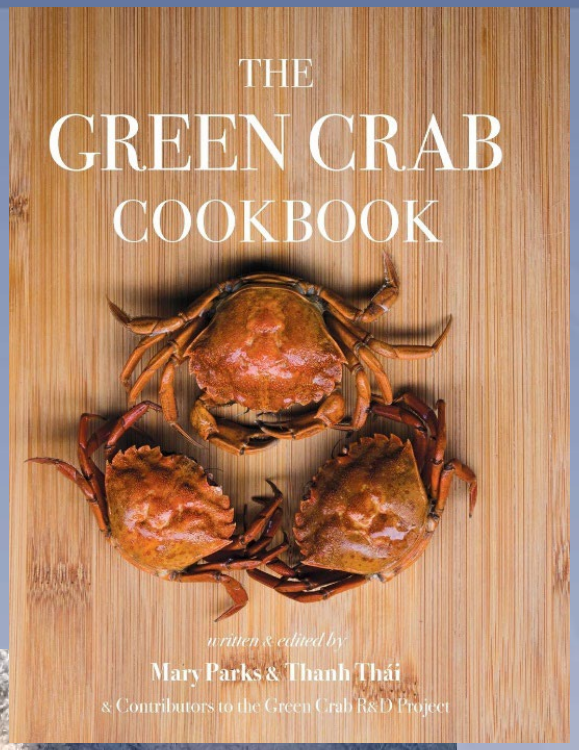
DISCOVERY - EDUCATION - INNOVATION


10,000
Scout Pro
400g
0.4
ON/ZERO
Off
PRINT
Unit
OHAUS


10,000!
10,000!
GREEN CRABS!

Now THAT'S a crab graph!!

Expanding a New England green crab pilot fishery by providing a molt detection assay and identifying seasonal aggregations for harvest



wellsreserve at laudholm
Wells National Estuarine Research Reserve

NOAA
National Oceanic and Atmospheric Administration
U.S. Department of Commerce

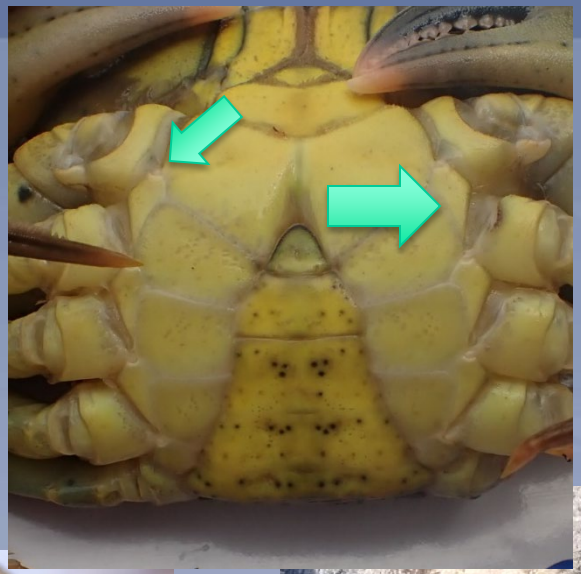
University of New Hampshire

Saint Joseph's College of Maine

arch reserve system

Three Techniques:

- Visual Cues
- UV Light
- Blood Draws



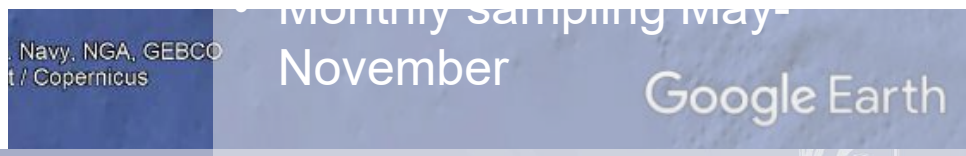
Update from Others:

Manomet Intertidal Green Crab Project

manomet

Events News Contact

ABOUT US WHAT WE DO WHERE WE WORK SUPPORT US DONATE



A DILEMA??

- Invasions Vs. Range Expansions

One Crab, Two Crab, Green Crab.... BLUE CRAB?!?

Green Crab (C. Meanas)

Does Range Expansion = Invasive Species?

Climate change/warming waters, impacts to native species, etc.

Blue Crabs (Callinectes sapidus) caught in the Webhannet River Marsh, Wells, ME.
Summer 2020.

The Backstory

2019

1 dead crab

2020

Live crabs in marsh!

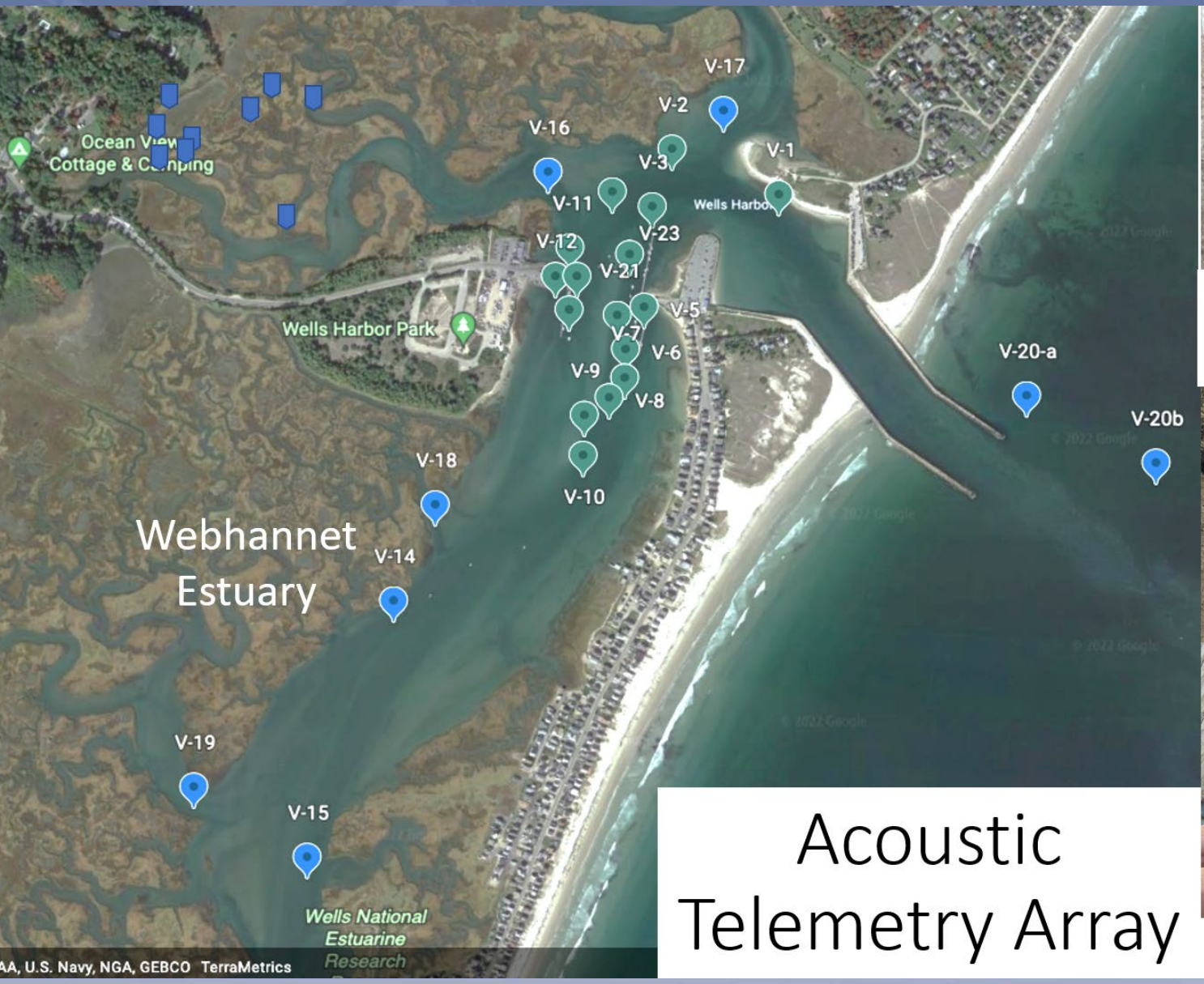
2020

Larvae found in historical samples!

2020-present

Start Trapping!


LR-M1

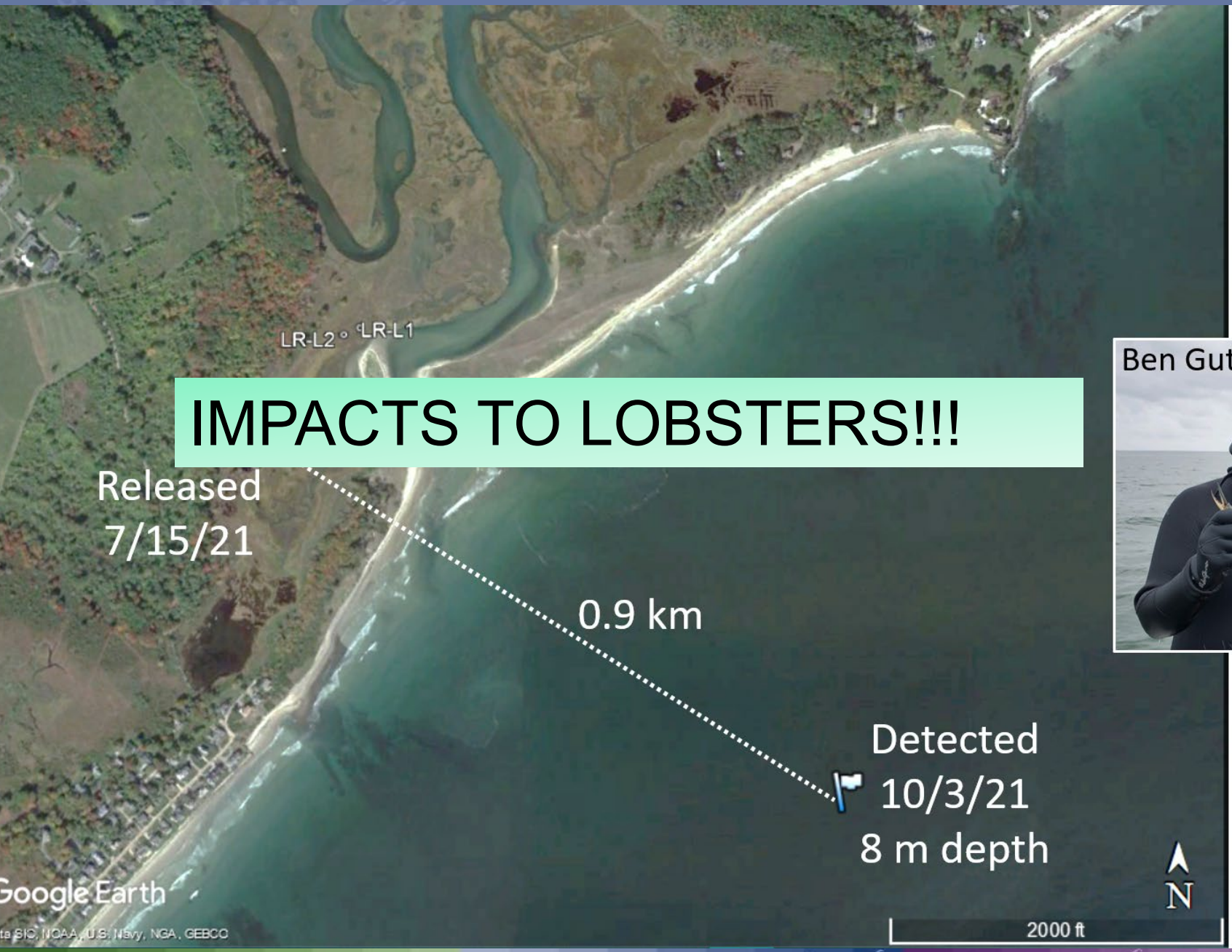


Acoustic Telemetry Array

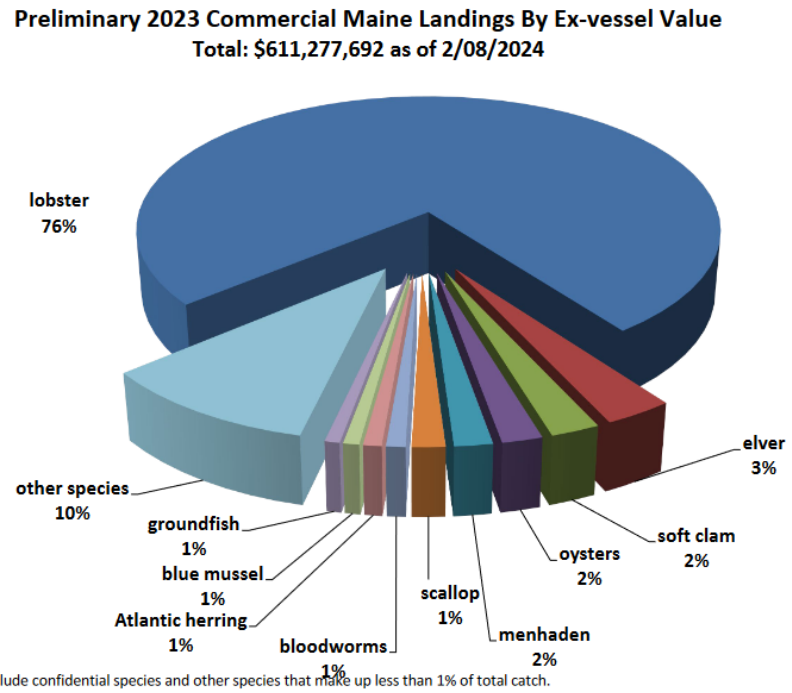
Underwater Receiver

Tagged Blue Crab

IMPACTS TO LOBSTERS!!!



ECONOMIC IMPACTS



http://media.kjonline.com/images/20140123_113747.xml-20070327_clam_digger_1.jpg

Conclusions:

- Warming GOM is biggest driver of invasive species success
  - RISCC Symposiums
  - Warmer winters/longer “seasons”
- Management very difficult:
  - Larval dispersal
  - Life histories
  - “Geography” and scope of GOM
- Aquaculture industry feeling the “heat”
  - Fisheries like soft shell clam continue to suffer.
  - Other “fisheries” impacted as well (scallops, kelp, etc)

Thank you!!


MAINE CALLING
maine public
maine public
wellsreserve
at laudholm
Wells National Estuarine

Murder Hornets, Microbes and Mites

Exotic Pests Impacting Honey Bees

Jennifer Lund
Maine State Apiarist
Department of Agriculture, Conservation, and Forestry
Division of Animal and Plant Health
Email: jennifer.lund@maine.gov
Office: 207-287-7562
Cell: 207-441-5822

Western Honeybee

- *Apis mellifera*
  - *Apis* is Latin for "bee", and *mellifera* comes from Latin *melli-* "honey" and *ferre* "to bear“
- Native to the continents of Europe, Asia, and Africa
- The insect was introduced to North America, early 1600s

20,000 species of bees worldwide

8 honey bee species worldwide: *A. andreniformis*, *A. florea*, *A. dorsata, A. laboriosa*, *A. cerana*, *A. nigrocincta*, *A. koschevnikovi, A. mellifera*


The
Children's


Worth1000.com

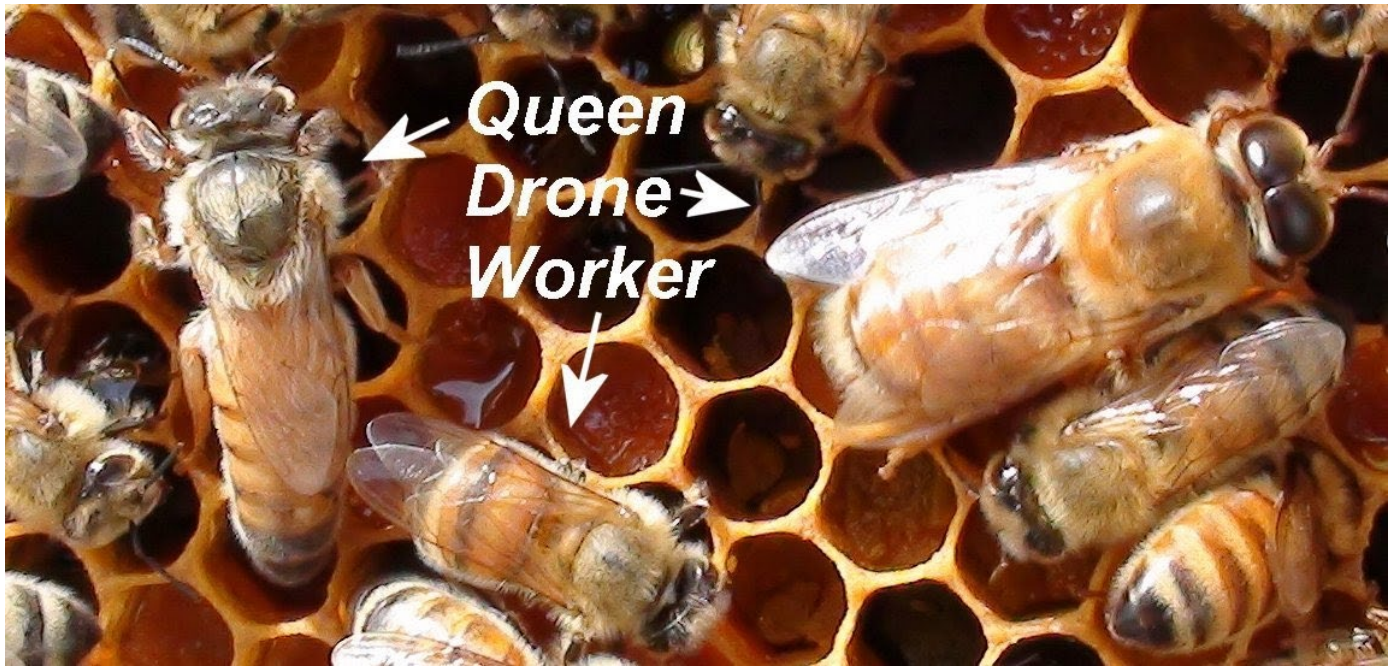
Social Behavior of Bees

- Social
  - 10% of species in the U.S.
  - Bumble and honey bees
  - Several generations in a nest at the same time
  - Cooperation in caring for young that are not their own
  - Division of labor

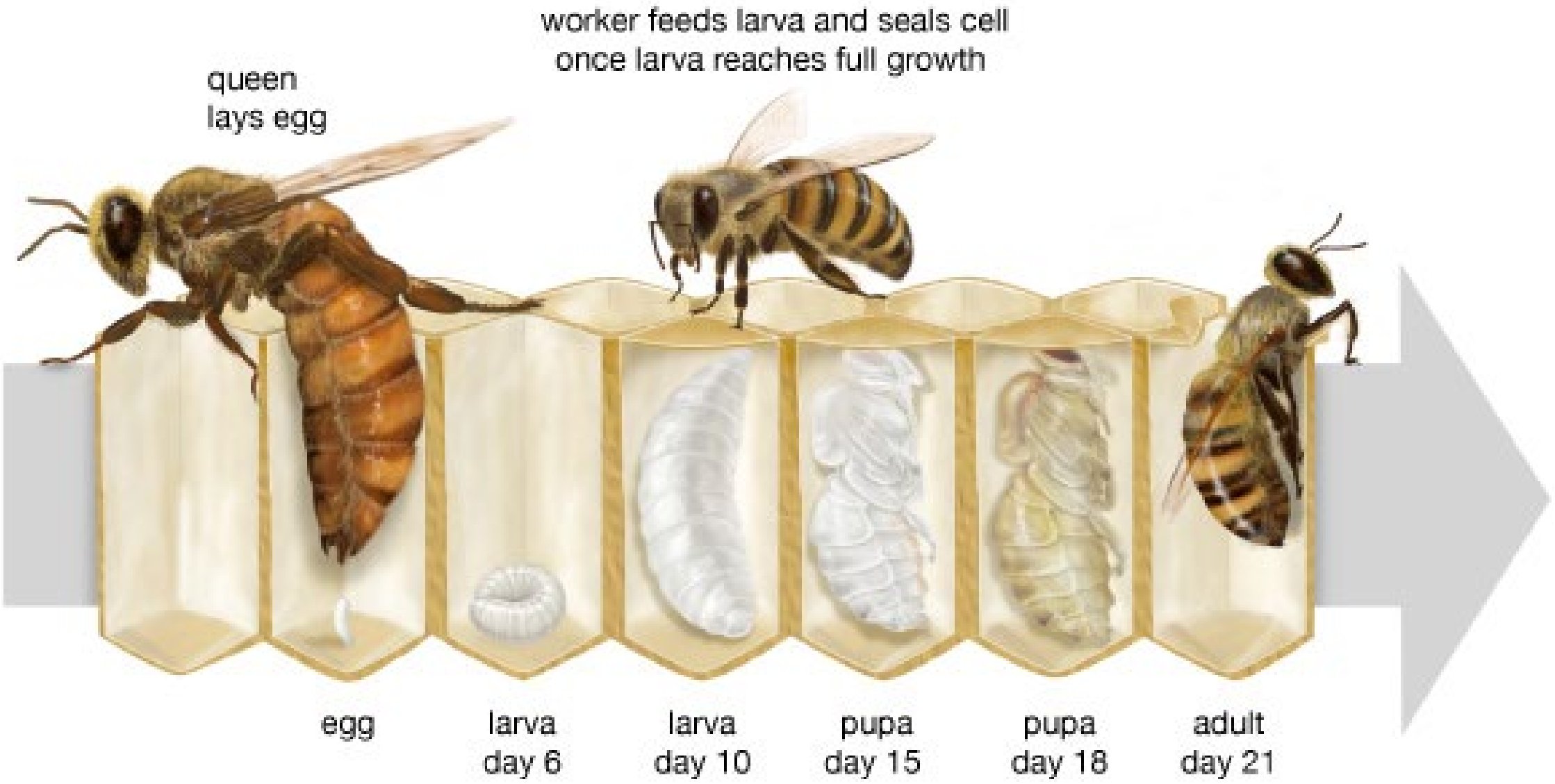
- Solitary
  - 90% of species in the U.S.
  - Each female constructs and provisions her own nest

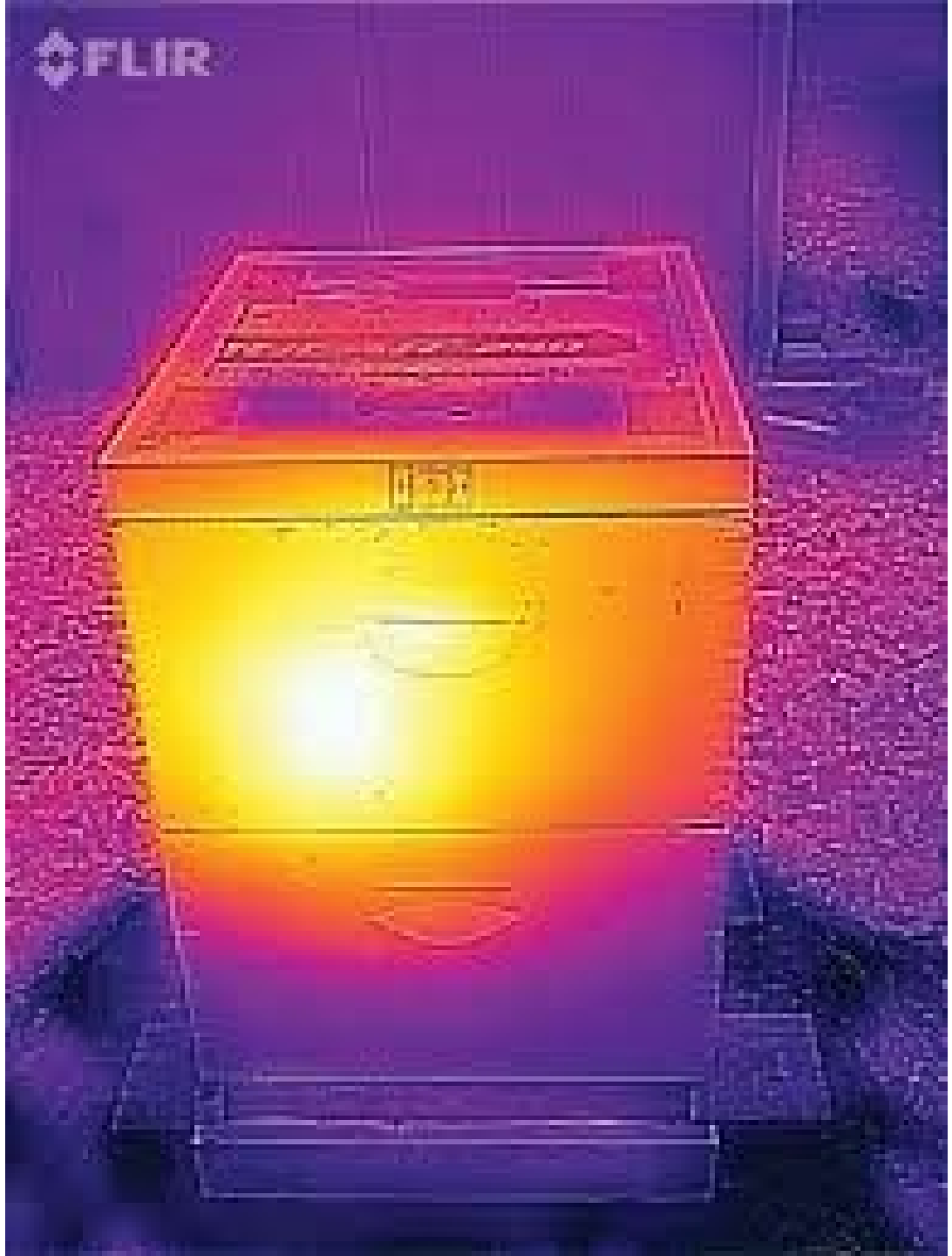
Members of a Colony

- Eggs
- Larvae
- Queen (Female)
  - Typically 1 per hive
- Workers (Female)
  - 10,000-60,000
- Drones (Male)
  - 100-500



Lifecycle




FLIR

Social Wasp/ Bumble Bee Lifecycle

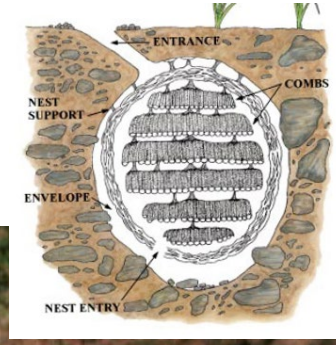
- Queen begins colony in spring
- Lays eggs which hatch into workers
- As the colony grows, workers take over caring for young
- Late summer/fall: drones and queens produced and mate
- Mated queens overwinter**
- Remaining colony and old queen dies after first hard frost

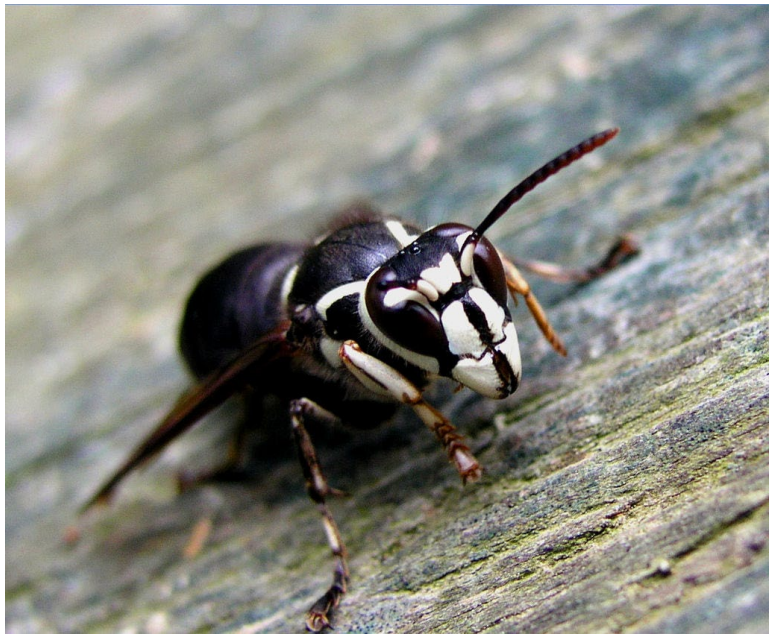
Mice: life blogspot

**A single mated females can start a whole colony

North America Social Wasps

- Native:
  - Yellow jackets
    - *Vespula* spp.
    - *Dolichovespula* spp.
  - *Polistes* spp. wasps
- Non-Native:
  - True hornets (*Vespa* spp.)
    - European Hornet
    - Northern Giant Hornet
    - Yellow-legged Hornet





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  - *Polistes* spp. wasps
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  - True hornets (*Vespa* spp.)
    - European Hornet
    - Northern Giant Hornet
    - Yellow-legged Hornet

European Hornet

Family Vespidae

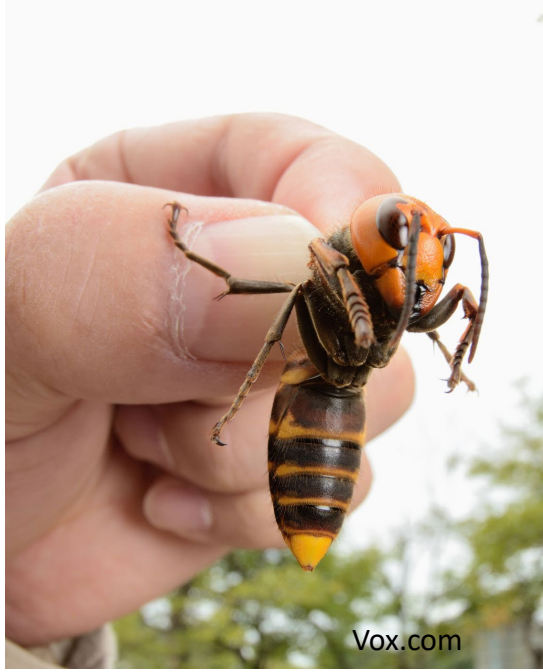
Vespa crabro

- Introduced in the 1800s
- Identification:
  - Abdomen striped brown and yellow
  - Head and thorax with red marlkings
  - Wings reddish-orange
  - Eyes indented and shaped like a "C"
- Primarily hunt large insects but are opportunistic
- Paper nests in dark places, hollow tree trunks
- Generally docile, but will sting in response to danger
- In decline and protected in several Europe countries

Northern Giant Hornet

Family Vespidae
Vespa mandarinia

https://commons.wikimedia.org



Vox.com

- Native to South and East Asia
- Identification:
  - World's largest hornet: up to 2 in long, 3 in wide
  - Head yellow-orange
  - Abdomen bands of dark brown/orange, yellow-orange tip
  - Thorax dark brown with tawny wings
  - Stinger 1⁄4 in long, venom neurotoxin with a LD50 of 4.0 mg/kg in mice

https://qz.com/136411/how-to-ward-off-a-giant-hornet-attack/

- Nests:
  - Almost exclusively subterranean
  - Created by digging, co-opting abandoned rodent tunnels, or occupying spaces under tree roots

https://commons.wikimedia.org

Northern Giant Hornet

Family Vespidae

Vespa mandarinia

- Hunts medium to large insects, social bees and wasp species favored

- Killing a western honey bee (*A. mellifera*) colony
  - Scout(s) approach hive, produce pheromones
  - One hornet can kill 40 bees per minute
  - 50 hornets can kill a colony in a few hours
  - NGH dismember the bodies, drink the juices for energy
  - Chew bees into a paste and return nest to feed larvae

- Eastern honey bees (*A. cerana*) defense mechanism:
  - Bees detect pheromones, set a trap
  - Honey bees swarm, vibrate muscles to overheat (115F) the hornet and raise carbon dioxide to a lethal level
  - Some of the bees die but the hive survives

https://commons.wikimedia.org

https://www.snopes.com/fact-check/honey-bees-cook-murder-hornets/

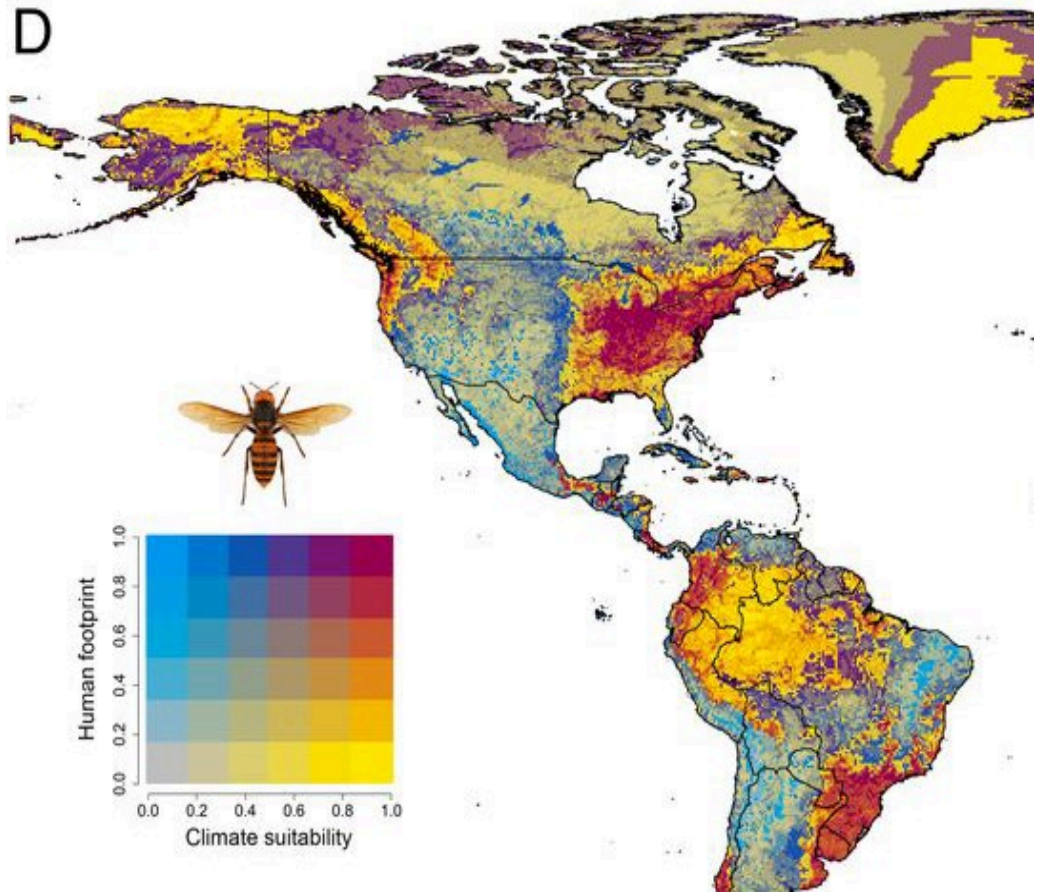
Northern Giant Hornet

Family Vespidae

Vespa mandarinia

- Aug 2019: 3 found on Vancouver Island
  - Nest found and destroyed
- Dec 2019: 3 AGH in Blaine, Washington
- Oct 2020: 1st nest located in Blaine WA
  - To date, four nests have been found and destroyed in WA
- 2022 & 2023: no detection in WA or BC

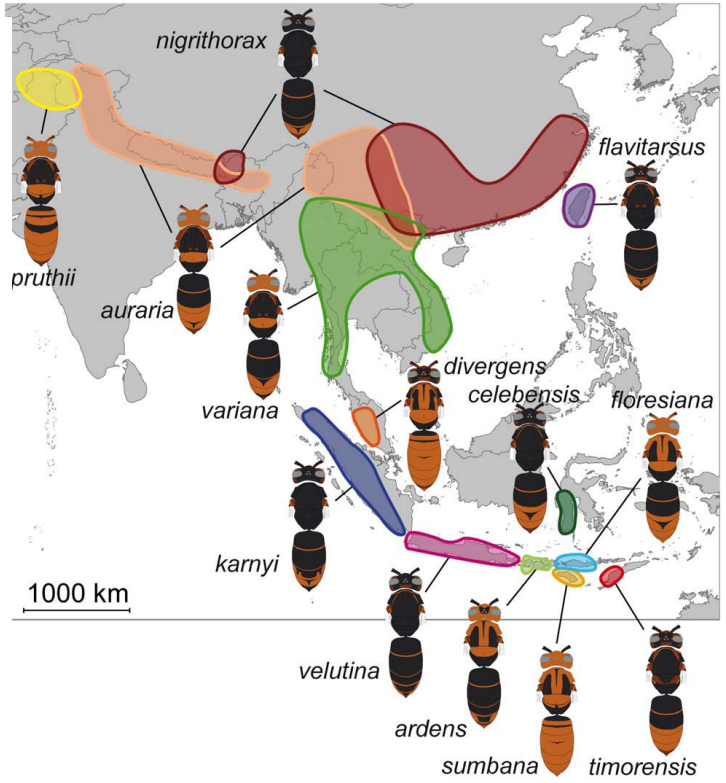
- BC and WA from different parent populations
  - BC from Japan
  - WA from S. Korea



Yellow Legged Hornet

Family Vespidae

Vespa velutina



- Native to Southeast Asia
- Identification:
  - Multiple color morphs exist, only *nigrithorax* has been introduced outside of Asia
  - 0.7 to 1 inch long
  - Head black with yellow/orange face markings
  - Thorax dark brown and velvety
  - Abdomen alternating banding with yellow/orange tip
  - Legs are black ending in yellow
- Nests:
  - Paper nests in trees and on structures such as barns, garages and sheds.
  - Large and contain a couple thousand workers

Nest of the Yellow-legged Hornet (YLH)
Vespa velutina

Yellow Legged Hornet

Family Vespidae

Vespa velutina

- Feeds on bees wasps, and flies
- Hunts around:
  - Hives
  - Flowers
  - Carcasses
- Hawking
  - Collect incoming bees
  - Foraging paralysis

Yellow Legged Hornet

Family Vespidae

Vespa velutina

- Eastern honey bee (*A. cerana*) defense mechanisms:
  - Balling behavior
  - Speed flying
  - Shimmering

- Western honey bee (*A. mellifera*), no defenses

Yellow Legged Hornet

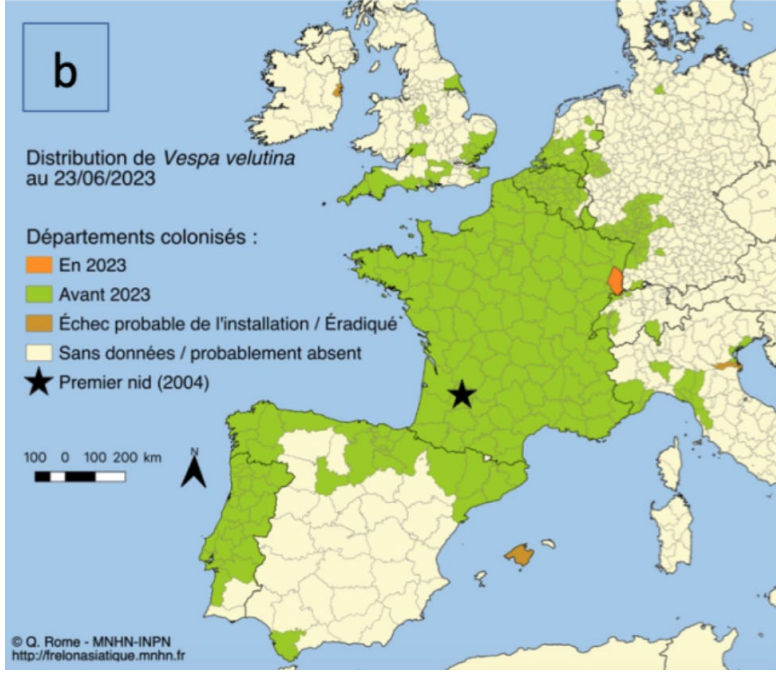
Family Vespidae

Vespa velutina

- Aug 2023: YLH near Savannah, GA
- Aug – Dec 2023: 5 nests found & eradicated
- Nov 2023: YLH found in Jasper County SC

- Europe: first discovered in 2004, France
  - Control efforts cost millions each year
  - 30% of commercial colonies were weakened, and 5% were killed outright
  - HB are 70% of prey in urbanized areas, 30% in agricultural areas

- Why are we worried:
  - Single queens easily transported in soil
  - Multiple drone mating (3-5)
  - 300-400 queens produced per colony
  - Disperse 30+miles



Villemant et al., 2011

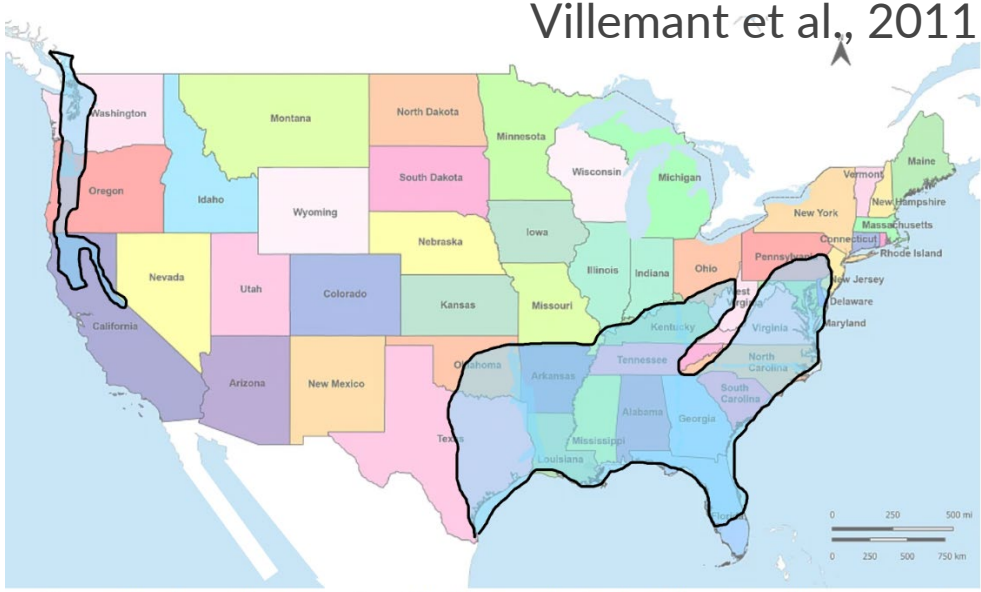


Figure 3. Regions of North America with climate well suited to Yellow-legged Hornet survival. Other regions with lower climate suitability not shown. Adapted from Villemany et al. (2011).

Varroa Mites

A current threat to honey bees

Losses 2022/2023

2022/2023 Loss: **37.4%**

Summer: 8.1%

Winter: 29.4%

2021/2022 Loss: **33.7%** (5.7%, 28.0%)

2020/2021 Loss: **43.9%** (9.2%, 34.7%)

2019/2020 Loss: **35.8%** (9.7%, 26.1%)

2018/2019 Loss: **45.2%** (6.2%, 39.0%)

2017/2018 Loss: **43.4%** (7.0%, 36.4%)

2016/2017 Loss: **45.0%** (5.9%, 39.1%)

County	N	Summer Loss (%)	Winter Loss (%)	Total Loss (%)
Androscoggin	8	3.6	32.1	35.7
Aroostook	4	0.0	75.0	75.0
Cumberland	80	6.8	37.1	43.9
Franklin	5	15.4	38.5	53.8
Hancock	7	17.0	14.9	31.9
Kennebec	33	4.6	32.3	36.9
Knox	14	6.5	22.6	29.0
Lincoln	17	9.6	20.2	29.8
Oxford	7	24.1	48.3	72.4
Penobscot	32	11.0	21.2	32.2
Piscataquis	0	ND	ND	ND
Sagadahoc	7	6.9	24.1	31.0
Somerset	15	2.1	30.5	32.6
Waldo	15	4.2	18.3	22.5
Washington	3	16.0	48.0	64.0
York	50	8.0	29.1	37.1

Losses 2019/2020: 35.8%

Summer:

- Queen loss/failure (13.8%)
- Varroa mites/viruses (11.3%)
- Unknown (8.7%)
- Environmental factors (5.1%)

- 69.6% no summer loss (217)

Winter:

- Varroa mites/viruses (25.6%)
- Unknown (17.0%)
- Environmental factors (16.0%)
- Queen loss/failure (14.1%)

- 37.8% no winter loss (118)

Losses 2020/2021: 43.9%

Summer:

- Queen loss/failure (13.9%)
- Varroa mites/viruses (10.6%)
- Environmental factors (7.2%)
- Robbing (4.6%)
- Unknown (4.1%)

- 69.6% no summer loss (217)

Winter:

- Varroa mites/viruses (32.2%)
- Environmental factors (18.8%)
- Unknown (17.5%)
- Queen loss/failure (12.6%)
- Starvation (11.1%)

- 37.8% no winter loss (118)

Losses 2021/2022: 33.7%

Summer:

- Queen loss/failure (11.2%)
- Varroa mites/viruses (4.6%)
- Unknown (4.6%)
- Environmental factors (4.0%)
- Robbing (2.4%)

- 76.3% no summer loss (251)

Winter:

- Varroa mites/viruses (19.5%)
- Starvation (18.2%)
- Environmental factors (17.0%)
- Unknown (16.1%)
- Queen loss/failure (12.5%)

- 36.8% no winter loss (121)

Losses 2022/2023: 37.4%

Summer:

- Queen loss/failure (15.1%)
- Varroa mites/viruses (5.6%)
- Unknown (4.6%)
- Environmental factors (4.6%)
- Robbing (3.9%)

- 69.8% no summer loss (208)

Winter:

- Varroa mites/viruses (24.2%)
- Queen loss/failure (15.8%)
- Environmental factors (15.4%)
- Unknown (13.4%)
- Starvation (9.7%)

- 37.9% no winter loss (113)

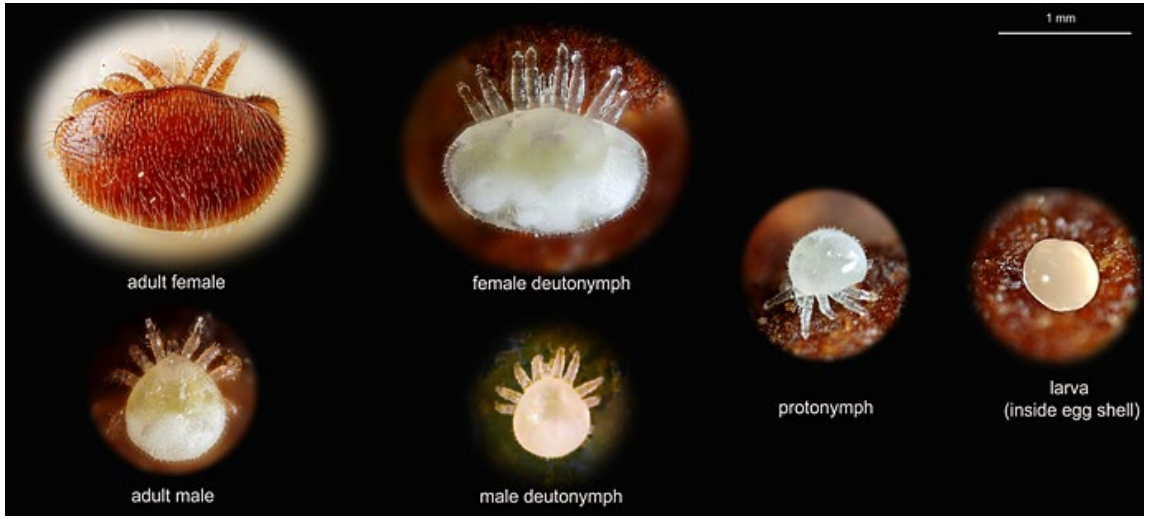
Inspector reported causes of death

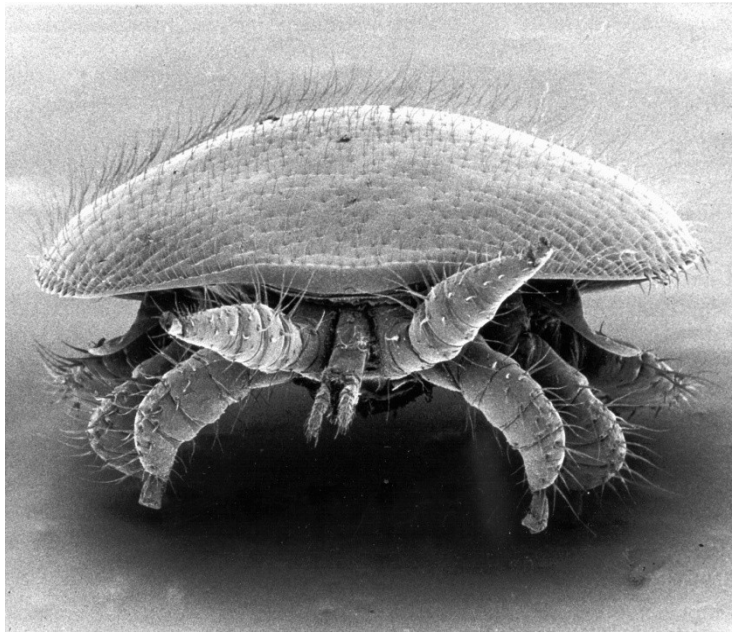
- 25% queen loss, starvation, poor winter
  - moisture, cold snaps, etc.
- 70% varroa mites and viruses
- 5% everything else
  - Foulbrood, nosema, vertebrates, insect pests, etc.

Varroa Mites

Number 1 cause of fall/winter deaths in Maine

- *Varroa destructor*
- Discovered in the United States in 1987, from SE Asia
- Small, red to brown, triangular
- Feed on adult, pupal and larval bees
- One of the largest ectoparasite to host relationship





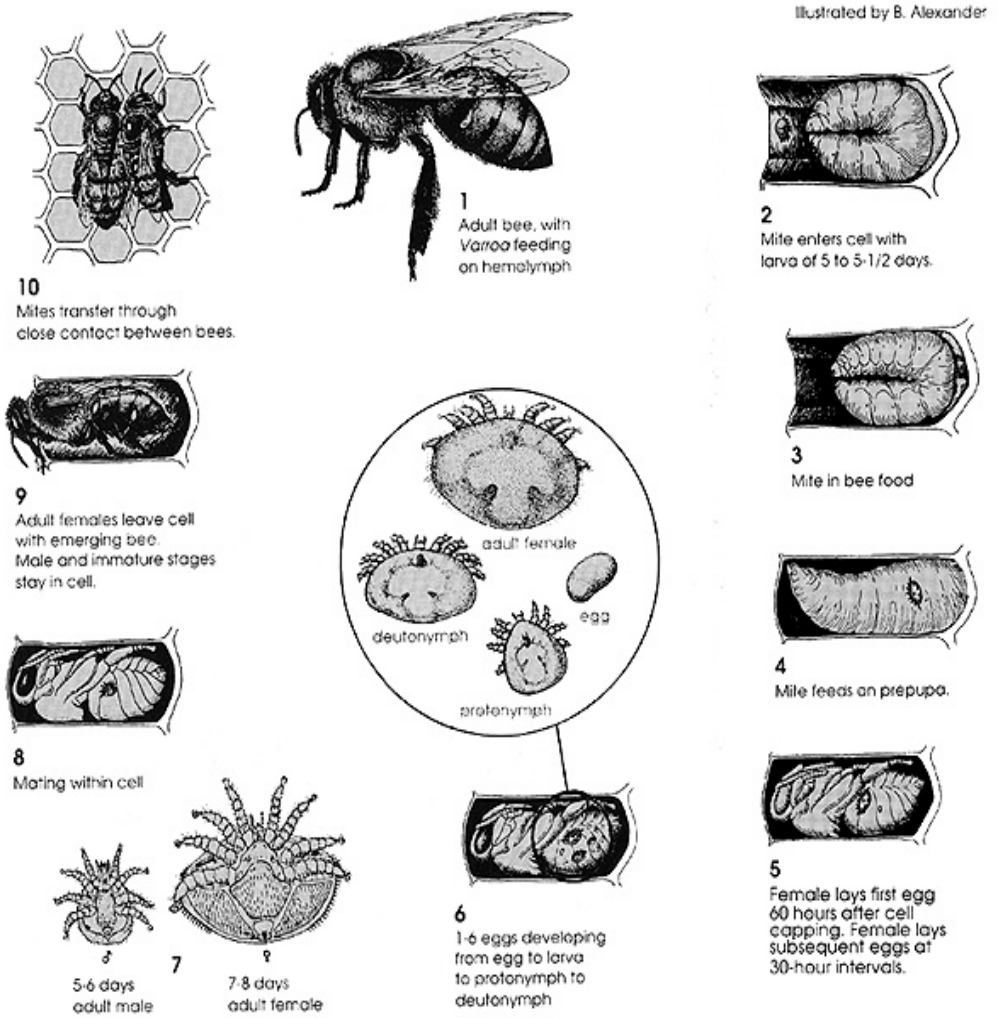
Varroa Mite – Dispersal Phase

- Female mites pass from bee to bee as they walk past one another
- Move to un-infested colonies by drift
- Mites feed between the abdominal segments
- Puncture exoskeleton and consume fat bodies

Varroa Mites - Reproductive Phase

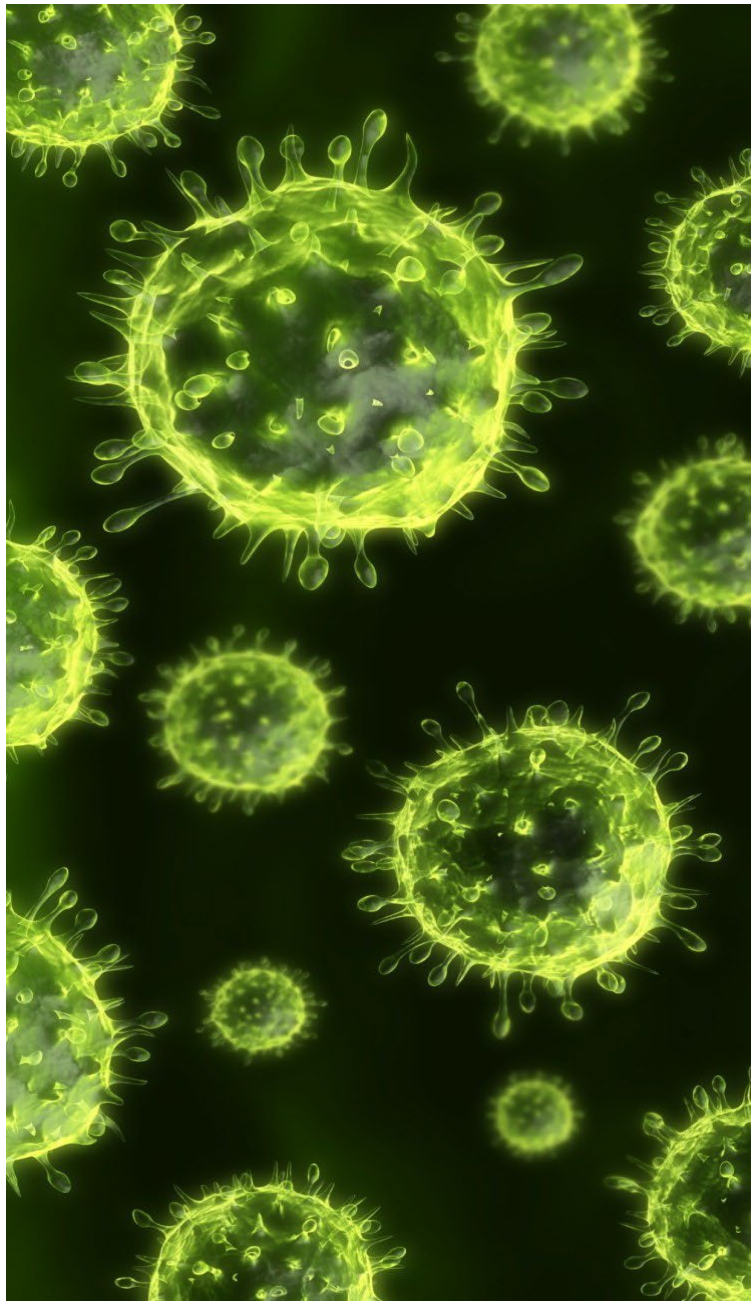
- Enters an about to be capped cell
- Mite hides in the brood food, cell is capped
- First egg is unfertilized, develops into a male mite
- Subsequent eggs (25 to 30 hours) are fertilized
- From egg to adult mite = six to seven days
- Adult mites mate before leaving cell

- Mite populations can increase 12-fold in colonies having brood half of the year and 800-fold in colonies having brood year-round



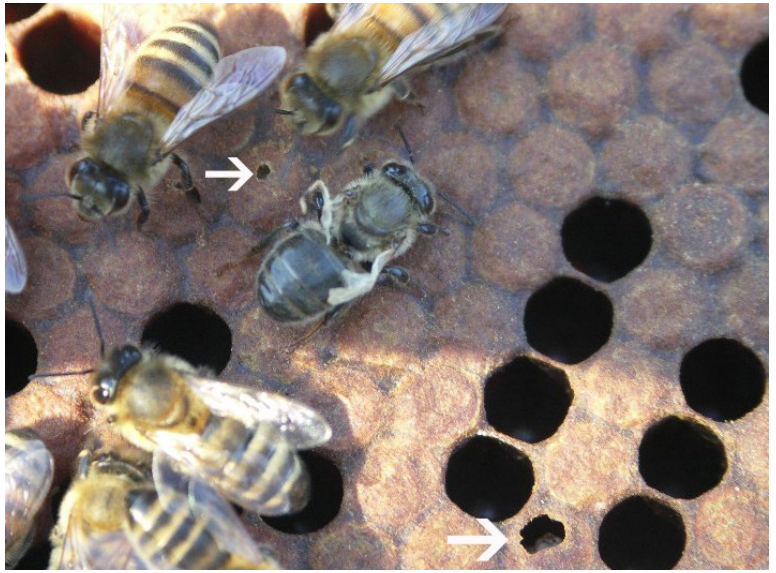
Viruses

- Around 40 viruses of honey bees have been identified
- Spread venerially, horizontally, and vertically
- Many have varroa mites associations



Generic Adult Viral Symptoms

- Trembling
- Paralysis
- Deformities
- Darkened bodies
- Greasy looking
- Hairless
- Small size
- Decreased longevity

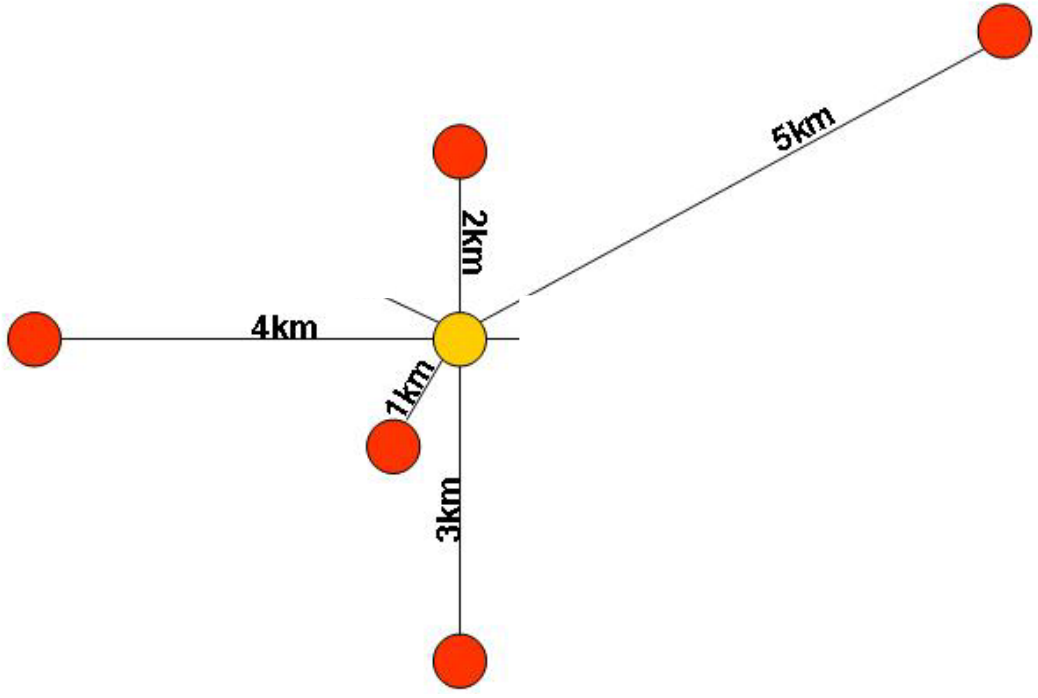


Varroa Mites

- CONSIDERED ONE OF THE BIGGEST PROBLEMS FACING HONEY BEES!!
- Disrupt immune, detoxification, back up energy supply, thermo regulation
- Can carry and spread viruses
- If left unchecked, varroa mites kill hives

Mite Bombs

- Not all hives make it to the winter
- Late fall/early winter deaths can become “mite bombs”

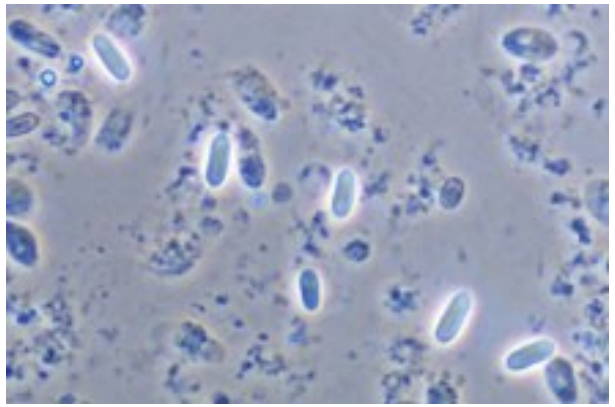


Varimorpha (Nosema)

Sometimes “invasives” turn out to be ok

*Vairimorpha (**Nosema**)* spp.

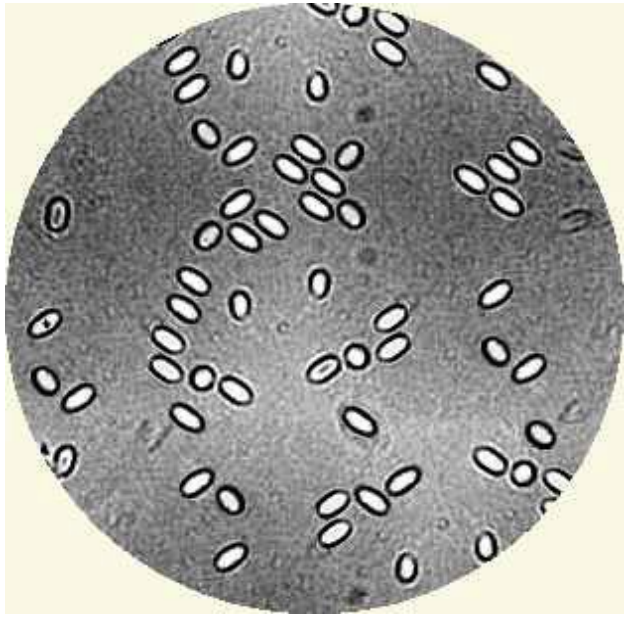
- *Vairimorpha apis* and *V. ceranae*
- Microsporidia (fungus)
- Impairs the digestion of pollen
- Dormant stage long lived
  - Resistant to heat, cold and dehydration
- Worker bees become infected as they clean up infected feces



Vairimorpha (Nosema) apis

- Was common in the spring after periods of bad weather
- Symptoms
  - Diarrhea
  - Distended abdomen
  - Workers unable to sting or fly
  - Dead bees in front of hive
  - Supersedure of the queen

Vairimorpha (Nosema) ceranae



- Higher virulence than the *V. apis*
- Symptoms can arise anytime of year
- Symptoms
  - Intestine injuries
    - Lesions
    - Digestive tract may appears whitish and swollen
  - No diarrhea
  - Often no outward sign of disease

Thank you!

Jennifer Lund

Maine State Apiarist

Department of Agriculture, Conservation, and Forestry

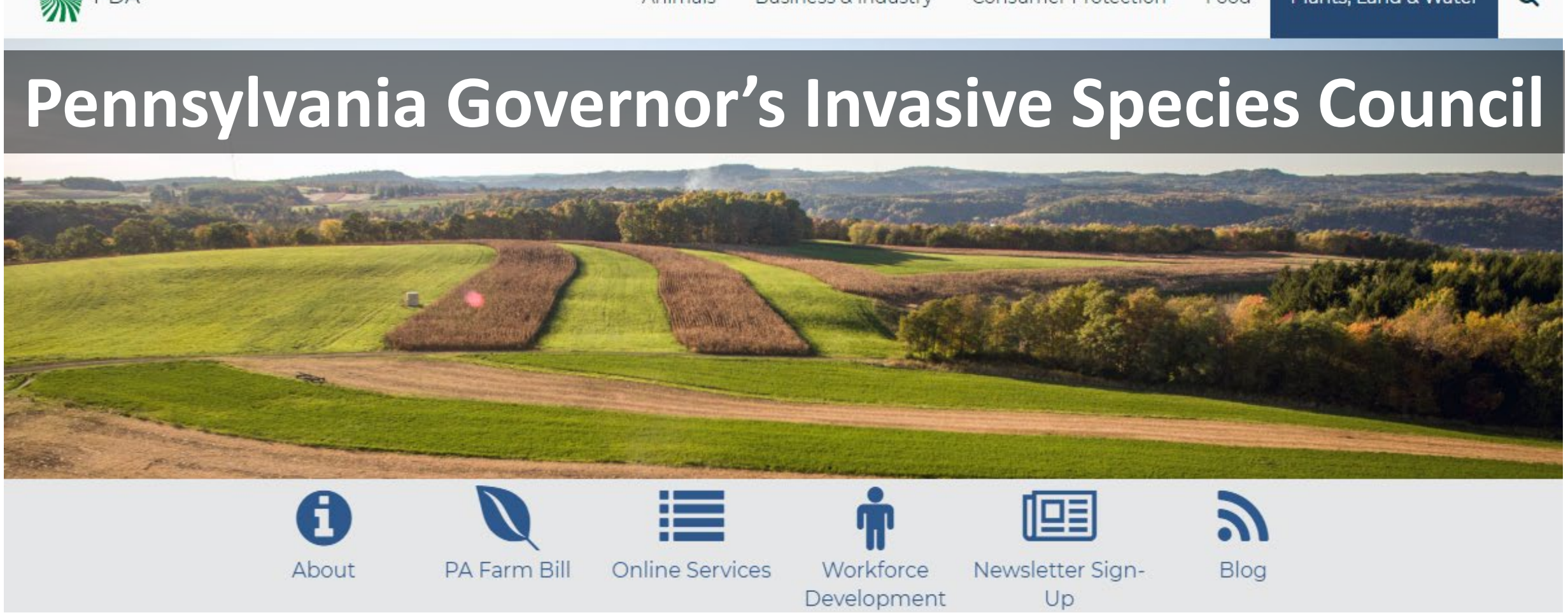
Division of Animal and Plant Health

Email: jennifer.lund@maine.gov

Office: 207-287-7562

Cell: 207-441-5822

Pennsylvania Governor's Invasive Species Council



Kristopher Abell
Coordinator

pennsylvania
DEPARTMENT OF AGRICULTURE

Origin and Purpose of the Pennsylvania Invasive Species Council

Brief History

Created by Governor's Executive Order

"The Council shall provide a forum through which multiple state agencies and non-governmental entities meet with a common purpose of identifying invasive species of concern that threaten the Commonwealth's natural and agricultural resources."

The Council shall:

1. Develop and implement a state invasive species management plan.
2. Provide guidance on prevention, control, and rapid response initiatives.
3. Facilitate coordination among federal, regional, state, and local efforts.

State Agency Members

PA Department of Agriculture (Chair)

PA Department of Conservation and Natural Resources

PA Department of Environmental Protection

PA Department of Transportation

PA Department of Health

PA Fish and Boat Commission

PA Game Commission

NGO's

Western PA Conservancy

PennAg Industries Association

PA Landscape & Nursery Association

Penn State University

PA Sea Grant

University of Pennsylvania

PA Farm Bureau

Pennsylvania Lake Management Society

Philadelphia Port Authority

Pennsylvania Association of Conservation Districts

County Commissioners Association of Pennsylvania

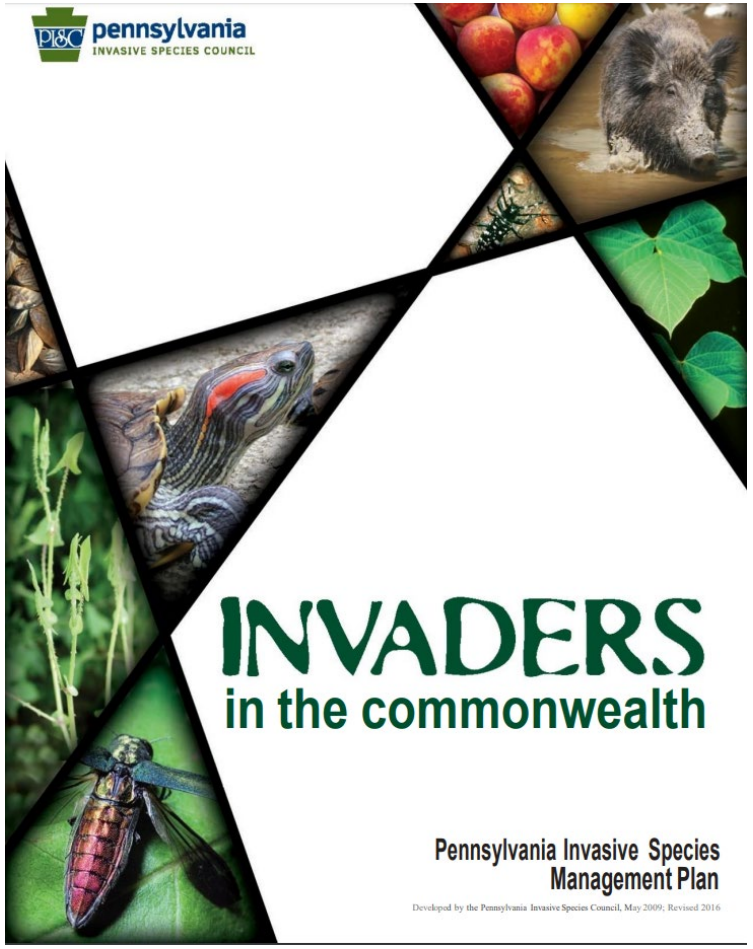
Pennsylvania State Association of Township Supervisors

Allegheny Plateau Invasive Plant Management Area

Temple University

Council Committees

1. Development of a Partnerships for Regional Invasive Species Management Program (PRISM)
2. Legislation and Policy
3. Communications
4. Invasive Species Listing
5. Aquatic Invasive Species Rapid Response Plan
6. AIS Education and Outreach



Partnerships for Regional Invasive Species Management

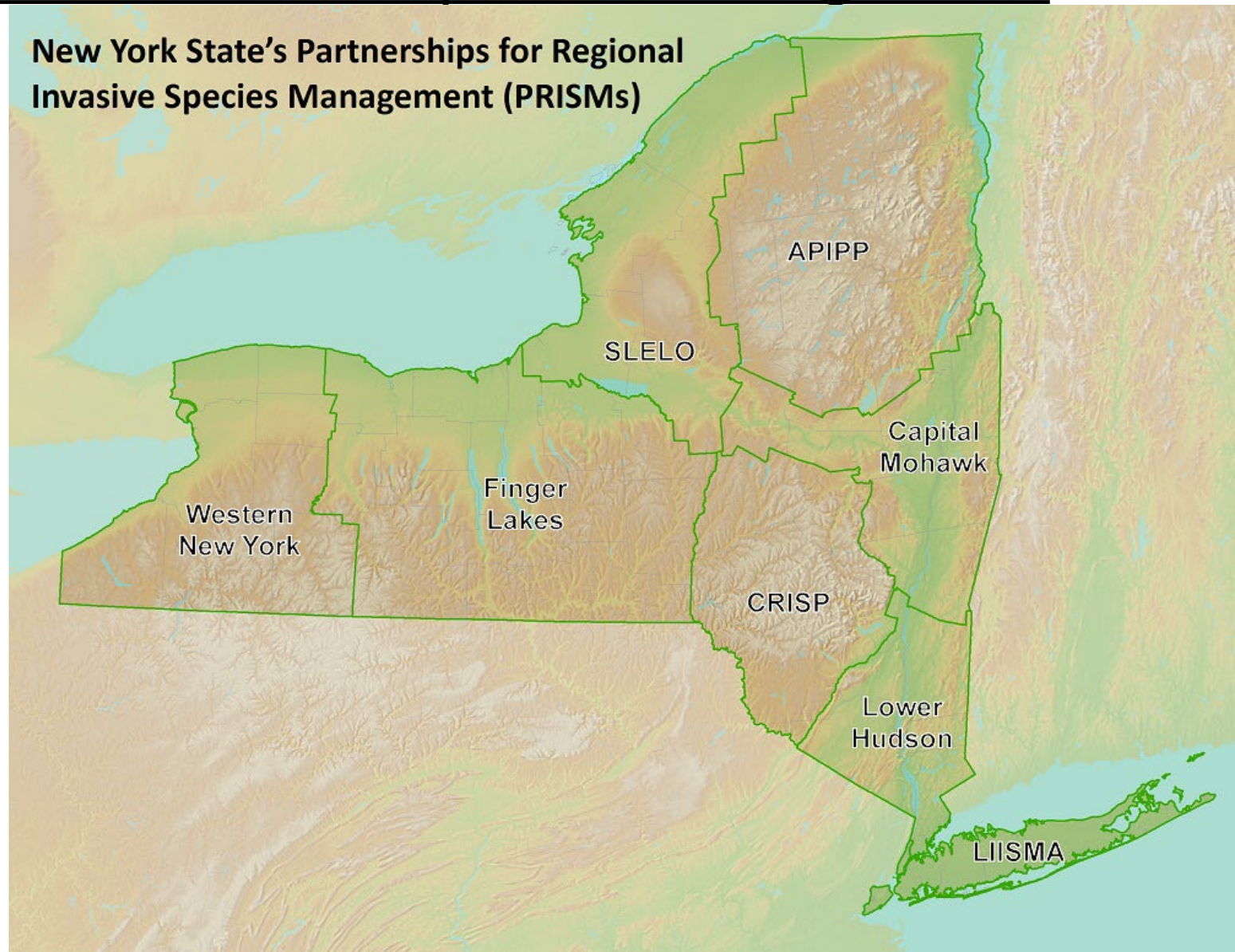
What is a PRISM Program?

- Statewide comprehensive invasive species management program

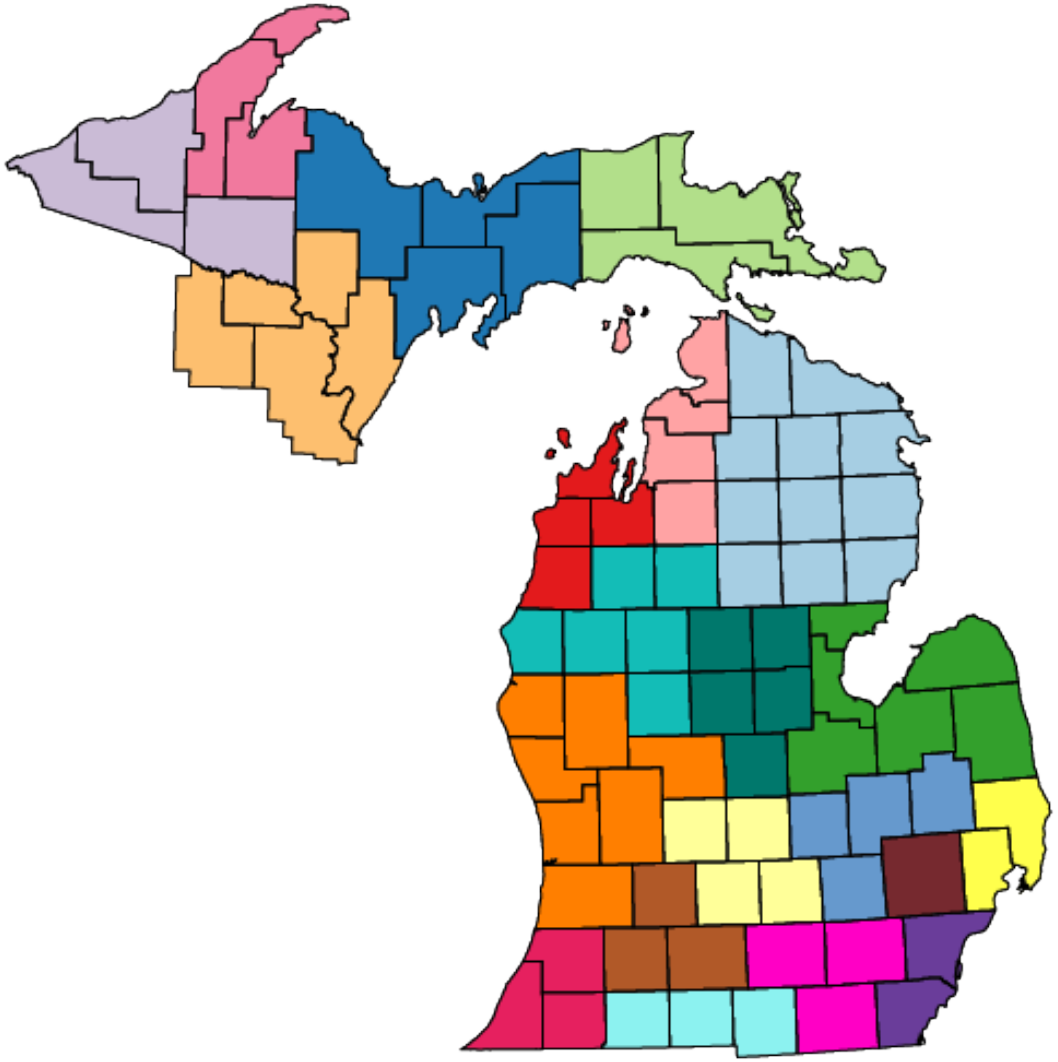
- Public-private **Partnerships**
  - Coordinated collaboration with all stakeholder groups: federal and state agencies, local government, businesses, organizations, colleges, private citizens, and more.

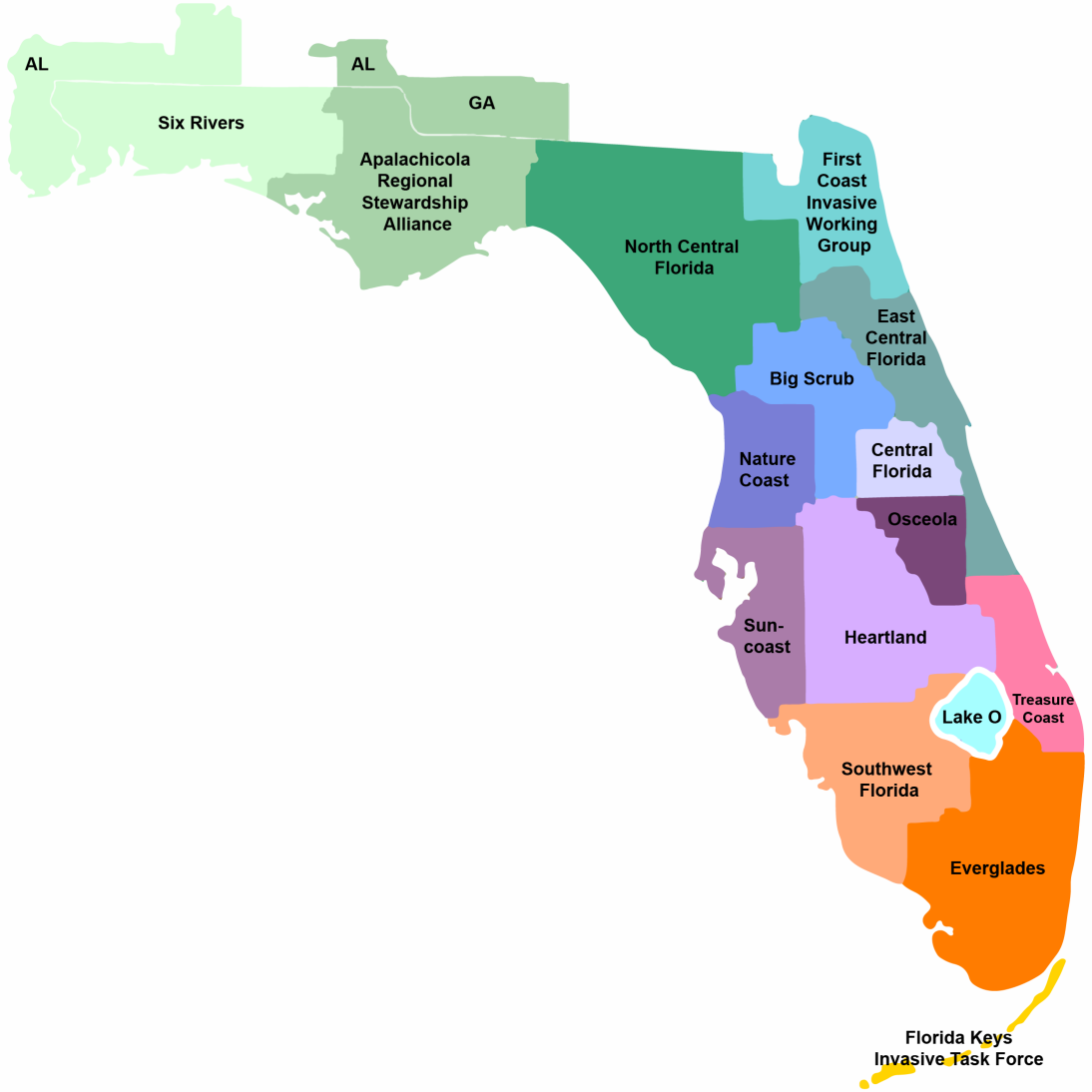
Partnerships for Regional Invasive Species Management

- **Regionally** based
  - Shared interests and values
  - Local community leadership
  - Local issues and priorities
- Single lead coordinating organization*
- State funding for capacity, stability, and legitimacy

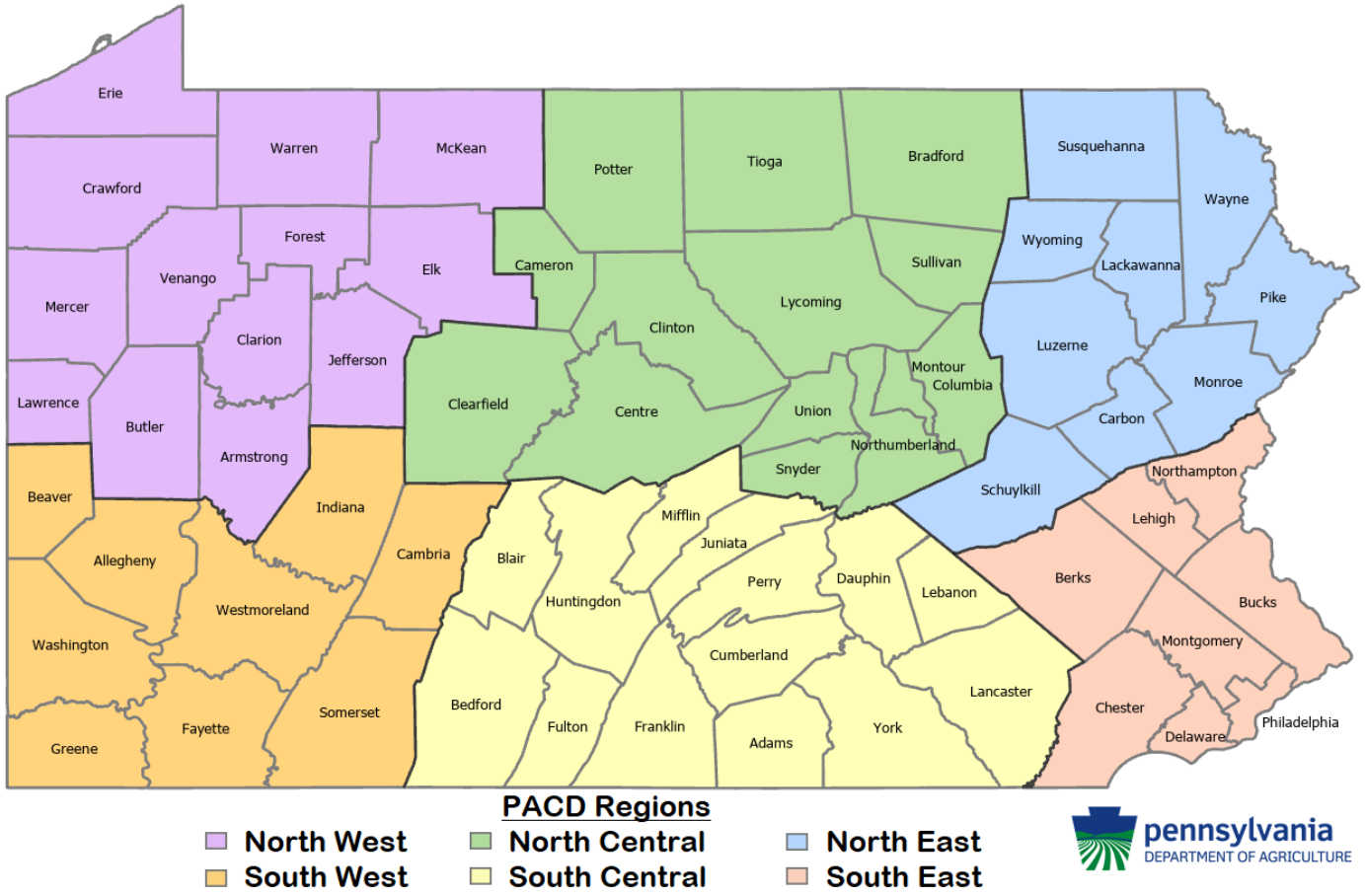


PRISMs are Regionally Based





Pennsylvania Association of Conservation District Regions



- Conservation districts are the primary local government unit responsible for the conservation of natural resources, preservation of wildlife and public lands, and the protection, health, safety and general welfare of the people.
- Conservation districts work in close cooperation with landowners, agencies of Federal and State Government, other local and county government units and other entities.

State funding needed – $4-12 million annually

What will PRISM do?

1. Build and Coordinate large and diverse partnerships.
2. Survey, map, monitor, manage, and eradicate all types of invasive species.
3. Develop early detection and rapid response capacity.
4. Provide education and outreach.
5. Organize events and volunteers.
6. Assist state agencies and universities.

Who is in a PRISM?

LOWER HUDSON PRISM

1. Bedford Audubon Society
2. Black Rock Forest Consortium
3. The Bronx River Parkway Reservation Conservancy
4. **Cary Institute of Ecosystem Studies**
5. Constitution Marsh Audubon Center & Sanctuary
6. Cornell Cooperative Extension – Dutchess County
7. Cornell Cooperative Extension – Orange County
8. **Cornell Cooperative Extension – Putnam County**
9. Cornell Cooperative Extension – Rockland County
10. Ecological Research Institute
11. Friends of the Great Swamp
12. The Friends of the Old Croton Aqueduct
13. Glenn Sungela
14. Hike New York
15. Hudson Highlands Land Trust
16. Hudsonia
17. Hudson River Sloop Clearwater
18. Jay Heritage Center
19. Mianus River Gorge, Inc.
20. The Native Plant Center
21. Natural Areas Conservancy
22. The New York Botanical Garden
23. **New York City Department of Environmental Protection**
24. New York City Department of Parks & Recreation
25. **New York-New Jersey Trail Conference**
26. Pace University
27. **The Pound Ridge Land Conservancy Inc.**
28. Putnam County Soil and Water Conservation District
29. Rye Nature Center
30. Saw Mill River Audubon
31. Scenic Hudson, Inc.
32. SOLitude Lake Management
33. Teatown Lake Reservation
34. The Invasives Project - Pound Ridge
35. Three Arrows Cooperative
36. **Trillium Invasive Species Management, Inc.**
37. Village of Tuxedo Park
38. Walter Daniels
39. Westchester County Parks, Recreation, Conservation
40. **Westchester Land Trust**
41. Winnakee Land Trust

How Effective are PRISMs?

Just some of what the NY State Lower Hudson PRISM accomplished in 2018

- 41 signed partners who participate and have dedicated 15,069 hours
- Several new invasive species were discovered in our region including Italian arum (*Arum italicum*), Japanese primrose (*Primula japaonica*), yellow archangel (*Lamiastrum galeobaldon*), and sapphireberry (*Symplocos paniculata*).
- Held 66 training sessions where 895 participants learned how to identify, manage or monitor for invasive species.
- 189 events reaching 8795 individuals about invasive species, 68 presentations which reaching 2,640 individuals

How Effective are PRISMs?

Just some of what the NY State Lower Hudson PRISM accomplished in 2018

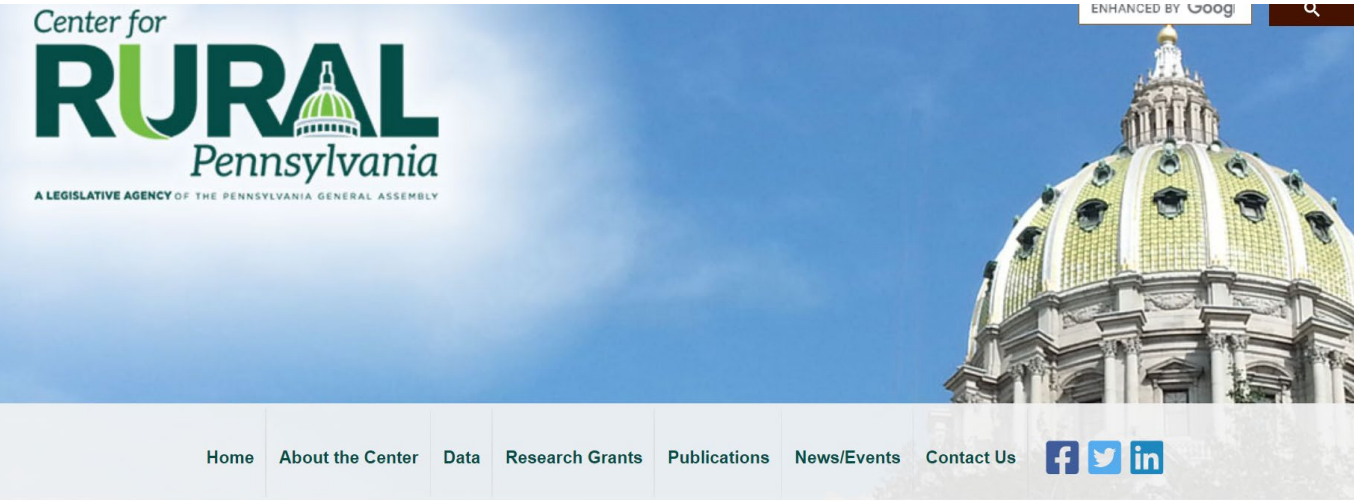
- 1,571 volunteers dedicated 14,340 hours to invasive species efforts.
- Supported 71 interns who conducted invasive management, prevention, and education work.
- Conducted 323 removal projects targeting 172 invasive species by treating 2,116 acres throughout the region.
- Treated all reported populations of 10 out of 37 of our Tier 2 species and completed treatments on several populations of an additional 5 Tier 2 species. We are actively working to treat 40% of our Tier 2 species.

How to establish PRISMs in Pennsylvania?

1. Develop implementation plan and program details
2. Governor's Office support
3. Line item in PDA budget or establish a restricted account
4. Outreach to Legislators
5. Agency advocacy
6. Advocacy from industries, organizations, clubs, associations, etc.

PRISM Program Committee

- Develop a Budget Proposal
- Implementation Plan Subcommittees
    1. Timeline
    2. Request for Funding Proposal
    3. Review Committee and procedures for evaluating RFPs
    4. Statement of Work/Contract – expectations, reporting, deliverables, etc.
    5. PRISM 5-Year Strategic Plan Guidelines
    6. GIS and Data Management – Central Clearinghouse
- Agency administration of program and staff needed



Public Hearing on Invasive Species in Rural Pennsylvania

FOR IMMEDIATE RELEASE
August 11, 2021
Agenda and Testimony (PDF) | **Video Recording**

HARRISBURG – The Center for Rural Pennsylvania, chaired by Sen. Gene Yaw, will hold a virtual public hearing on Tuesday, August 24, beginning at 10 a.m., to examine the impacts of invasive species, such as the spotted lanternfly, gypsy moth, emerald ash borer, hydrilla, and reed canarygrass, to Pennsylvania's economy, agriculture, and natural resources. The hearing will also review policy approaches to manage these invasive threats.

"Invasive species have been wreaking havoc on Pennsylvania land and waterways for decades," Sen. Yaw said. "**Research** published by the Center in 2019 estimated a direct economic impact of $13.1 million annually to Pennsylvania agriculture because of the spotted lanternfly. That's an estimate for the damage to one industry and economy for just one of many invasive species."

Department of Agriculture Secretary

Department of Conservation and Natural Resources Secretary

Fish and Boat Commission Executive Director

Penn State Fruit Research and Extension Center Director

Kane Hardwood Resource Manager

Crawford County Conservation District Watershed Specialist

Shippensburg University Law Professor

Pennsylvania Sea Grant Director

Conservation District Communications and Outreach Director

New York State Department of Environmental Conservation Invasive Species Coordination Section Chief

Council Newsletter

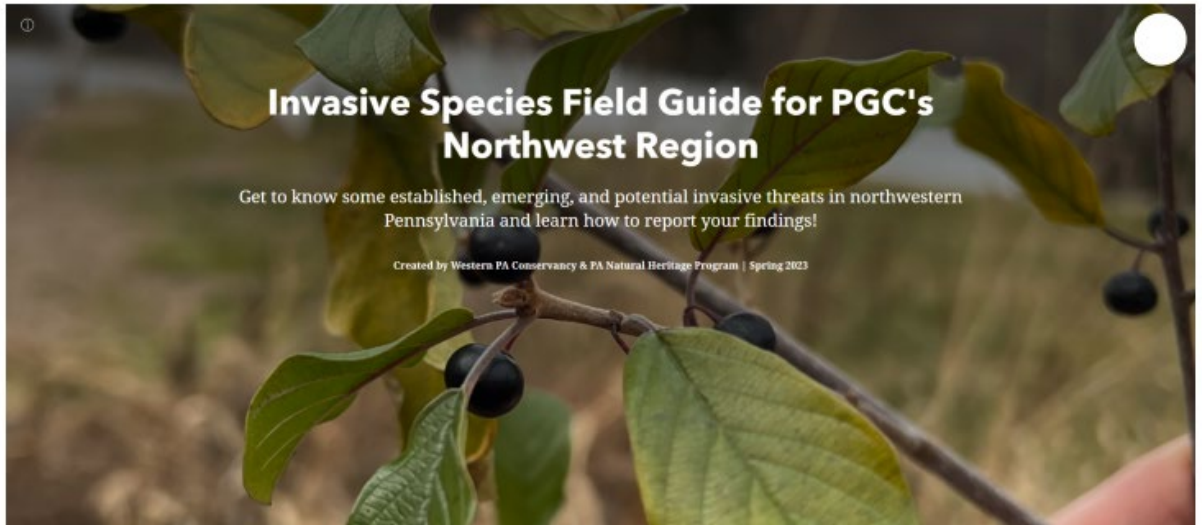
September 2021

Pennsylvania Governor's Invasive Species Council News

Please help us spread the word on invasive species challenges and solutions in Pennsylvania. Forward this newsletter to your professional networks and the Pennsylvanians you serve. Here's the signup page.

If you have a question or comment about an item in this newsletter or are interested in learning more about the Pennsylvania Governor's Invasive Species Council, drop me a line or visit the council website. — Kris Abell, Coordinator

Pennsylvania Game Commission and Western Pennsylvania Conservancy Team Up Against Invasive Species



Funding 2022

Based on work and recommendations of the Council, PDA submitted a budget request to the Governor's Office in 2021

Program: Protection and Development of Agricultural Industries, continued

Further supported by the PA Farm Bill, the State Conservation Commission operates the Resource Enhancement and Protection (REAP) tax credit program as well as the Agri-Link program, which offers interest rate reductions on loans to implement Best Management Practices (BMPs). The commission also administers the Conservation Excellence Grant Program which offers financial and technical assistance for farmers to implement BMPs in accordance with their farm plan. BMPs offer dual benefits of improved water and soil quality and economic savings by reducing inputs and preserving valuable resources.

Program Recommendations:

This budget recommends the following changes: (Dollar Amounts in Thousands)

GENERAL FUND:

General Government Operations

$ 912	—to replace nonrecurring benefits cost reduction.
2,944	—to continue current program.
$ 3,856	*Appropriation Increase*

Transfer to Dog Law Administration

$ 1,660	—to supplement insufficient license fee revenues to cover dog law enforcement costs.

Agricultural Preparedness and Response

$ 3,500	—Initiative—to monitor and respond to impacts of invasive species.

Animal Health and Diagnostic Commission

$ (2,000)	—program elimination.

Transfer to Agricultural College Land Scrip Fund

$ 2,748	—Initiative—to invest in higher education and improve college access and completion.

University of Pennsylvania - Center for Infectious Disease

$ 1,598	—Initiative—to invest in higher education and improve college access and completion.

Funding 2022

Based on work and recommendations of the Council, PDA submitted a budget request to the Governor's Office

Appropriations within this Program:

(Dollar Amounts in Thousands)

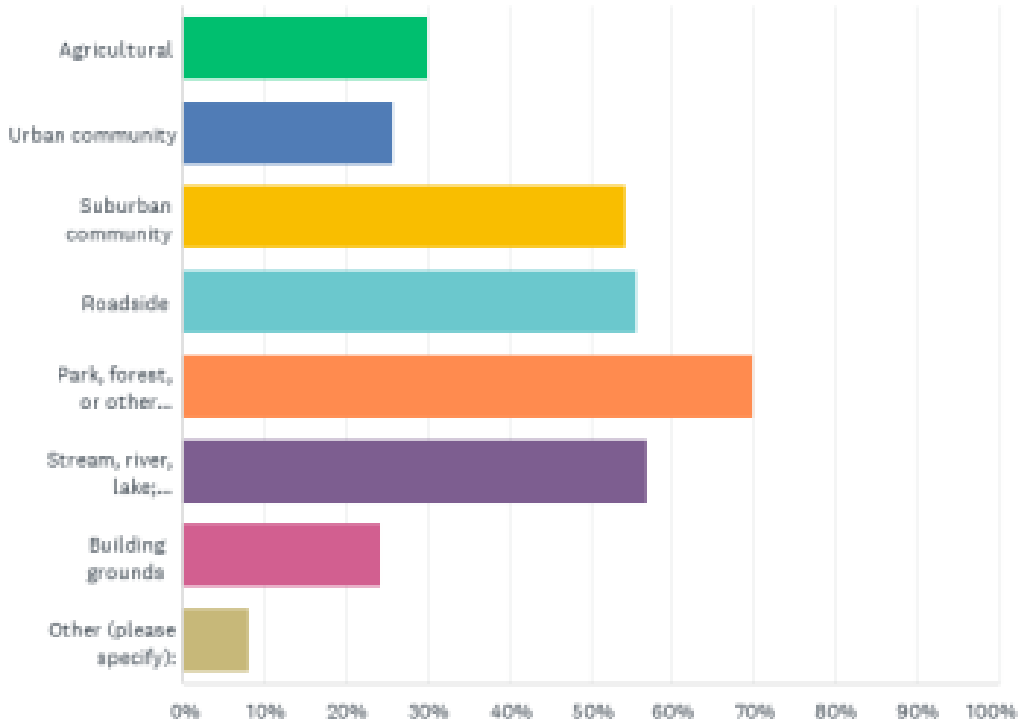
	2020-21 Actual	2021-22 Available	2022-23 Budget	2023-24 Estimated	2024-25 Estimated	2025-26 Estimated	2026-27 Estimated
GENERAL FUND:							
General Government Operations	$ 33,128	$ 34,952	$ 38,808	$ 38,808	$ 38,808	$ 38,808	$ 38,808
Transfer to Dog Law Administration	-	1,340	3,000	4,250	5,640	6,130	6,440
Agricultural Preparedness and Response	3,000	3,000	6,500	6,500	6,500	6,500	6,500
Agricultural Excellence	2,800	2,800	2,800	2,800	2,800	2,800	2,800
Agricultural Business and Workforce Investment	4,500	4,500	4,500	4,500	4,500	4,500	4,500
Agricultural Research	2,187	2,187	2,187	2,187	2,187	2,187	2,187
Agricultural Promotion, Education, and Exports	553	553	553	553	553	553	553
Hardwoods Research and Promotion	474	474	474	474	474	474	474
Livestock and Consumer Health Protection	1,000	1,000	-	-	-	-	-
Animal Health and Diagnostic Commission	2,000	2,000	-	-	-	-	-

Funding 2022

High Path Avian Influenza Update and the On-Farm Financial Impacts from an Outbreak

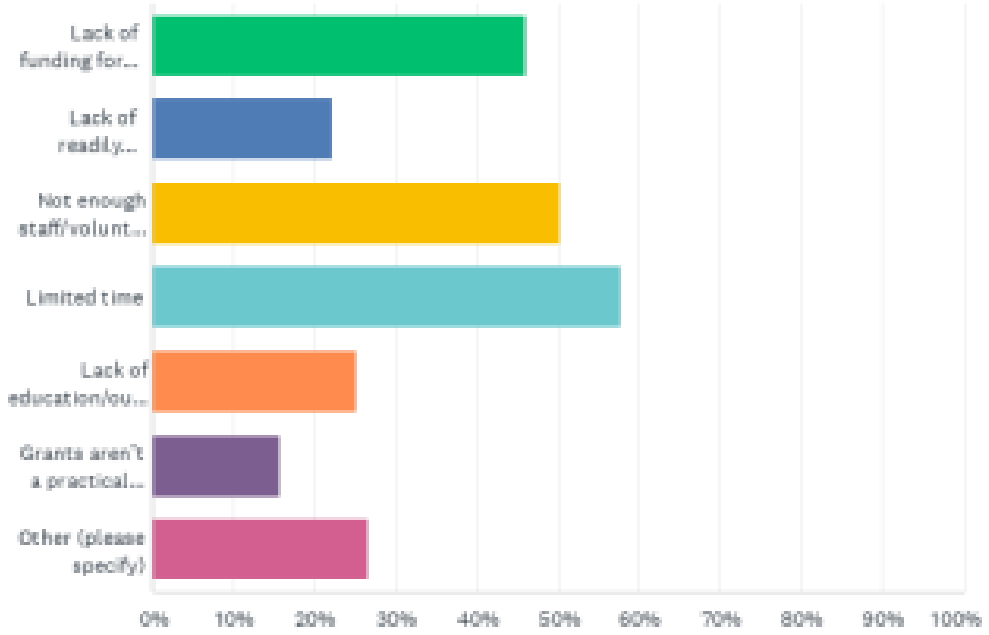
Governor's Invasive Species Council:
Pennsylvania Invasive Species Impacts Survey 2022

Q4 In what setting(s) do you most often encounter invasive species? Check all that apply.



Governor's Invasive Species Council:
Pennsylvania Invasive Species Impacts Survey 2022

Q21 What limits your ability to manage any of the invasive species identified above? Check all that apply.



Pennsylvania Invasive Species Impacts Survey 2022

Q9 Example location of impact:

Statewide Invasive Species Impact Survey

Interviews completed: WESA FM Pittsburgh, WBNG TV Binghamton

Interview scheduled: WITF FM Harrisburg

“Pilot program announced to combat invasive species across Pennsylvania.” FOX43

“Invasive species are a scourge in PA, report says.” Pittsburgh Tribune Review

“Invasive species program promises to address ongoing issues in Pa.” NorthcentralPA.com

“PA council takes aim at invasive species.” Bedford Gazette

“Gov.'s Invasive Species Council shares results of survey, starts pilot program.” Bradford Era

“Findings from PA's first ever survey on the impact of invasive species released.” Franklin County Free Press

“PA announces findings of invasive species survey, creates management program.” NewsTalk103.7

Pilot PRISM Program in NW PA

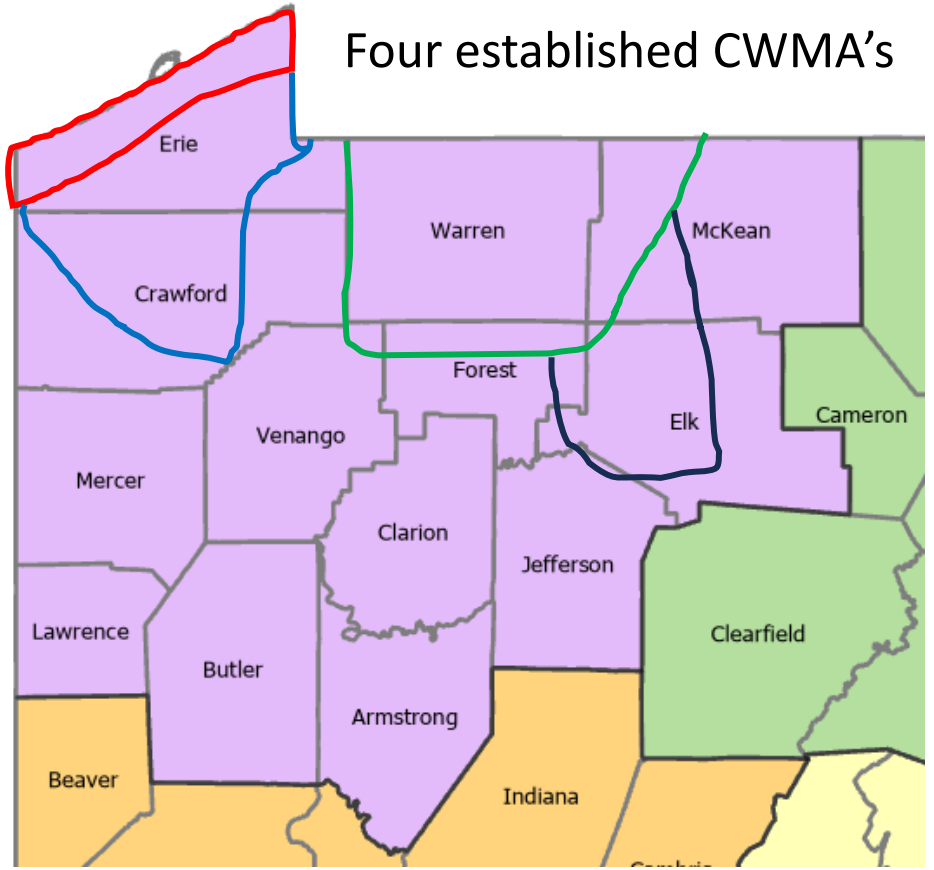
Applied for USDA Forest Service Landscape Scale Restoration grant

$250,00 to be administered by the Pennsylvania Association of Conservation Districts

Mini-grant program to individual districts

Advisory Committees

Four established CWMA's



Funding 2023-24

New Administration – starting from scratch

Continue to submit recommendations and budget request

Current priorities are economic development and job creation

JUNE 2023

2023 BIENNIAL REPORT

PENNSYLVANIA GOVERNOR'S INVASIVE SPECIES COUNCIL

pennsylvania
DEPARTMENT OF AGRICULTURE

Pennsylvania Native Species Day

May 18, 2023

Pennsylvania Native Species Day

Thursday May 16, 2024

Big Elk Creek State Park

House Ag and Rural Affairs Committee Hearing and Field Tour
September 2023

House Ag and Rural Affairs Committee Hearing and Field Tour

House Ag and Rural Affairs Committee Hearing and Field Tour

House Ag and Rural Affairs Committee Hearing and Field Tour

Recording Available

Northwest Pennsylvania Invasive Species Stakeholder Meeting

November 17, 2023 at Moshannon State Forest

- Facilitate networking, cooperation, and PRISM
- Focused on NW PA projects and issues
- ~70 attended in person
- 13 Presentations

A recording of the meeting is available online.

Northwest Pennsylvania Invasive Species Stakeholder Meeting

PENNSYLVANIA DEPARTMENT OF AGRICULTURE

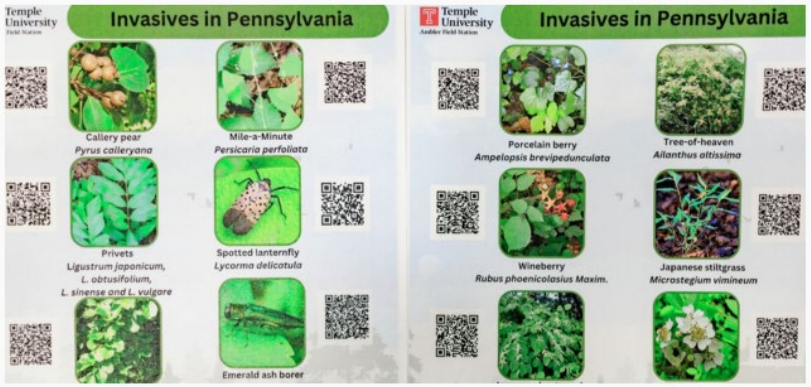
food for thought

COMING TOGETHER TO COMBAT INVASIVE SPECIES

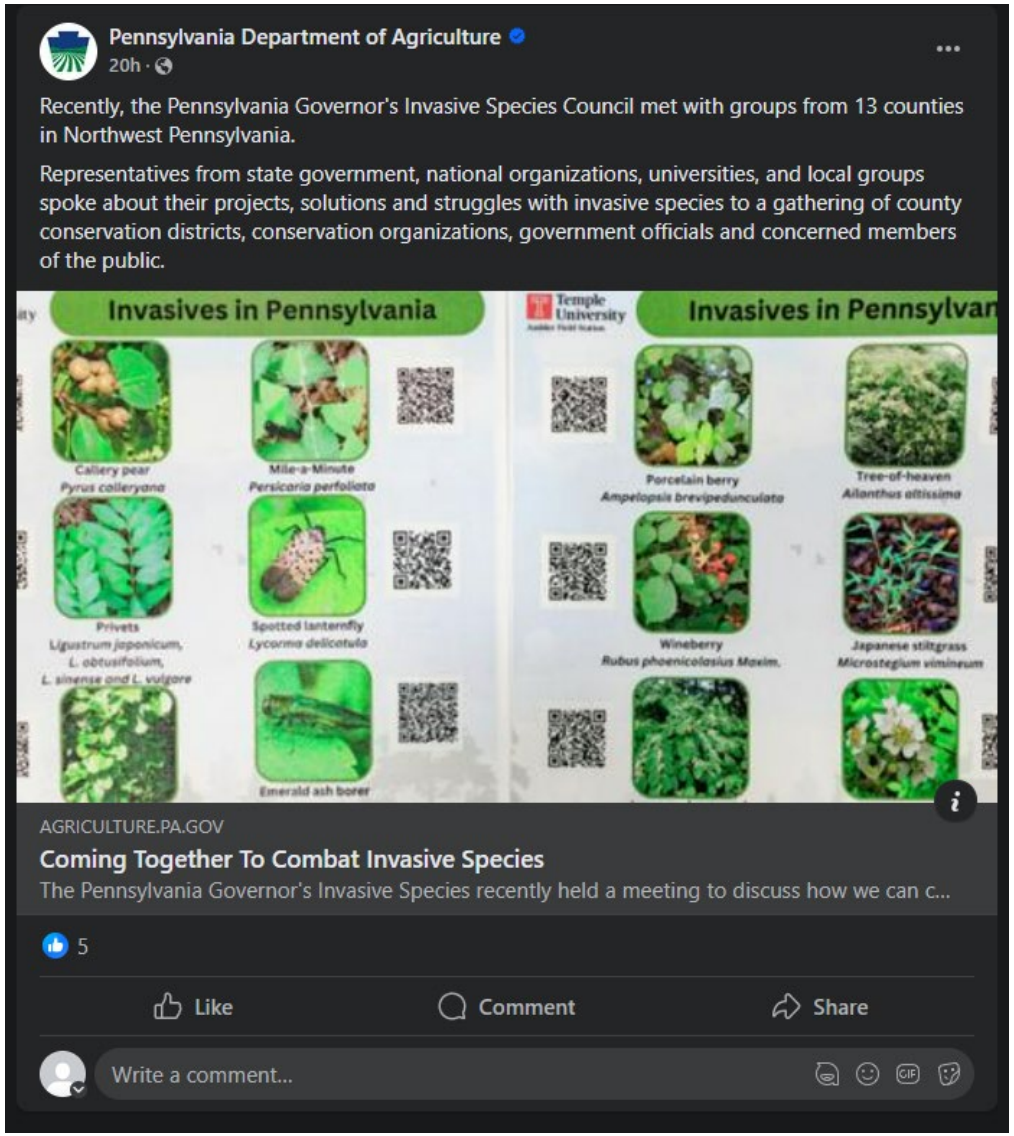
Tags: Invasive Species

December 01, 2023 01:30 PM

By: Governor's Invasive Species Council



Invasive species are a costly problem in Pennsylvania, and their effects impact virtually every economic interest and ecosystem. Their impacts are felt on our farms, in our waterways, throughout our forests, and in our pocketbooks across



Introduce New Legislation: The Invasive Species Act

Establish the Invasive Species Council in statute

Create a restricted Invasive Species Account with annual appropriation

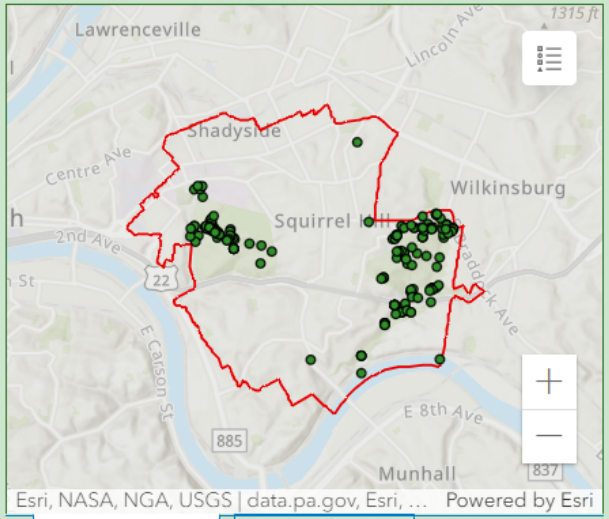
Authority and mandate for PRISM

https://wpcgis.maps.arcgis.com/apps/dashboards/1a002e0cde054d08baa1db0103858b12

Pennsylvania Noxious Weeds by Legislative District

START HERE!
House District 23 - The ...

The Honorable Dan Frankel
Pennsylvania House of Representatives
District 23



District Map | PRISM Map

Your Proposed PRISM Region: South West

News In Your PRISM Region:

"Pennsylvania banning sale of Japanese barberry" by 2023 by WPXI News Staff

"Invasive plants: Southwestern Pennsylvania's most wanted list" by TRIB Live

"Fighting the spread of invasive plants in Murrysville, Pittsburgh and Southwestern Pennsylvania" by TRIB Live

# of Noxious Weeds in Your District

25

Noxious Weeds Observed in District

- **Amur Honeysuckle** *Lonicera maackii*
  iMap Record Count: 10
- **Bohemian Knotweed** *Reynoutria x bohemica*
  iMap Record Count: 3
- **Bull Thistle** *Cirsium vulgare*
  iMap Record Count: 1
- **Burning Bush** *Euonymus alatus*
  iMap Record Count: 1
- **Canada Thistle** *Cirsium arvense*
  iMap Record Count: 2
- **Common Buckthorn** *Rhamnus cathartica*
  iMap Record Count: 3
- **European Privet** *Ligustrum vulgare*
  iMap Record Count: 6
- **Garlic Mustard** *Alliaria petiolata*
  iMap Record Count: 11
- **Honeysuckle (species unknown)** *Lonicera spp (species unknown)*
  iMap Record Count: 3
- **Japanese Angelica Tree** *Aralia elata*
  iMap Record Count: 1
- **Japanese Barberry** *Berberis thunbergii*

Selected Species: Bohemian Knotweed (Reynoutria x bohemica)

Jiri Kunstmuller, www.iNaturalist.org

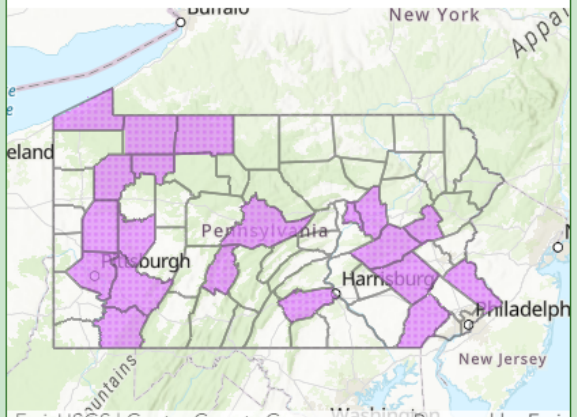
Impact Photo | Impact Video

Selected Species Impacts:

*this list of impacts is not comprehensive

Economic: Overtakes fields, pastures, along roadsides, and railways (iNaturalist)

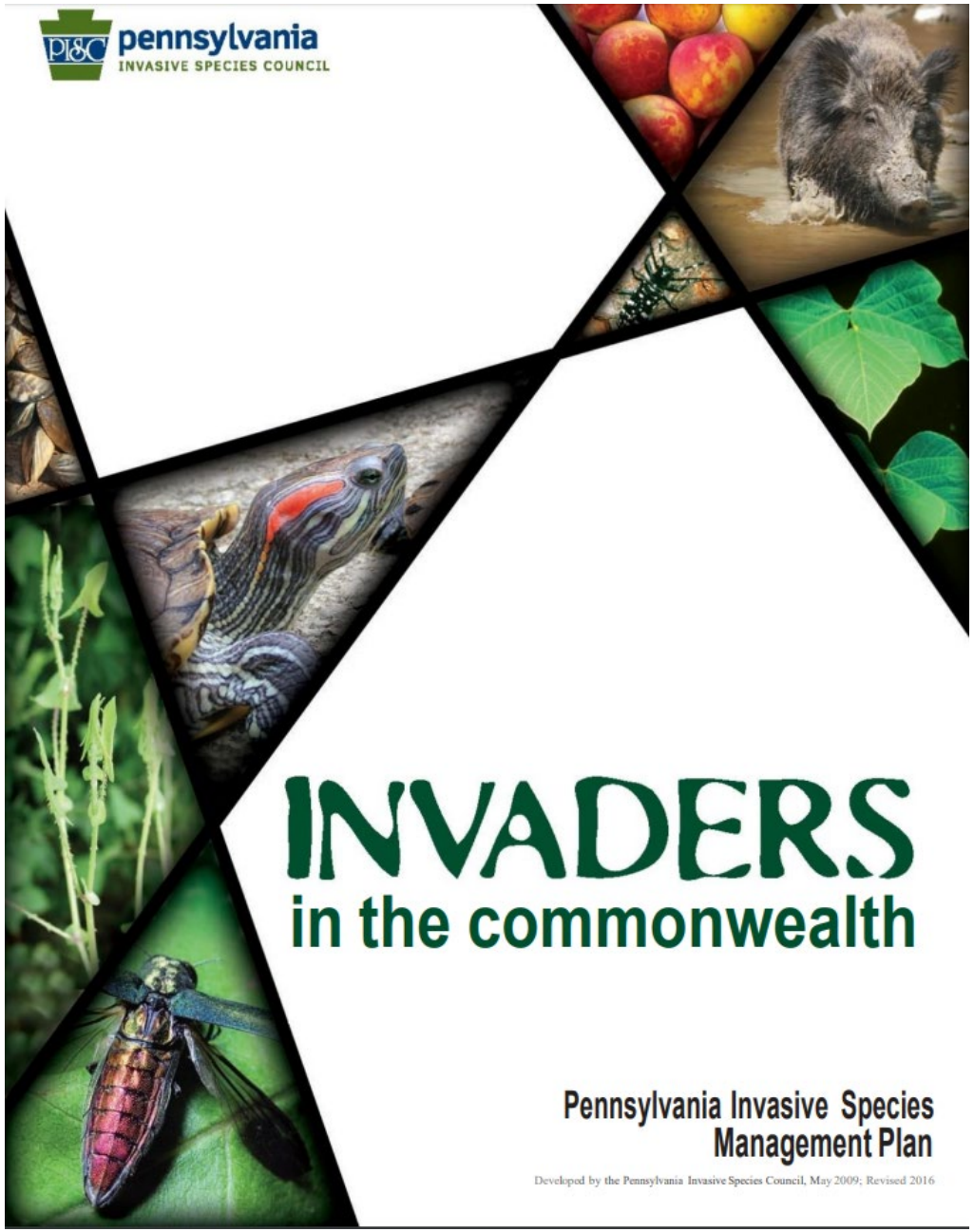
Selected Species County Distribution



Shaded counties indicate where selected species infestations occur

Species Identification Photo

Mason Heberling, www.iNaturalist.org



Questions or Comments?

Kristopher Abell
PDA Harrisburg
krabell@pa.gov

Next PISC Meeting
June 7, 2024
10:00-12:30

NEW YORK STATE OF OPPORTUNITY. | Agriculture and Markets

Partnerships for Invasive Species Management and Response in New York

Maine Invasive Species Network
April 2024

Kathy Hochul
Governor

Richard A. Ball
Commissioner

Chris Logue
Division of Plant Industry

History of Invasive Species Management in New York

- Not a new activity- efforts go back into the 1920's and 1930's.
- Concept of invasive species is relatively new in the state
  - Mid-1990's legislature authorizes NYSDEC to work on invasive species problem-Article 9 Title 17 of the Environmental Conservation Code
  - Directs AGM and DEC Commissioners to co-chair an Invasive Species Council made up of 9 State agencies, authorities and public corporations.
  - 2005 Invasive Species Task Force Report.

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Council Agencies

- NYS Environmental Conservation
- NYS Agriculture and Markets
- NYS Department of Transportation
- NYS Office of Parks, Recreation and Historic Preservation
- NYS Education Department
- NYS Department of State
- NYS Thruway Authority
- NYS Canal Corporation
- Adirondack Park Agency

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Invasive Species Council Roles and Tasks

- Consult with the Invasive Species Advisory Committee.
- Assess the impacts of invasive species and assist with prioritizing funding.
- Develop a comprehensive invasive species management plan for the state.
- Host an Invasive Species Summit every two years.

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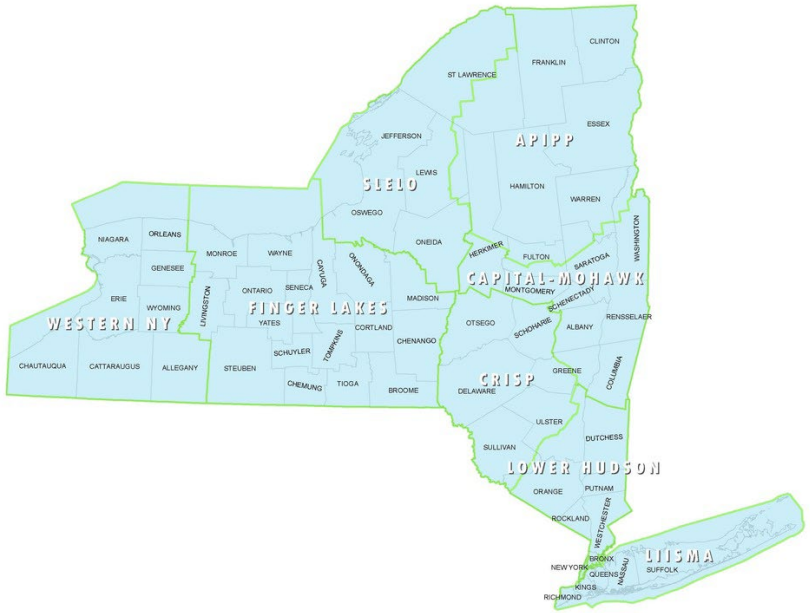
2023 Invasive Species Exposition

NEW YORK STATE OF OPPORTUNITY. Agriculture and Markets

A Program Matures

- Formation of the Partnerships for Invasive Species Management (PRISMS).
- Adoption of Part 575- New York's Comprehensive Invasive Species Regulation.



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PRISMS in New York

- Contracts are managed through the NYS DEC Bureau of Invasive Species Management and Ecosystem Health
- Open, competitive RFP process governed through the state procurement process
- Local workplans are developed and monitored in conjunction with the parent entity.

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Pros and Cons of the PRISM system

- Pros
  - Local needs, local solutions
  - Flexible
  - Not state staff
  - Contracting process
- Cons
  - Local
  - Accountability
  - Not state staff
  - Contracting process

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Conclusion

- Pros outweigh the cons
- All approaches are going to have positive and negative aspects
- As the relationships mature the various groups and agencies settle into roles and develop an understanding of how the pieces fit together.
- PRISMS in New York have added value to the invasive species discussion and individual responses.

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Acknowledgements

- USDA, APHIS PPQ
- NYS Invasive Species Council
- Cornell University
- Cornell Cooperative Extension
- NYS PRISMS
- NYS DOT
- NYSDEC

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NEW YORK STATE OF OPPORTUNITY. | Agriculture and Markets

PRISMS In New York
Adding Value to IS Management Success

Maine Invasive Species Network
community engagement session
April 2024

Kathy Hochul
Governor

Richard A. Ball
Commissioner

Chris Logue
Division of Plant Industry

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NEW YORK STATE OF OPPORTUNITY. Agriculture and Markets

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NEW YORK STATE OF OPPORTUNITY. Agriculture and Markets

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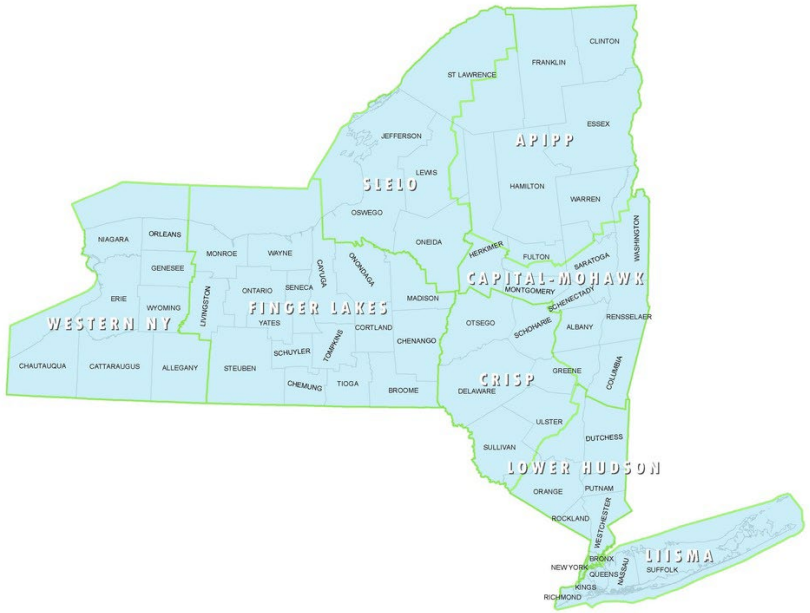

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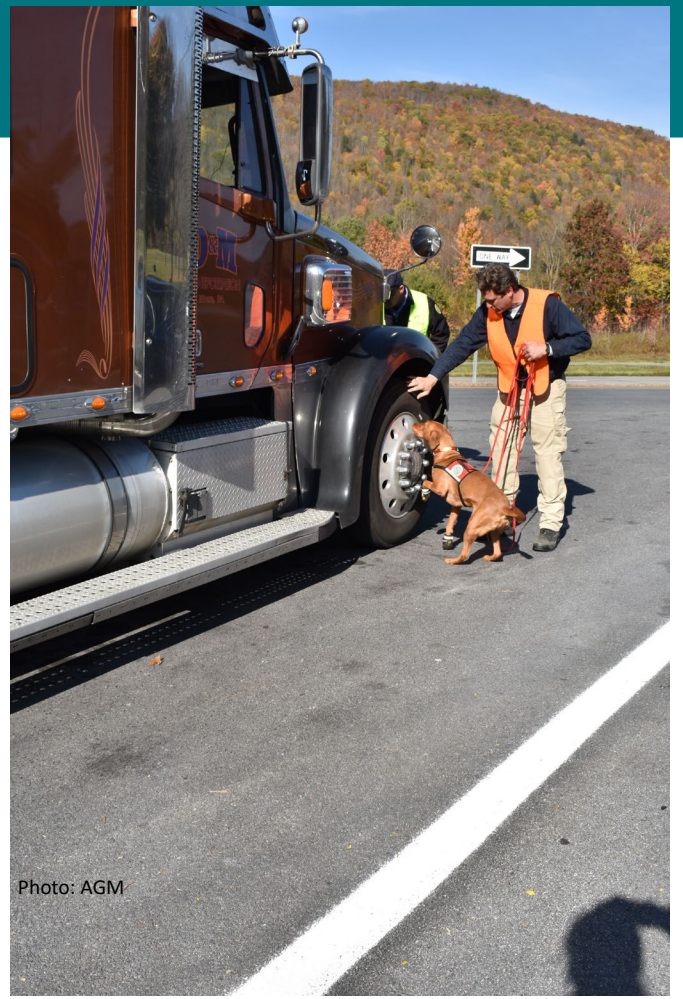
Detector Dogs and Treatments



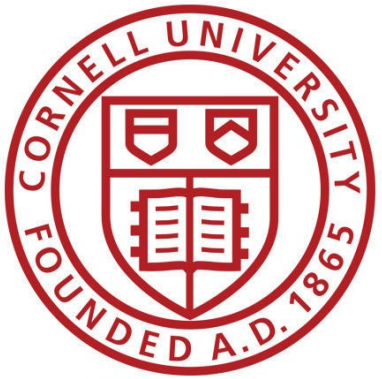
NEW YORK - NEW JERSEY TRAIL CONFERENCE

LOWER HUDSON PRISM

NEW YORK STATE OF OPPORTUNITY. Agriculture and Markets

Spotted Lanternfly Summit and 101

- Several hundred participants over multiple days.
- Outreach, research and regulatory topics.
- Hosted by Cornell IPM Program.



Cornell University
Cooperative Extension

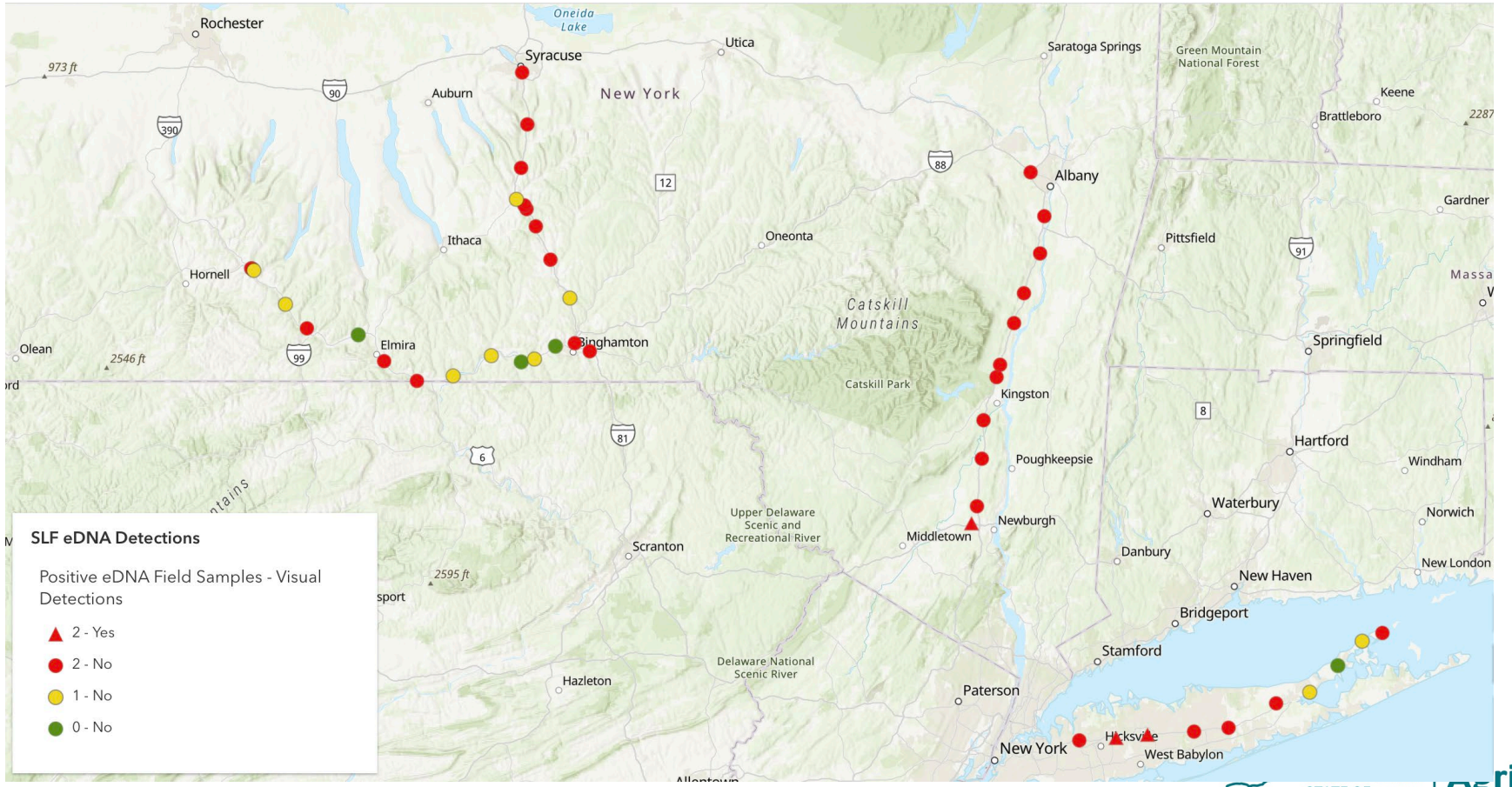
Agriculture and Markets

Departmental / Academic Collaboration

- e DNA research
- Collaboration with partners at NYS DOT
- Collaboration with Rutgers
- Can e DNA be utilized as an effective early detection tool for terrestrial invasive species ?

Departmental/Academic Cooperation

- e DNA



STATE OF OPPORTUNITY. Agriculture and Markets

Unstaffed aerial vehicles (UAV) for Inspection

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Summary

- The collaborative relationships built with sister agencies and the PRISMS add value to the IS conversation and response in NYS.

- We have made an effort to engage the PRISMS in the conversation around how invasives impact agriculture and how the responses to IS must be tailored to and considerate of the needs of our agricultural producers.

- The relationships we have built will improve our responses in the future and the various players in invasive species management understand the roles and strengths of the various agencies and organizations involved.

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- Cornell Cooperative Extension
- NYS PRISMS
- NYS DOT
- NYSDEC

NEW YORK STATE OF OPPORTUNITY. Agriculture and Markets

Ash Protection Collaboration Across Wabanakik Update

Emily Francis
PhD Candidate

John Daigle
SFR Professor

Ella McDonald
Masters Student

Tyler Everett
PhD Student

Maine Invasive Species Network Meeting
April 11, 2024

Virginia Cooperative Extension

Why care for ash forests?

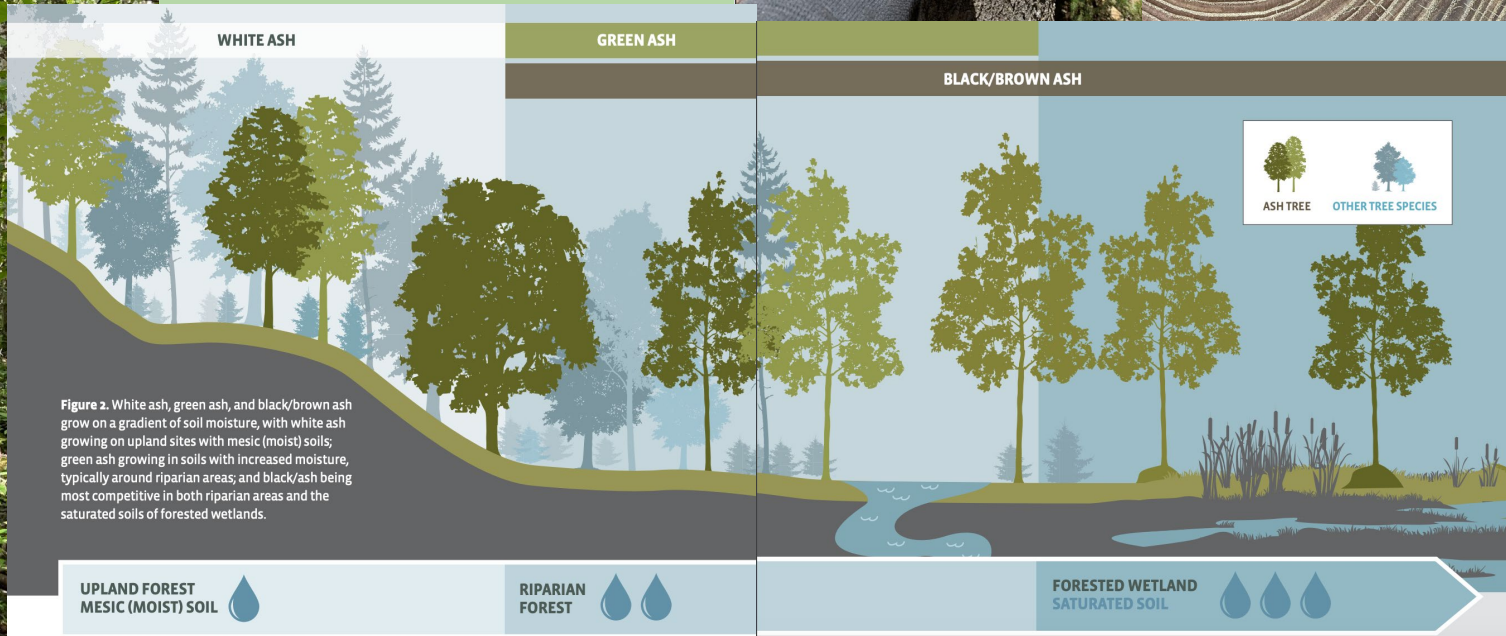


Figure 2. White ash, green ash, and black/brown ash grow on a gradient of soil moisture, with white ash growing on upland sites with mesic (moist) soils; green ash growing in soils with increased moisture, typically around riparian areas; and black/ash being most competitive in both riparian areas and the saturated soils of forested wetlands.

Cultural Significance

Maine Indian Basketmakers Alliance

Gabe Frey splitting

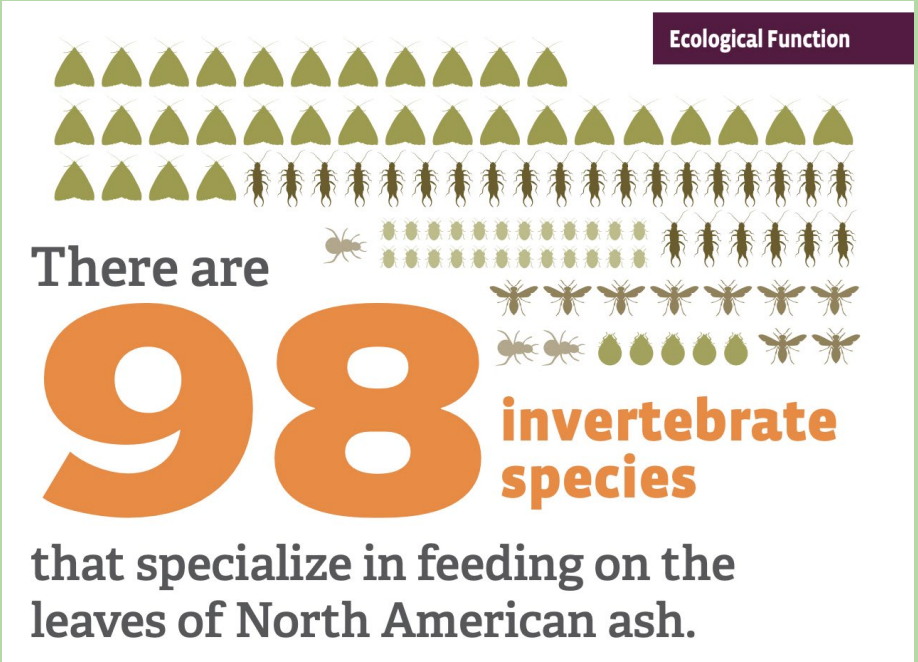
Tyler Everett harvesting

Richard Silliboy basket

Richard Silliboy weaving

Gabe Frey baskets

Ecological significance of ash forests



Our Collaborators

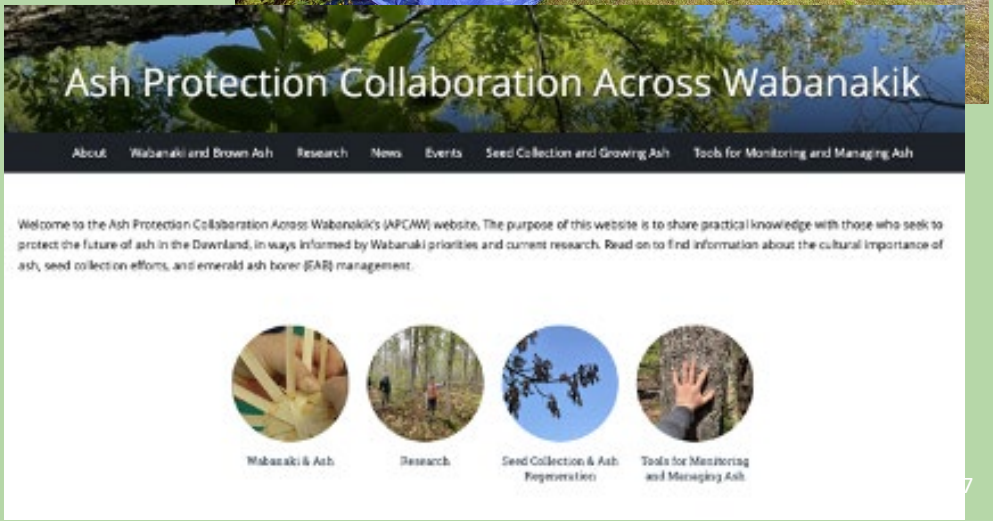
Ash Protection Collaboration Across Wabanakik

Named in 2023, APCAW is a group of Indigenous and non-indigenous researchers and forest caretakers working together to organize actions to protect ash, based out of the University of Maine.

APCAW Programs and Website

- Held 10 events in 2023
- Reached 914 people
- Presented for other networks
  - RISCC, MLTN, GMRI, Forest Service
- Goal: To generate collective engagement in ash protection actions across the region
- Created APCAW website in February 2023

https://umaine.edu/apcaw/



Ash Inventory and Silvicultural Trials - Tyler

Listening to the Tribal Nation Communities

Brown ash & emerald ash borer Tribal Nation community meetings

Listening to the Tribal Nation Communities

Discussing Aspects of an Integrated Pest Management (IPM) Strategy

OR

More Holistic: A plan to take care of and challenge new distant relatives

Mi'kmaq: Ilsuteget ango'tg aq gaqamutoq pilei gneg wetagutijig

Listening to the Tribal Nation Communities

Participants hear about considerations

regarding:

- The cultural importance of brown ash and the threat of emerald ash borer
- The involvement of Tribal youth in emerald ash borer Response on Tribal lands
- Silvicultural Strategies for brown ash wetland forests
- Seed and other Genetic material collection initiatives

Listening to the Tribal Nation Communities

Participants hear about considerations regarding:

- The Biological control of emerald ash borer
- The Chemical treatment of emerald ash borer
- Data Sovereignty Concerns in Ash Preservation
- Integrating multiple approaches

Private Landowner Survey 2022: Suggested Adaptive Management Strategies

a. Participate in monitoring programs to assist efforts with detections of EAB
b. Plan to harvest all or majority of merchantable ash trees ahead of EAB
c. Identify sites to reserve ash trees with different size classes ahead of EAB
d. Allow for the collection of ash seed by seed collectors
e. Consider practices for protecting certain ash trees using chemical treatments
f. Consider practices to cooperate with the state in efforts to introduce and monitor biological control agents that kill EAB

Discussion Points: What we found

1- Only a portion of the respondents lived within the quarantine boundaries in 2022: **high interest, regardless of impact or county of ownership**

2- Landowners are interested in **keeping species found on their properties,** regardless of adaptive management strategies

3- Of the 6 adaptive management strategies, **allowing for ash seed collection** was the **most popular,** and plan to harvest all or majority of merchantable ash was the least

4- Influential factors for taking part in the management strategies were: **financial,** that landowners need cost-sharing and to know costs, and

Discussion: Needs for the future

5- Need to **formally inventory private land** (does the landowner have ash?) to figure out what management strategies are **appropriate for each landowner** - if any

6- **Forestry community involvement** with these efforts: securing forester and logger interest or buy-in to **promote these strategies to landowners**

7- Next steps: studies to understand **more than landowner interest.** Are landowners **actually** going to take part in adaptive management strategies?

Thank you!

Brown Ash Meeting
Oct. 8-9, 2024 @ UMaine

umaine.edu/apcaw/
-> sign up for newsletter

APCAW Partners:





A Community Approach to Browntail Moth Control

Tom Schmeelk, Entomologist,

Maine Forest Service

Raising Awareness: February is BTM awareness month

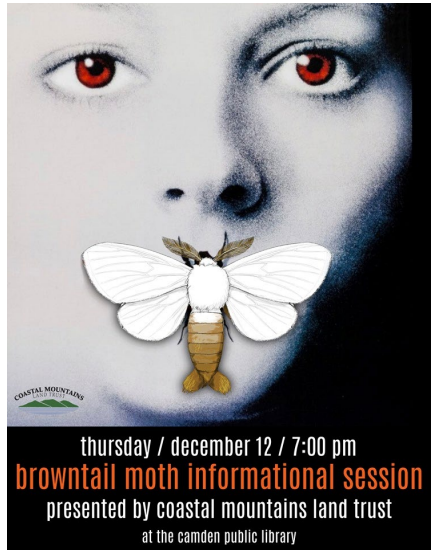
- Why: February(and the winter in general)is a great time from the perspective of web visibility, low hair activity and minimal nontarget effects
- Also allows time for individuals to plan and conduct management
- MFS events calendar
- Four R's
  - **Recognize** what BTM winter webs look like
  - **Reach out** if you find BTM in your community
  - **Recruit** professional help if you can't clip the webs out
  - **Remove** winter webs before April

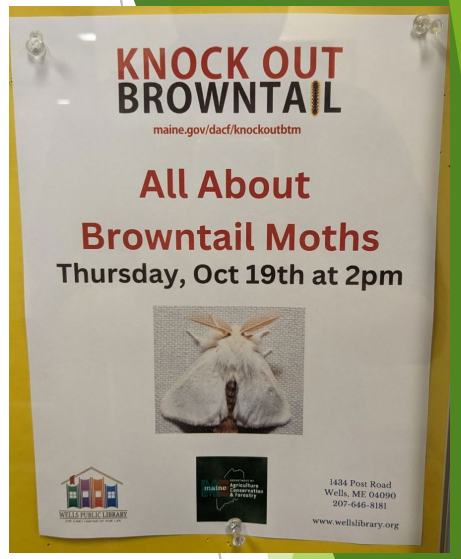
Community Education Through Informational Sessions:

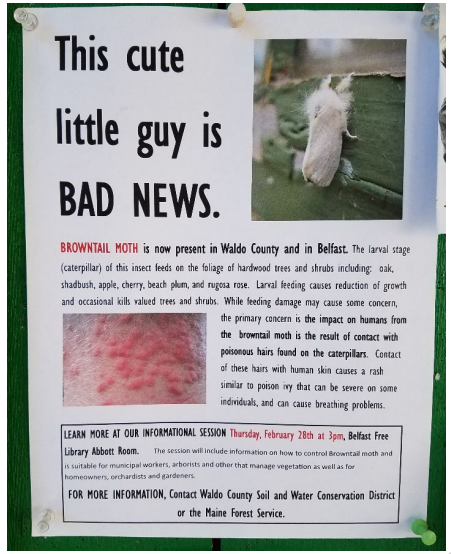
The first step to management is education

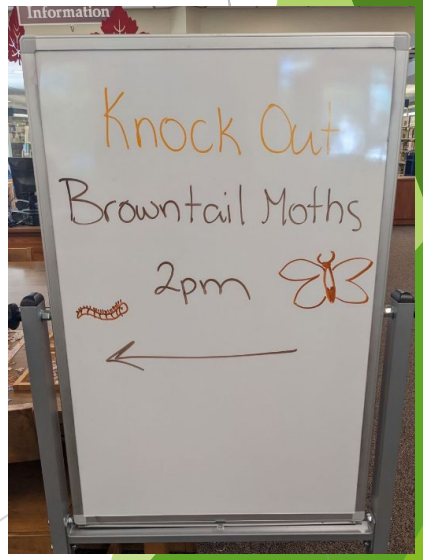
Typically held October-March (Ideally Jan-March)

Topics covered include: Biology, History, Current situation, Look alikes and management and mitigation strategies









Ways to get the community involved:

- Service projects (survey and web clipping)

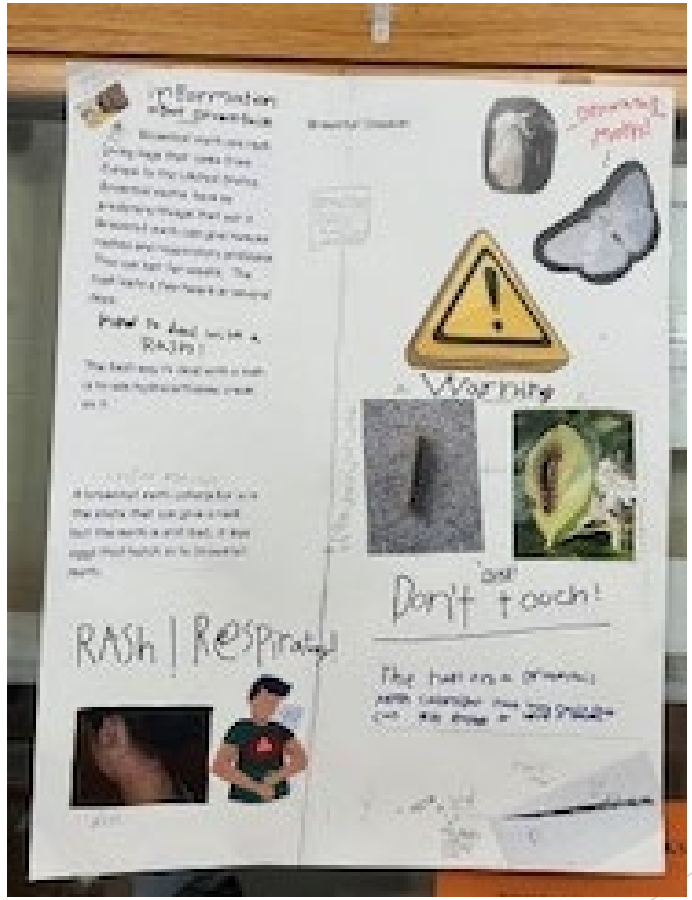
- Celebrations
  - Community web burning with treats and beverages
  - Neighborhood contests for # of webs clipped
  - Challenging a neighboring town
  - Web bounties

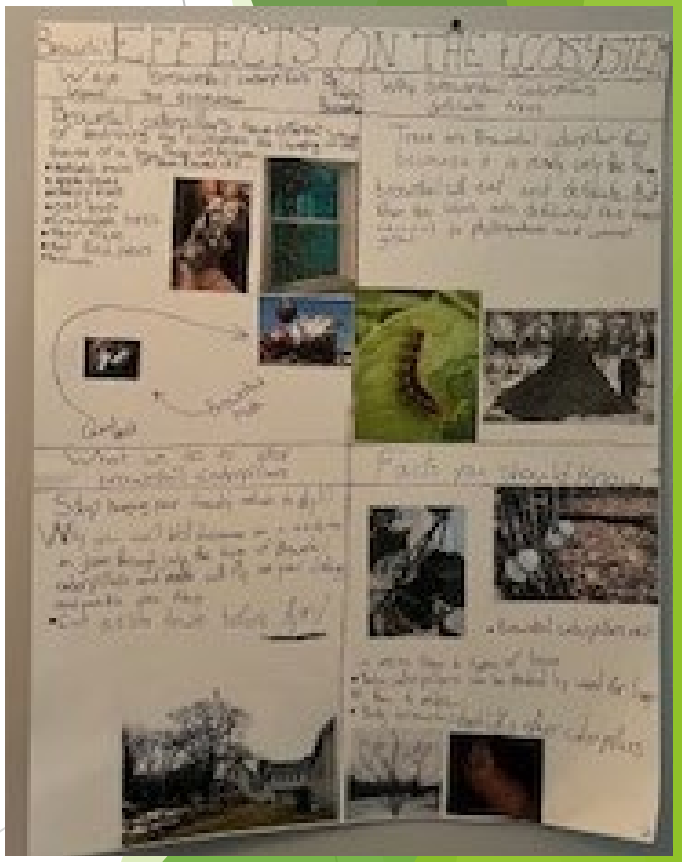
Photo: Megan Hess, Orono Public Works

Other Ways To Foster Community Engagement:

- Pole pruner lending program: Bowdoinham Public Library, Island Heritage Trust, City of Bangor, Hallowell etc.

- Getting schools involved





Pownal 5th Graders

Other Actions:

- Town/city website presence
- Social media reminders
- Signage warning of infestation
- Referral to 211 for more info

Town of Yarmouth

BTM Mitigation Fund:

- One time ~$150,000 fund to subsidize/promote education and management at the local level

- Two 1.5-year term positions

- Open to government entities and nonprofit organizations in the affected areas

- Eligible activities are those that may help reduce the impacts of browntail moth:

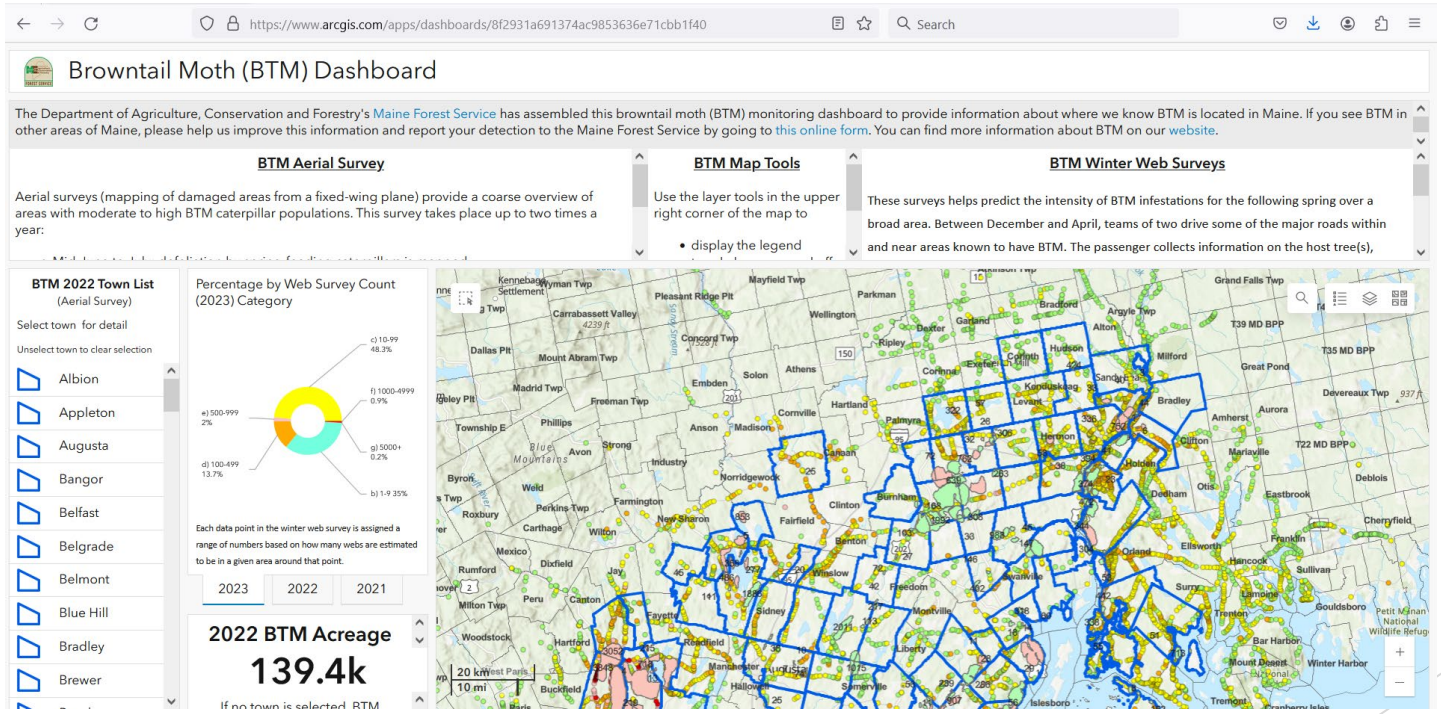
1. Physical controls such as removal and destruction of overwintering webs,
2. Pesticide treatments,
3. Cultural controls such as taking actions to limit exposure, reduce habitat or attraction
4. Education.

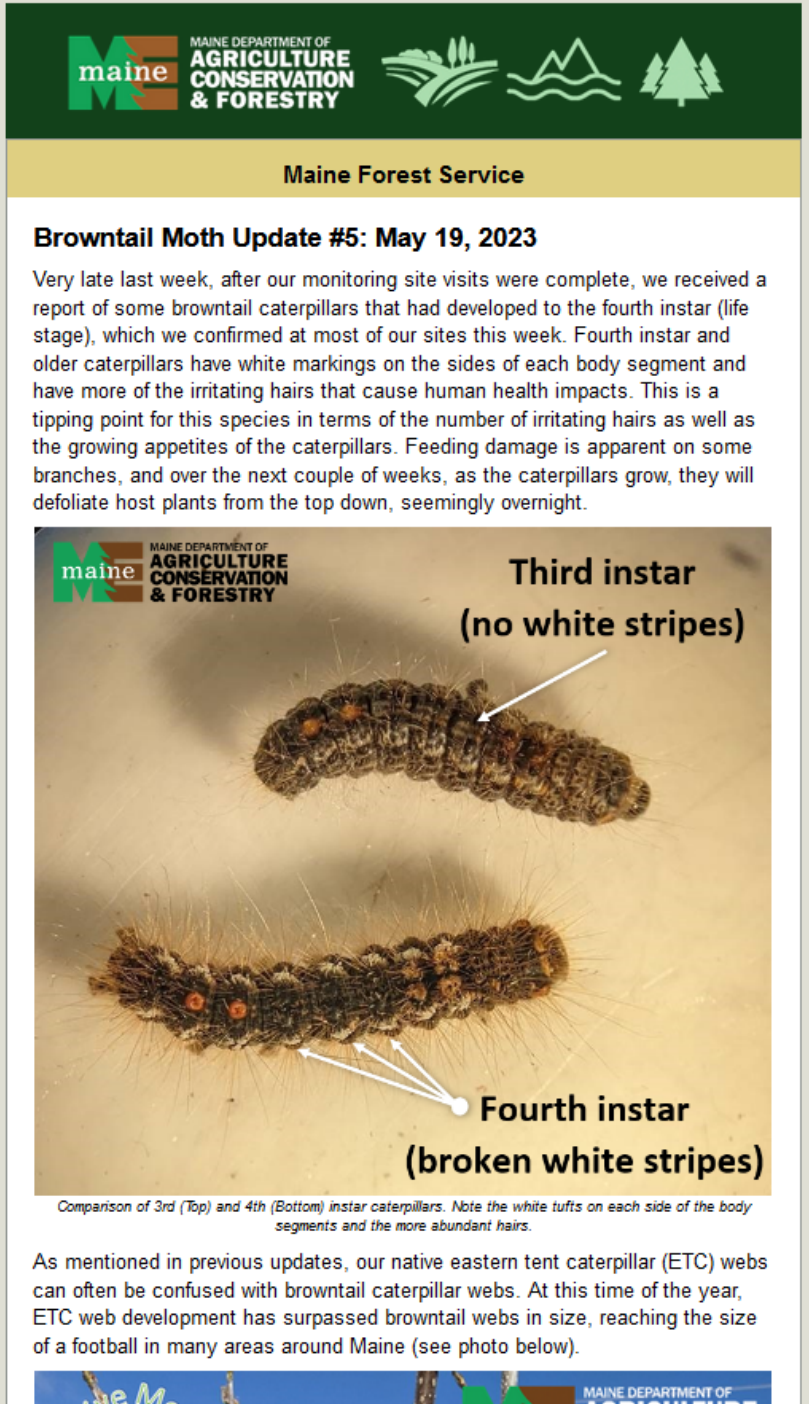
- 14 awardees total

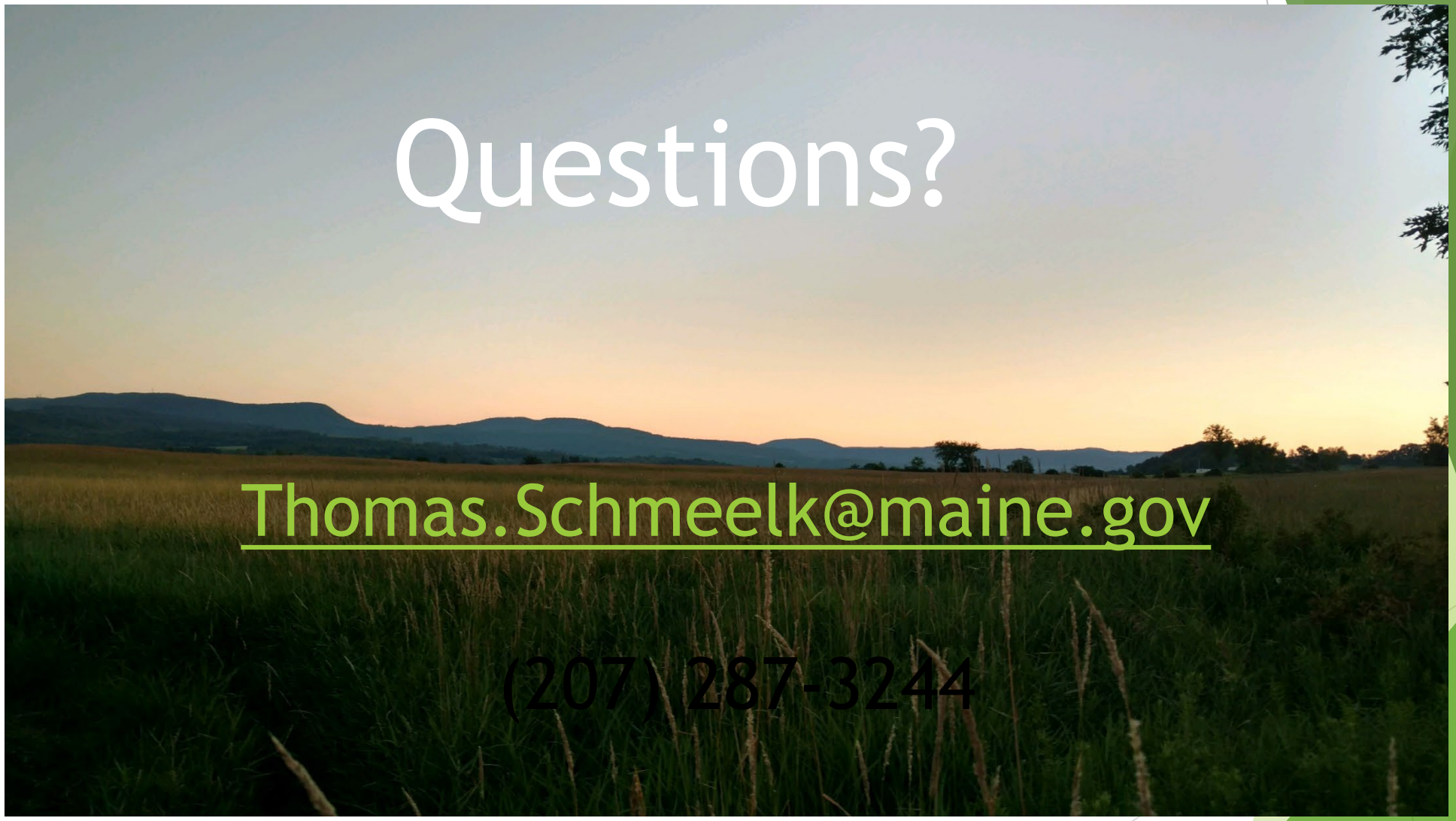
Maine Forest Service Tools To Promote Public Engagement:

- BTM dashboard
- FAQ page
- Weekly monitoring site updates

- Municipal Battle Book – management overview, timeline of activities, workplan, restrictions, ideas






Questions?
Thomas.Schmeelk@maine.gov
(207) 287-3244

Integrated Management of Invasive Plants

Integrated Pest Management

- An ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques
  - Biological Control
  - Mechanical Methods
  - Chemical Techniques
- Common Invasive Plants and How To Control Them

Alligare®
A member of the ADAMA Group

Biological Methods

- Predators
  - Feed on target plant
- Parasites
- Pathogens

Mechanical Methods

- Hand Pulling
  - Make sure roots are removed
  - Dispose properly
- Tillage
- Barriers
- Mowing
  - Before treatment
    - Reduce biomass
  - After treatment
    - Clear space for natives

Popular Herbicides

Growth Regulators (Group 4)

- Triclopyr
- 2,4-D
- Whetstone (Aminopyralid)
- Sonora (Clopyralid)

Enzyme Inhibitors

- Glyphosate
- MSM 60
- Ecomazapyr (Imazapyr)
- Panoramic (Imazapic)
- Imox (Imazamox)

Foliar Treatment

- Smaller brush, shrubs, grasses, herbaceous plants
- Timing
  - Group 4- Spring
  - Other herbicides- Spring-Fall
- Spray leaves of plant with diluted herbicide mixture
  - Spraying crown of plants most important
  - Wiping in sensitive areas

Basal Bark

- Woody plants less than 6 inches in diameter
- Best on smooth bark
- Timing
  - Any time of year
- Spray bottom 12in of bark
  - Dilute herbicide with oil

Cut Stump

- Best for large woody plants
- Timing
  - Late Summer/ Fall
  - Too much sap flow in Spring
- Cut down tree
- Immediately apply herbicide
  - Dilute with oil or water
  - Spray or paint outer ring of stump, inside the bark

Hack and Squirt

- Best for large trees and rough bark species
- Get product into cambium
- Treats leaves and roots
- Make cut in tree
- Immediately spray with herbicide

Alligare®
A member of the ADAMA Group

Common Invasive Plants

- Bittersweet
- Honeysuckle
- Glossy and Common Buckthorn
- Knotweed
- Norway Maple
- Swallowworts
- Multiflora Rose
- Phragmites
- Autumn Olive
- Barberry

Alligare
A member of the ADAMA Group

Bittersweet

- Foliar Treatment
  - Early Spring
    - Triclopyr + MSM
  - Follow up in late summer/fall
    - Glyphosate + MSM
- Basal Bark
  - All year
    - Triclopyr + oil
- Cut Stump
  - Late Summer/Fall
    - 50% Glyphosate

Honeysuckle

- Foliar Treatment
  - Spring
    - Triclopyr + **MSM**, Whetstone, Imazapyr
  - **Late Summer/Fall**
    - Glyphosate + MSM
- Basal Bark
  - All year
    - Triclopyr + oil
- Cut stem
  - Less effective

Glossy and Common Buckthorn

- Foliar Treatment
  - Late Summer/Fall
    - Glyphosate + MSM
    - Hold leaves long, can treat late in year after natives drop leaves
- Basal Bark
  - Triclopyr + oil
- Cut Stump
  - Less effective

Knotweed

- Foliar
  - Spring
    - Triclopyr or 2,4-D
  - Follow up in fall
    - Glyphosate + MSM, Imazapyr
- **IPM**
  - ~July
    - Mow to weaken root reserves
  - Late Summer/Fall
    - Glyphosate + MSM, Imazapyr

- Plan for multiple years of treatment

Norway Maple

- Foliar
  - Late Summer/Fall
    - Glyphosate + Imazapyr
- **Basal Bark**
  - Triclopyr + Imazapyr + Oil
- **Hack and Squirt**
  - Glyphosate + Imazapyr
- Cut Stump
  - Triclopyr + Imazapyr + Oil

Swallowworts

- Foliar
  - Spring
    - Triclopyr 4 (ester)
  - Follow up in Fall
    - Glyphosate + MSM
  - Plan to treat again in year 2

Multiflora Rose

- Foliar
  - Spring
    - Triclopyr 3 (amine) + **MSM**
  - Late Summer/Fall
    - Glyphosate + **MSM**
- Basal Bark
  - Triclopyr + oil

Phragmites

- Foliar
  - Spring
    - Imazapyr or Imox to stop growth and keep green
  - Late Summer/Fall
    - Glyphosate
    - Glyphosate + Imazapyr
    - Imox
  - Cut in winter
  - Plan for multiple years of treatment

Autumn Olive

- Foliar
  - Imazapyr + MSM + Whetstone + MSO
    - Waxy leaves, hard to control
- **Basal Bark**
  - Triclopyr + oil

Barberry

- Foliar
  - Spring
    - Triclopyr 3 (amine) + MSM
  - Fall
    - Glyphosate + MSM

Questions?

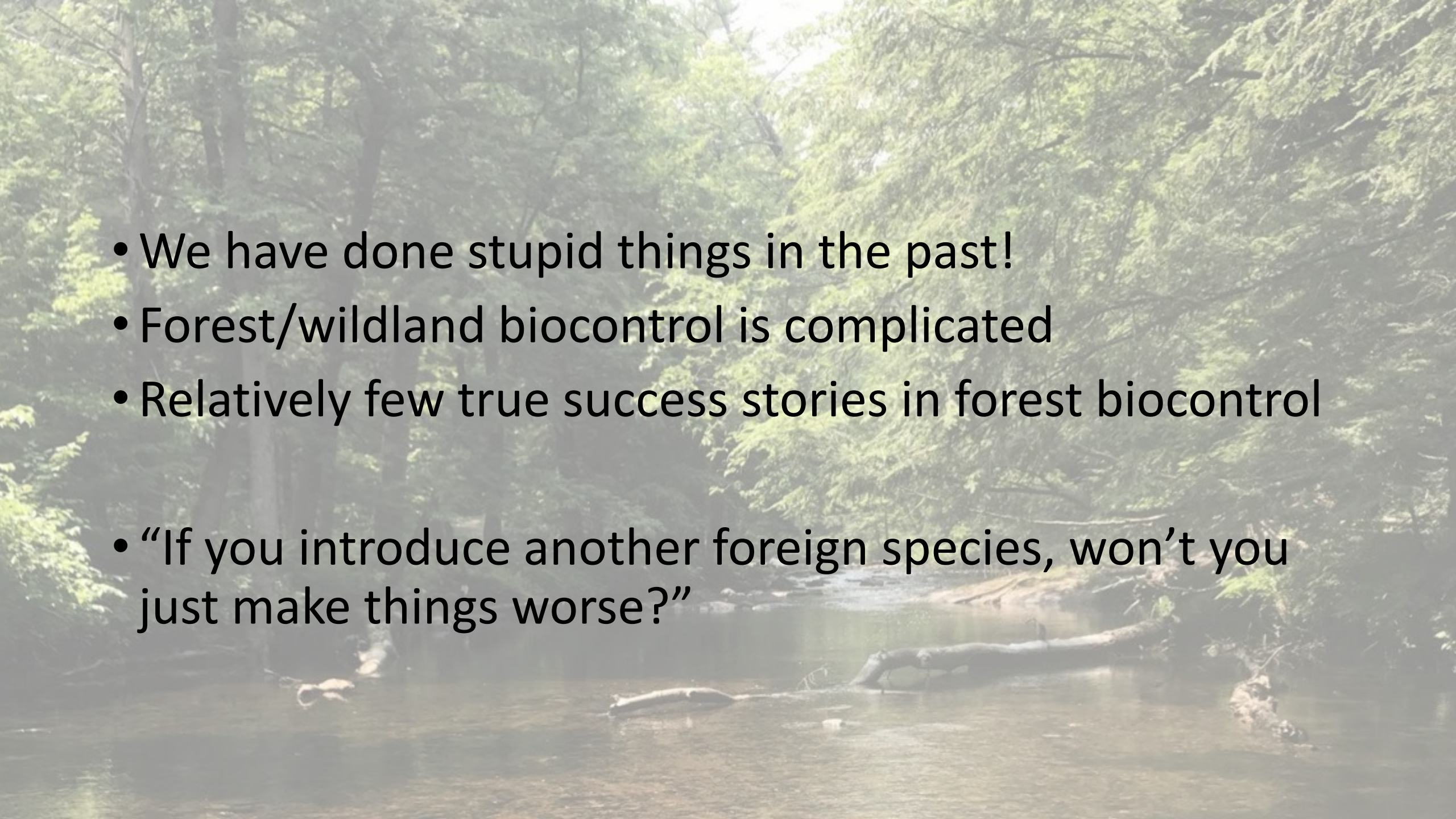
- Paul Conti- Northeast Territory Manager
  - Paul.Conti@Alligare.com
  - 610-742-6303

Biological Control in Maine

Colleen Teerling

Forest Entomologist

Maine Forest Service



- We have done stupid things in the past!
- Forest/wildland biocontrol is complicated
- Relatively few true success stories in forest biocontrol

- “If you introduce another foreign species, won’t you just make things worse?”

Biological control in the past

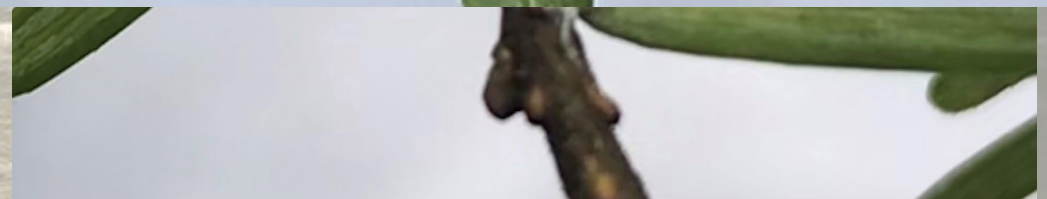
- **Spongy moth**

- **Browntail moth**

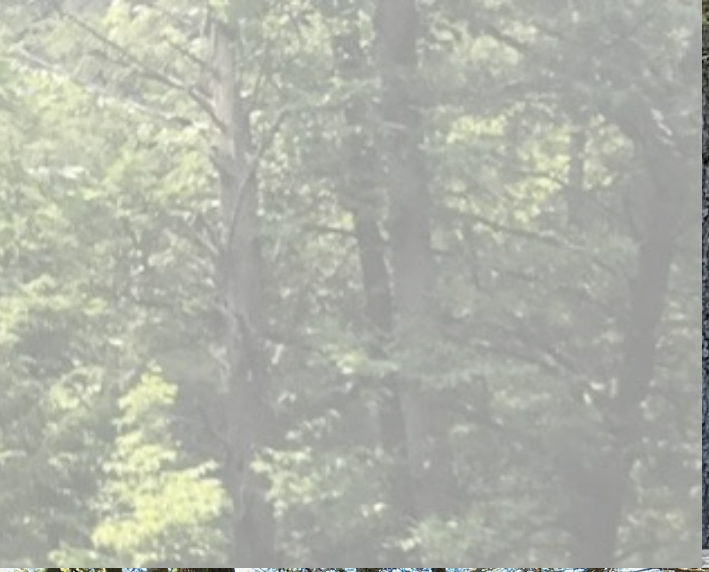
- **Purple loosestrife**

Hemlock Woolly Adelgid

Laricobius nigrinus
Laricobius osakensis
“Lari”



Sasajiscymnus tsugae “St”



2022 ~8500 St released
2023 ~43 000 St released

USDA
United States Department of Agriculture

TECHNOLOGY
TRANSFER

INTEGRATED
PEST MANAGEMENT

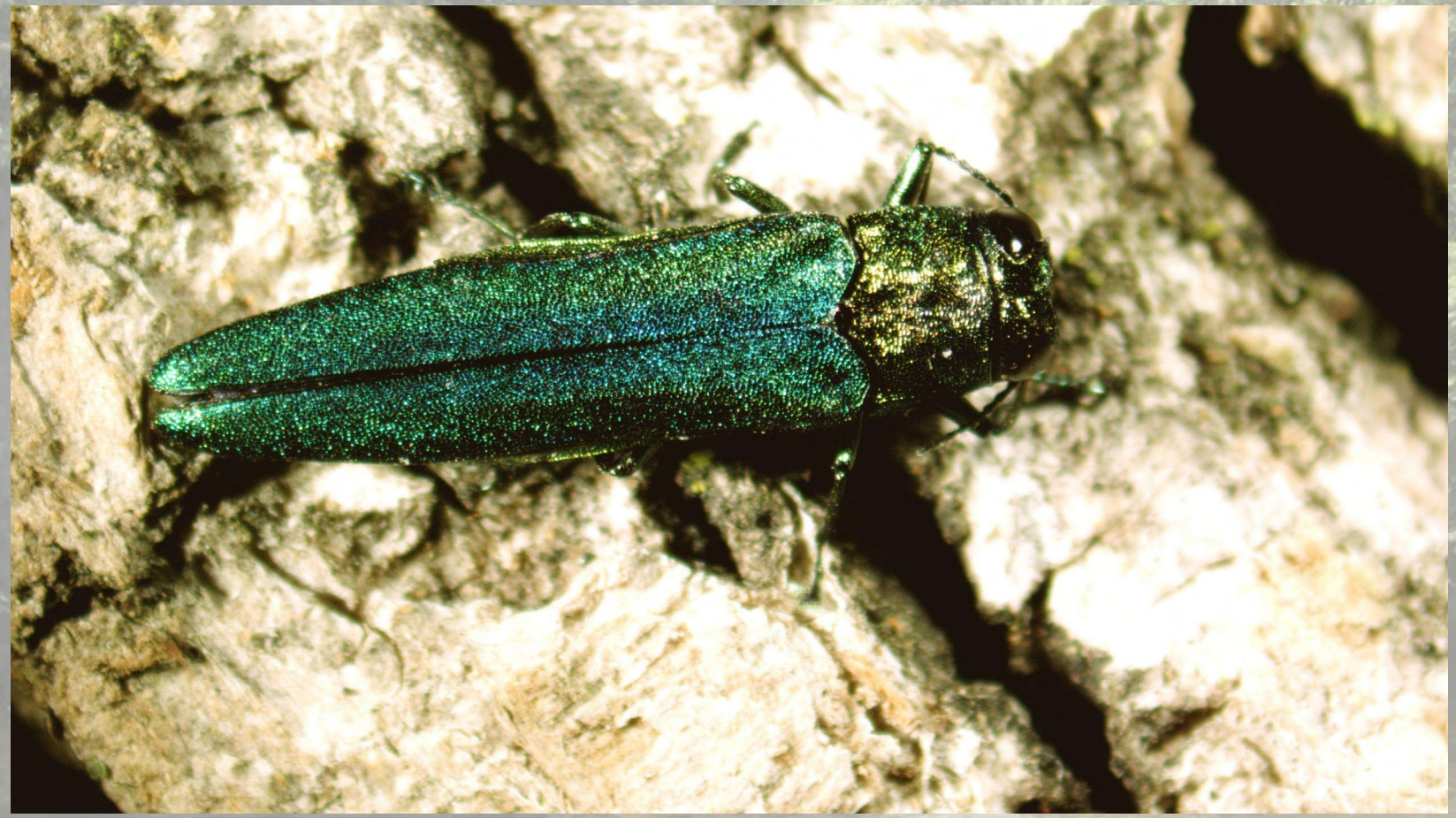
INTEGRATING CHEMICAL AND BIOLOGICAL CONTROL OF THE HEMLOCK WOOLLY ADELGID:

A RESOURCE MANAGER'S GUIDE

ALBERT E. MAYFIELD III, SCOTT M. SALOM, KENTON SUMPTER,
TOM MCAVOY, NOEL F. SCHNEEBERGER, AND RUSTY RHEA

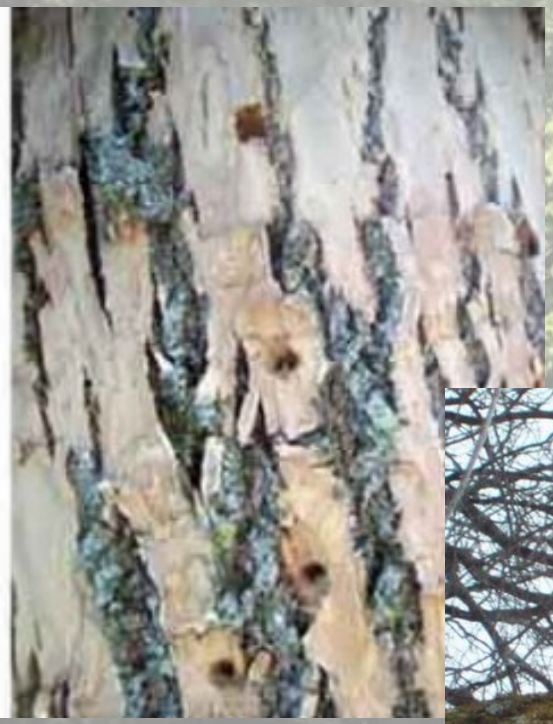
Keep trees alive long enough for predators to build up numbers

Emerald Ash Borer

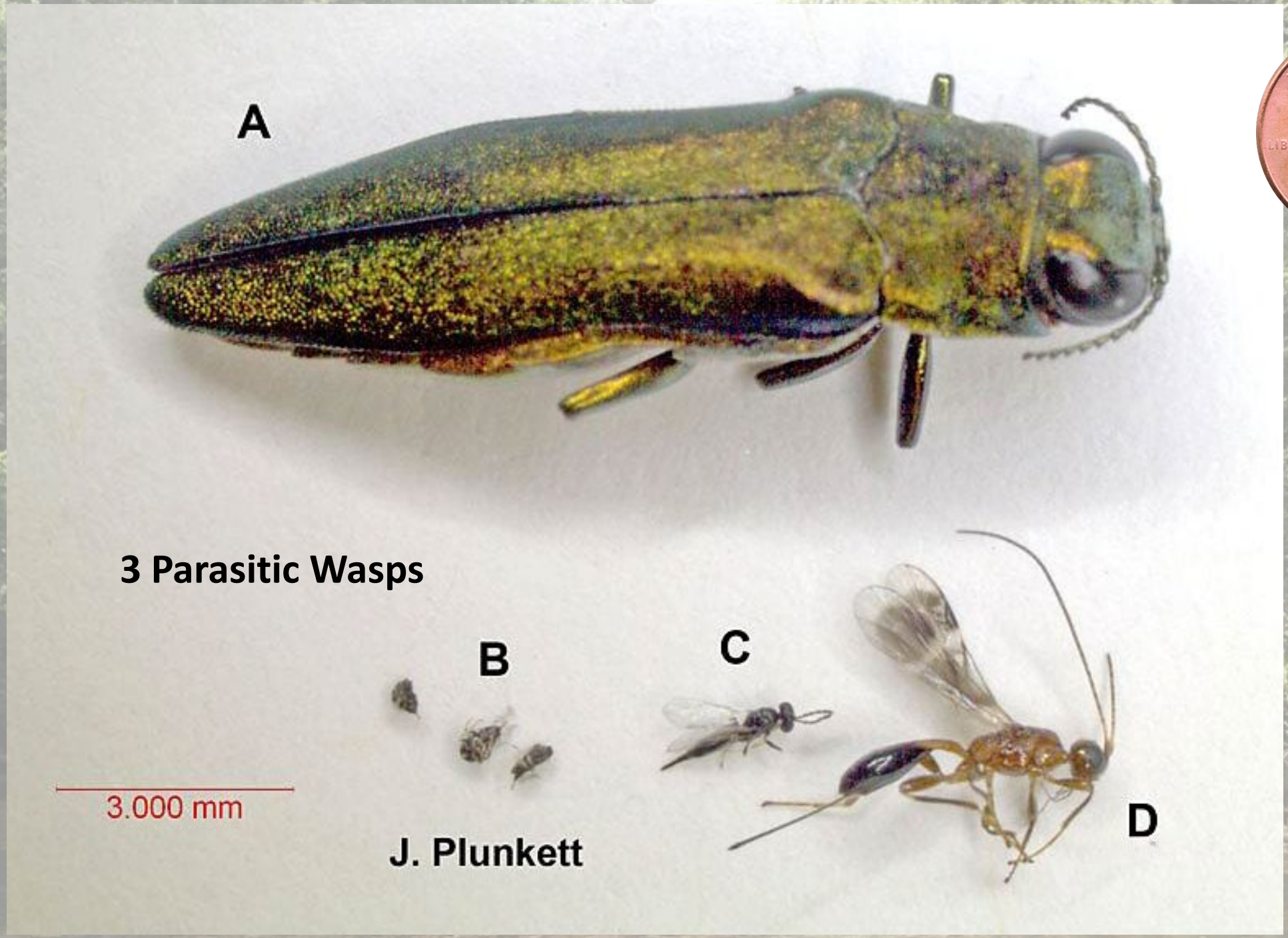


Woodpeckers

- Can cause over 90% mortality of EAB (in individual trees) early in an infestation



Can’t keep up as


A
3 Parasitic Wasps
B
C
D
3.000 mm
J. Plunkett


IN GOD WE TRUST
LIBERTY
2002
D

Tetrastichus planipenisi (larval parasitoid)

Spathius galinae (larval parasitoid)

Oobius agrili (egg parasitoid)

Winter Moth

Cyzenis albicans

Spotted Wing Drosophila

Spotted Wing Drosophila (SWD) Parasitoid

Ganaspis brasiliensis

A parasitoid approved for release for control of SWD in Maine

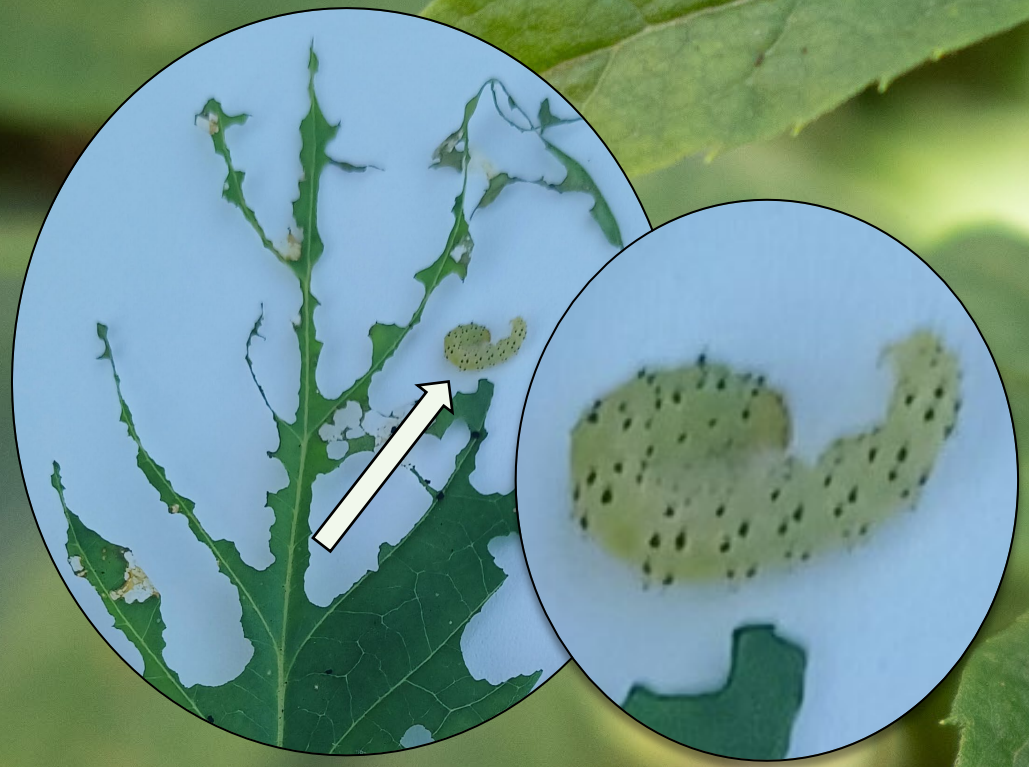
Photos: Matt Bertone; Buffington et al. 2016; Tim Haye

Black Swallow-wort

confuses monarch butterflies

competes with native vegetation

toxic to livestock & damages fencing



Hypena opulenta as a classical biological control agent of black swallowwort (*Vincetoxicum nigrum*)

Photo: Hillary Peterson


2022
Release in
Harpswell
R

	Control 1	Control 2	Treatment 1	Treatment 2
Start (7/7/22)				
Middle (8/26/22)				
End (10/5/22)				

Biological Control

- Rarely a silver bullet (usually part of IPM)
- Often one of best options for long-term management of invasives in forest / wildland
- Complex, requires long-term research

MISN 2024
What to do when you have nothing you can do?

Brittany Schappach and Gabe LeMay

Amanda E. Beal
Commissioner

Patty Cormier
State Forester

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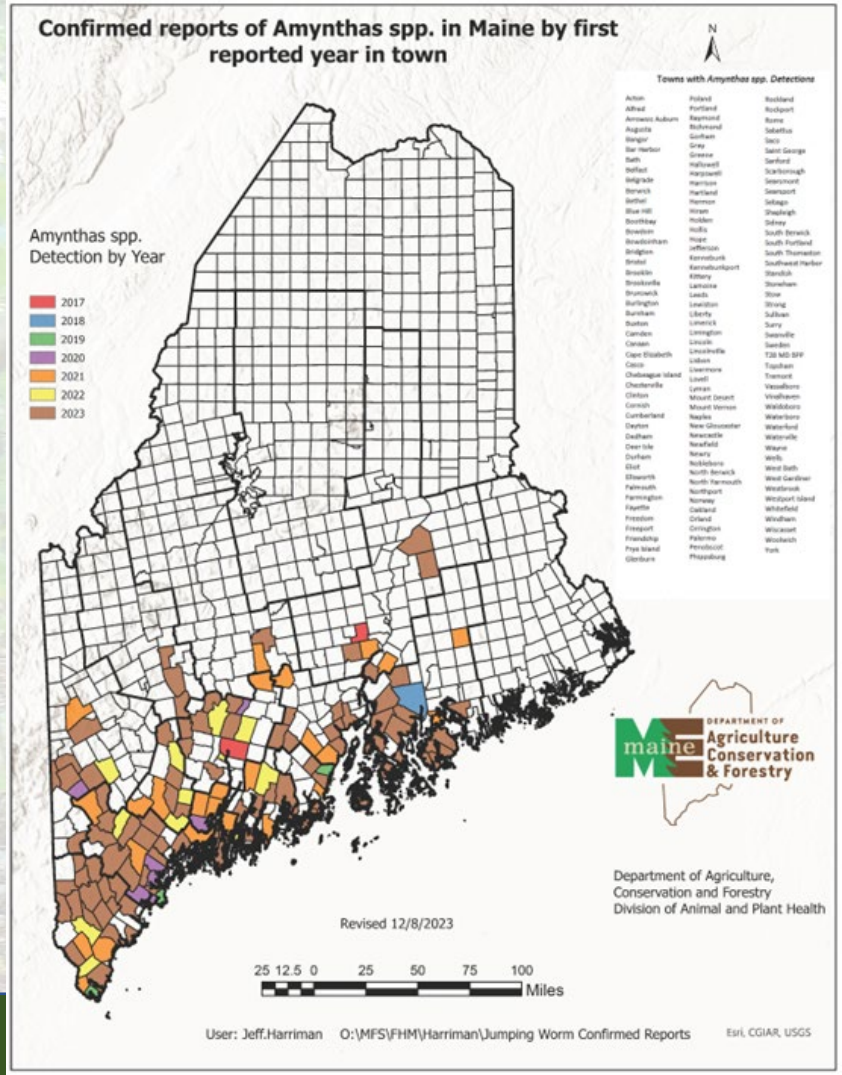
Augusta, ME 04333

(207) 287-3200
www.maine.gov/dacf

Case Study 1: Jumping Worms

- 3 species
  - *Amynthas agrestis, Amynthas tokioensis, and Metophire hilgendorfi*
- AKA: Crazy Worms, Snake Worms, “Jumpers”
- Native to eastern Asia
- Invasive

Photo: Brittany Schappach, Maine Forest Service



Jumping Worms in Maine

- Confirmed in 13 of the 16 counties
- Now considered widespread* and seems to be expanding

Damage

Photos: Brittany Schappach, Maine Forest Service

Impacts

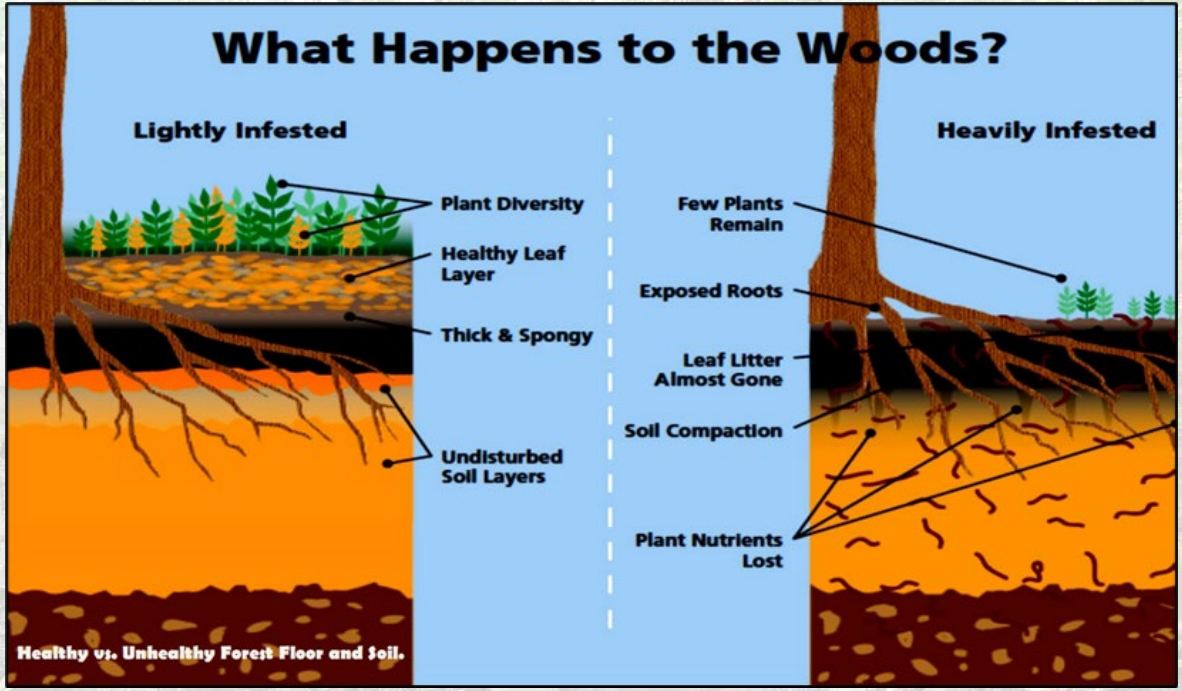
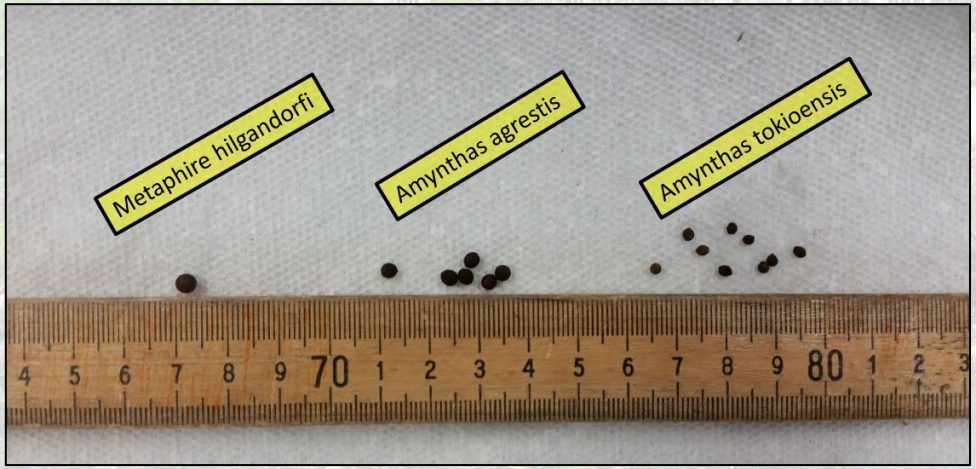


Photo: Wisconsin DNR

Photos: Brittany Schappach, Maine Forest Service

The real problem: Cocoons

- Resistant to cold seasons in Maine
- Parthenogenetic
- "Seed banking"



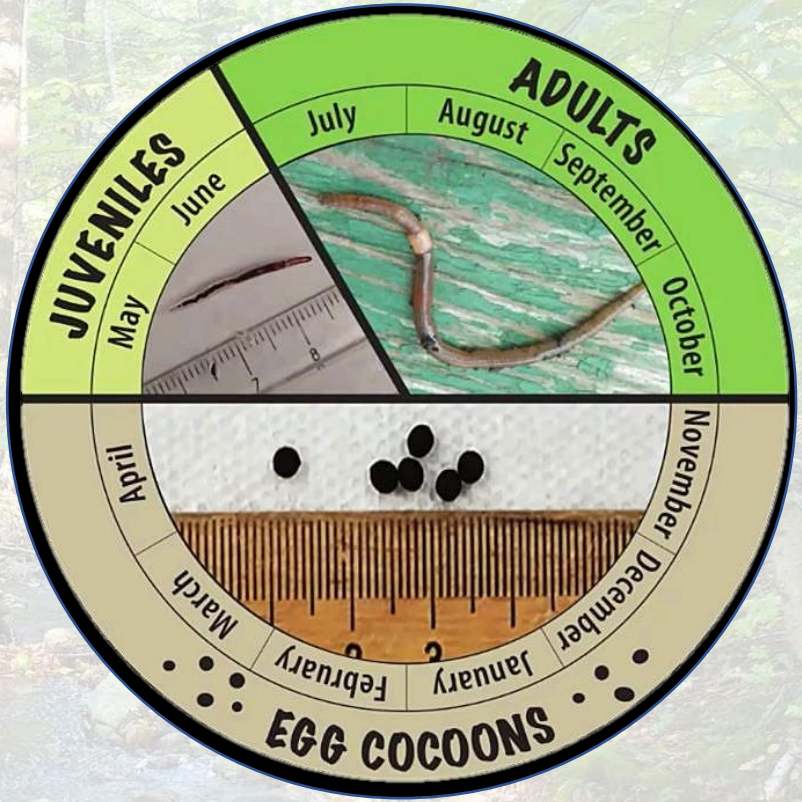


Photo: University of Wisconsin Arboretum

Management

- No approved pesticides on the market
  - Research is ongoing
- Difficult to manage

What do you do when you have nothing you can do?

Photo: Brittany Schappach, Maine Forest Service

Management - Prevention

- **Don’t** purchase jumping worms for composting or fishing bait
- **Don’t** discard live worms in the wild
- **Do** buy bare root plants & heat-treated soil
- **Do** clean soil off tools, boots, etc.
- **Do** teach others about jumping worms

Management - Education

Know the signs

- Educate yourself and others on recognizing jumping worms, their life cycle, and the soil characteristics
- Support groups

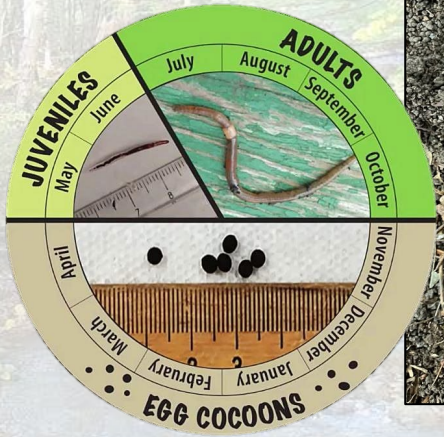


Photo: Brittany Schappach, Maine Forest Service
Life Cycle: K. Johnson, Wisconsin

Management - Monitoring

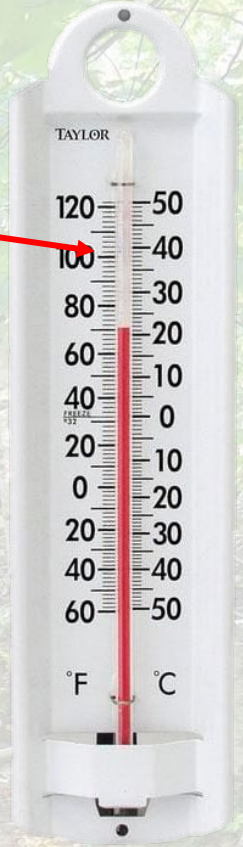
- Check for adults in early fall

Sept - Oct

Photos: Brittany Schappach, Maine Forest Service

Management - Solarization

3+ days

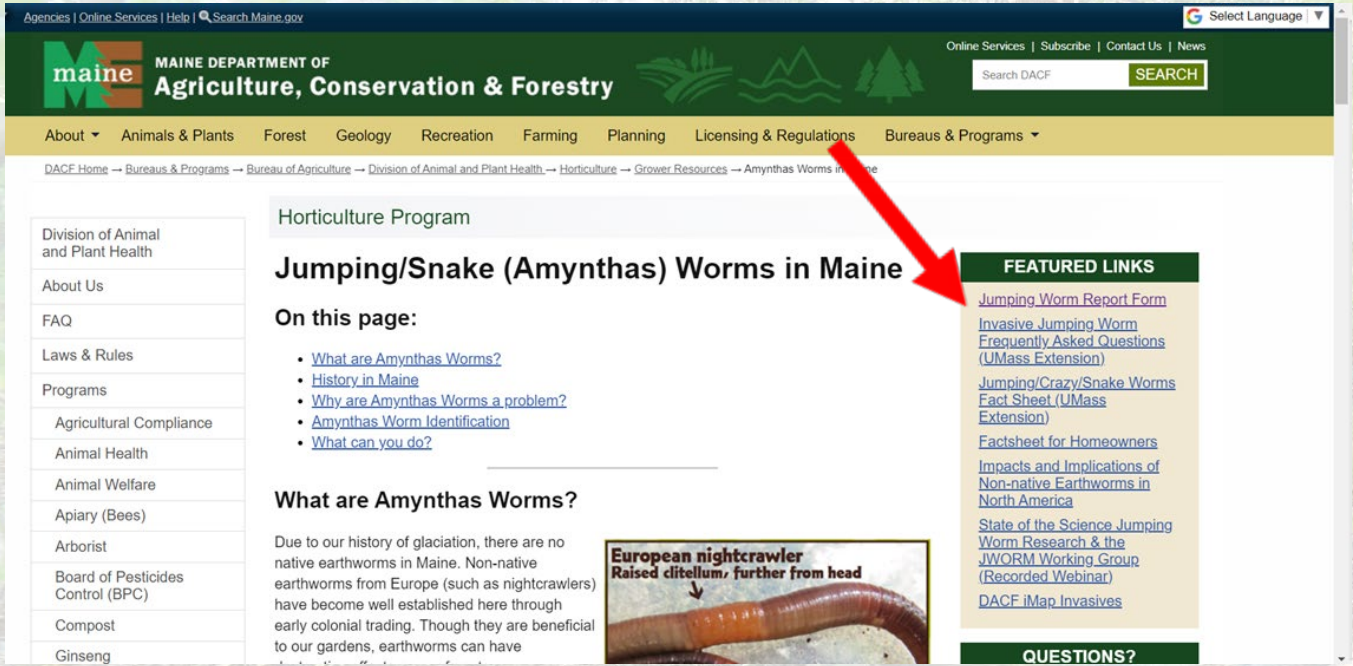


Current research suggests:

- Worms die ~85°F
- Worms & cocoons die ~104°F
- Create solarization "package" and leave in the sun for at least 3 days to kill worms & cocoons in the summer

Source: UMass Extension

Management – Public reporting



Scan to Report Jumping Worms

Case Study 2:
Red Pine Scale

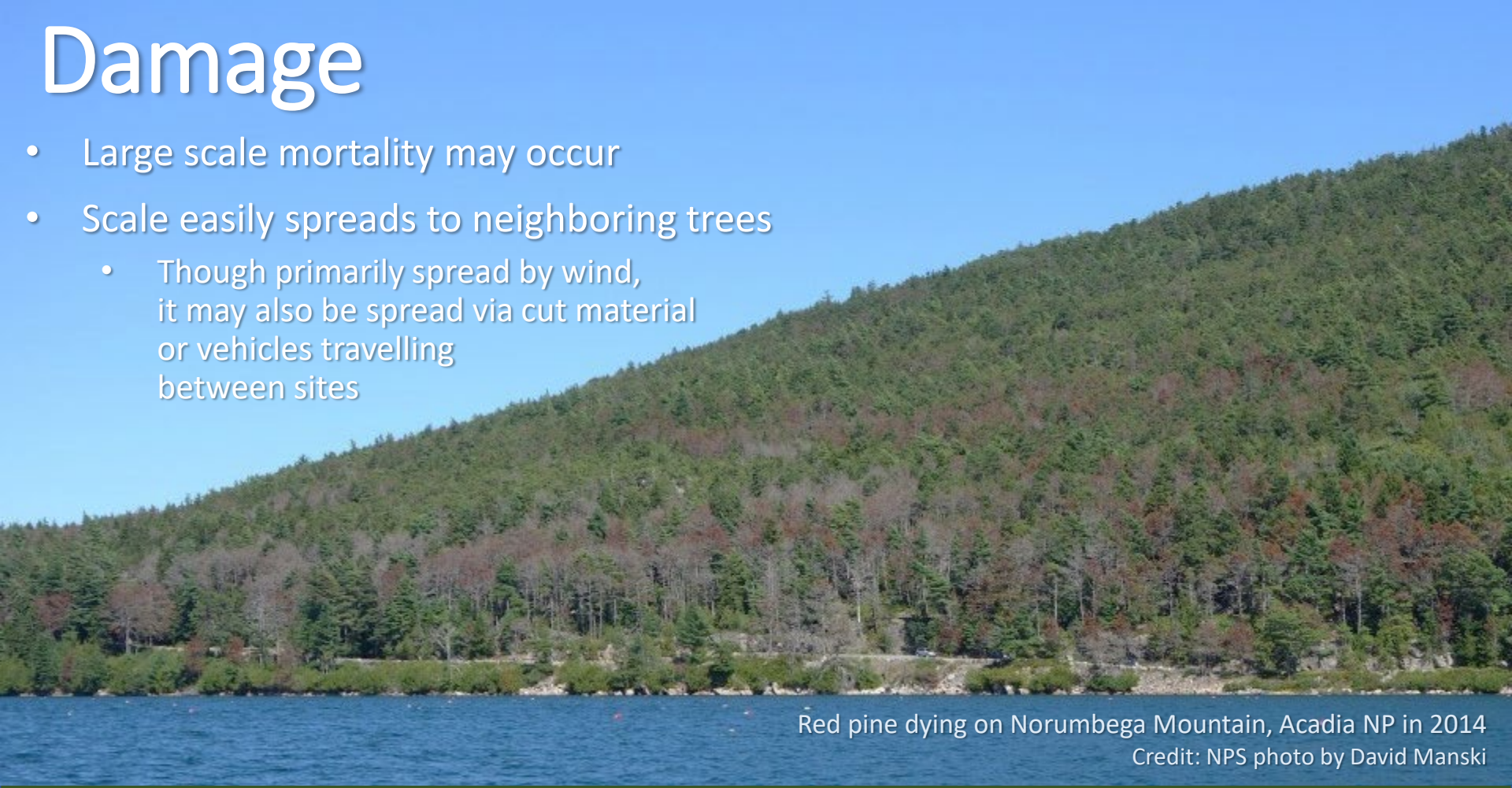
- Native to Japan
- Now found in US, as well as China & Korea
- Injects toxins causing necrosis of the phloem
  - Results in foliage discoloration

Damage

- No apparent tree size preference
- Off-color needles progress from an olive-green color through red

Damage

- Large scale mortality may occur
- Scale easily spreads to neighboring trees
  - Though primarily spread by wind, it may also be spread via cut material or vehicles travelling between sites



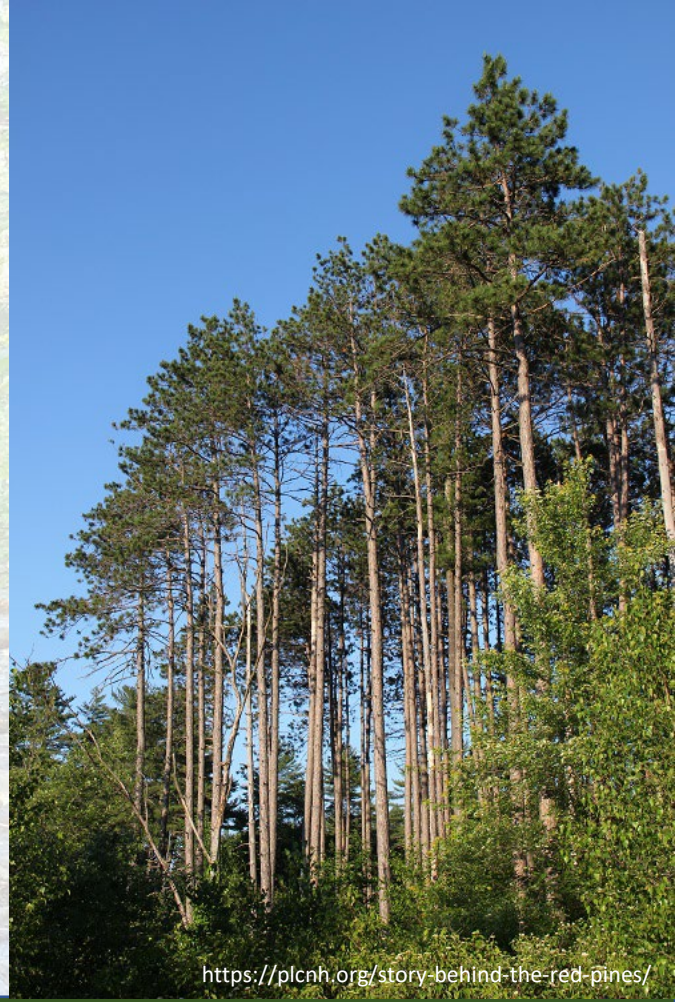
Red pine dying on Norumbega Mountain, Acadia NP in 2014
Credit: NPS photo by David Manski

Host species

- Red pine, Pinus resinosa
- Non-native species:
  - Japanese red pine, P. densiflora
  - Japanese black pine, P. thunbergii
  - Chinese pine, P. tabulaeformis

Impacts

- Red pine planted extensively in the northeast up until the 1960's
  - Benefits:
    - Fast growing
    - Immune to white pine weevil & blister rust
    - Provided work for the Civilian Conservation Corps
- Northwards, in Canada, red pine is more often found occurring naturally



https://plcnh.org/story-behind-the-red-pines/

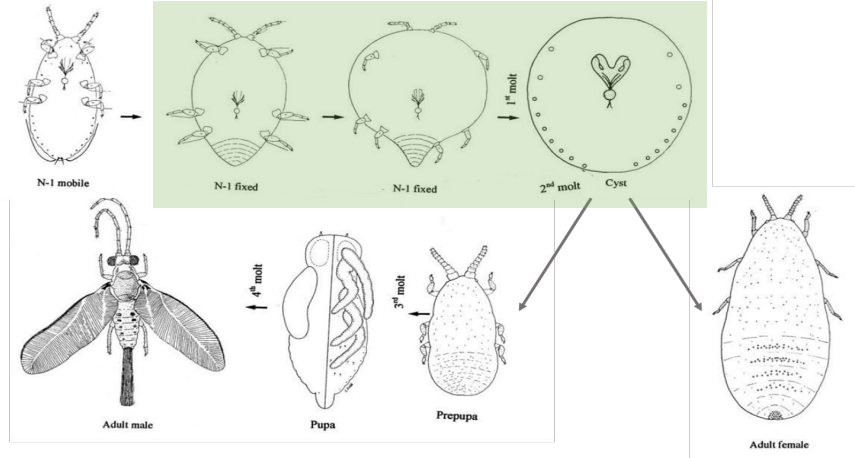
Management

- Treatment options limited…
  - Tree fertilization may exacerbate the infestation
  - Horticultural oil on individual ornamentals not feasible on landscape scale

- Salvage harvests of infested stands
  - Can be conducted in a way to reduce the risk of spread

Harvest timing

- Winter operations best, due to the scale being settled on the host
- Spring – fall: eggs, nymphs, and adults are present
  - Potential risk of picking up the insect on clothing and machinery



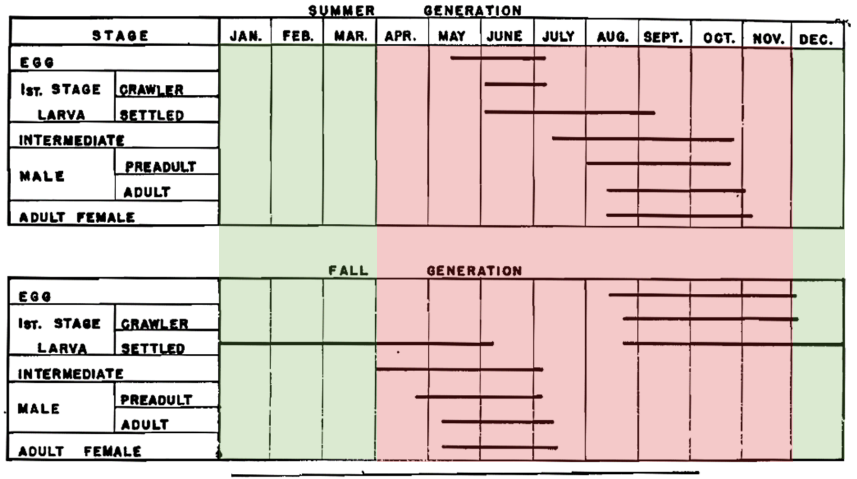


Figure 5.—The seasonal life cycle for summer and fall generations of red pine scale.

(top) Imre Foldi (2004) The Matsucoccidae in the Mediterranean basin with a world list of species (Hemiptera: Sternorrhyncha: Coccoidea)
(bottom) Bean, J. L., & Godwin, P. A. (1955). Description and bionomics of a new red pine scale, Matsucoccus resinosae. Forest Science, 1(2), 164-176.

Additional efforts - Detection

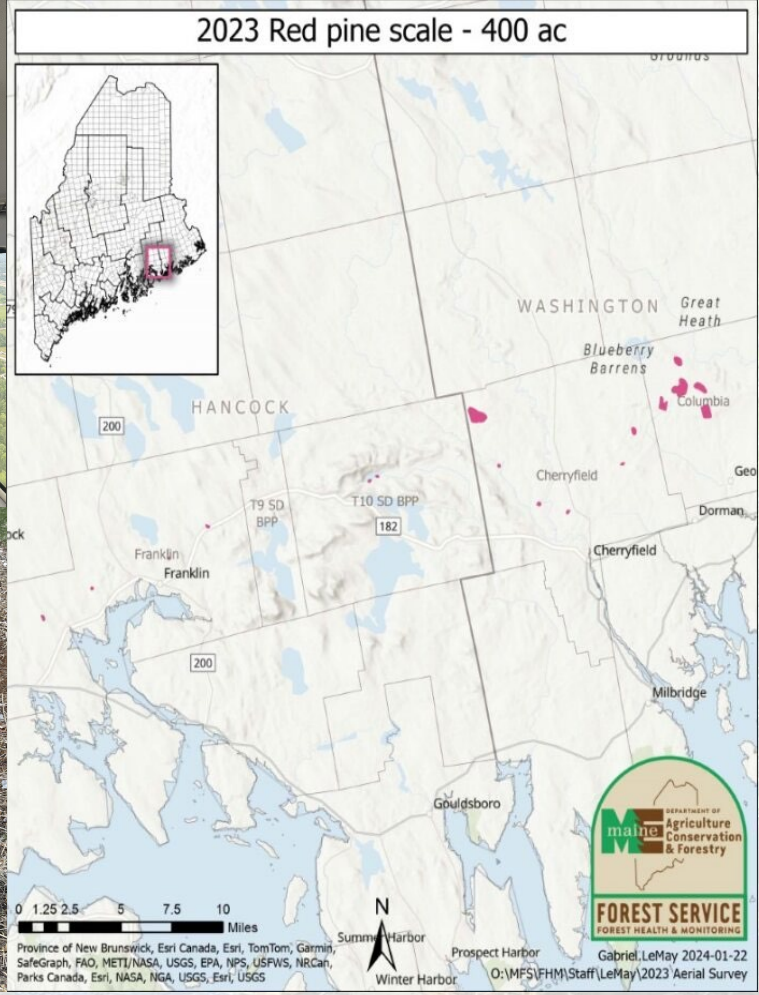
- Confirming red pine scale can be difficult but not impossible
  - Usually requires branch sampling
- Signs to look for are dependent on the life stage found during each season

(clockwise from top-left) NPS photo by Jesse Wheeler; Gabe LeMay MFS; Gabe LeMay MFS;
Liu W, Xie Y, Dong J, Xue J, Zhang Y, et al. (2014) Pathogenicity of Three Entomopathogenic Fungi to Matsucoccus matsumurae

maine DEPARTMENT OF Agriculture, Conservation & Forestry

Monitoring

- MFS conducts an annual aerial survey to detect many types of insect damage, including red pine scale
- This year, also trialing a trapping survey to detect crawler stage



Monitoring

Pest and host distribution allows for more informed management decisions

Year RPS detected
- 2014
- 2015
- 2016
- 2017
- 2018
- 2019
- 2020
- 2021
- 2022
- 2023

Red pine basal area (sq ft/acre)
- 1 - 25
- 25 - 50
- 50 - 75
- 75 - 100

Augusta
Lewiston
Brunswick
Portland
Conway
Sanford
Rochester
Dover
Portsmouth
Concord
Manchester
Bangor
2023
2014
2019

N
W
E
S

0 10 20 40 60 80
Miles

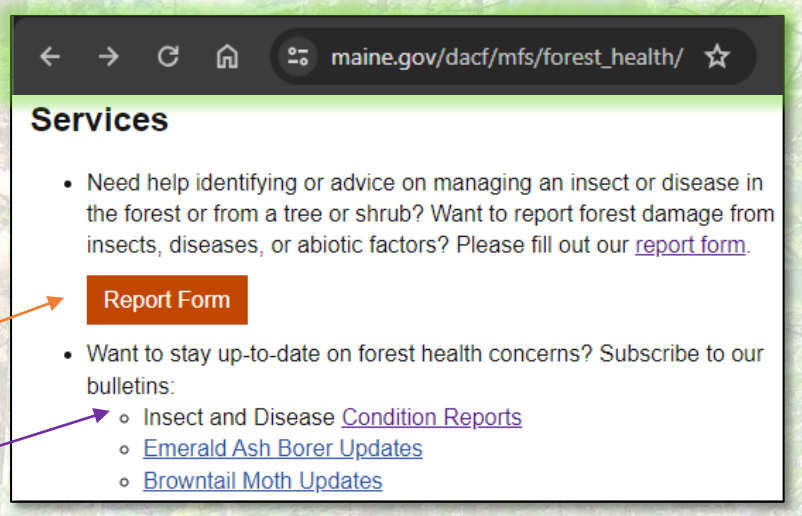
Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NPS, USFWS

maine Department of Agriculture Conservation & Forestry
FOREST SERVICE
FOREST HEALTH & MONITORING

September 2023 Gabe LeMay
O:\MFS\FHM\Staff\LeMay\Red Pine Scale 2023

What you can do

- Recognize the signs and symptoms of red pine scale
- Submit reports of red pine in decline
- Subscribe to the Forest Health Condition Reports to stay up to date on the most recent information
- Take care when travelling between infested areas of red pine



Thank you!

Brittany.Schappach@maine.gov

Gabriel.LeMay@maine.gov

What Happened in Maine Last Season?

Maine Invasive Species Network Annual Meeting

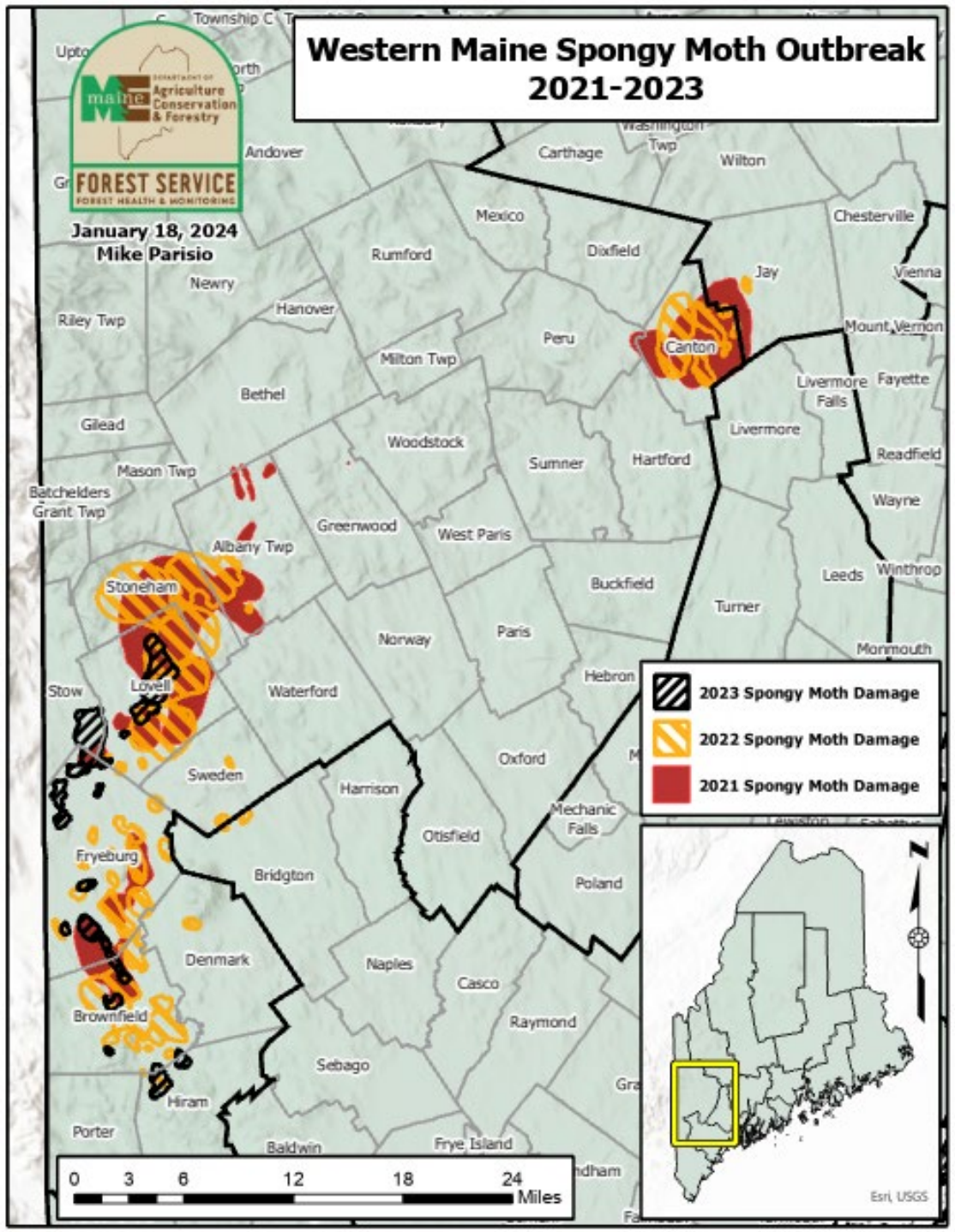
April 2024

2023 Maine Major Defoliator Review

1) Spongy moth populations in western Maine appear to have collapsed, however late frost damage and aerial survey delays prevented accurate aerial survey mapping in 2023. Extent of mortality remains to be determined in 2024
2) Browntail Moth populations have shifted dramatically from Midcoast areas into the lower Penobscot River Basin and parts of central Maine. Pathogen load was not as high as hoped for in 2023 despite abundant moisture.
3) Midcoast Maine bore the brunt of winter moth damage in 2023 and heaviest damage occurred in areas like West Bath, Phippsburg, and the Bristol peninsula. MFS continues an active winter moth biological control program.
4) Forest Tent Caterpillar was very active in northern Maine for the second consecutive year. Defoliation damage roughly doubled in 2023 to over 30K acres.
5) Spruce budworm pheromone trap captures in northern Maine have remained stable at 16 moths per trap in 2021 and 2022 and dropped again slightly in 2023 to 13 MPT. No visible defoliation was observed in 2023 during aerial or ground survey.





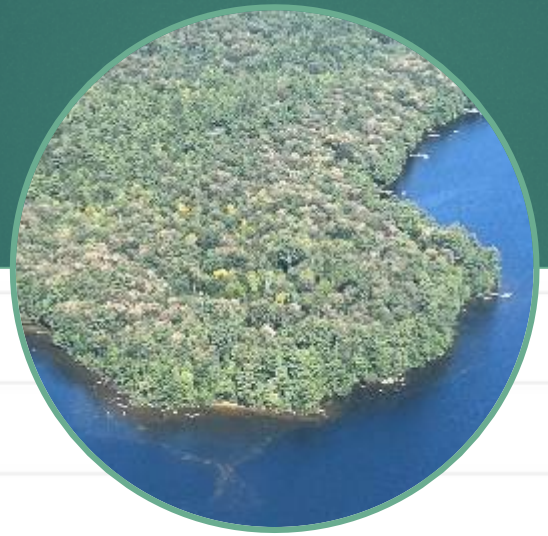



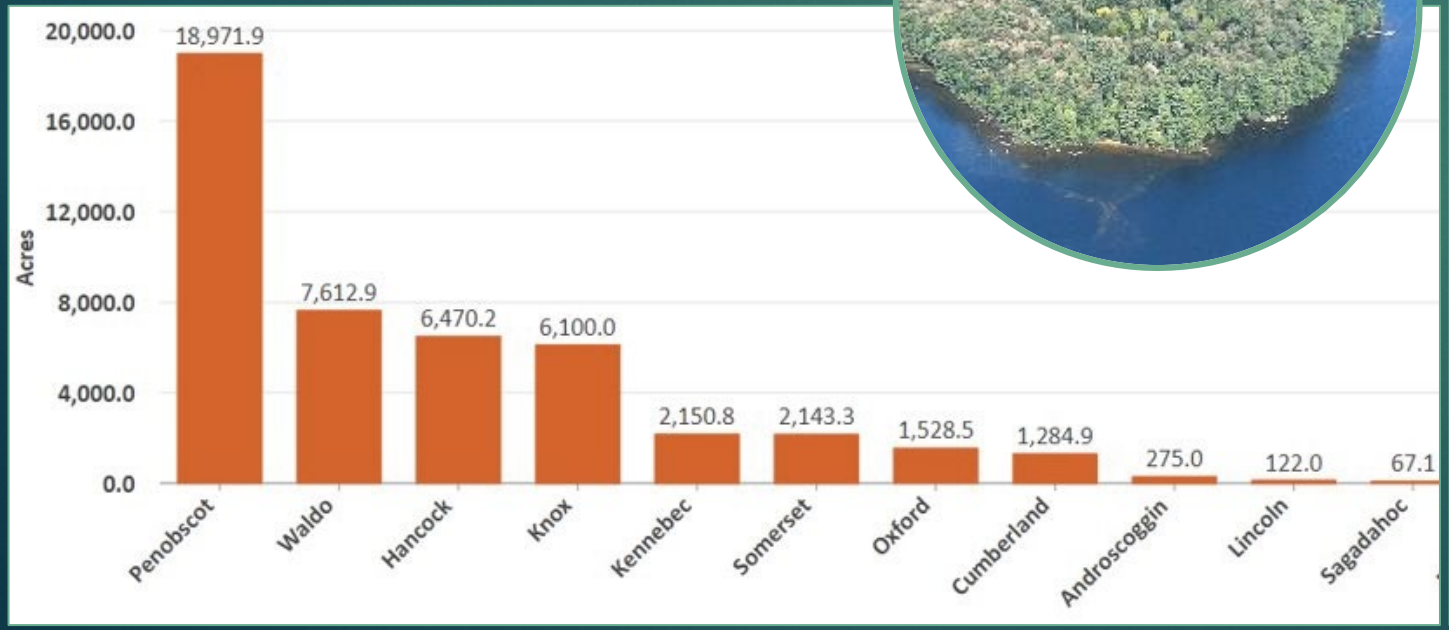
Spongy Moth

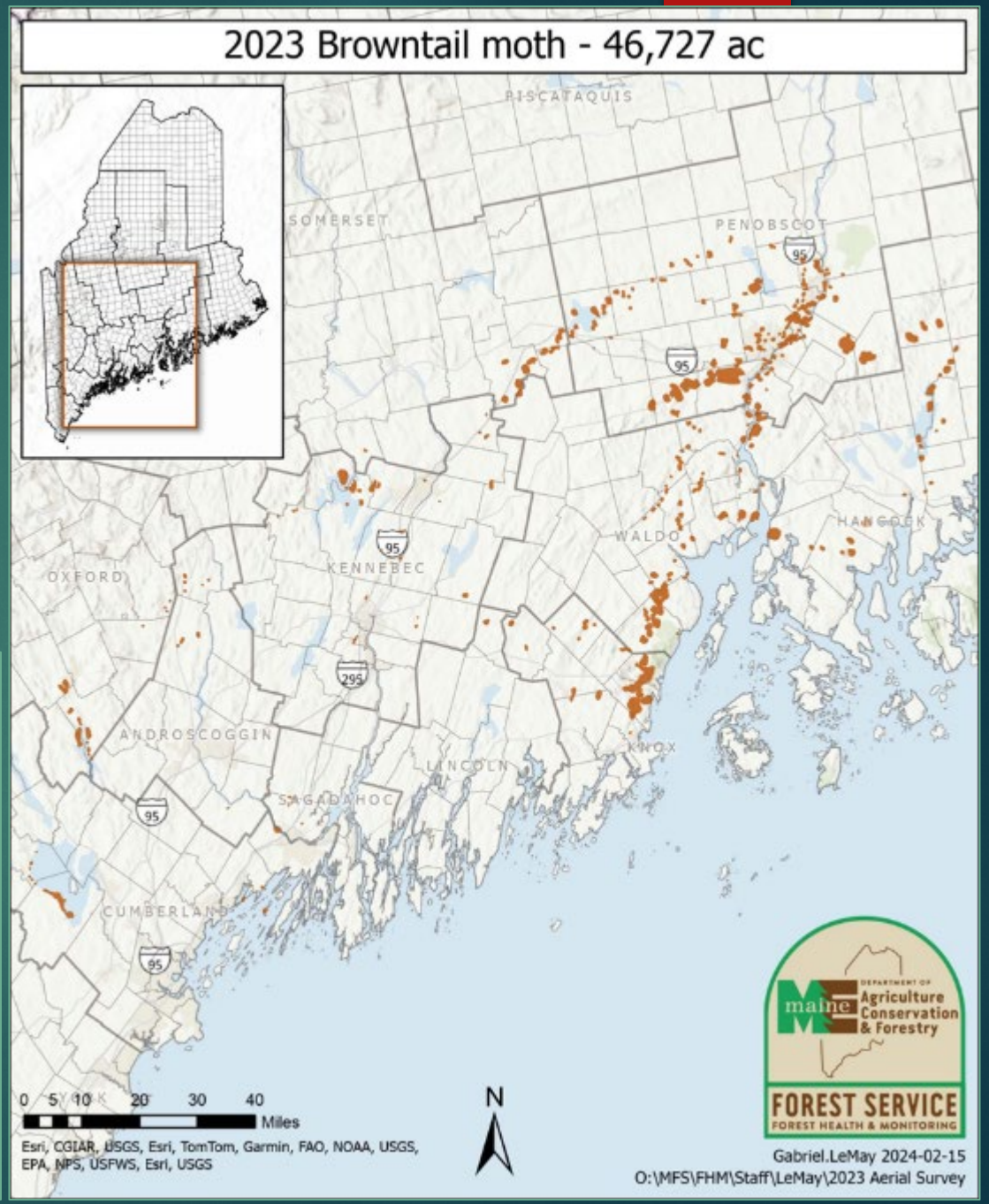
- 2021 population explosion resulted in ~55K acres of damage located primarily along NH border, contiguous with additional ~30K acres of defoliation spanning into NH
- Damage levels were similar in 2022 at ~52.5K acres and primarily located in the same core areas in southern Oxford Co.
- Significant levels of disease were observed in western Maine beginning in 2022
- True extent of 2023 spongy moth damage was obscured by late aerial survey and regional frost event in May affecting oaks.
- Extent of mortality will likely be revealed in 2024 providing appropriate aerial survey timing. As map shows, some areas were defoliated for a minimum of three growing seasons. Several of these growing seasons were paired with drought conditions or frost damage.
- Little evidence of spongy moth activity documented in 2023 and low volume of public reports

Browntail Moth

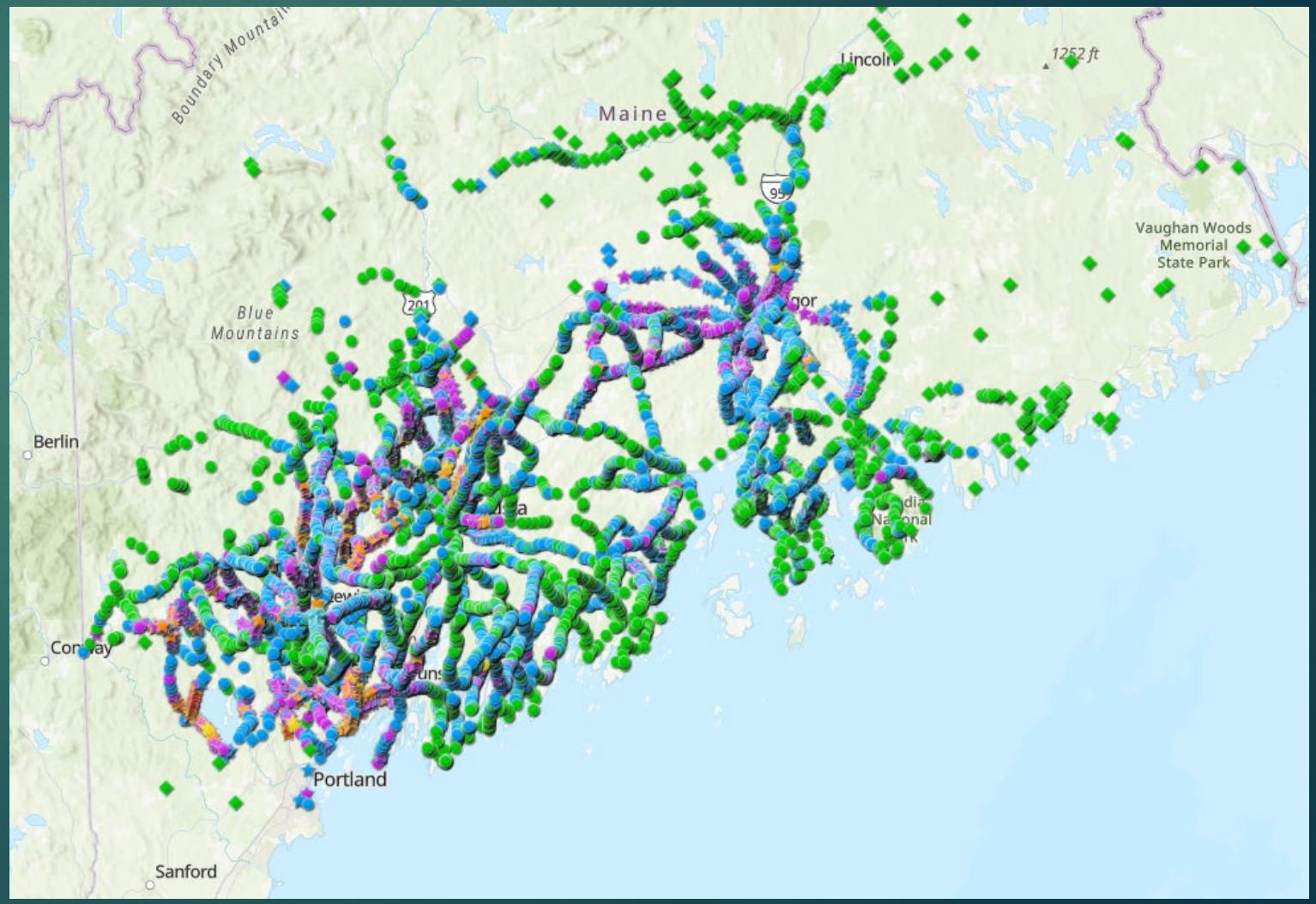
- 2021 Total = 199,721 ac
- 2022 Total = 151,806 ac
- **2023 Total = 46,727 ac ***



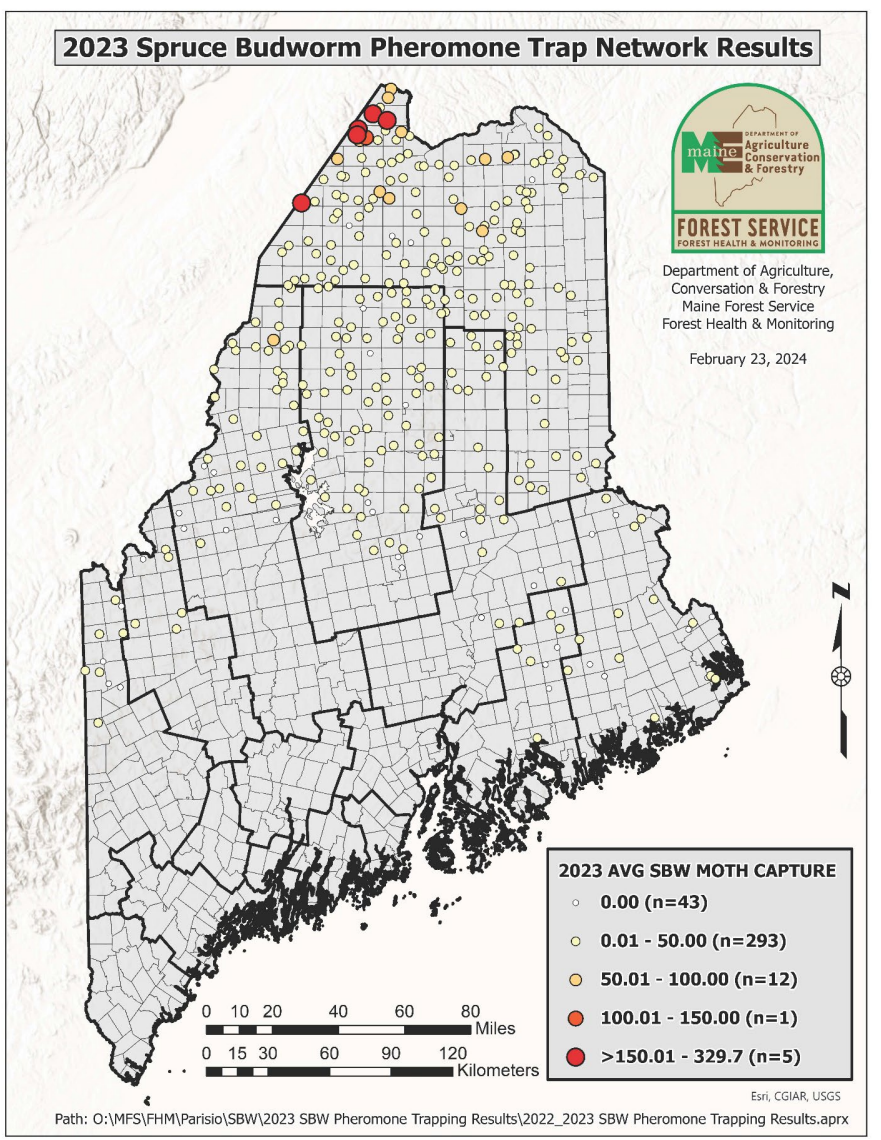


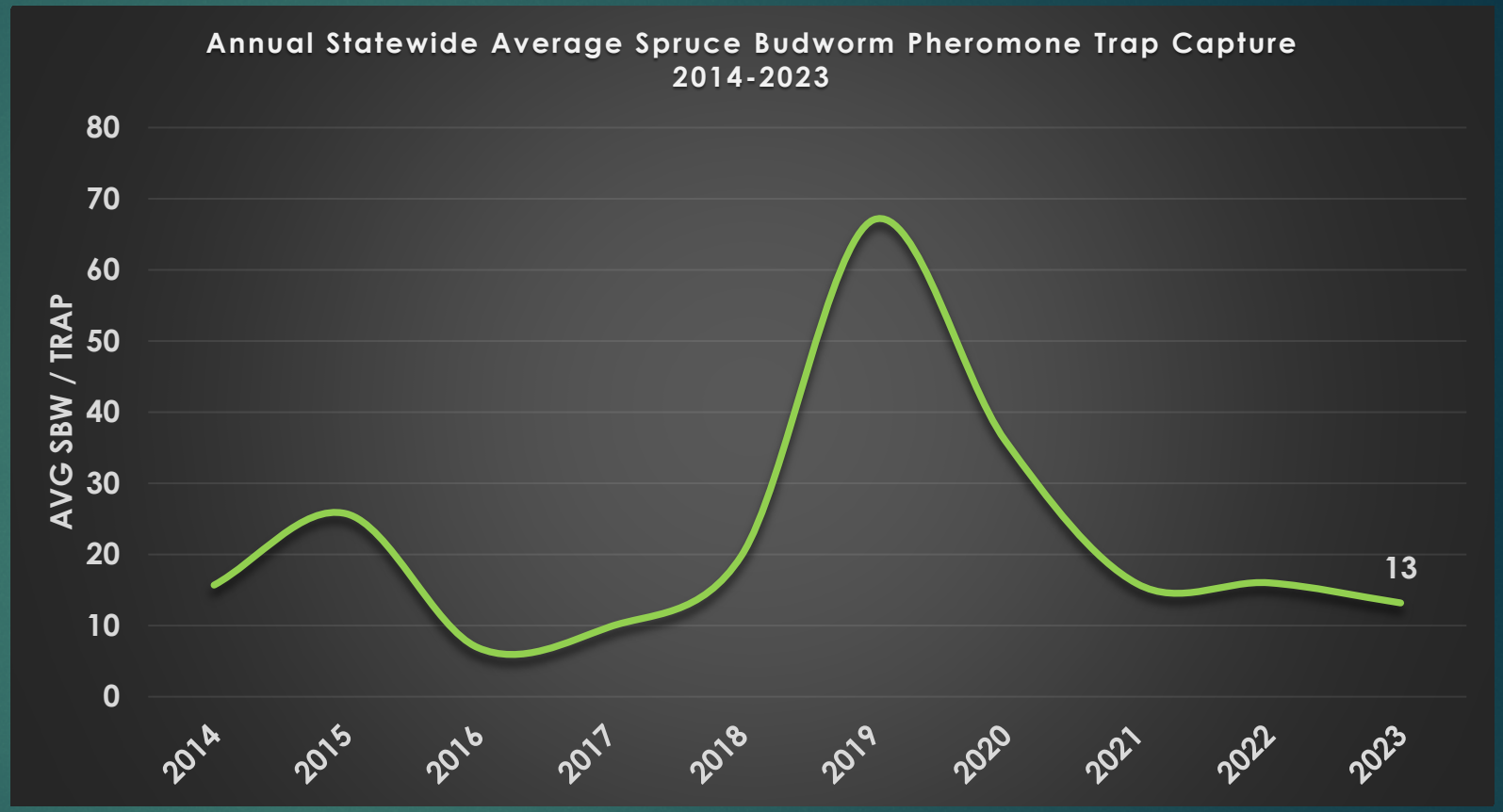


Browntail Moth Winter Web Survey

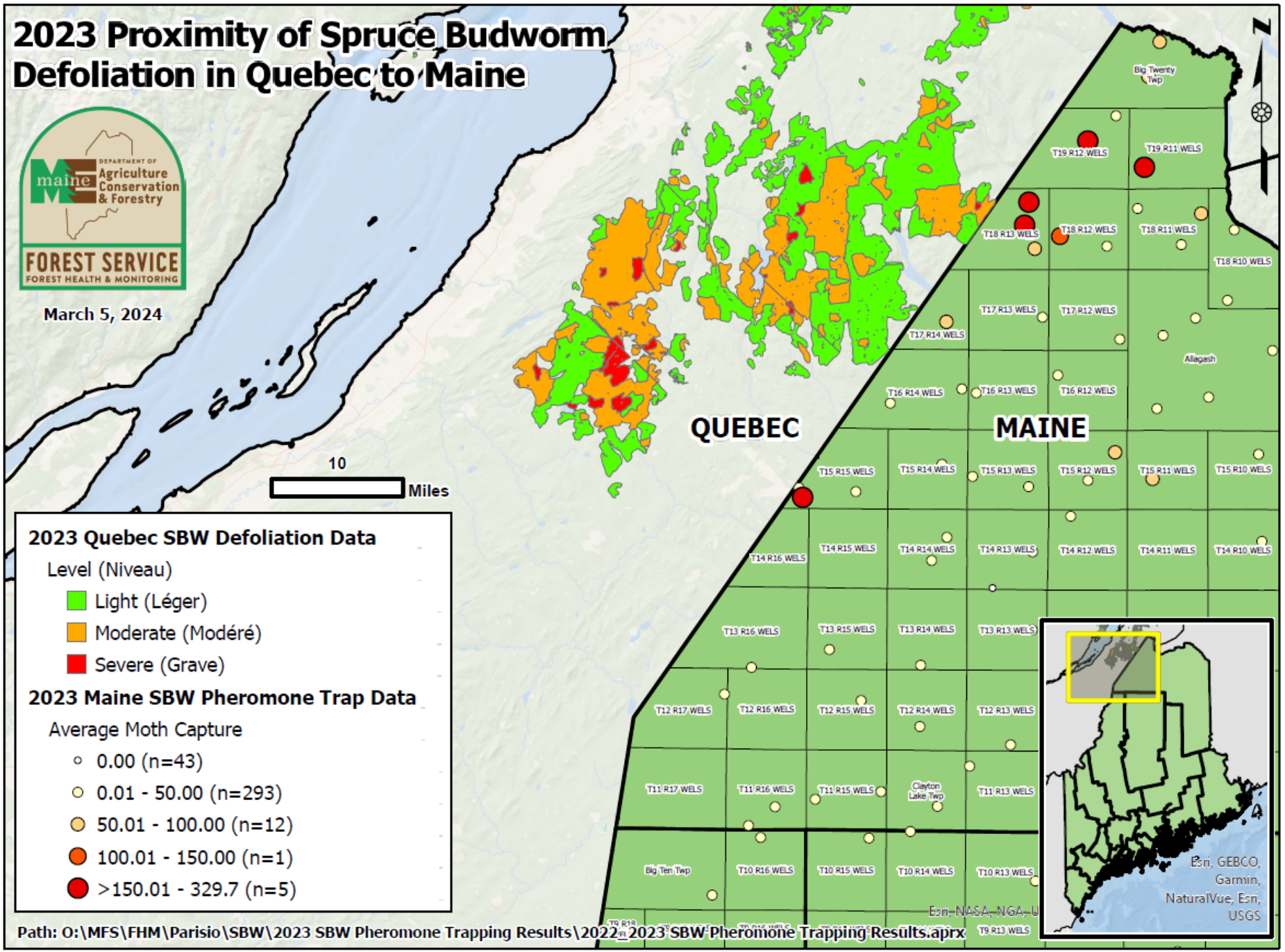


Spruce Budworm Pheromone Trapping Trends





- Maine continues to maintain a large annual statewide cooperator network of around 350 SBW pheromone trap sites
- Overall statewide SBW situation in Maine appears stable in 2023 except for a few areas of interest being investigated now

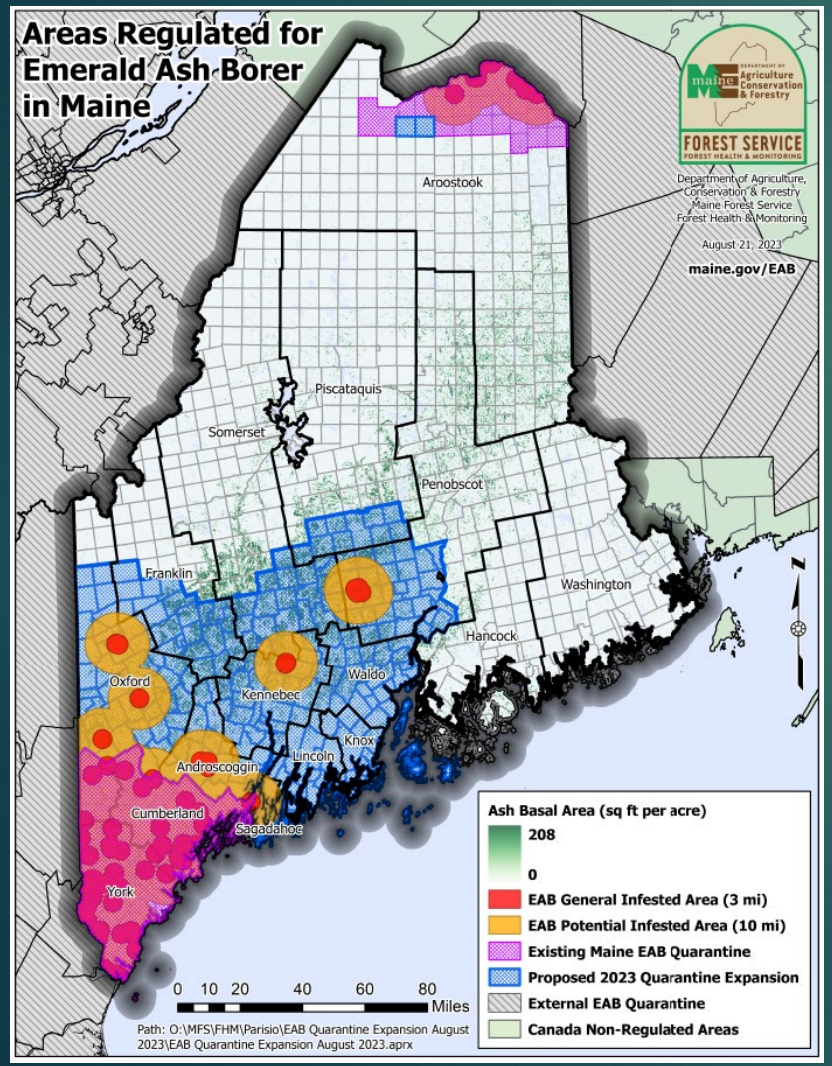


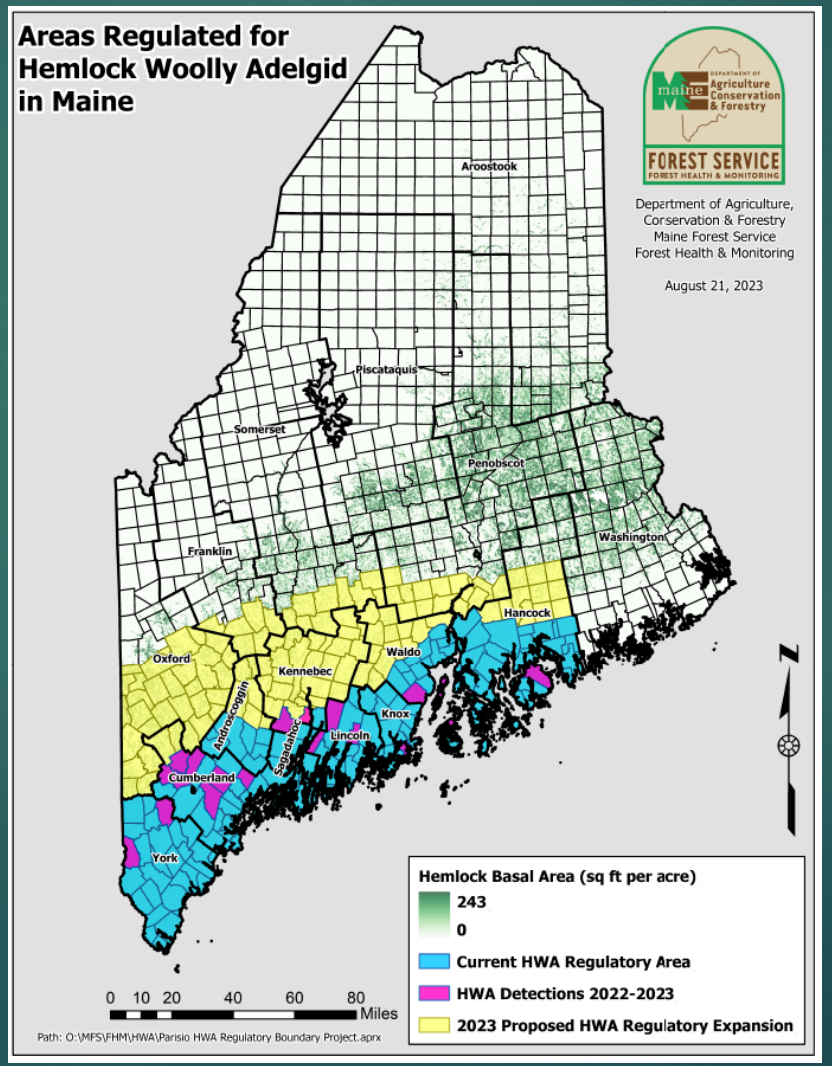
QUEBEC DEFOLIATION DATA SOURCED FROM: MINISTRY OF NATURAL RESOURCES AND FORESTS. Data on natural disturbances - Insect: Spruce budworm, [Dataset], in Data Quebec, 2013, updated November 1, 2023. [https://www.donneesquebec.ca/recherche/dataset /data-on-natural-disturbances-lepinette-budworm-insect], (accessed March 5, 2024).

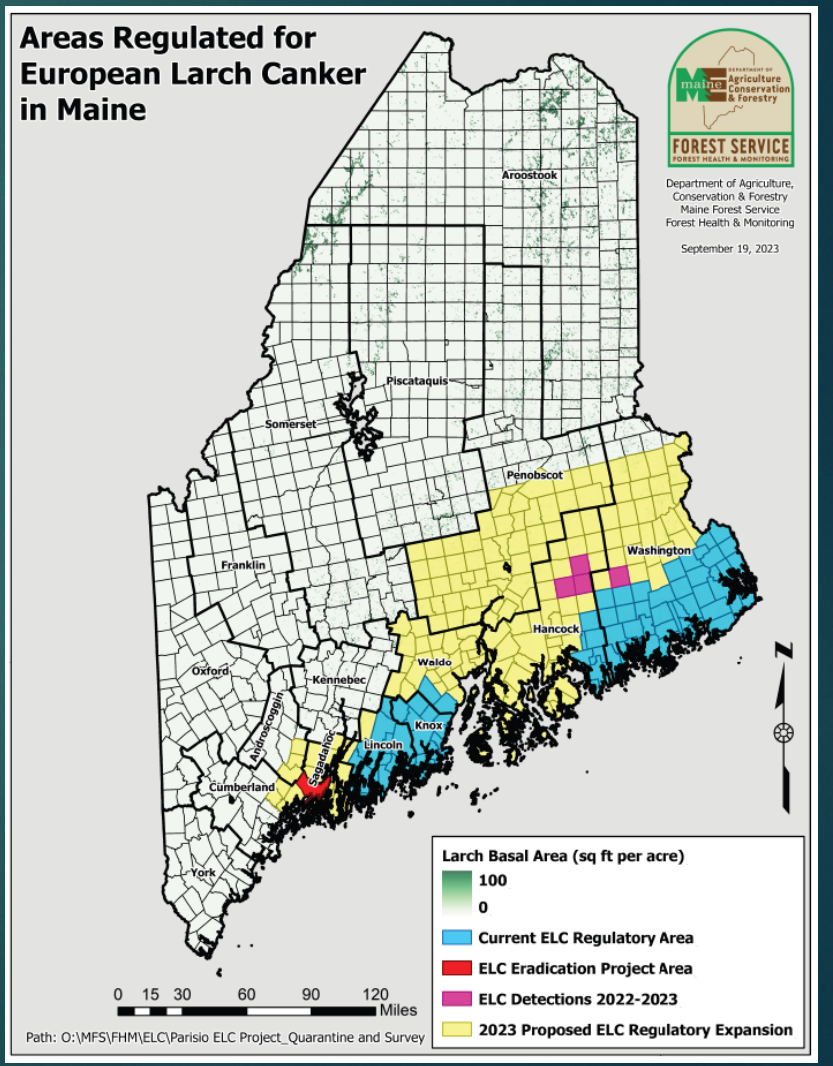
- Maine will be keeping a close eye on SBW defoliation near the Quebec border in areas adjacent to high pheromone trap captures in 2024. These areas were unable to be flown during 2023 aerial survey, but not on the ground reports of defoliation were received from our SBW cooperator network.

Regulatory Expansions in 2023

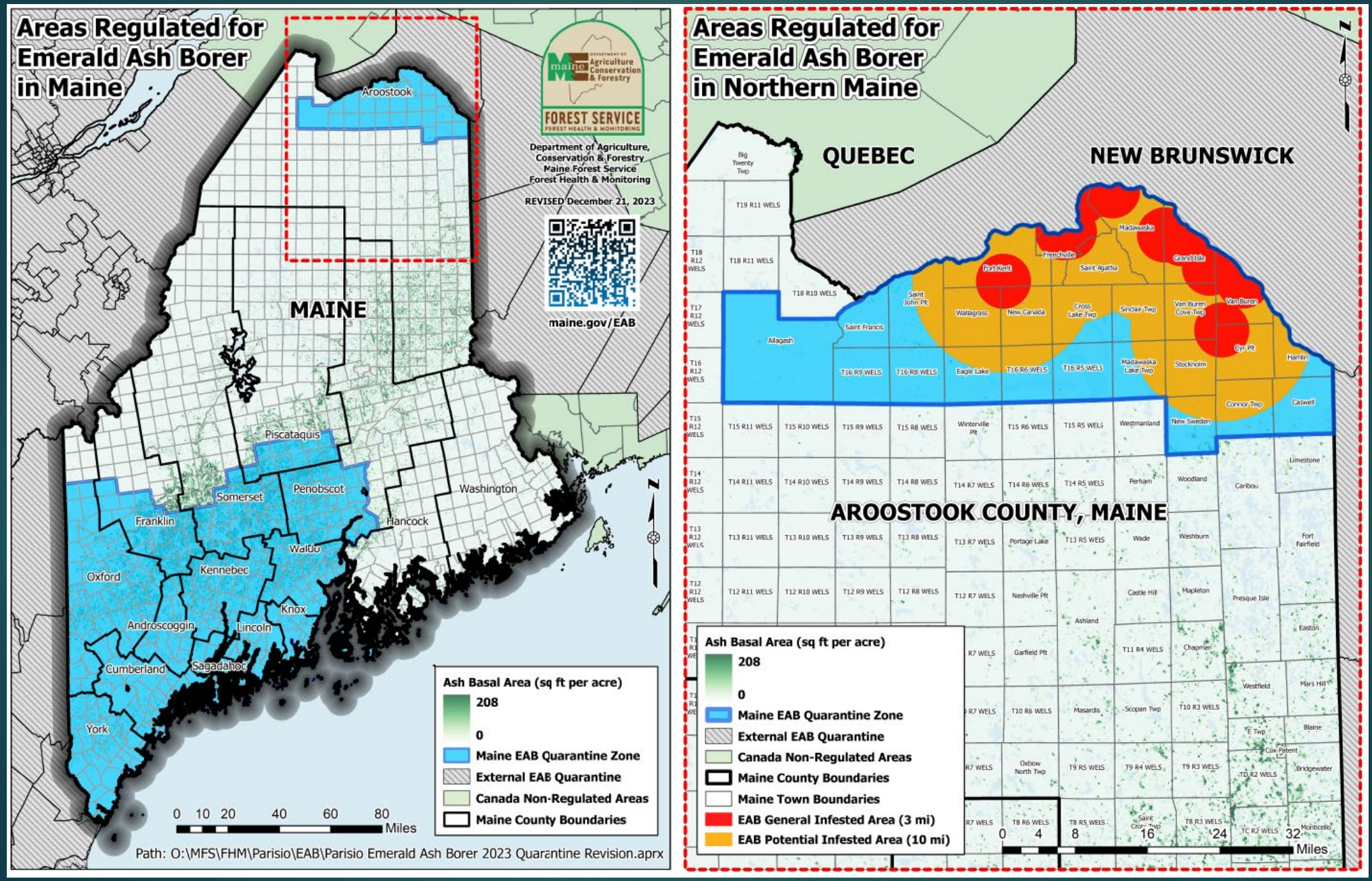
- New detections in 2022 & 2023 have spurred the revision of regulatory boundaries for emerald ash borer, hemlock woolly adelgid, and European larch canker
- Proposed maps shown below, with rules accepted and new maps available as of December 2023



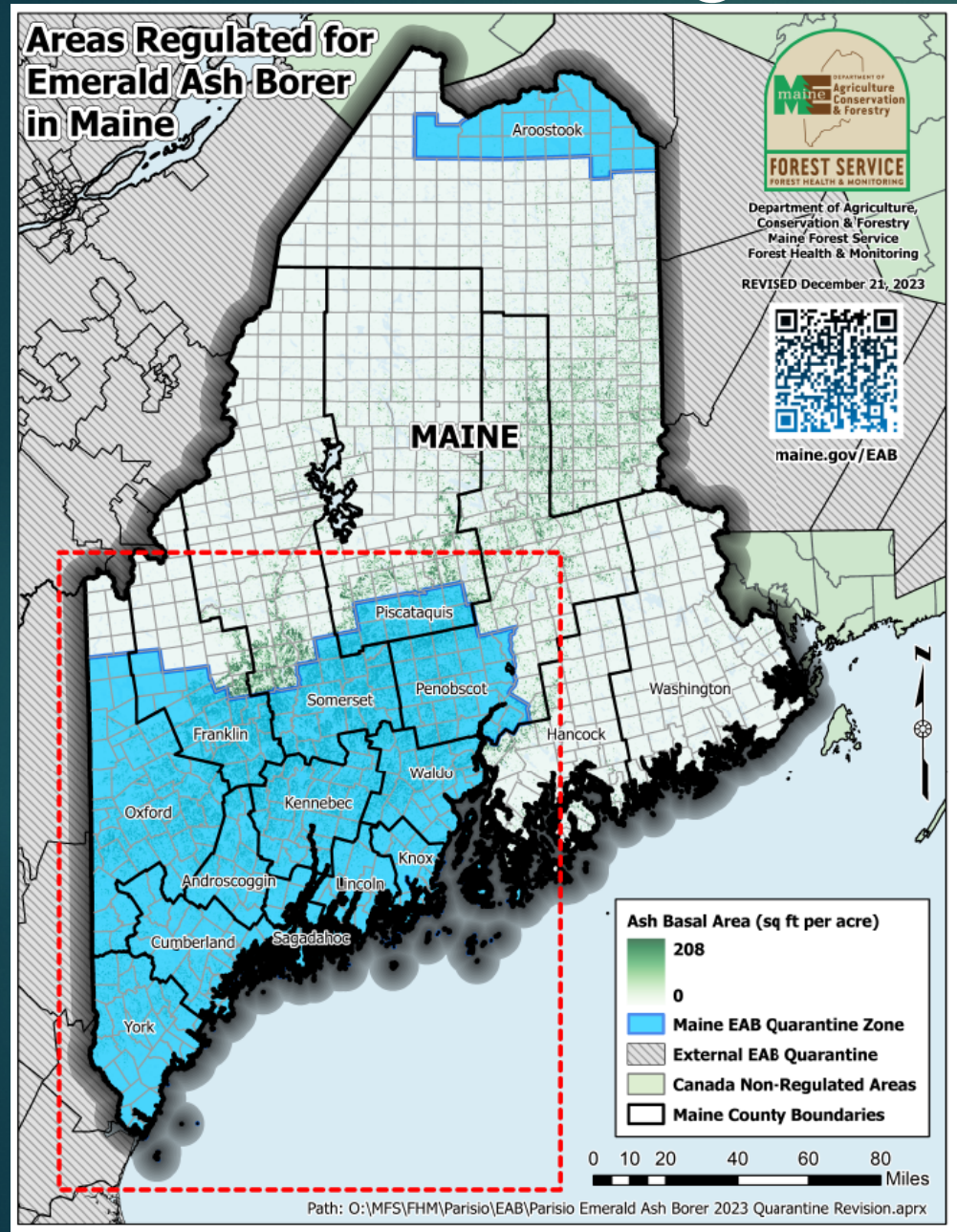


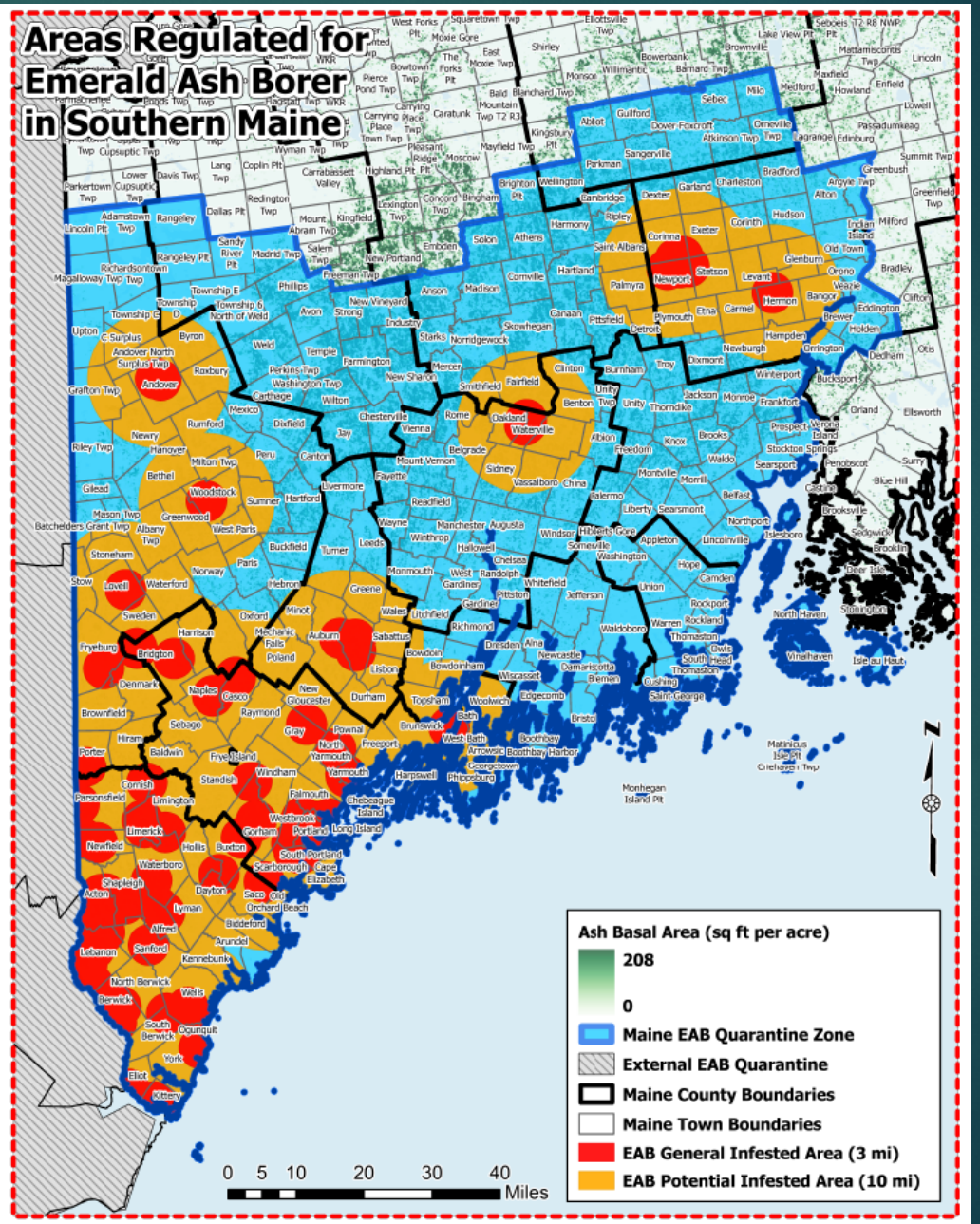


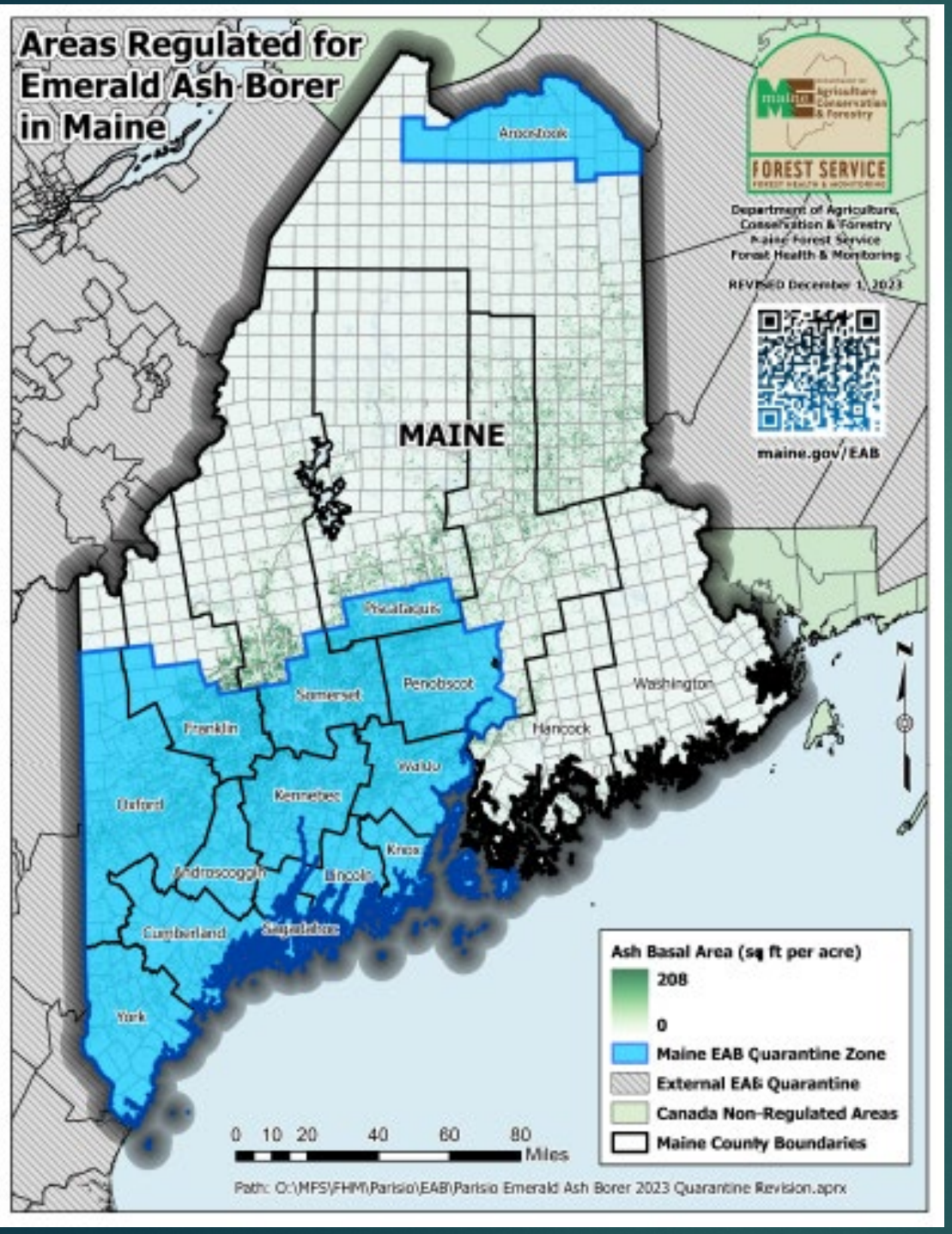
Revised Areas Regulated for EAB in northern Maine



Revised Areas Regulated for EAB in southern Maine







What is Maine Trying to Protect?

- ~481,457,542 ash trees over 1" DBH account for ~2% of all trees in Maine
- Presently ~70% of Maine's ash are in regulated areas
- Despite recent setbacks with detections in new areas, the majority of Maine is still presumed EAB-free

EAB Monitoring & Management Activities in 2023

Maine continued to survey for emerald ash borer in 2023 using:

Purple Prism Traps

- 197 traps deployed, no positives

Girdled Trap trees

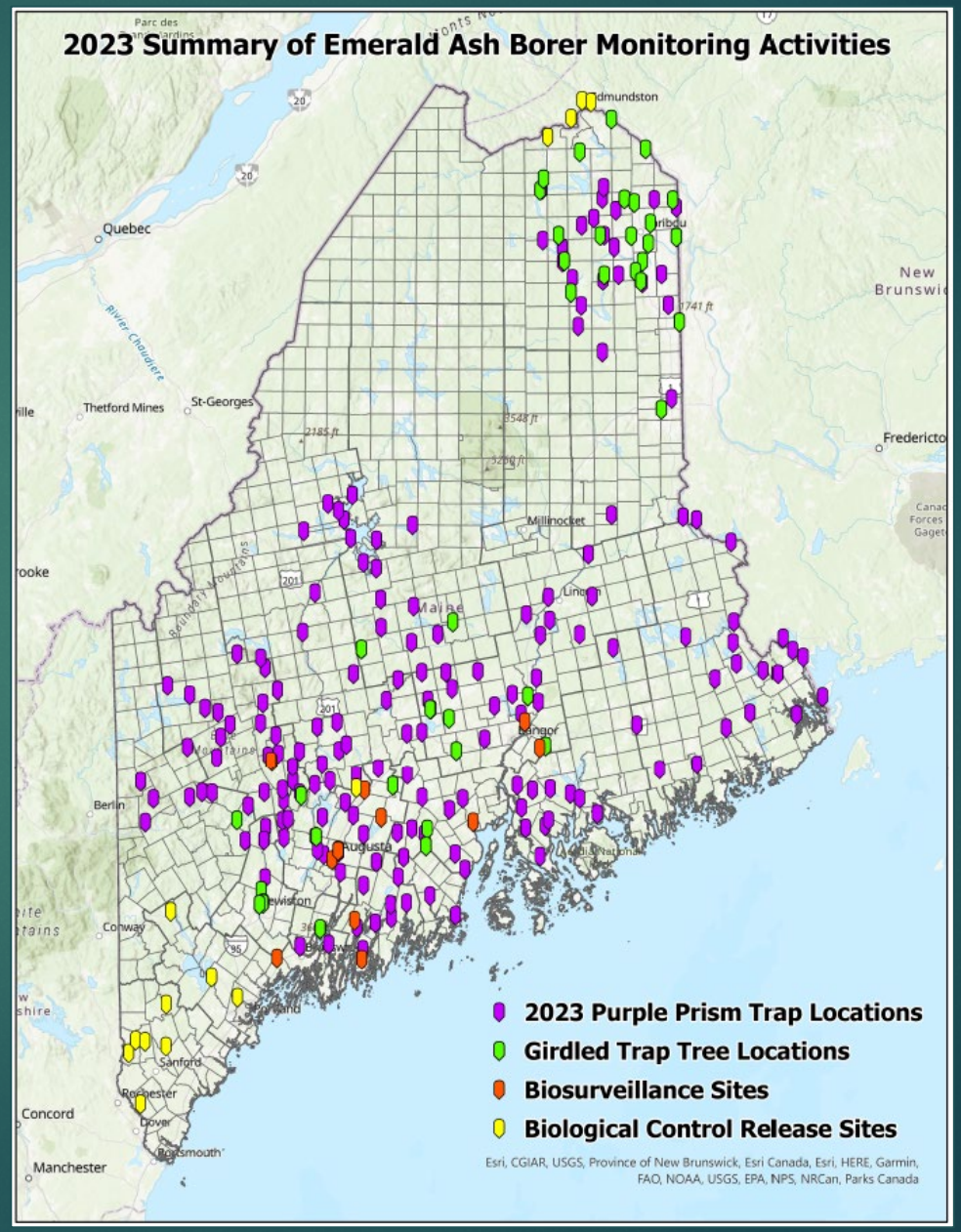
- 47 tree peeled, 5 positives
- Grand Isle, Cyr Plt, Newport, Lewiston (2)

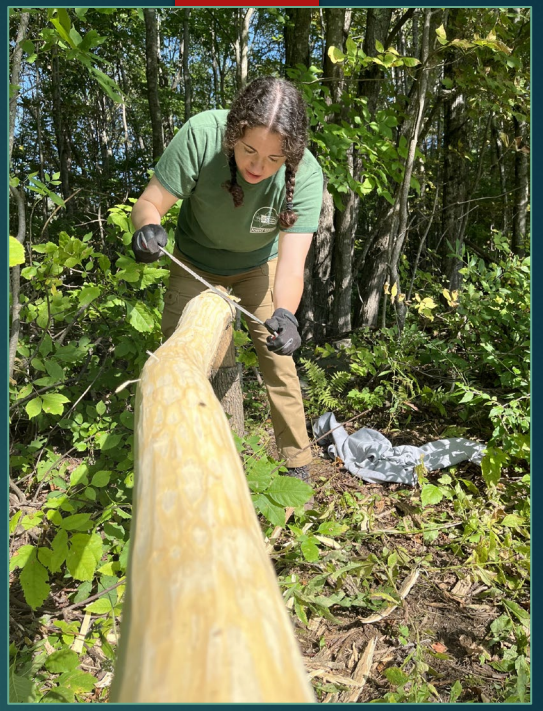
Biosurveillance

- 30 surveys,14 sites,11 towns, 8 counties
- 282 Buprestidae recovered, no positives

Biological Control

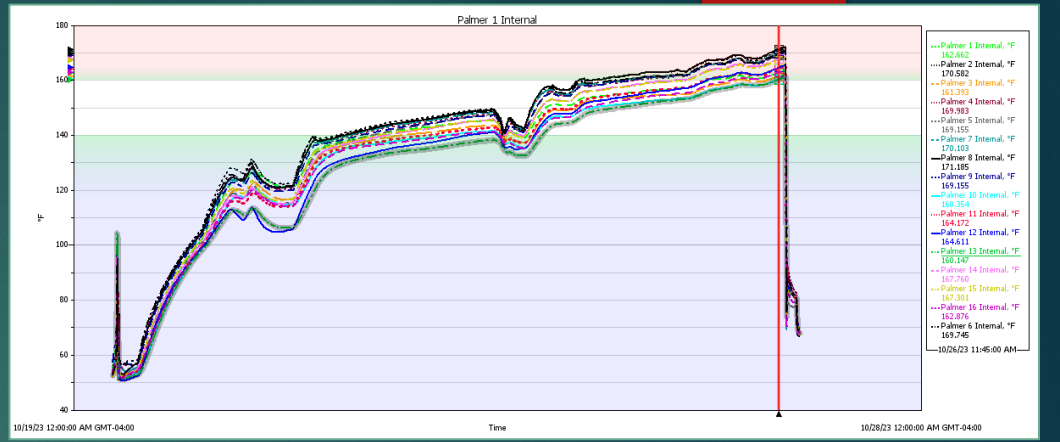
- Maine has released biological control agents at 14 sites since the launch of the program. Recent recoveries of biocontrol agents from field sampling indicate establishment occurring in southern Maine



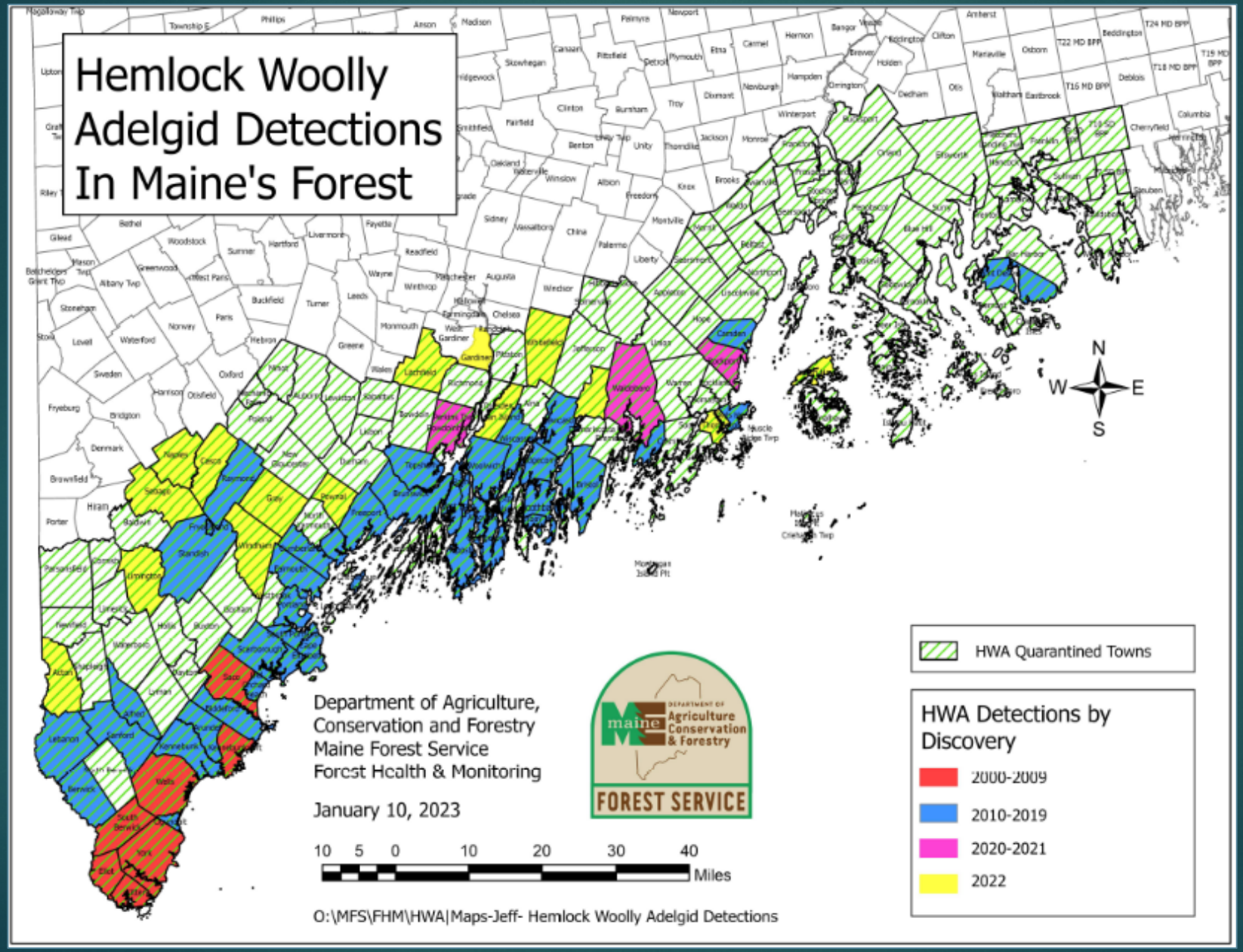


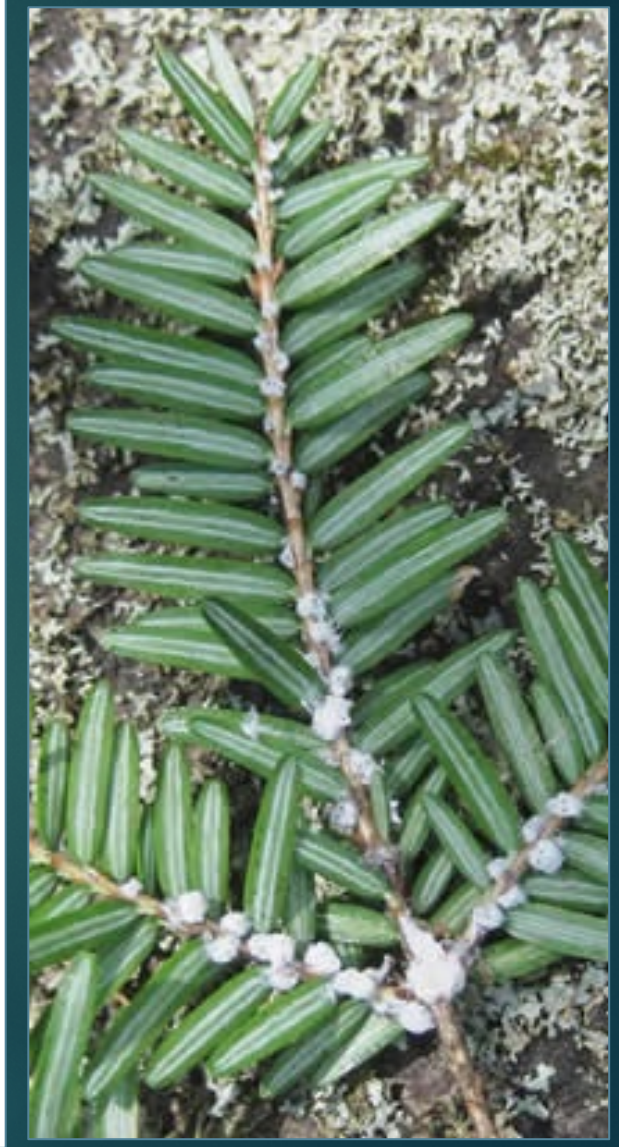
Regulatory Activities in 2023

A greater number of firewood dealers are now working with Maine Forest Service on heat-treatment certification of kilns to ensure a pest-free product is being distributed around Maine.



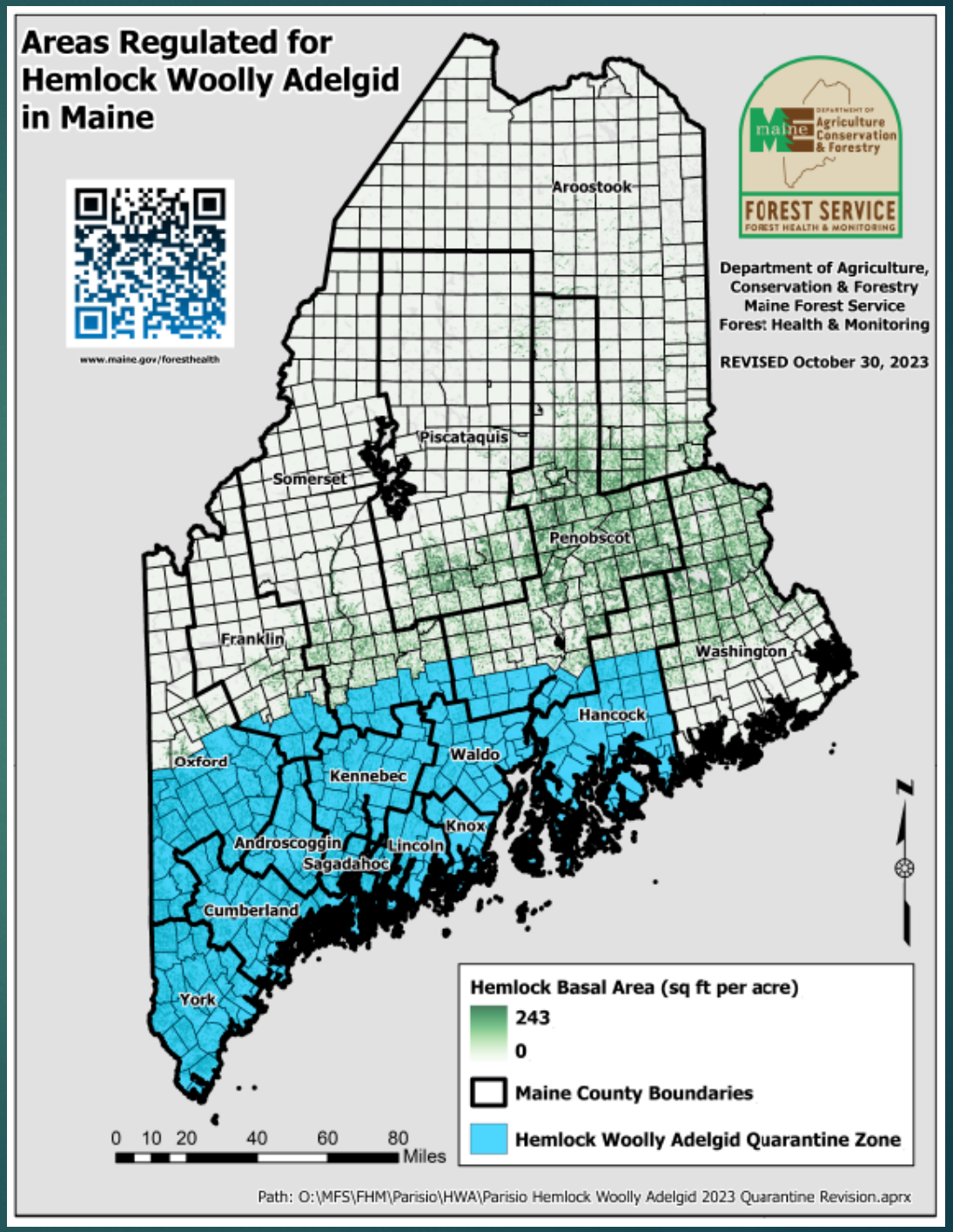
Maine HWA Forest Detection Trends





Revised HWA Quarantine Zone

- Chips with top material included in regulated articles and are not permitted to leave the quarantine zone
- Given the sizeable expansion and HWA-free area within quarantine zone, chips with top material should still be moved the bare minimum or left onsite when possible



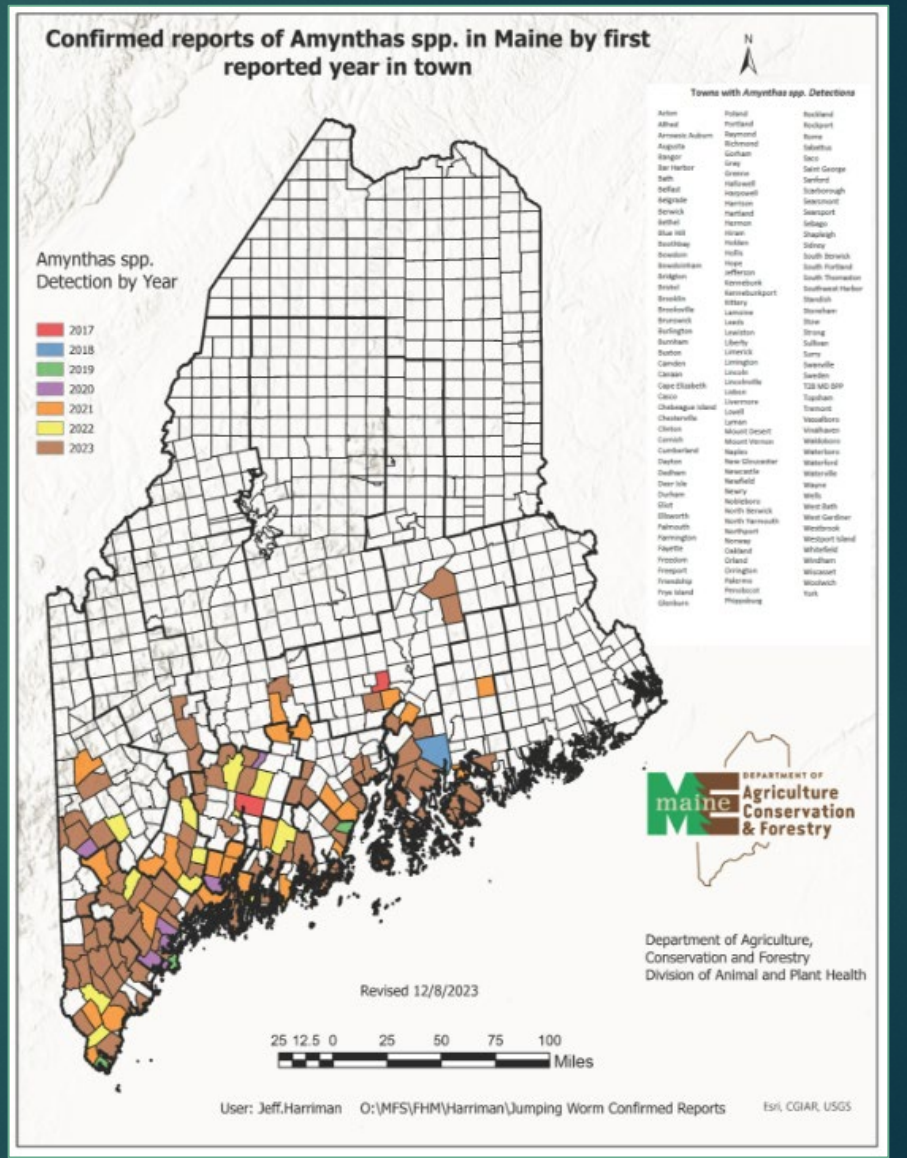
Hemlock Woolly Adelgid Biological Control

- In 2023, MFS trained cooperators and facilitated the release of 44,100 *Sasajiscymnus tsugae* across 47 sites from Midcoast to southern Maine. *Sasajiscymnus tsugae* was purchased by the members of the cooperative and this group effort involved private and public lands, including private landowners, land trusts, municipalities, a state park, and a school.

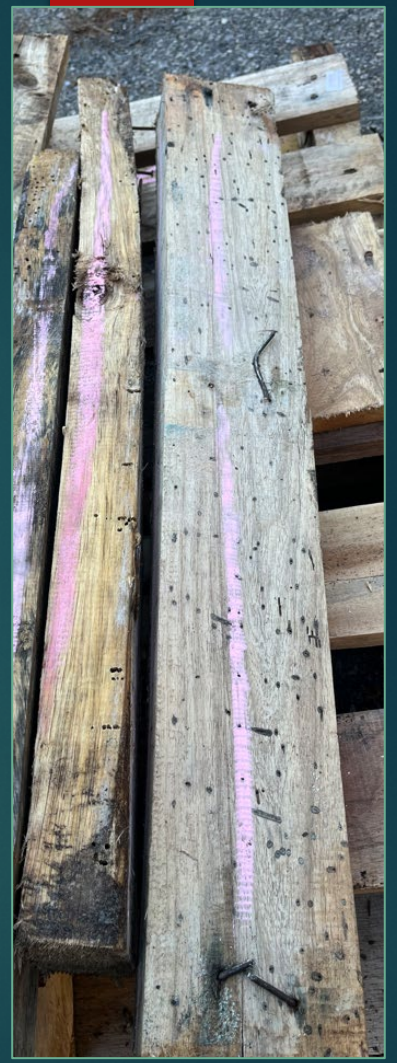
- MFS staff travelled to Maryland in late 2023 to collect HWA biological control agents to be brought back to Maine for release.

Jumping Worms in Maine

- First reported in Maine in 2014
- Now found in 14 of 16 counties
- Jumping worms are not regulated in Maine – action limited to education and outreach



Notable Interceptions in 2023



Emerald ash borer infested firewood from Pennsylvania on Memorial Day Weekend, Spotted Lanternfly on a cruise ship sailing from NY – RI – Portland, ME – Bar Harbor, ME – Canada, and Conifer Auger Beetle (*Sinoxylon unidentatum,* Bostrichidae) from infested pallets from Indonesia.


BAG
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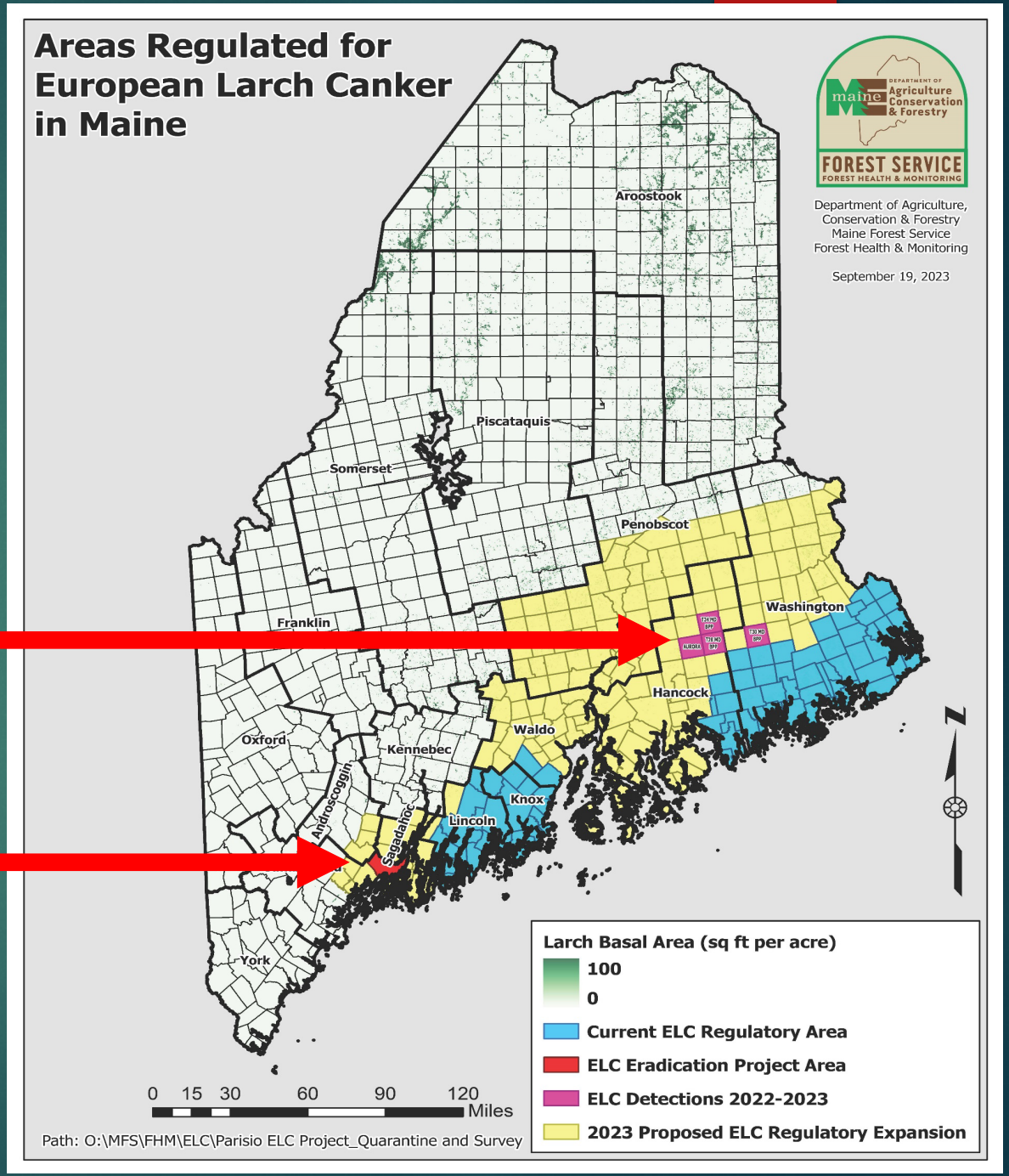
Maine Forest Service

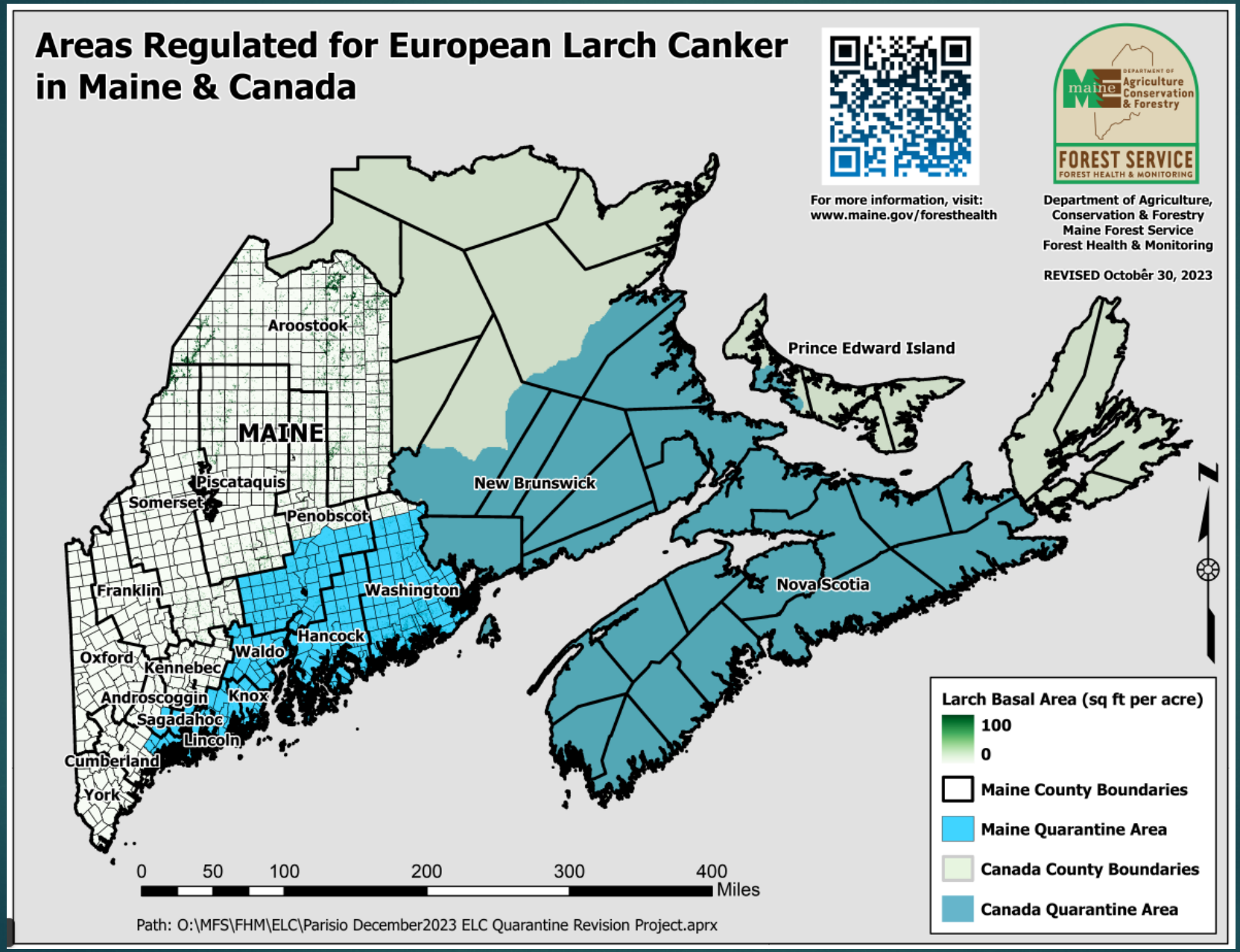
European Larch Canker

- Successful survey of European larch canker continues
- Fall survey critical to identifying areas for winter survey
- Winter survey led to another new ELC positive area in 2023
- Eradication efforts continue at Brunswick Country Club with yearly larch tree evaluations and management guidance for pruning, removal
- The Brunswick Country Club has carried out yearly removals based on our recommendations, communicated to their grounds crews in the form of MFS-made maps



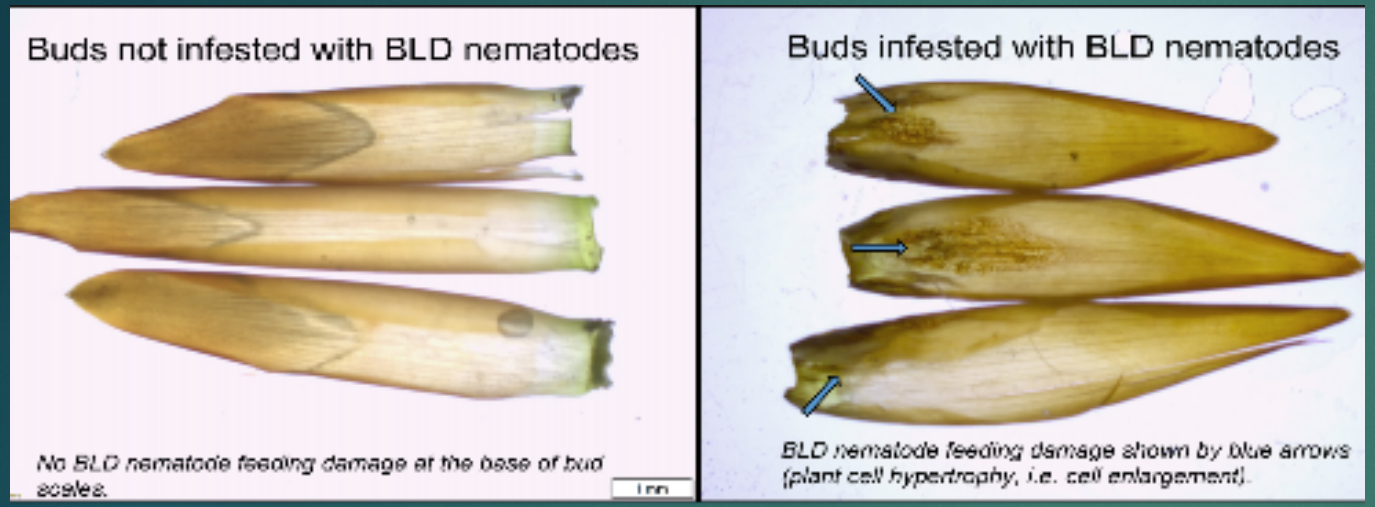
(left) A flagging branch impacted by European larch canker as would be seen in fall survey (*Dave Houston*); (middle) Numerous apothecia of the causal fungus of ELC *(Maine Forest Service, Forest Health and Monitoring);* (right) Close-up of the white-haired apothecia of the ELC fungus. *(Maine Forest Service, Forest Health and Monitoring)*

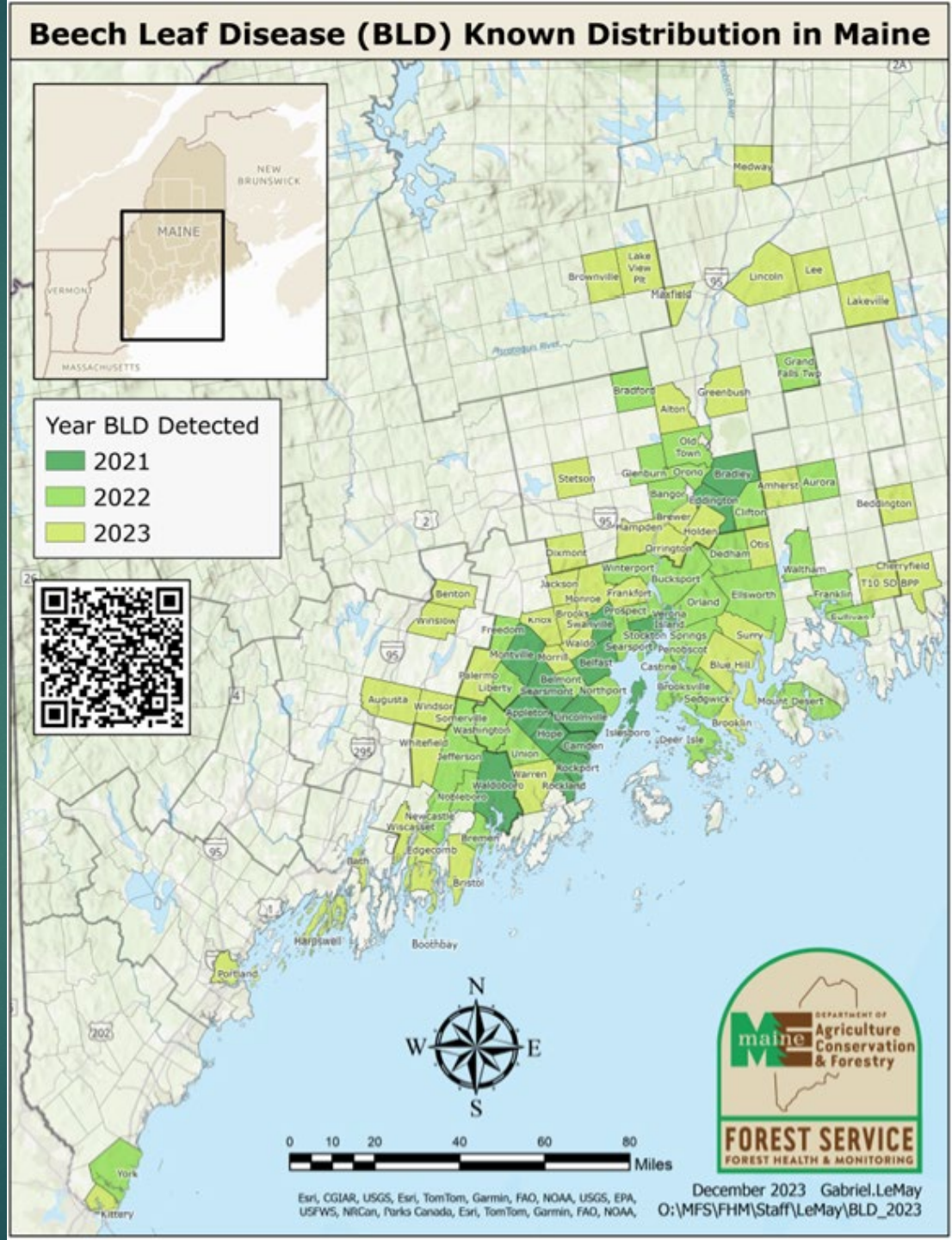
Revised ELC Quarantine Zone



Beech Leaf Disease

- Found in 11 of Maine's 16 counties.
- New survey method resulting in new confirmations during winter months prior to 2024 leaf-out





Rosellinia spp. Needle Blight of Conifers

- Reported on transplanted white spruce in Northeast Harbor, Hancock County, Maine
- Trees were believed to be from Maine, but some were also possibly sourced from North Carolina
- This appears to be the furthest north report of a *Rosellinia* sp. needle blight in the US
- Also found in CT and NH in 2023 – in NH, in forest hemlock trees
- Please report anything suspicious to MFS

(top left) A branch showing dense growth of mycelia; (bottom left opposing images) The top of an infected branch tip and the bottom of the same branch tip showing dense fungal growth and black, round and embedded spore-producing structures; (right) Lower crown symptoms of a tree infected with *Rosellinia* spp. showing thinning from needle drop and branch dieback.

(left) A branch tip with dense fungal growth and black, round and numerous embedded spore-producing structures; (middle 2 panels) Close-up images of spore-producing structures; (right) Spores of the *Rosellinia* spp. fungus held in elongate spore sacs called asci.

maine DEPARTMENT OF Agriculture Conservation & Forestry

FOREST SERVICE
FOREST HEALTH & MONITORING

foresthealth@maine.gov or (207) 287-2431

Terrestrial invasive plants

Why be concerned about invasive species?

Because we love Maine!

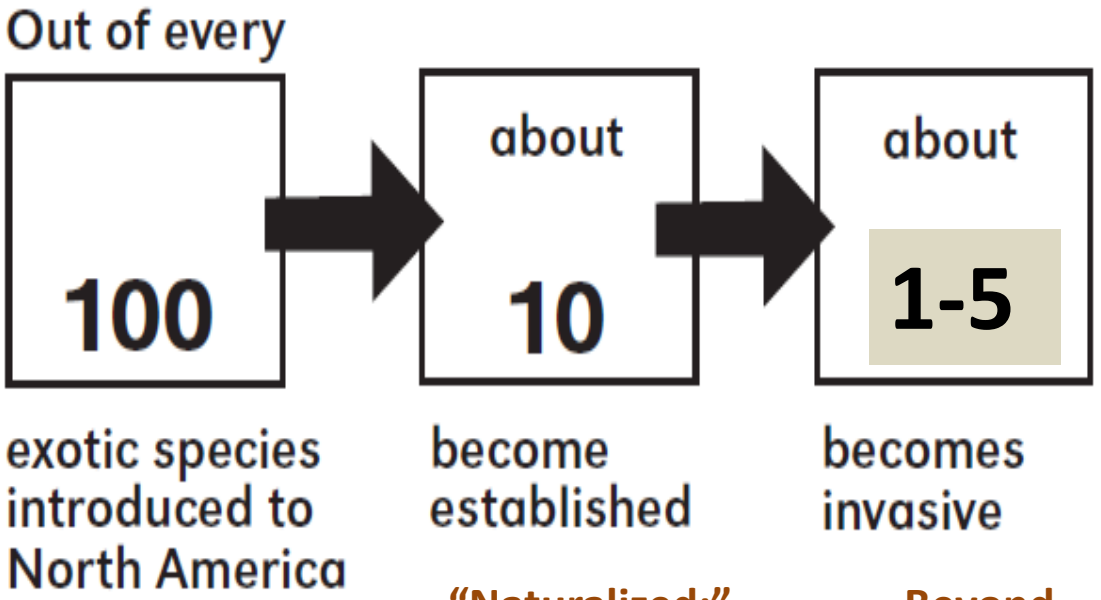
What is an Invasive Plant?

A non-native species whose introduction causes economic or environmental harm, or harm to human health, and which can establish and spread in minimally managed habitats.

Most non-native species are not invasive

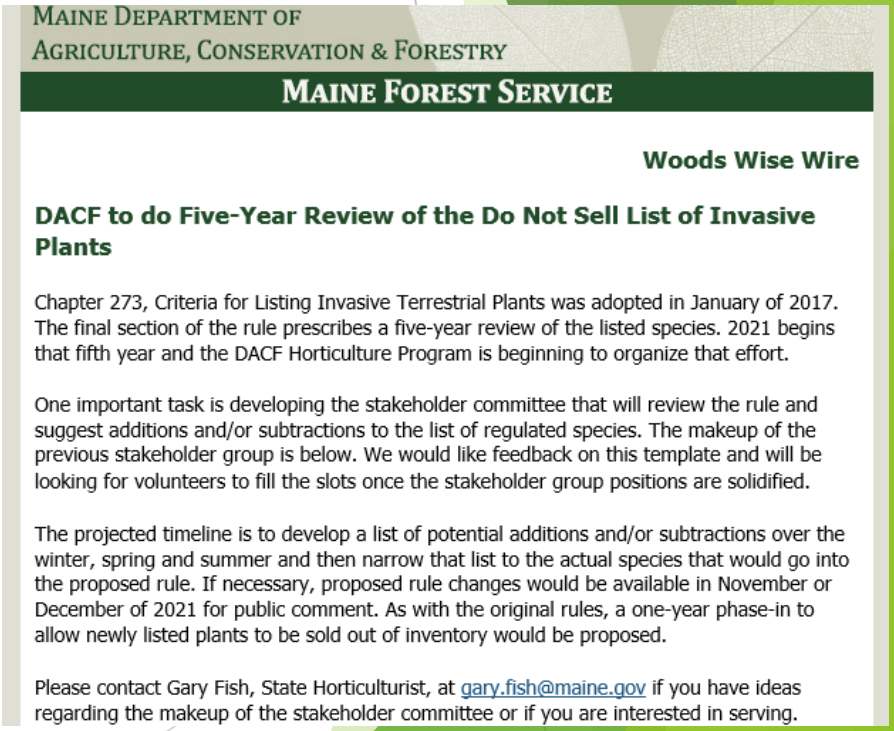
FIGURE 1.1

Number of Exotic Species That Become Invasive



Five-Year Review of the Do Not Sell List of Invasive Plants

- Chapter 273 was originally adopted in January of 2017
- Rule prescribes a five-year review to add new plants
- In November 2021 DACF established a new stakeholder committee
- The committee developed a list of potential plant additions and changes to the rule
  - Committee met six times
- The changes were proposed on March 30, 2022
- A public hearing was held on April 22, 2022



MAINE DEPARTMENT OF
AGRICULTURE, CONSERVATION & FORESTRY

MAINE FOREST SERVICE

Woods Wise Wire

DACF to do Five-Year Review of the Do Not Sell List of Invasive Plants

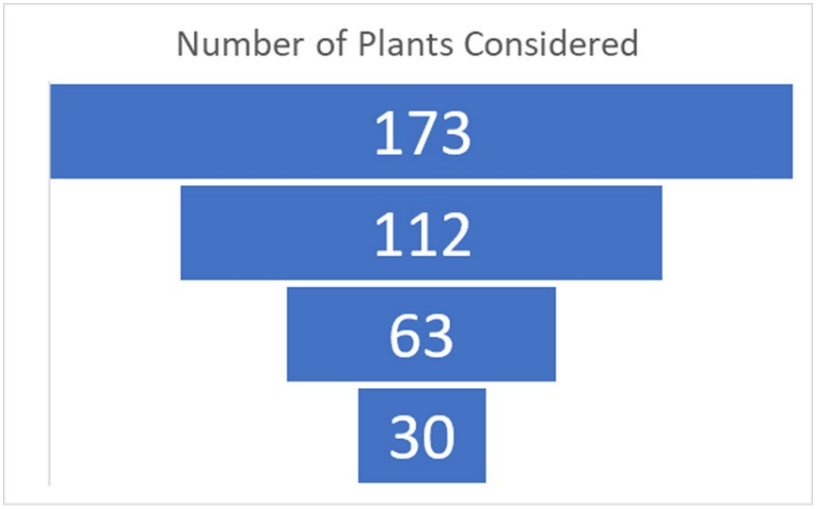
Chapter 273, Criteria for Listing Invasive Terrestrial Plants was adopted in January of 2017. The final section of the rule prescribes a five-year review of the listed species. 2021 begins that fifth year and the DACF Horticulture Program is beginning to organize that effort.

One important task is developing the stakeholder committee that will review the rule and suggest additions and/or subtractions to the list of regulated species. The makeup of the previous stakeholder group is below. We would like feedback on this template and will be looking for volunteers to fill the slots once the stakeholder group positions are solidified.

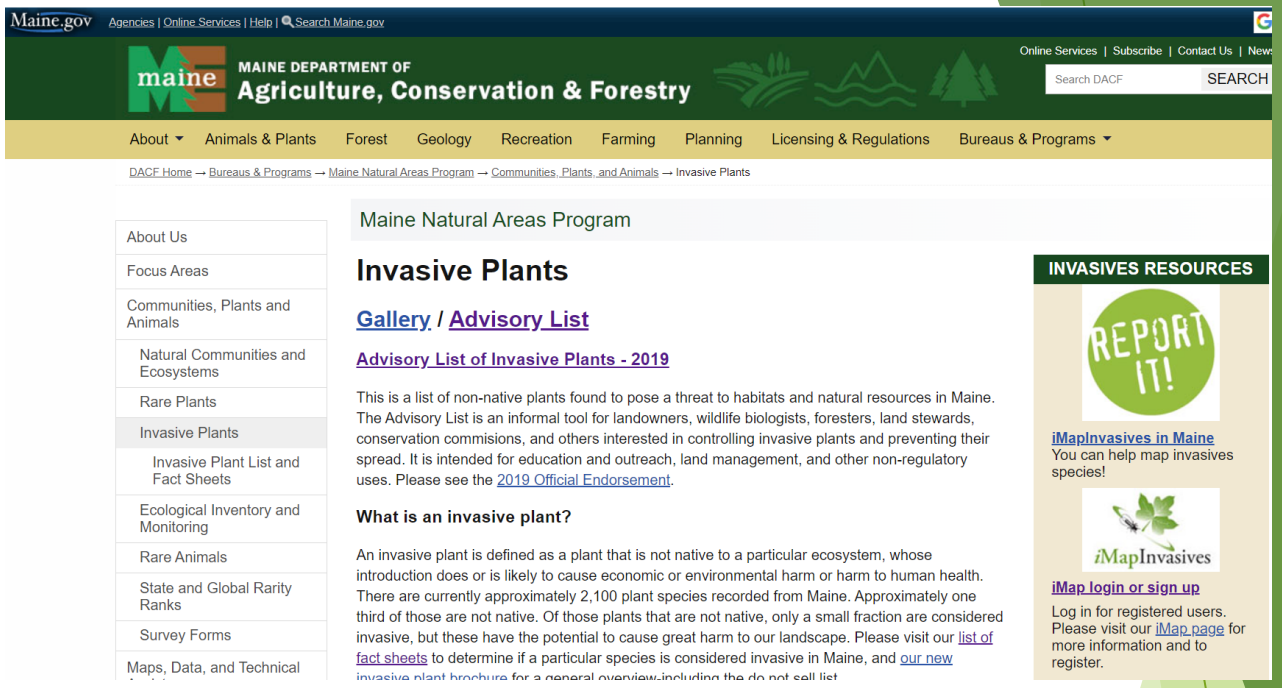
The projected timeline is to develop a list of potential additions and/or subtractions over the winter, spring and summer and then narrow that list to the actual species that would go into the proposed rule. If necessary, proposed rule changes would be available in November or December of 2021 for public comment. As with the original rules, a one-year phase-in to allow newly listed plants to be sold out of inventory would be proposed.

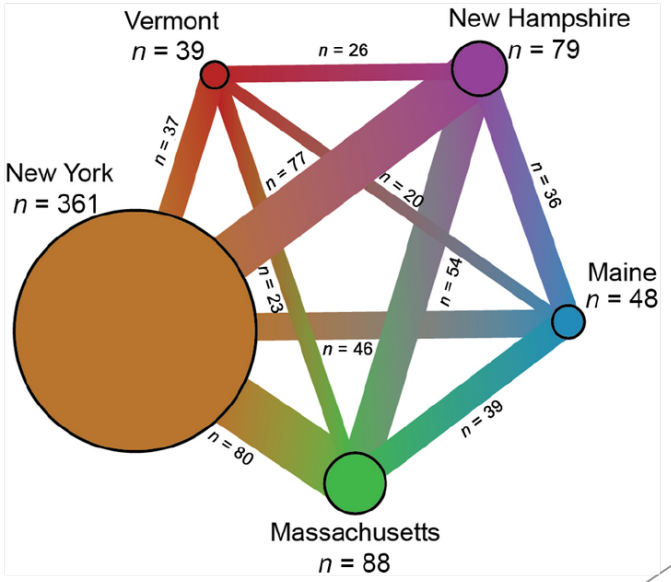
Please contact Gary Fish, State Horticulturist, at gary.fish@maine.gov if you have ideas regarding the makeup of the stakeholder committee or if you are interested in serving.

Terrestrial Invasive Plant Committee



- The committee started with a list of 173 species which was reduced to (112) - 81 priority plants to evaluate and another 31 seemingly lower risk plants to evaluate if time permitted
- 49 hitchhiker plants were removed from the list because it is very difficult to detect them, reducing the list to 63
- We are doing this training partly to help address the concern for hitchhiker plants





Why those 173 plant species?

- Our pipeline for plant suggestions included:
  - The MNAP Advisory List of Invasive Plants - https://www.maine.gov/dacf/mnap/features/invasive_plants/invsheets.htm
  - NE RISCC Network impactful range shifting species
    - https://esajournals.onlinelibrary.wiley.com/doi/full/10.1002/ecs2.4014
  - Plants listed by other Northeast states
  - Plants nominated through the online form
    - https://www.maine.gov/dacf/php/horticulture/documents/MaineInvasivePlantNominationForm_Dec2016.pdf

Chapter 273 - Criteria for Evaluating Terrestrial Plant Species

- In order to include a plant on a list of invasive terrestrial plant species administered by the Maine Department of Agriculture, Conservation, and Forestry, ALL the following criteria must be met:
  - Be non-native to Maine, and
  - Have the potential for rapid growth, dissemination, and establishment in minimally managed habitats, and
  - Have the biological potential for widespread dispersion and for dispersing over spatial gaps, and
  - Have the biological potential for existing in high numbers or large colonies in minimally managed habitats, and
  - Have the potential to displace native species in minimally managed habitats.

Terrestrial Invasive Plant Committee

- After a deep dive into the evaluations, the committee decided to:
  - Move forward by adding 30 species to the do-not-sell list and
  - To create a “Watch List” with 29 plants
  - The committee struggled with what to do with *Rosa rugosa* and decided to put it in its own category - Invasive Species of Special Concern
  - Recommended clarifying the requirements to petition for removal of a cultivar, hybrid, or subspecies
- The rule was adopted May 24, 2022
- As of January 1, 2024, 30 additional plants are banned from sale or import

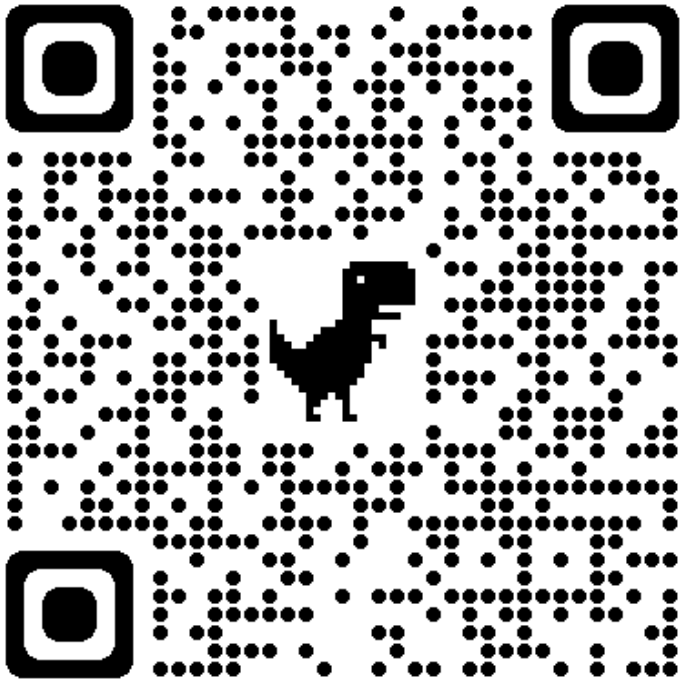
Have You Seen These Plants?

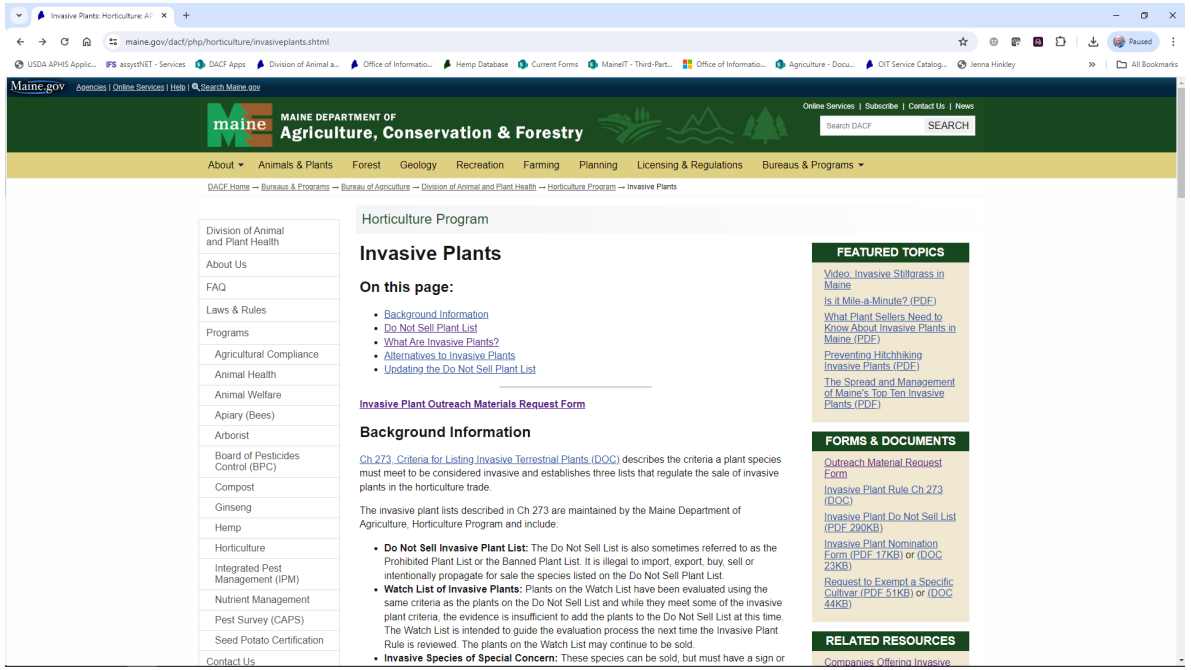
Wanted for crimes against nature. State horticulturalist Gary Fish on the state's newest horticultural outlaws (and a warning label for beach roses).

ABOVE *Beach roses, which have been given the ominous designation, “Invasive Terrestrial Plant of Special Concern.” Photograph by Benjamin Williamson.*

TEXT BY AURELIA C. SCOTT
PHOTOGRAPHS COURTESY OF THE MAINE NATURAL AREAS PROGRAM

https://mainehomes.com/have-you-seen-these-plants/





Invasive plant Do-Not-Sell list webpage

Invasive Plant Do Not Sell List

The invasive plants listed below, including all cultivars, varieties and hybrids are illegal to sell, import, export, buy or intentionally propagate for sale in Maine. See reverse for more information.

Acer ginnala (amur maple)
Acer platanoides (Norway maple)
Aegopodium podagraria (bishop's weed)
Ailanthus altissima (tree of heaven)
Alliaria petiolata (garlic mustard)
Alnus glutinosa (European alder)
Amorpha fruticosa (false indigo bush)
Ampelopsis glandulosa (porcelain berry)
Angelica sylvestris (woodland angelica)
Anthriscus sylvestris (wild chervil)
Aralia elata (Japanese angelica tree)
Artemisia vulgaris (common mugwort)
Berberis thunbergii (Japanese barberry)
Berberis vulgaris (common barberry)
Butomus umbellatus (flowering rush)
Celastrus orbiculatus (Asiatic bittersweet)
Elaeagnus angustifolia (Russian olive)
Elaeagnus umbellata (Autumn olive)
Euonymus alatus (burning bush)
Euonymus fortunei (wintercreeper)
Euphorbia cyparissas (cypress spurge)
Fallopia baldschuanica (silver lace vine)
Fallopia japonica (Japanese knotweed)
Festuca filiformis (fine-leaved sheep fescue)
Ficaria verna (lesser celandine)
Frangula alnus (glossy buckthorn)
Glaucium flavum (yellow hornpoppy)
Glechoma hederacea (creeping charlie)
Glyceria maxima (reed/great mannagrass)
Hesperis matronalis (dame's rocket)
Hippophae rhamnoides (sea buckthorn)
Impatiens glandulifera (ornamental jewelweed)
Iris pseudacorus (yellow flag iris)
Ligustrum obtusifolium (border privet)
Ligustrum vulgare (common privet)
Lonicera japonica (Japanese honeysuckle)
Lonicera maackii (amur or bush honeysuckle)
Lonicera morrowii (Morrow's honeysuckle)
Lonicera tatarica (Tatarian honeysuckle)
Lonicera xylosteum (dwarf honeysuckle)
Lythrum salicaria (purple loosestrife)
Lythrum virgatum (European wand loosestrife)
Microstegium vimineum (stiltgrass)
Miscanthus sacchariflorus (amur silvergrass)
Paulownia tomentosa (paulownia, princess tree)
Persicaria perfoliata (mile-a-minute)
Petasites japonicus (fuki, butterbur)
Phalaris arudinacea (reed canary/ribbon grass)
Phellodendron amurense (amur cork tree)
Photinia villosa (photinia, Christmas berry)
Phragmites australis (common reed)
Phyllostachys aurea (golden bamboo)
Phyllostachys aureosulcata (yellow grove bamboo)
Populus alba (white cottonwood, white poplar)
Pyrus calleryana (Callery/Bradford pear)
Ranunculus repens (creeping buttercup)
Robinia pseudoacacia (black locust)
Rosa multiflora (multiflora rose)
Rubus phoenicolasius (wineberry)
Silphium perfoliatum (cup plant)
Sorbus aucuparia (European mountain ash)
Tussilago farfara (coltsfoot)
Valeriana officinalis (common valerian)

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 certain invasive plant species. See the reverse for the full list of plants.

Invasive Plant Rule Quick Facts

- The sale/import ban includes the listed species and all cultivars, varieties and hybrids. See the full list of species on the Do Not Sell List on the reverse.
- Plants listed in the rule as an "Invasive Terrestrial Plant Species of Special Concern," may still be sold, but sellers must display a sign or tag indicating the plant could be invasive in some habitats. See website for details of sign and tag requirements.
- Variances may be applied for and granted for varieties, cultivars or hybrids that have been shown to not be invasive through university, USDA or botanical garden research and for scientific research purposes.
- The invasive plant rule and included prohibited plant list will be reviewed every 5 years.
- The invasive plant rule also contains a "Watch List" of plants. Plants on the "Watch List" may still be sold, but may be banned in future rule reviews.
- In addition to the invasive plants listed here, Department of Environmental Protection rules ban the sale of 11 invasive aquatic plants. www.maine.gov/dep/water/invasives/index.html
- More information is available at www.maine.gov/hort or scanning the QR code below.

Invasive Terrestrial Plant Species of Special Concern

These plants require signage or plant tags indicating the plant may be invasive in some habitats. See website for more information.

Rosa rugosa (rugosa rose, beach rose)

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

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

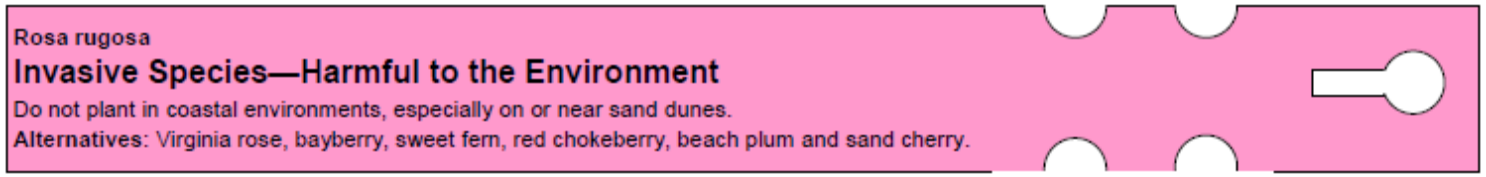
Invasive Species – Harmful to the Environment

Ask About Alternative Plants

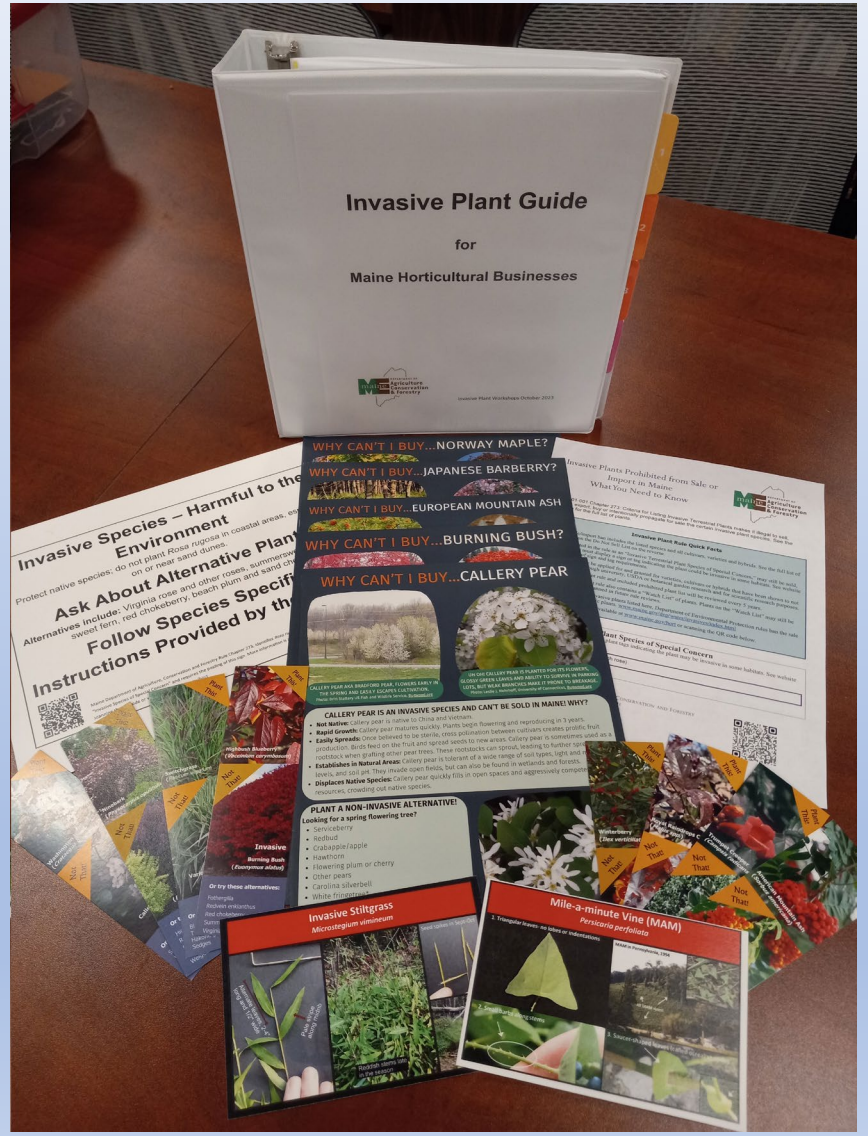
Follow Species Specific Instructions Provided by the Vendor

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.



Invasive plant outreach materials for plant sellers



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

Questions?

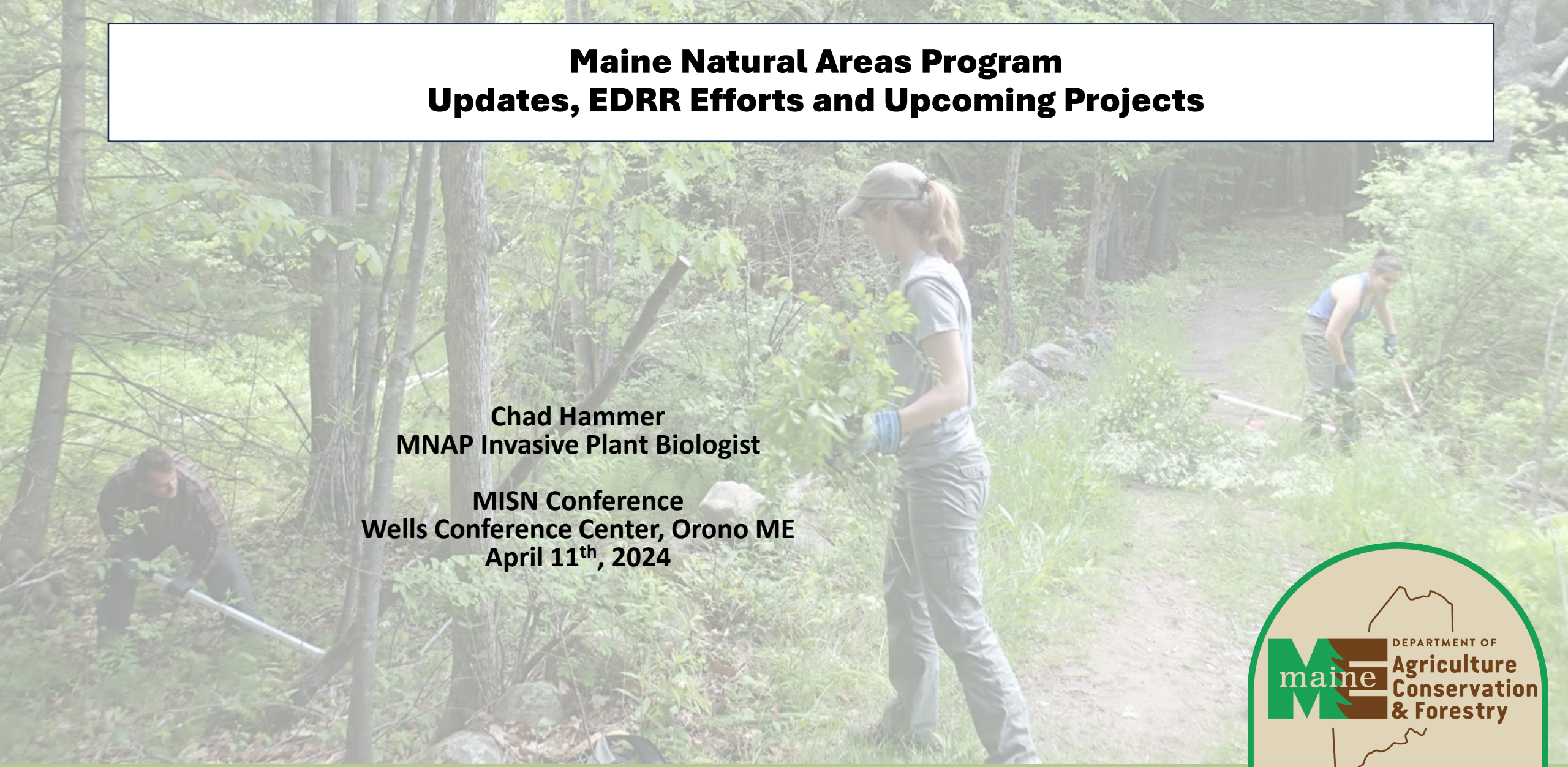
Gary Fish

Maine State Horticulturist

gary.fish@maine.gov

207-287-7545

Maine Natural Areas Program
Updates, EDRR Efforts and Upcoming Projects



Chad Hammer
MNAP Invasive Plant Biologist

MISN Conference
Wells Conference Center, Orono ME
April 11th, 2024

DEPARTMENT OF
Agriculture, Conservation & Forestry

NATURAL AREAS

Facilitates Conservation of Maine's Biodiversity

Collecting, tracking, and providing data

- Landowners
- Developers
- Resource managers
- Towns
- State agencies
- Various conservation partners

At-risk species + **Exemplary Natural Communities** + **Wildlife Habitat** + **Ecological Reserves** + **Invasive Plants**


Portsmouth Herald

Friday, June 28, 2019 SeacoastOnline.com | @seacoastonline | Facebook

Knotweed called 'hazardous waste'

University of New Hampshire researcher Chad Hammer explains that under a canopy of Japanese knotweed, it's hard for anything else to grow, increasing an ecological imbalance and the potential for erosion. [RICH BEAUCHESNE/SEACOASTONLINE]

UNH researcher says Japanese species can take over landscape

By Elizabeth Dinan
edinan@seacoastonline.com

PORTSMOUTH — Lining Seacoast roads, choking stream banks and spreading underground in backyard groves, Japanese knotweed is a scourge to be treated as hazardous waste, warns Chad Hammer, a University of New Hampshire researcher.

It looks like bamboo and the invasive knotweed has been mistaken for bamboo, but it's not,

The U.S. post office in the McIntyre Federal scheduled to relocate to Heritage Avenue [RICH BEAUCHESNE/SEACOASTONLINE]

Ex-postmas asbestos re from post o

Hersey informed city last fall of work done in late 1990s

By Jeff McMenemy
jmcmenemy@seacoastonline.com

PORTSMOUTH — Former Portsmouth Postmaster Patricia Hersey said this week the post office section of the McIntyre Federal Building went through an asbestos

Lawmakers pass b as veto by governo

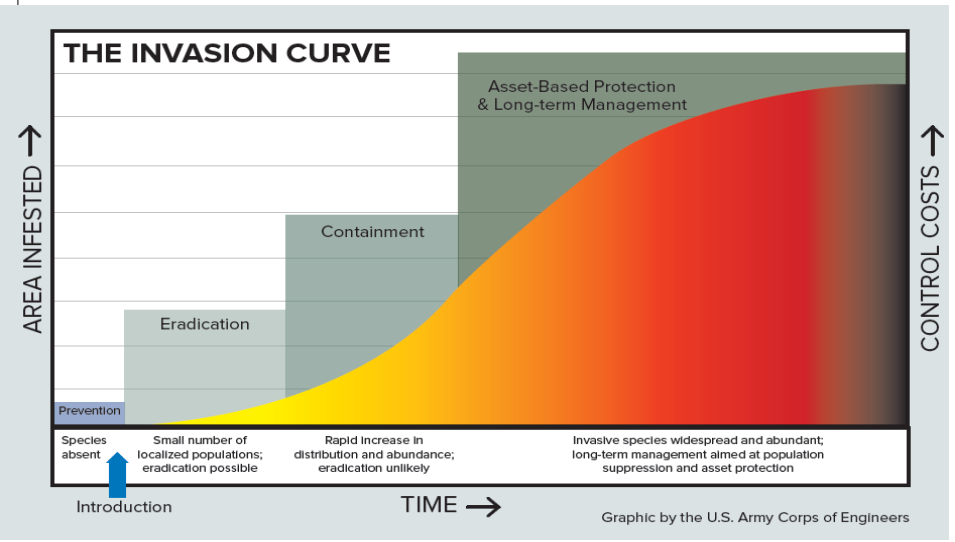
By Holly Ramer
The Associated Press

CONCORD — Lawmakers on Thursday sent a $13 billion, two-year state budget

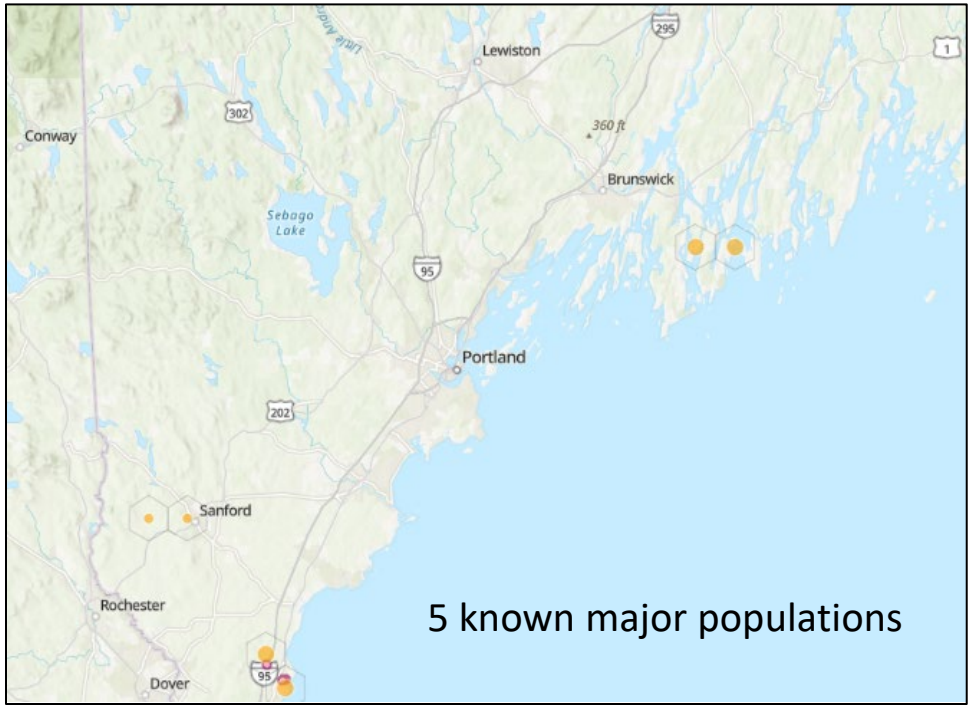
Update: New MNAP Staff!

- **Botanist:** Eric Doucette
- **Forest Ecologist:** Chris Schorn
- **Public Lands Ecologist:** TBD
- **Invasive Plant Biologist:** Chad Hammer

Early Detection/Rapid Response



Japanese Stiltgrass
(Microstegium vimineum)



(2) Georgetown (2020-2023)

- Complex forested sites
- Complex land ownership status
- MNAP & KELT Joint Effort

(2) York (2020-2023)

- Disturbed Nursery Site
- Parent Population Spread
- MNAP & DACF Horticulture Program

Sanford/Springvale (2022-2023)

- Skid trails
- Three Rivers Land Trust

Perennial Pepperweed *(Lepidium latifolium)*

***MNAP & Rachel Carson National Wildlife Refuge staff**

Kittery Point/Gerrish Island (2014-2023)

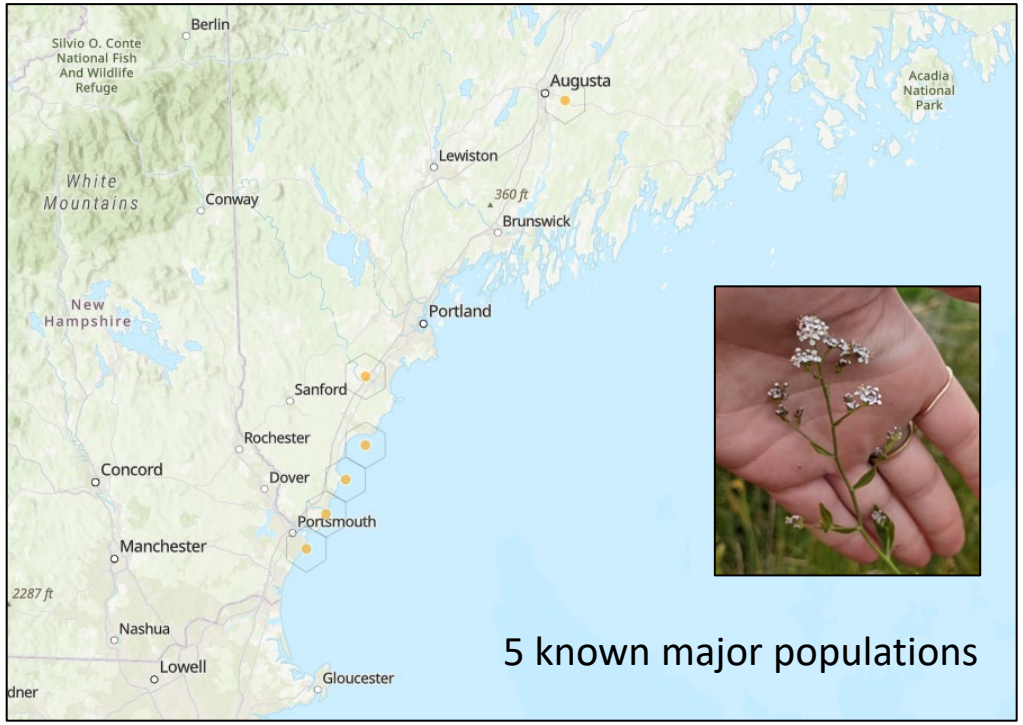
- 7 bags removed in 2014
- Private beach

Oqunquit Beach (2021-2023)

- Rocky dunes/parking lot area/mulched garden

Crescent Surf Beach, Kennebunk (2013-2022)

- Salt marsh/beach



Perennial Pepperweed *(Lepidium latifolium)*

Biddeford (2020-2023)

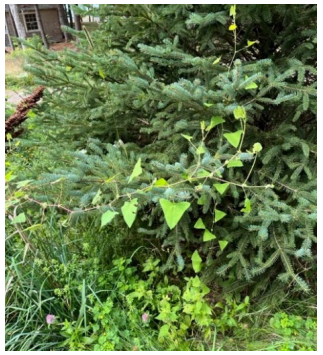
- Median of (I-95) 20-40 plants
- 2021/2022/2023: MTA applied herbicides
- MNAP re-inspects site and fill material stockpile

Augusta/Kennebeck River: (2016)

- 2-3 small plants found by MNAP staff
- Hand-pulled for 3 years

***100's-1000's plants removed**
*** Flower/seed in recent years**
*** Prolific seedbed**
*** On-going monitoring and hand-pulling**
*** Herbicides**

Mile-A-Minute Vine
(Persicaria perfoliata)



4 locations: Topsham, Boothbay Harbor, Isleboro, Winthrop

Nursury stock hitchhiker
- Most in pots or gardens
- Single Vines

Topsham location potential seed production
- Revisit and survey

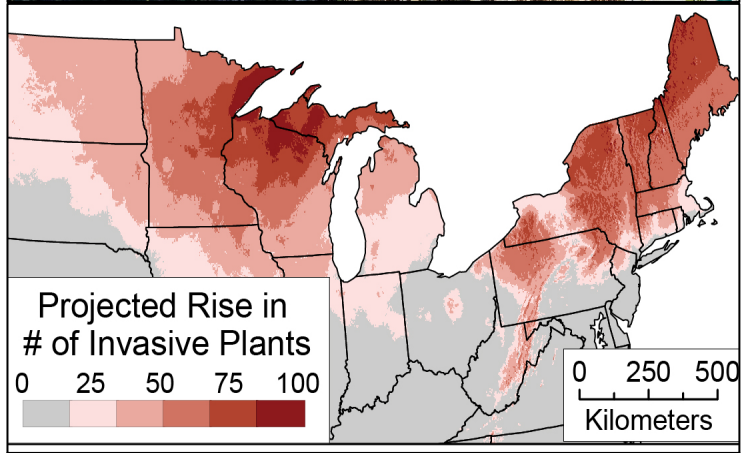
Joint venture with DACF Horticulture & MNAP
- Traced back and inspected nurseries

Intercepted (for now)! ☺

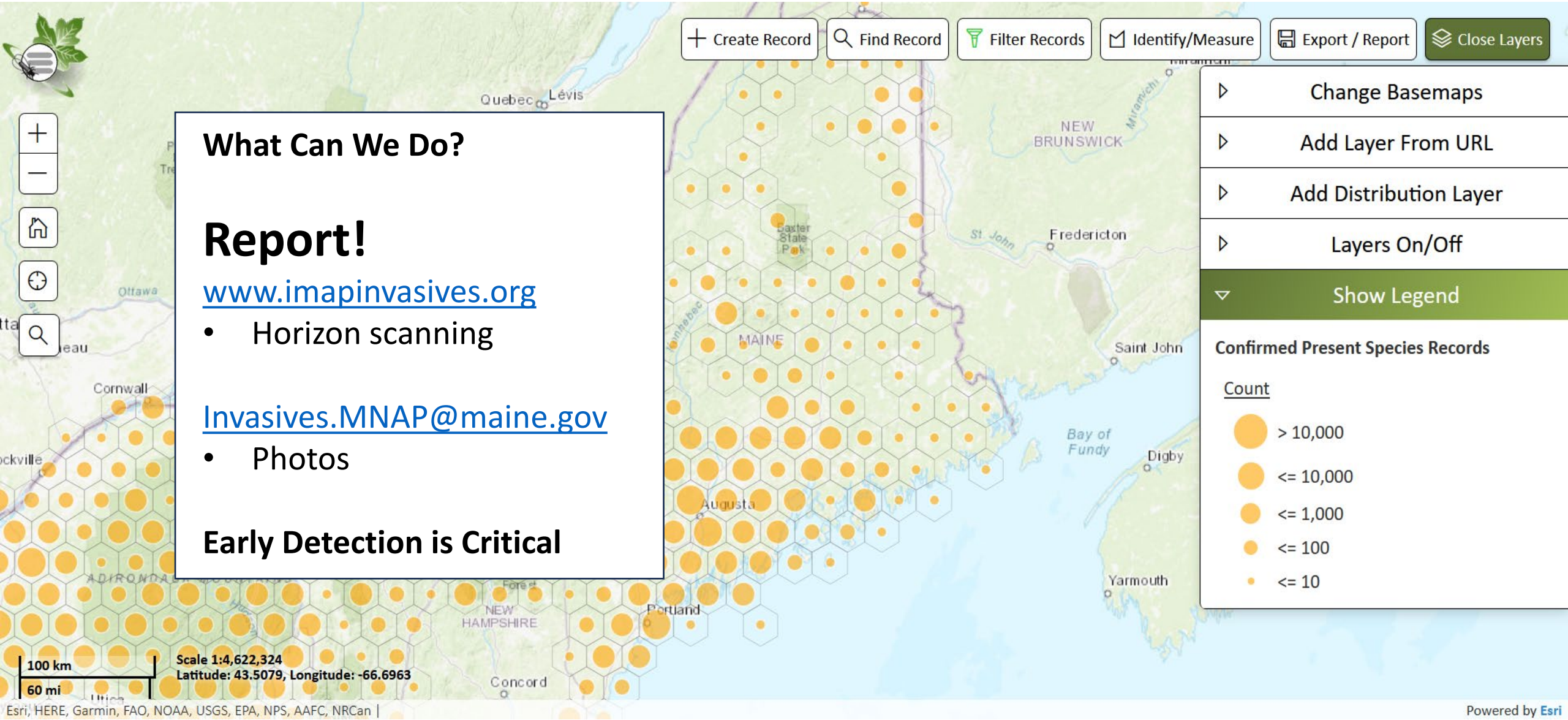
2024 and Beyond!

- Monitoring
- Repeated Management
- Collaborating
- Outreach
- Staying Vigilant!

"Together we can do more" ☺ *~NHO*



iMap Invasives: Central repository for invasive plant data in Maine



Create Record | Find Record | Filter Records | Identify/Measure | Export / Report | Close Layers

Change Basemaps

Add Layer From URL

<= 1,000

<= 100

<= 10

Quebec Lévis Shawinigan Trois-Rivières Montpelier VERMONT ADIRONDACK MOUNTAINS NEW HAMPSHIRE Portland Yarmouth Concord

100 km
60 mi

Scale 1:4,622,324
Latitude: 43.5079, Longitude: -66.6963

Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NPS, AAFC, NRCan |

Powered by Esri

DEPARTMENT OF Agriculture, Conservation & Forestry

Invasive Plant Academy: Coming Fall 2024

10-10,000 acres

Private woodland owners and woodlot managers

- Land trusts
- SWCD's
- And more…

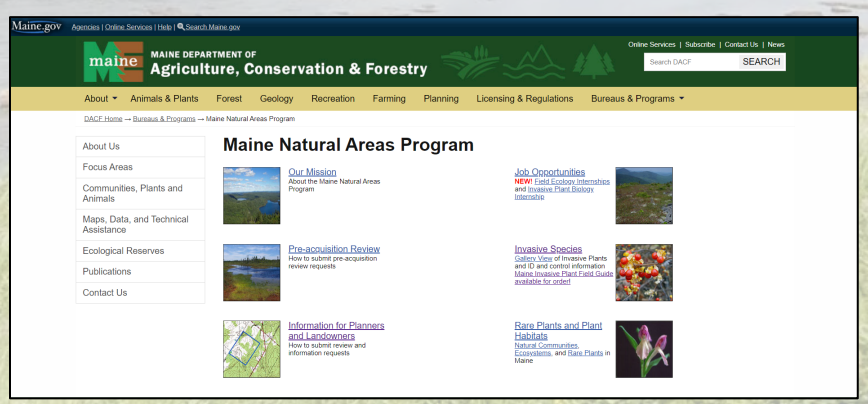
DEPARTMENT OF
Agriculture
Conservation
& Forestry

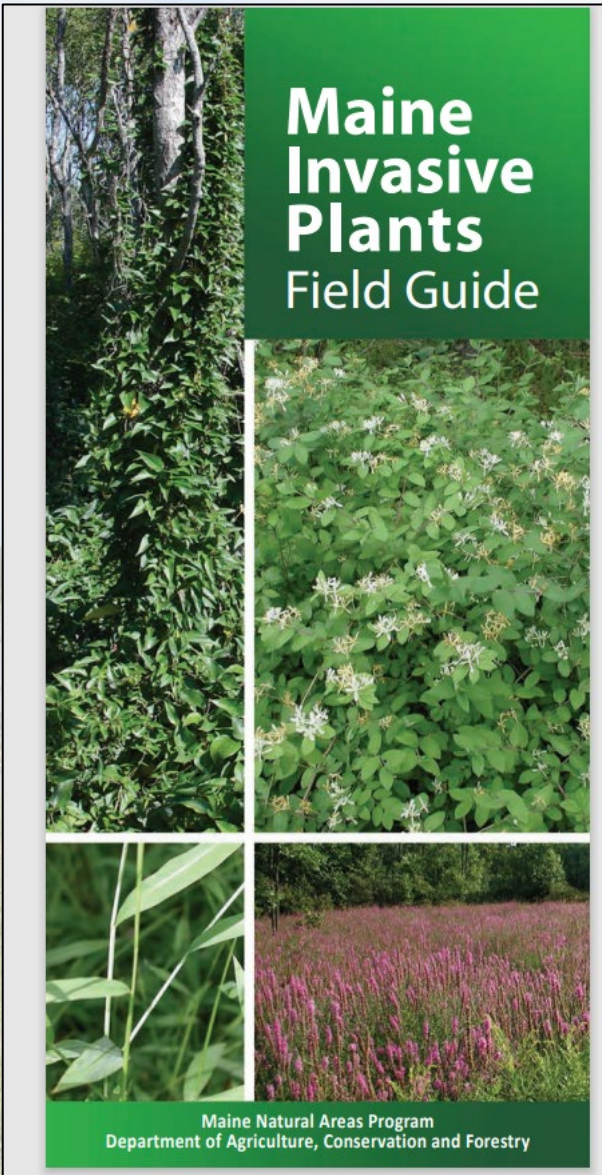
NATURAL AREAS

Maine Invasive Plant Field Guide

- Categorized by growth form
- Identification
- Description & Ecology
- Look-alikes
- Control Methods
- Disposal
- And more…

Event Pricing: $20





DEPARTMENT OF Agriculture Conservation & Forestry

NATURAL AREAS

(www.financialtimes.com)

Thank You!

Chad.Hammer@maine.gov

Phone: 287-8040

Cell: 441-1214

Status: Invasive Aquatic Plants in Maine 2024

John McPhedran
Biologist, Invasive Aquatic Species Program

DEP Updates

Infestation status

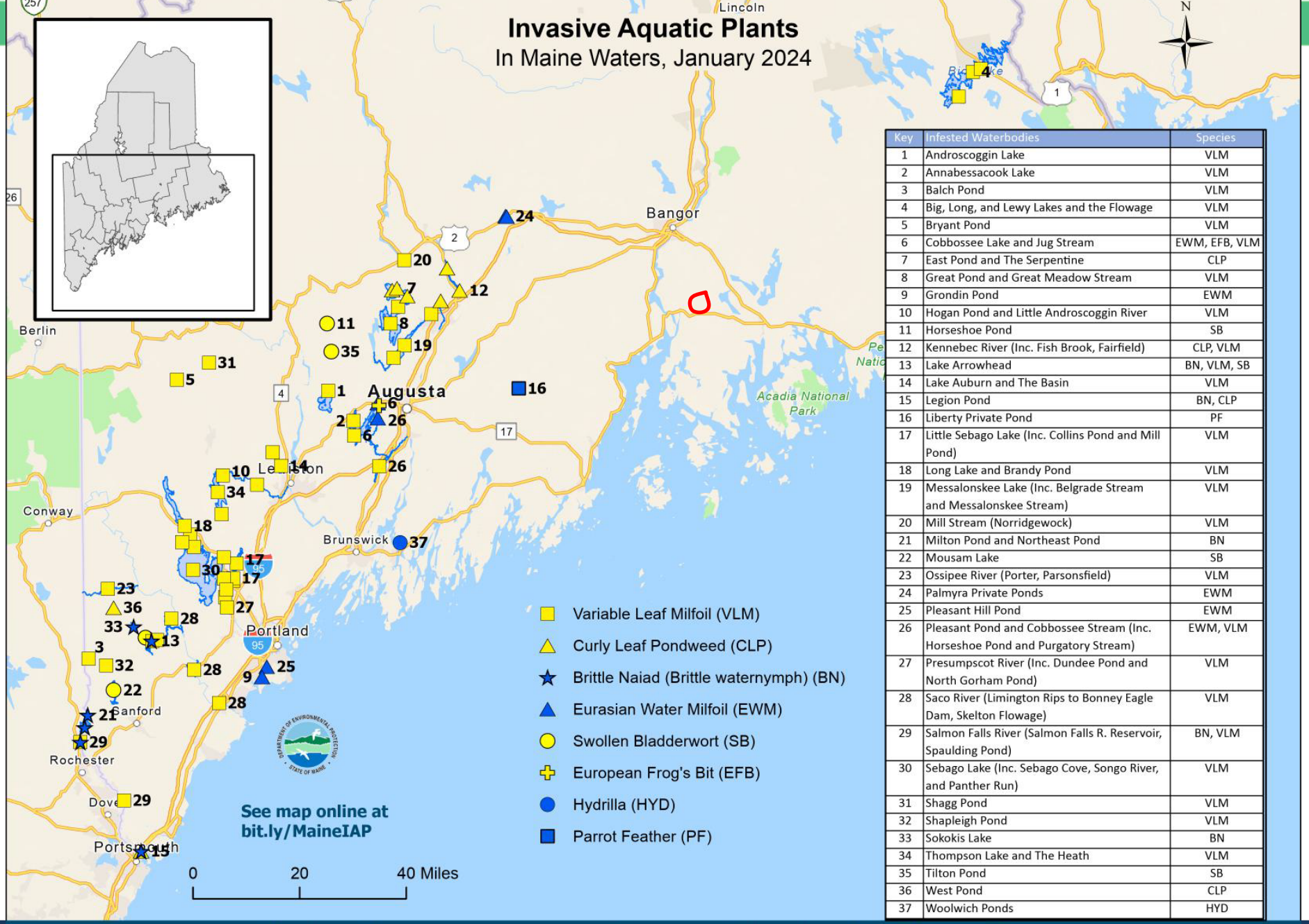
Legislation

Boat inspections

Planning for the future

Invasive Aquatic Plants

In Maine Waters, January 2024



Key	Infested Waterbodies	Species
1	Androscoggin Lake	VLM
2	Annabessacook Lake	VLM
3	Balch Pond	VLM
4	Big, Long, and Lewy Lakes and the Flowage	VLM
5	Bryant Pond	VLM
6	Cobbossee Lake and Jug Stream	EWM, EFB, VLM
7	East Pond and The Serpentine	CLP
8	Great Pond and Great Meadow Stream	VLM
9	Grondin Pond	EWM
10	Hogan Pond and Little Androscoggin River	VLM
11	Horseshoe Pond	SB
12	Kennebec River (Inc. Fish Brook, Fairfield)	CLP, VLM
13	Lake Arrowhead	BN, VLM, SB
14	Lake Auburn and The Basin	VLM
15	Legion Pond	BN, CLP
16	Liberty Private Pond	PF
17	Little Sebago Lake (Inc. Collins Pond and Mill Pond)	VLM
18	Long Lake and Brandy Pond	VLM
19	Messalonskee Lake (Inc. Belgrade Stream and Messalonskee Stream)	VLM
20	Mill Stream (Norridgewock)	VLM
21	Milton Pond and Northeast Pond	BN
22	Mousam Lake	SB
23	Ossipee River (Porter, Parsonsfield)	VLM
24	Palmyra Private Ponds	EWM
25	Pleasant Hill Pond	EWM
26	Pleasant Pond and Cobbossee Stream (Inc. Horseshoe Pond and Purgatory Stream)	EWM, VLM
27	Presumpscot River (Inc. Dundee Pond and North Gorham Pond)	VLM
28	Saco River (Limington Rips to Bonney Eagle Dam, Skelton Flowage)	VLM
29	Salmon Falls River (Salmon Falls R. Reservoir, Spaulding Pond)	BN, VLM
30	Sebago Lake (Inc. Sebago Cove, Songo River, and Panther Run)	VLM
31	Shagg Pond	VLM
32	Shapleigh Pond	VLM
33	Sokokis Lake	BN
34	Thompson Lake and The Heath	VLM
35	Tilton Pond	SB
36	West Pond	CLP
37	Woolwich Ponds	HYD

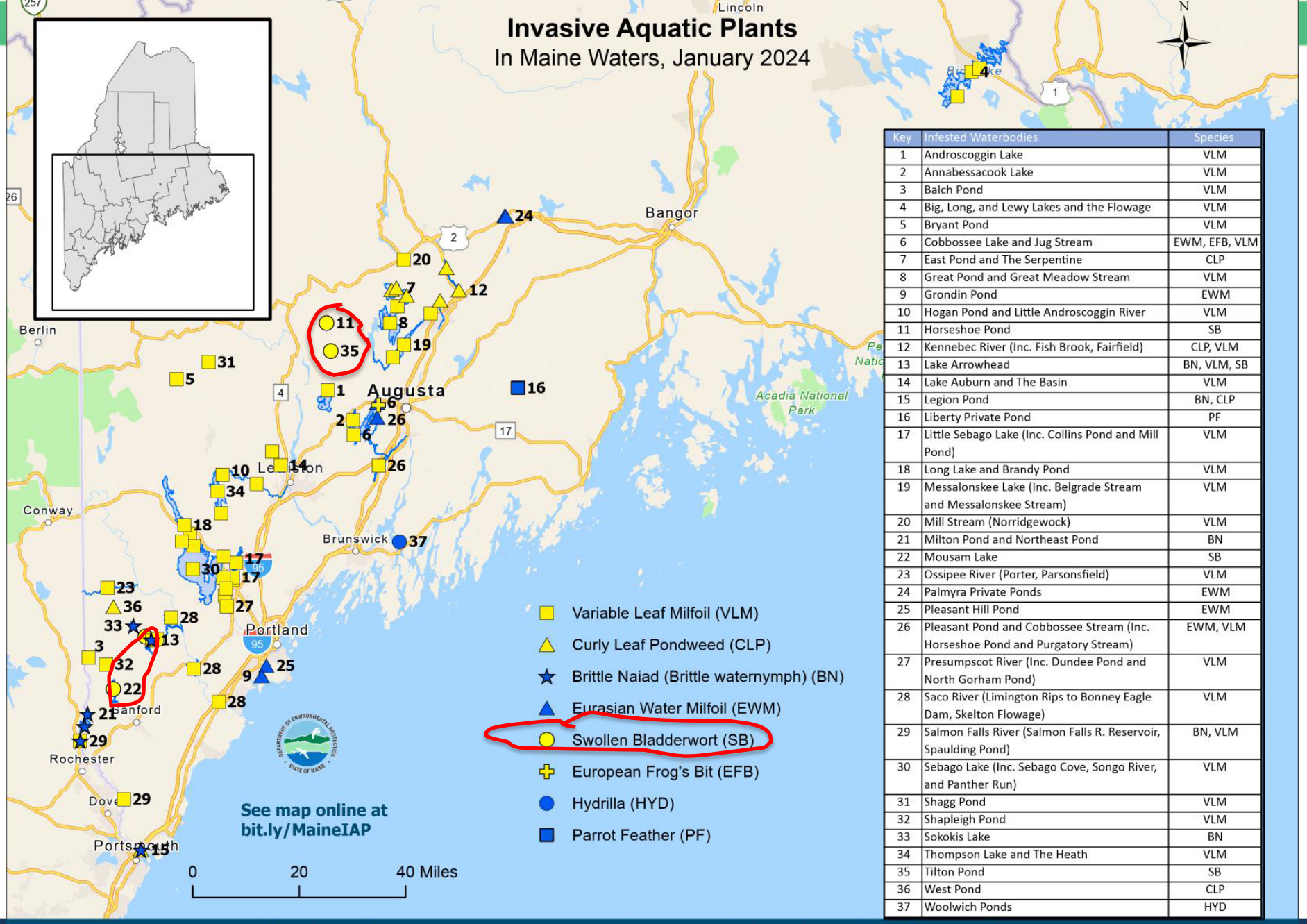
Find out more: www.maine.gov/dep/water/invasives

De-listings Since Program Start

- Cushman Pond – Lovell
- Middle Range Pond – Poland
- Great East Lake – Acton
- Pleasant Lake & Parker Pond – Casco/Otisfield
- Salmon Lake – Belgrade (*M. spicatum*)
- Damariscotta Lake – Jefferson (*H. verticillata*)
- Pickerel Pond – Limerick (*H. verticillata*)

Invasive Aquatic Plants

In Maine Waters, January 2024



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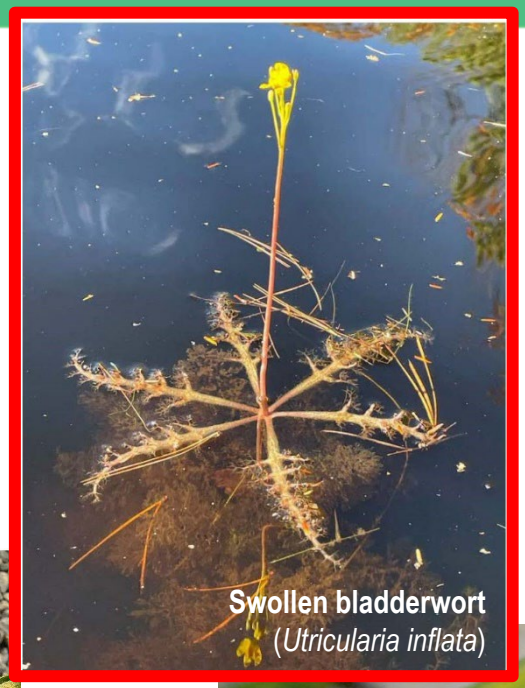
Find out more: www.maine.gov/dep/water/invasives

Restricted Plants Added In 2023

Giant salvinia (*Salvinia molesta*)



Swollen bladderwort
(*Utricularia inflata*)

Water soldier
(*Stratiotes aloides*)

Starry stonewort
(*Nitellopsis obtusa*)

Also Prohibited…

All *Cabomba* species

All *Trapa* species

All *Myriophyllum* species non-digenous to Maine

Draining bill became law June 2023

Prior to entering a water body and when preparing to leave launch sites, boaters are required to remove or open any devices designed for routine removal/opening (for example, hull drain plugs, bailers, live wells, ballast tanks) to encourage draining of areas containing water (excluding live bait containers).

This must be done in a way that does not allow drained water to enter any inland water of the state.

Clean Drain Dry

Funding Increase

- Carry-over bill became law yesterday, April 10, 2024
- Increased fees to motorized watercraft:

	Instate	Out of State
Current	$15	$45
Starting 2025	$25	$60
Starting 2028	$35	$75

-

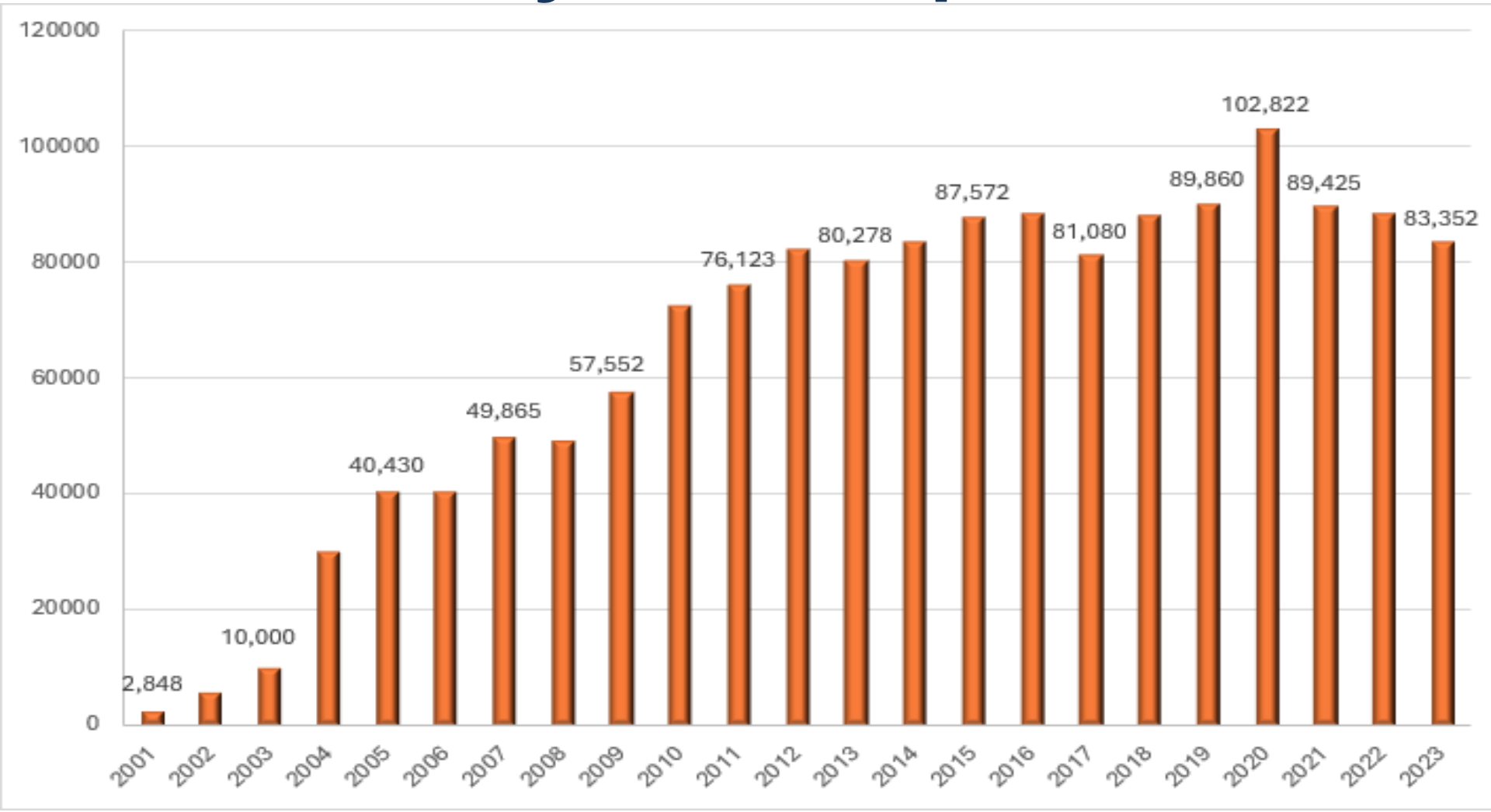
Funding Increase

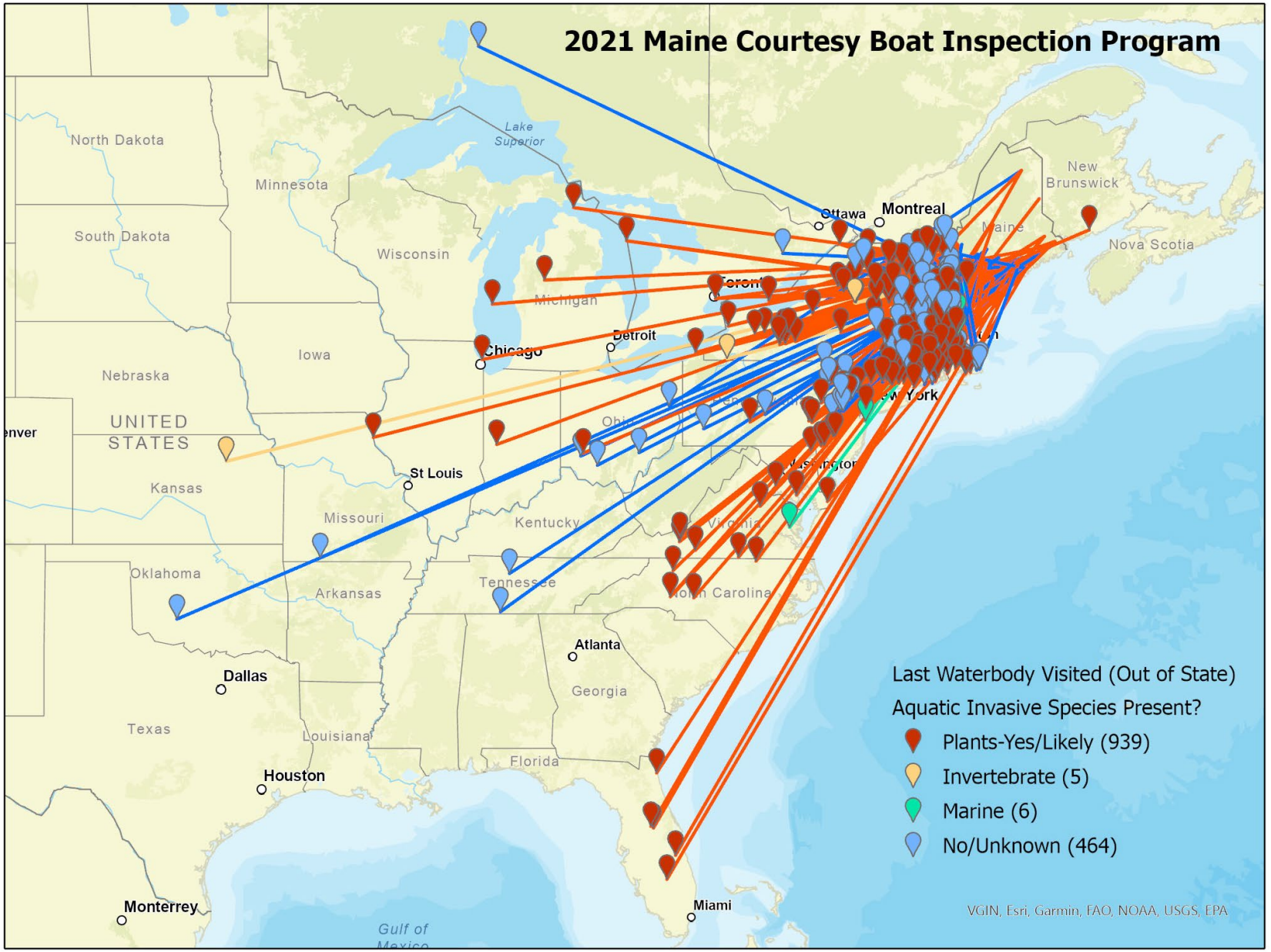
- Adjusts distribution of revenue:
  - -Currently: 80% to DEP and 20% to DIFW
  - -2025+ 70% to DEP and 30% to DIFW

DEP Annual Revenue starting 2028 ~ $2,898,937

DIFW Annual Revenue starting 2028 ~ $1,242,402

Courtesy Boat Inspections




2021 Maine Courtesy Boat Inspection Program
North Dakota
Minnesota
South Dakota
Wisconsin
Lake Superior
Michigan
Iowa
Nebraska
UNITED STATES
Kansas
Missouri
Oklahoma
Arkansas
Texas
Louisiana
Kentucky
Tennessee
Georgia
Florida
Ohio
Virginia
North Carolina
Maine
New Brunswick
Nova Scotia
Ottawa
Montreal
Toronto
Detroit
Chicago
St Louis
Atlanta
Dallas
Houston
Monterrey
Miami
Gulf of Mexico
Last Waterbody Visited (Out of State)
Aquatic Invasive Species Present?
Plants-Yes/Likely (939)
Invertebrate (5)
Marine (6)
No/Unknown (464)
VGIN, Esri, Garmin, FAO, NOAA, USGS, EPA

Where do we go from here?

Maine DEP AIS Unit
10-Year Strategic Goals:

- Strong Communication & Support to Partners
- Expand Program Reach
- No New Infestations
- Robust Management

- Pro-active vs Re-active
- We don't know what we don't know re infestations
- Regional Approach
- Focus more on early detection, expand CBI
- Updated Management Plans for all existing infestations
- RFP for Community Based Social Marketing

Contact:

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John McPhedran: john.mcphedran@maine.gov
Toni Pied: toni.pied@maine.gov
Chris Reily: chris.reily@maine.gov

www.maine.gov/dep

Invasive species and climate change in the Northeast

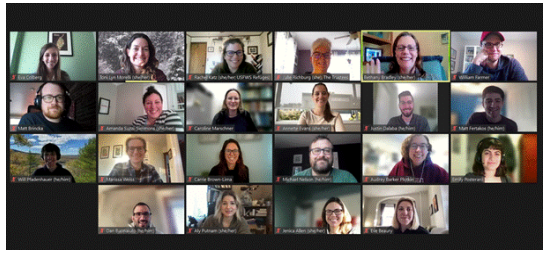
Jenica Allen

Senior Research Fellow
University of Massachusetts, Amherst

Northeast RISCC MANAGEMENT NETWORK

NECASC
Northeast Climate Adaptation Science Center

UNIVERSITY OF MASSACHUSETTS 1863



Northeast RISCC MANAGEMENT NETWORK

… aims to reduce the compounding effects of invasive species and climate change by **synthesizing** relevant science, **communicating** the needs of practitioners to researchers, **building** stronger scientist-practitioner communities, and **conducting** priority **research**.

Science Synthesis

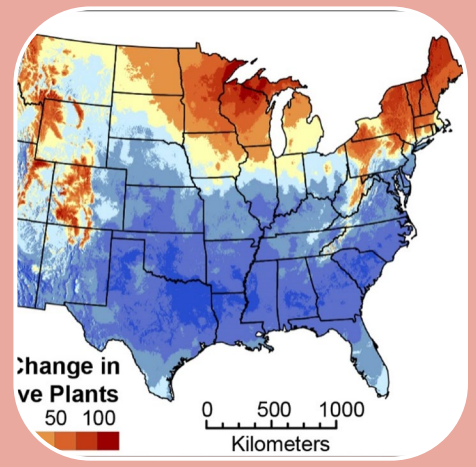
Management Challenges, Research Summaries

Communicating practitioner needs

Surveys, Workshops

Building practitioner-researcher communities

Symposium, Webinars, Networking events



Conducting priority research

Scientific papers, presentations

NE RISCC Leadership Team

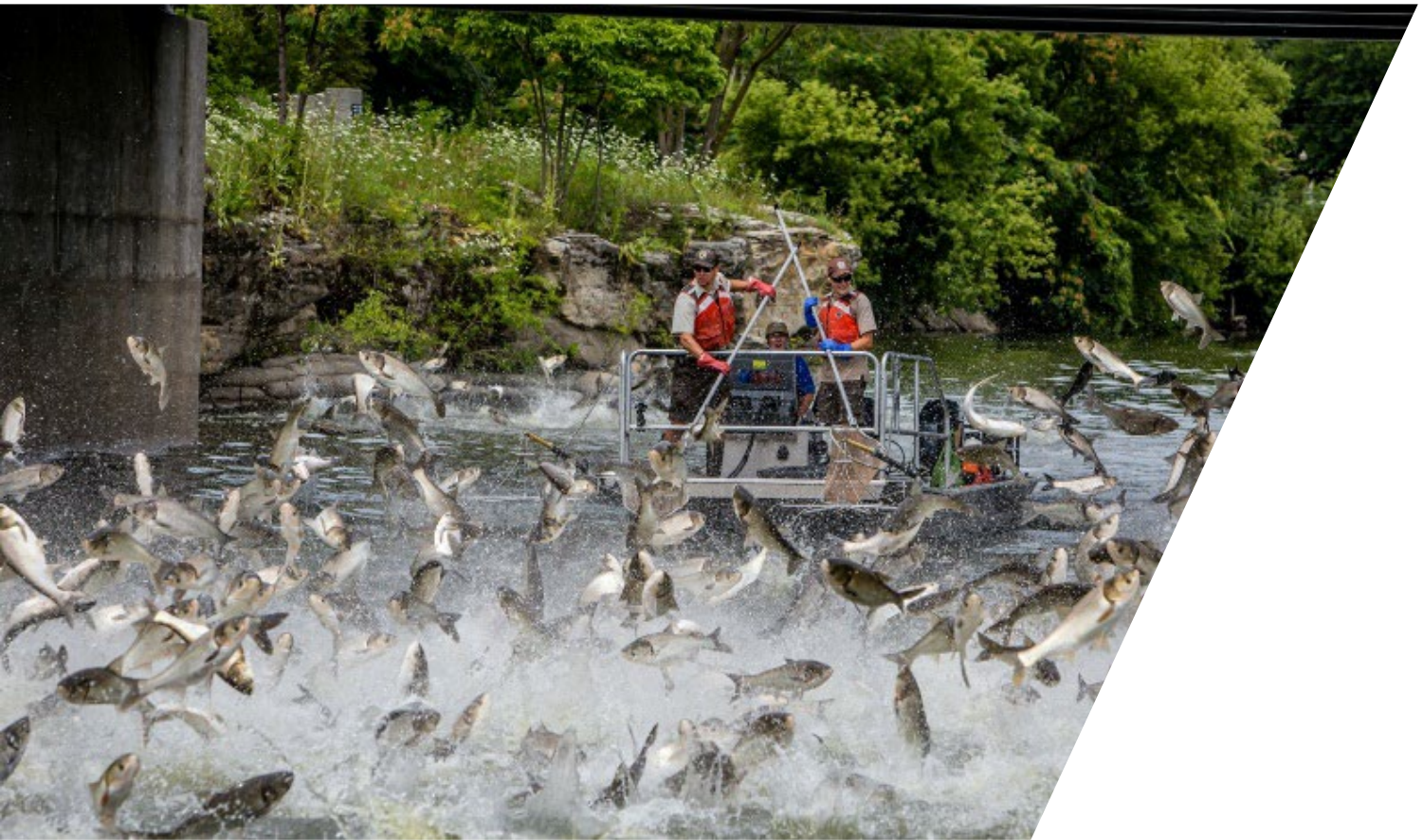
Northeast RISCC MANAGEMENT NETWORK

Outline of topics

1. Invasive species and climate change
2. Overview of Northeast RISCC Priorities
3. Resources for the Northeast

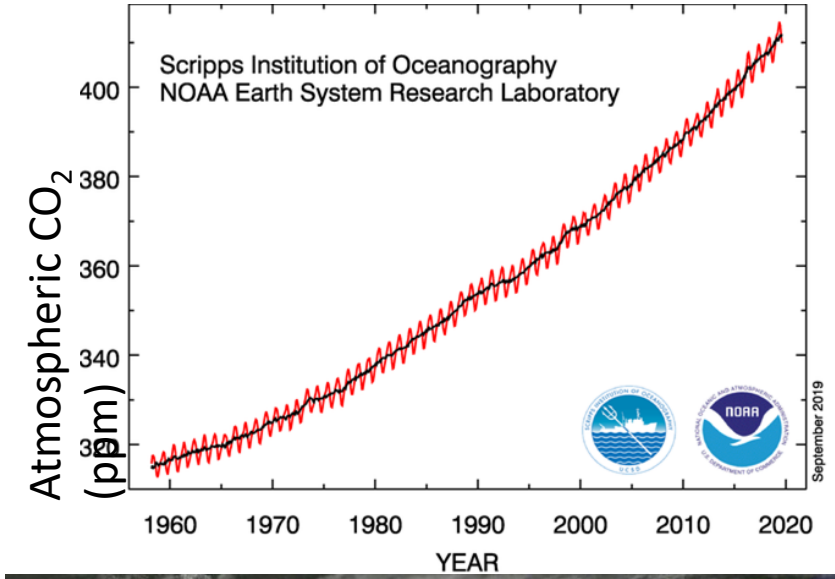


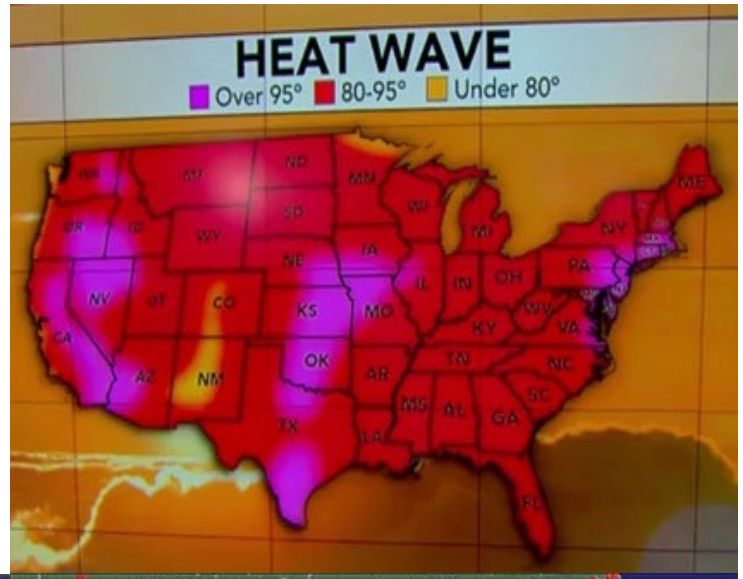




Invasive species are bad enough

Now we need to add climate change?





“Climate change will also be a major cause of future increases in the risk of invasive alien species.”

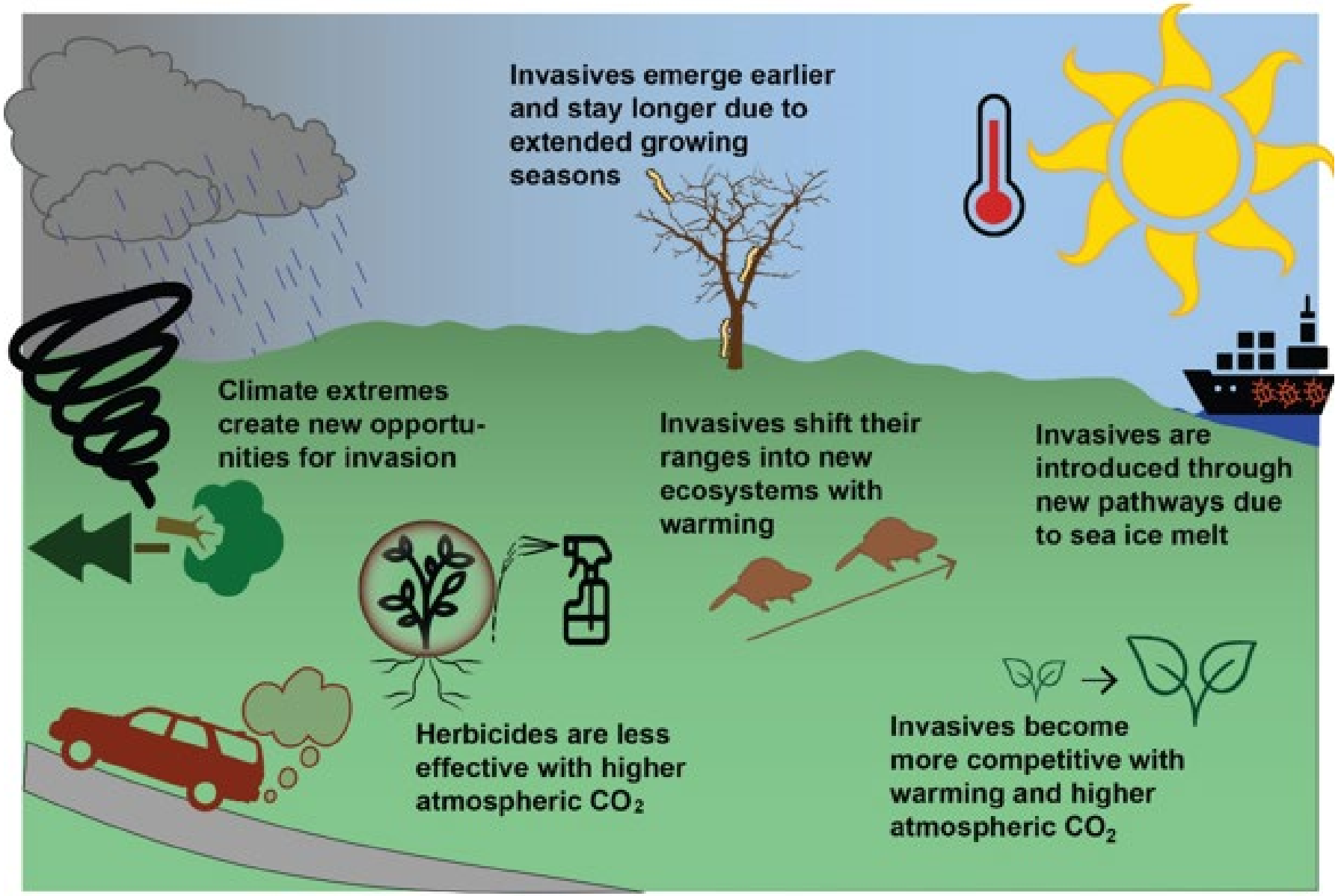
UN environment programme

unesco

Food and Agriculture Organization of the United Nations

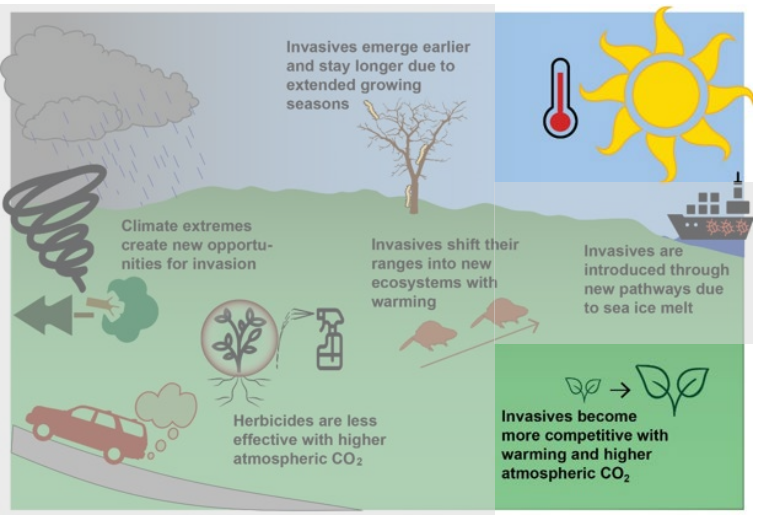
UNDP

Climate Change Impacts on Invasive Species



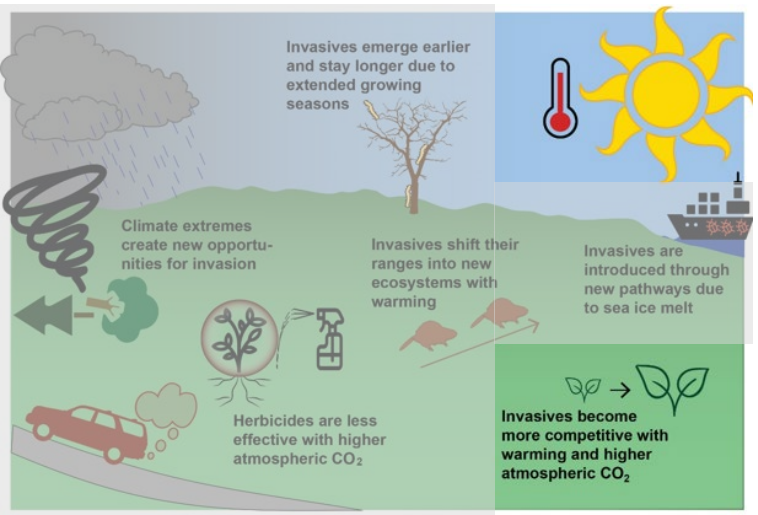
Double Trouble: Understanding risks from invasive species and climate change (NE RISCC Management Challenge)

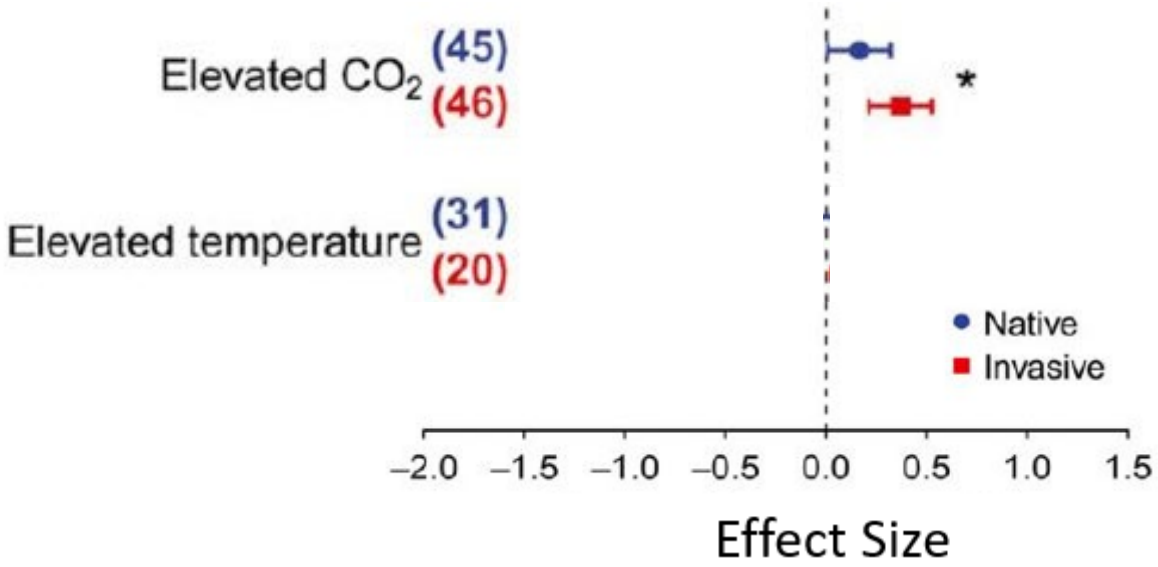
Rising CO_2 and temperature increase plant performance



Liu et al. 2017

But invasives get a bigger boost than natives





Liu et al. 2017

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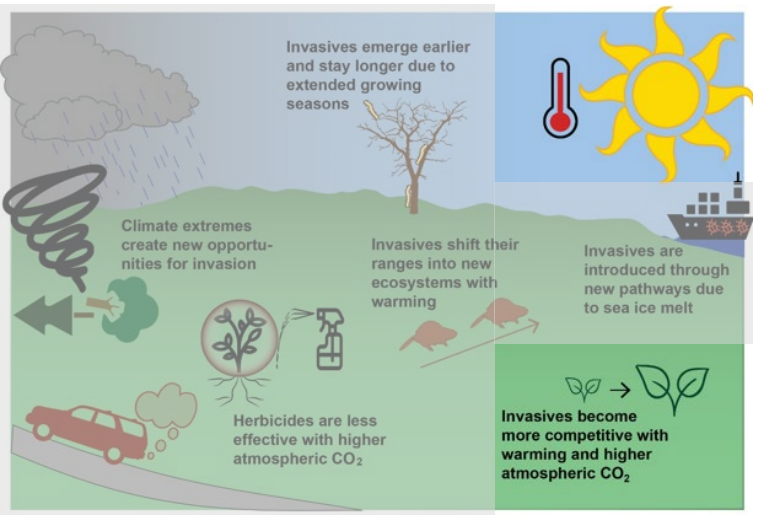
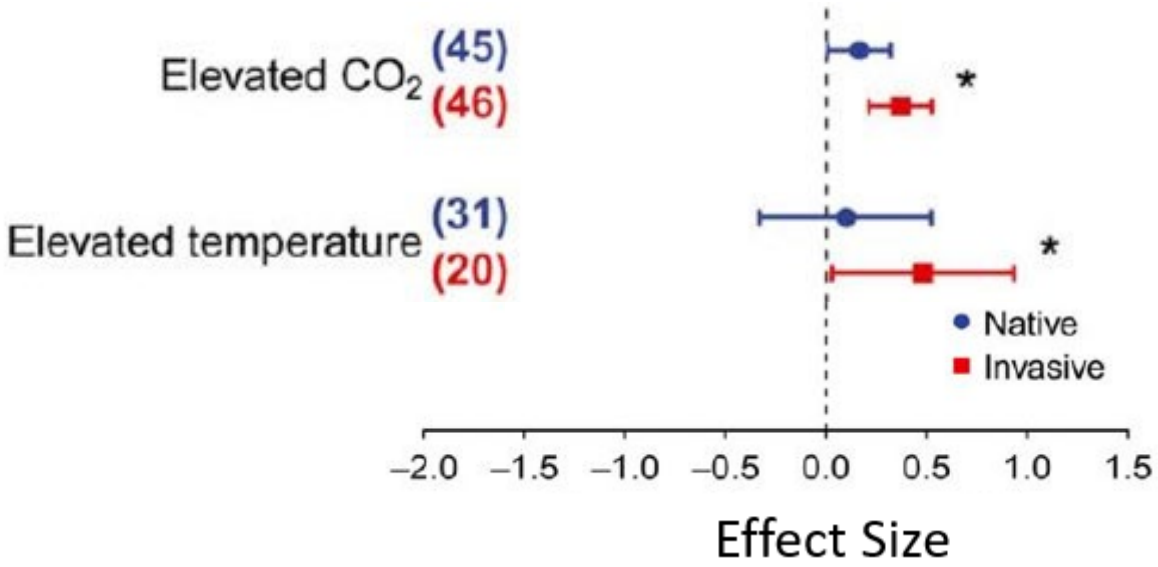
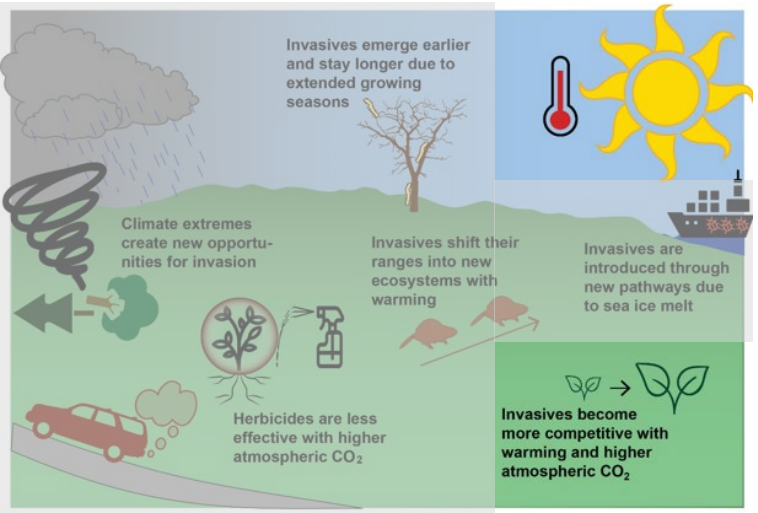




Liu et al. 2017

Warming favors greater quantity and variety of forest pests

- Earlier spring warming increases populations of insect pests, such as defoliating insects and bark beetles
- Longer growing season may increase the number of generations per year



Winter moth caterpillar looking for a snack

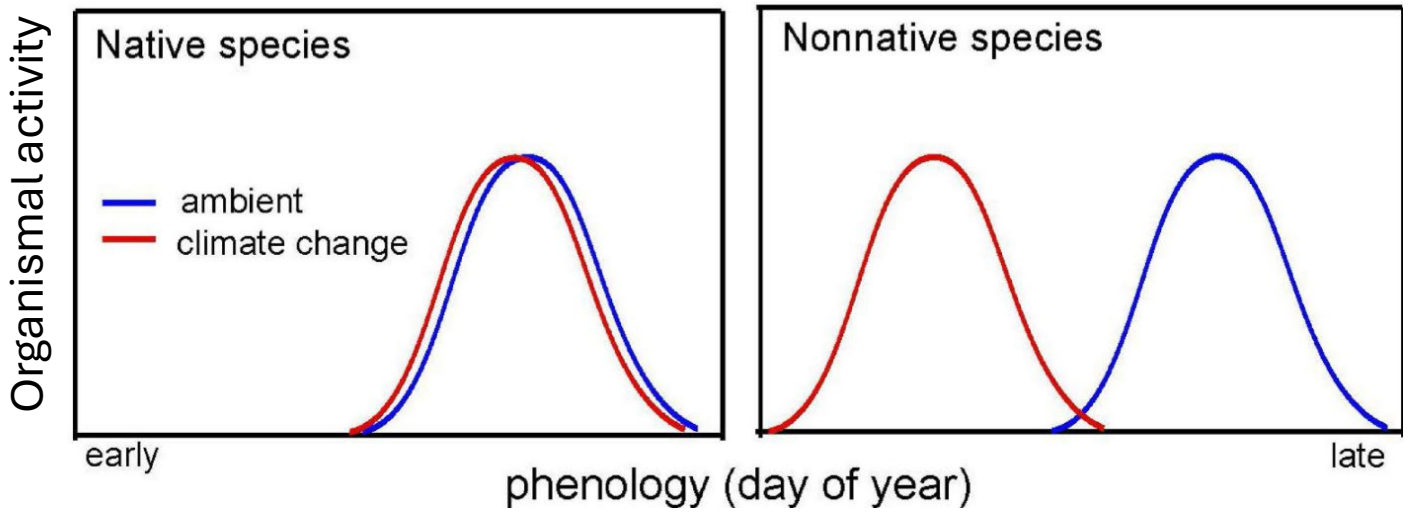
Northeast RISCC Management

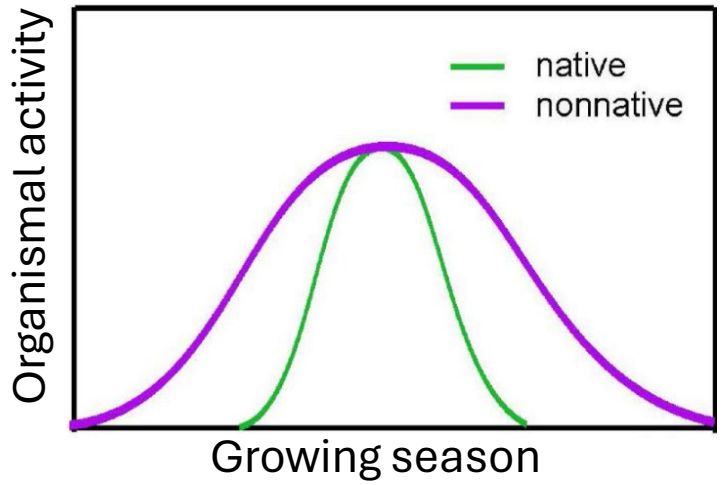
Regional Invasive Species & Climate Change

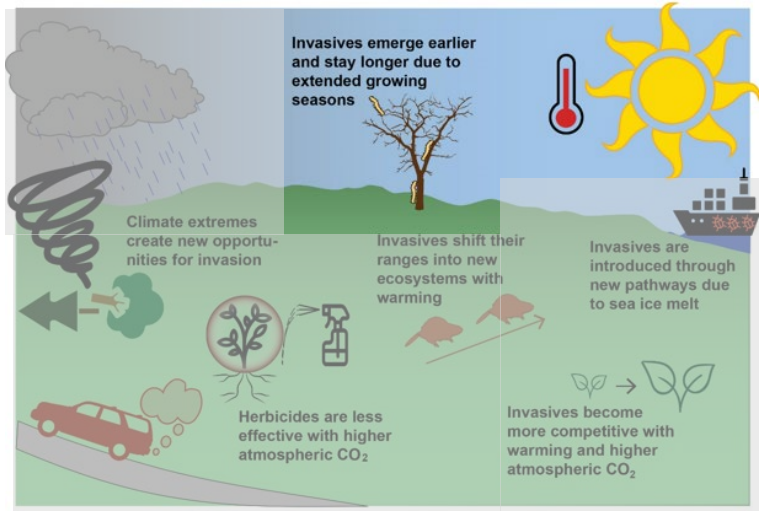
Management Challenge

Forest Pest Risk is Heating Up

More phenological flexibility in invasives than natives





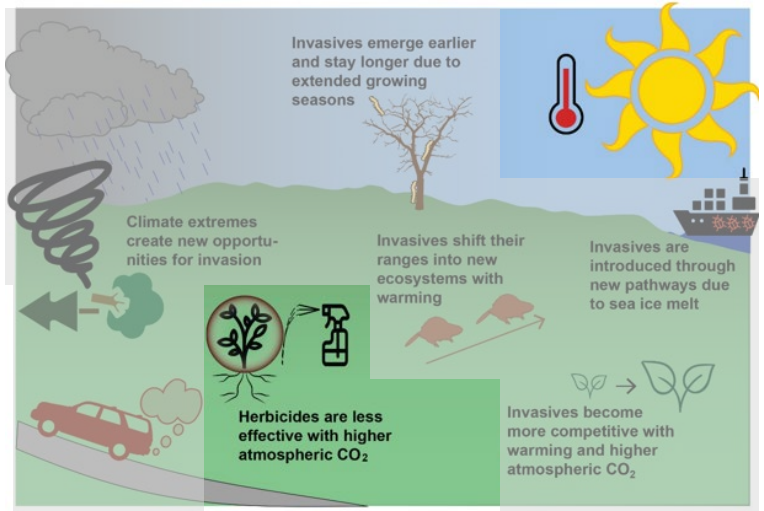


~60% cases show phenological difference between native & invasive species (mostly plants)

Zettlemoyer et al. 2022

Japanese barberry *(B. thunbergii)*

Rising CO_2 may lower herbicide efficacy (on more vigorous plants)



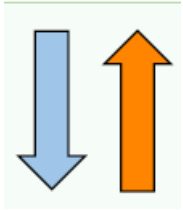
Canada thistle

Ziska et al. 2004

Rising CO_2 and temperature can alter biocontrol efficacy, but changes are not reliably predictable (yet?).

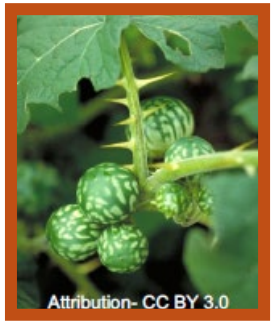
biocontrol

+ CO_2



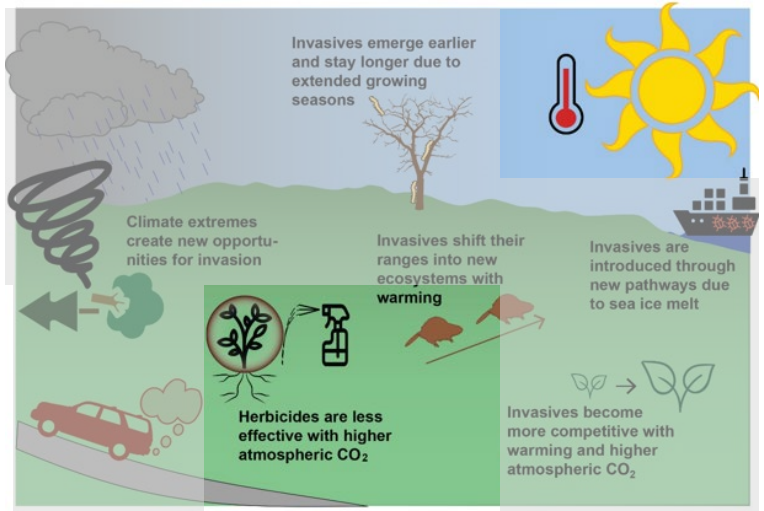
efficiency/ growth

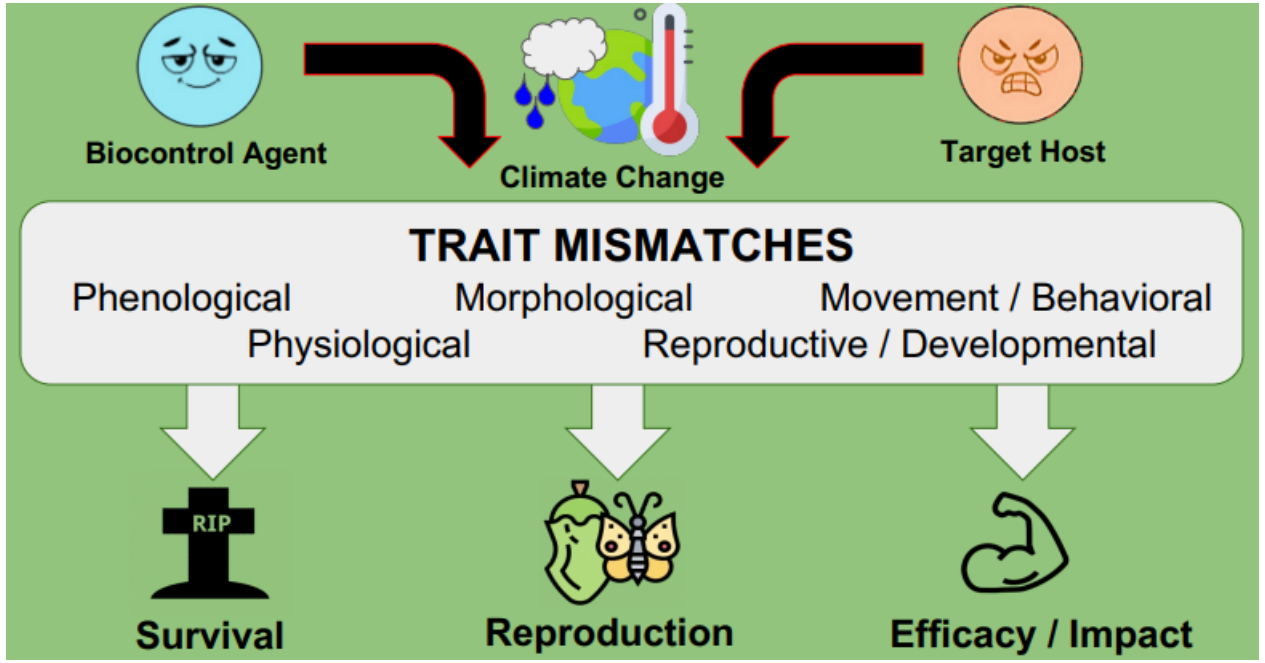
invasive



Tropical soda apple grew larger and beetles ate less leaf area with elevated CO_2.

Diaz et al. 2012





Northeast RISCC MANAGEMENT NETWORK

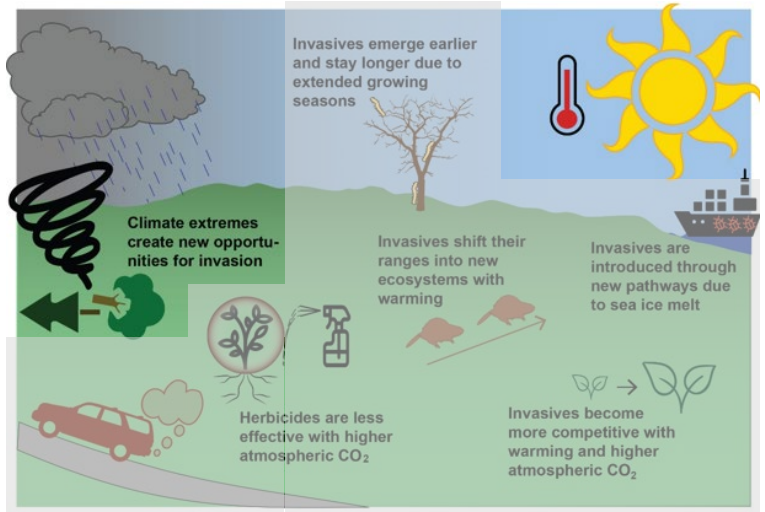
Regional Invasive Species & Climate Change

Management Challenge

Out of Control? The Effects of Climate Change on Biological Control Agents and their Target Hosts

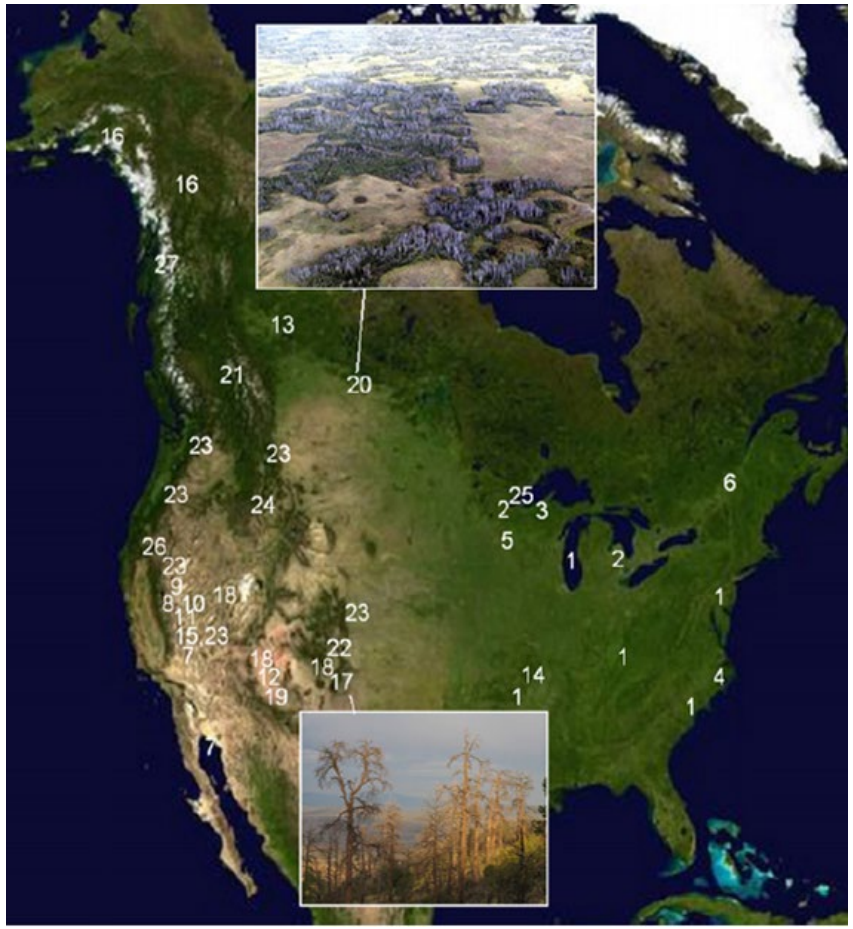
Climate extremes create novel disturbance, harming native ecosystems and providing an opening for invasives

New Jersey Forest after Hurricane Sandy



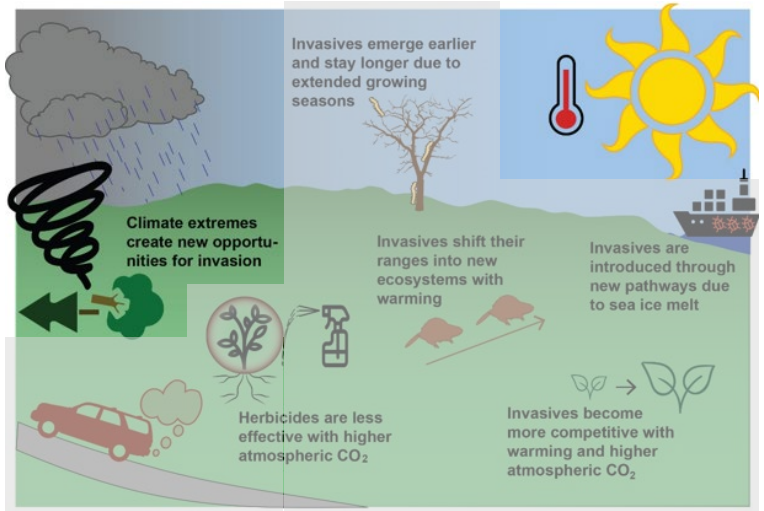
<u>Western US:</u>
Forest die-off linked to drought

<u>Eastern US:</u>
Tree mortality tied to severe winter + hot summer

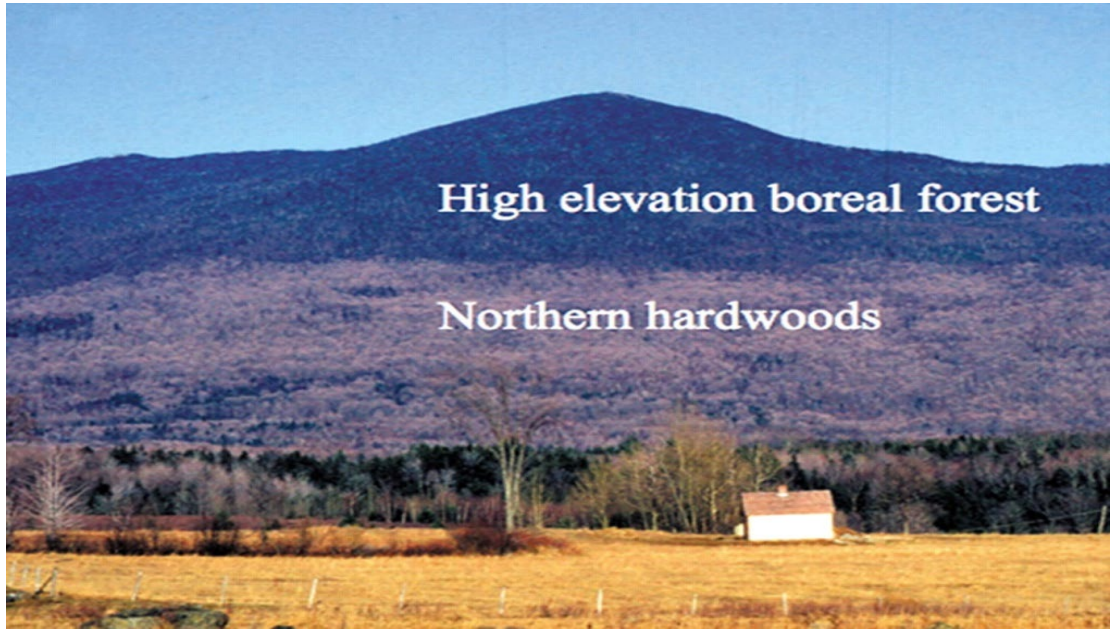


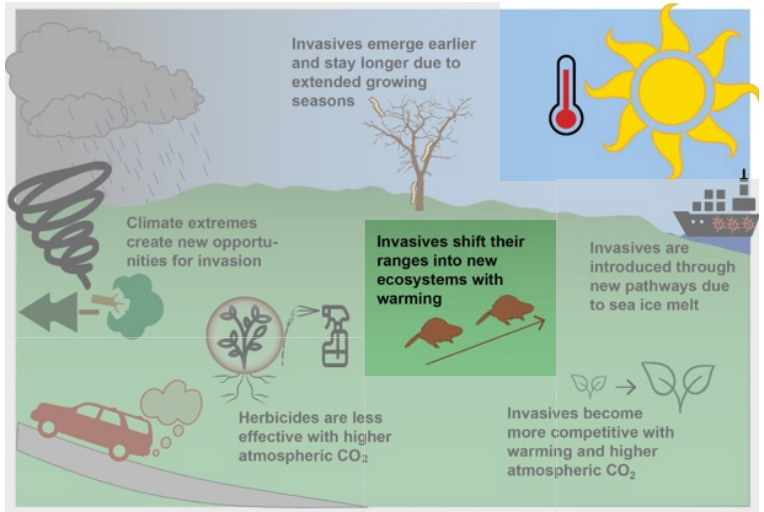
Allen et al. 2010

Storms can also cause unintentional spread of invasives



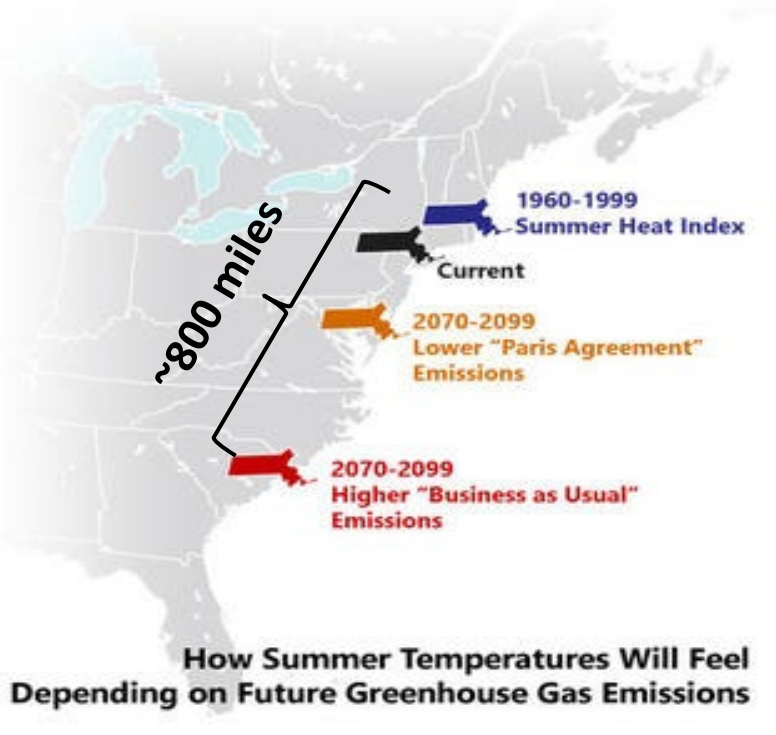
Native species aren’t keeping up with climate change





Native species are shifting their ranges about half as fast as climate.

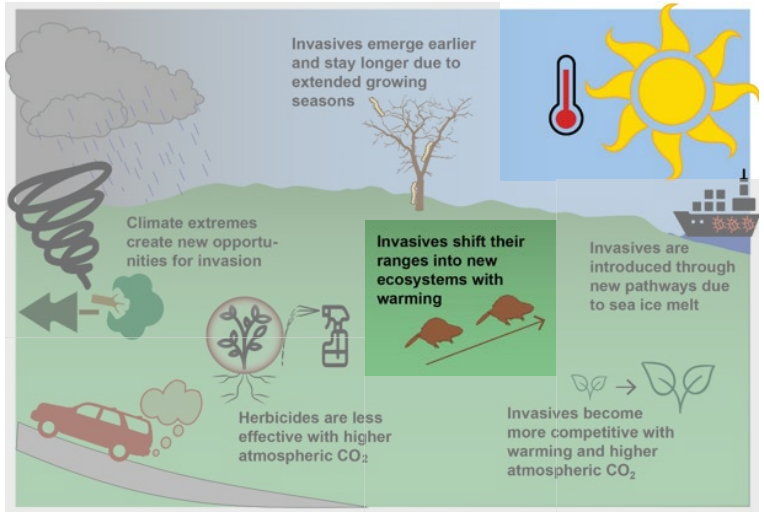
Beckage et al. 2008, Ash et al. 2017

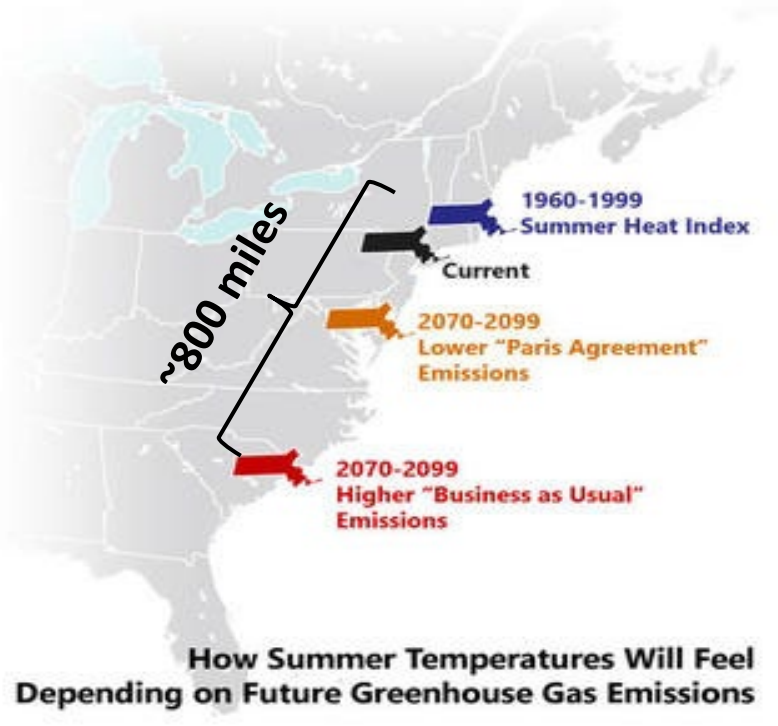


Native species aren’t keeping up with climate change and invasives have a dispersal boost.

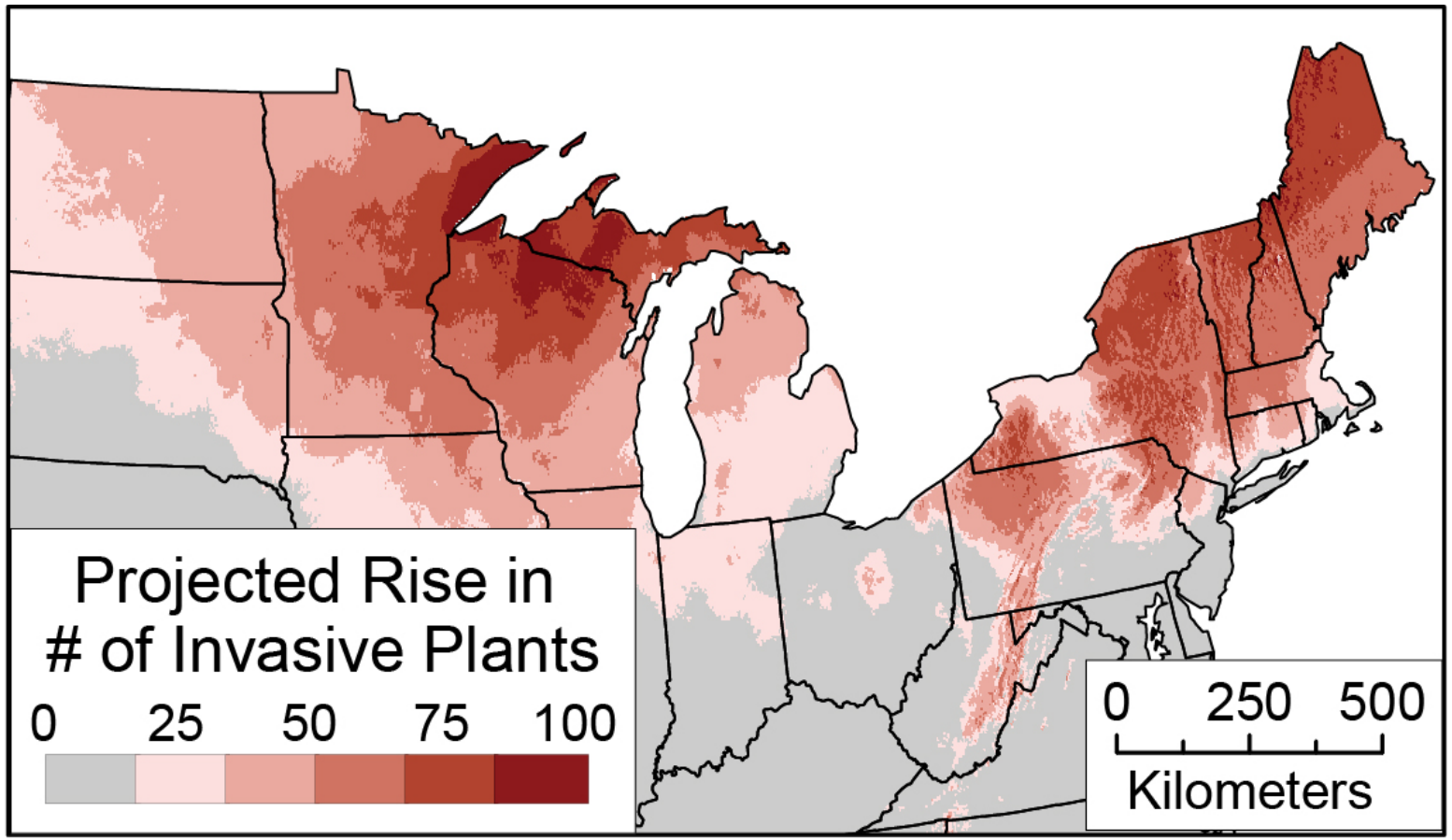
Native species are shifting their ranges about half as fast as climate.

Beckage et al. 2008, Ash et al. 2017

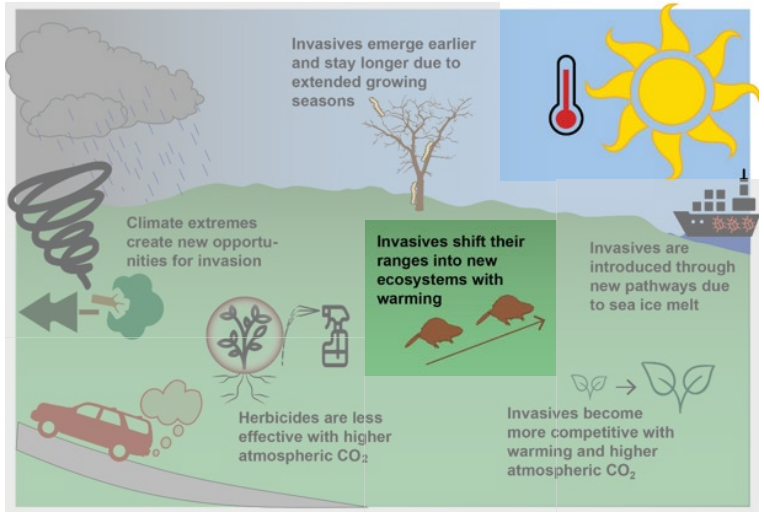




Risk from current invasive species is shifting



Allen & Bradley 2016



The Northeast is a hotspot of future plant invasion

Science Synthesis

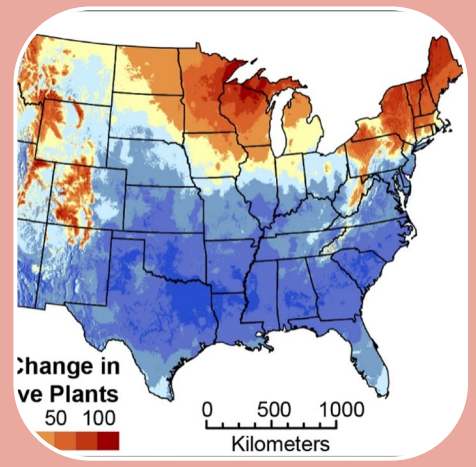
Management Challenges, Research Summaries

Communicating practitioner needs

Surveys, Workshops

Building practitioner-researcher communities

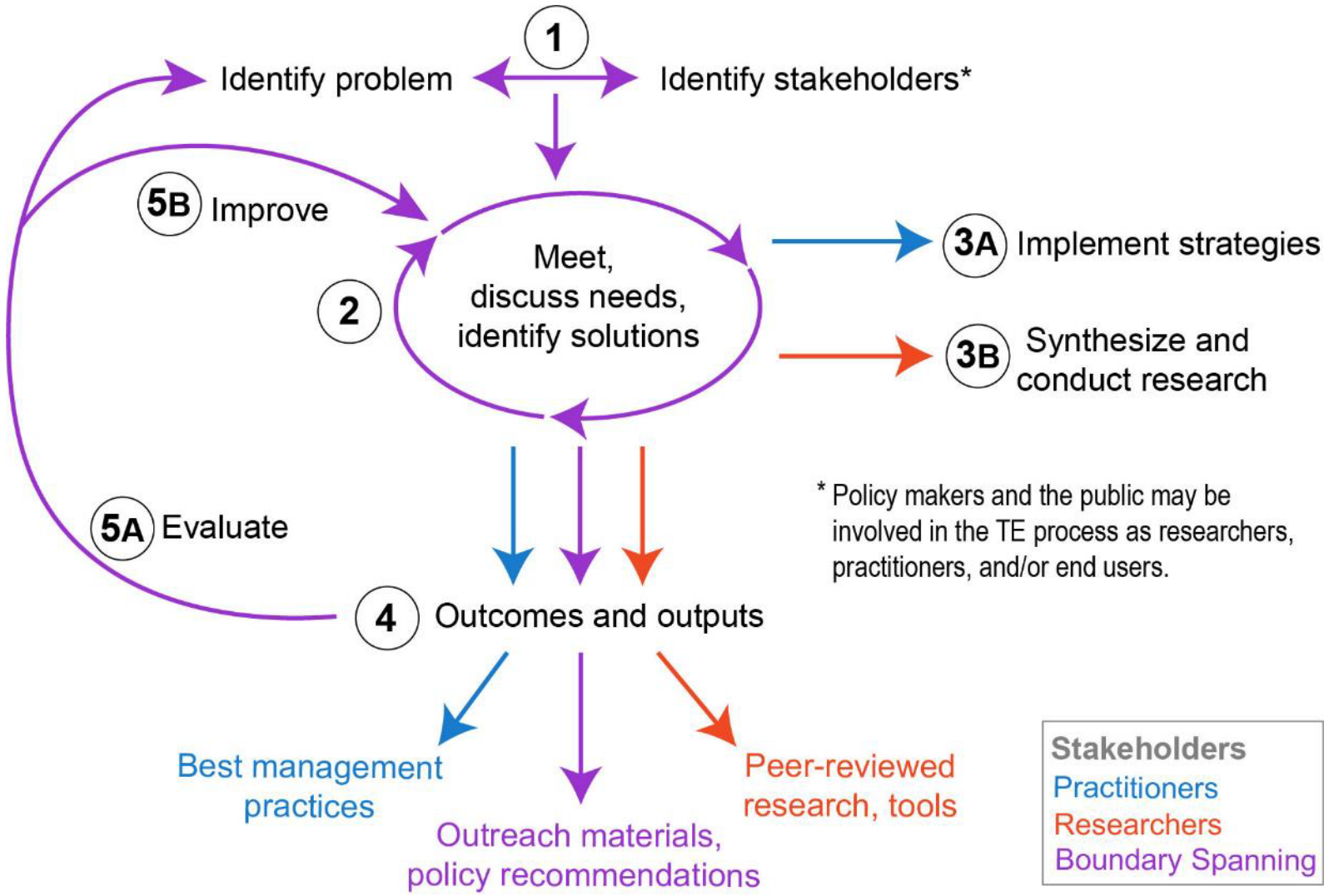
Symposium, Webinars, Networking events



Conducting priority research

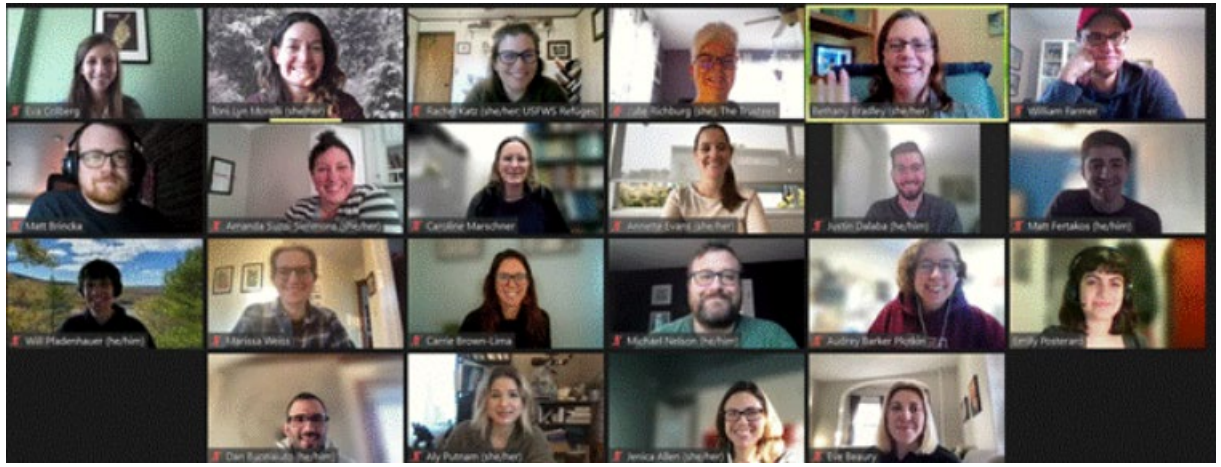
Scientific papers, presentations

Translational Invasion Ecology Model



Morelli et al. 2021

Stakeholder engagement is key



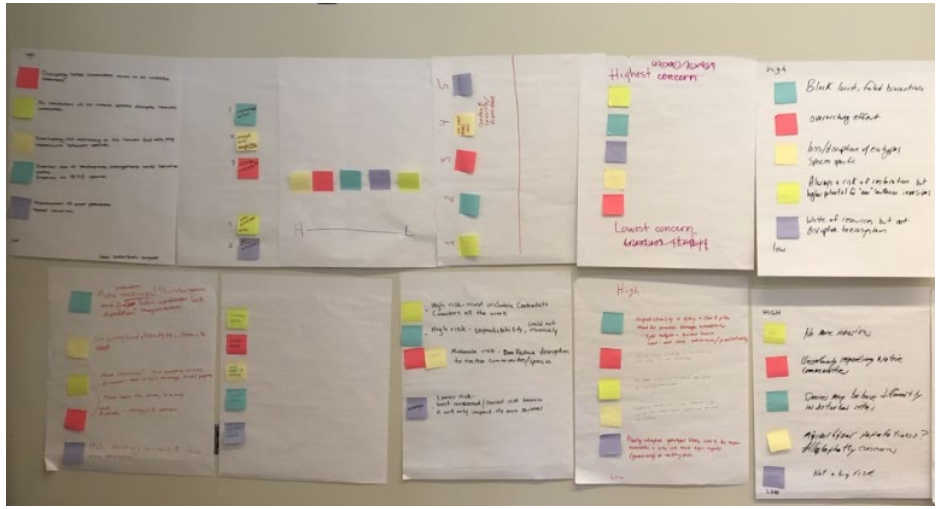
2.i. Strategic planning: Mission, values, & goals

Options for climate-smart invasive species management:
Mission, values, & goals

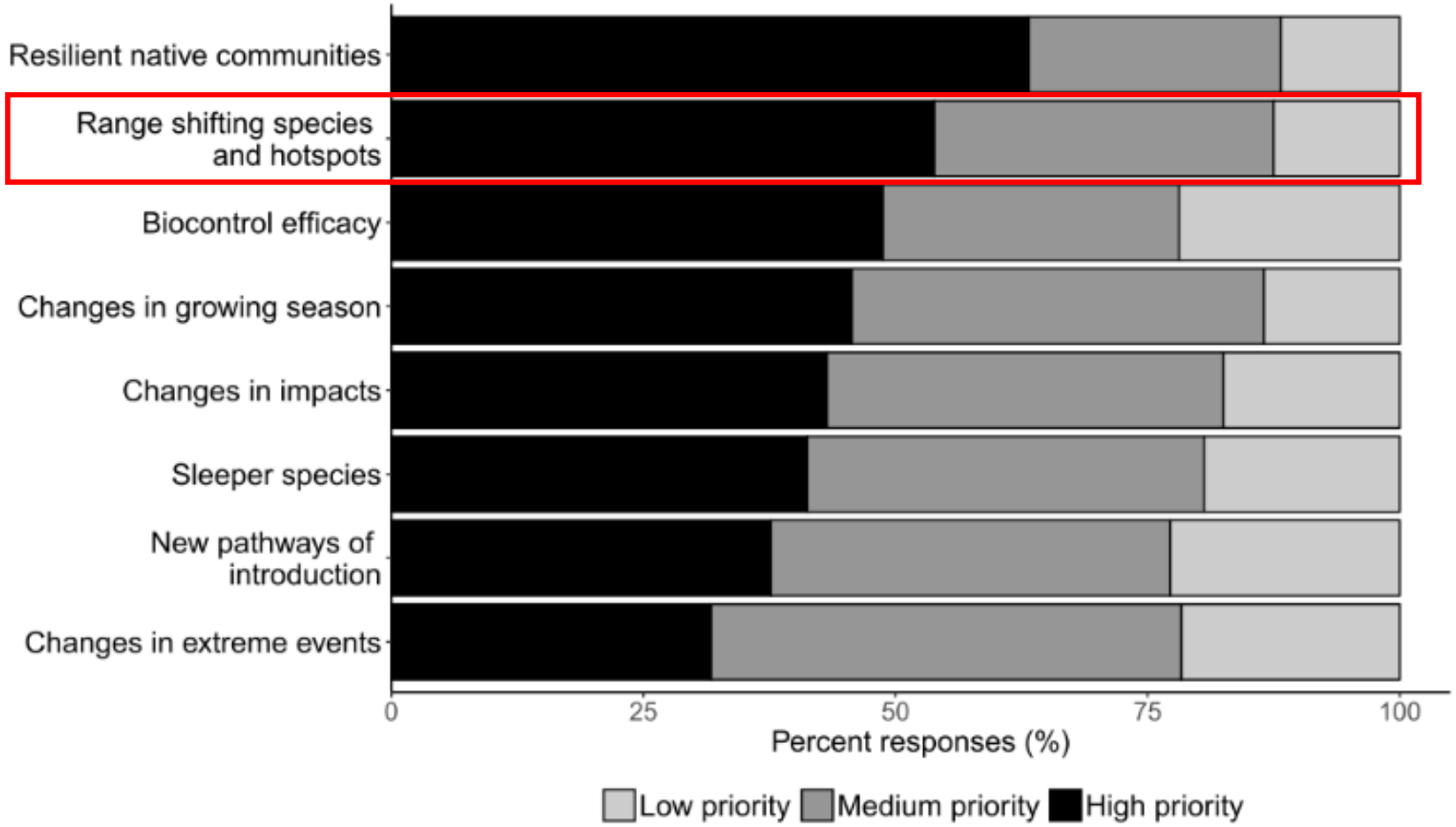
a. Explicitly address the impacts and mediation of CC in organizational mission, goals, and strategic plan.
b. Consider potential impacts of CC on reference ecosystems, target native species, and management goals.
   - Consider the vulnerability of target species and ecosystems to CC and IS.
   - Consider CC-mitigating and CC-adaptive services when setting management goals.
c. Incorporate predicted CC impacts on IS range shifts when selecting watchlist species.
d. Conduct natural resource inventory so that we know what species we have, where, so that we can plan management better

Policy & funding implications & supporting actions:
Mission, values, & goals

- Fund and support regional and local IS horizon scans and climate vulnerability assessments.
- Include CC impacts in IS horizon scans and risk assessments and provide results at local scales.

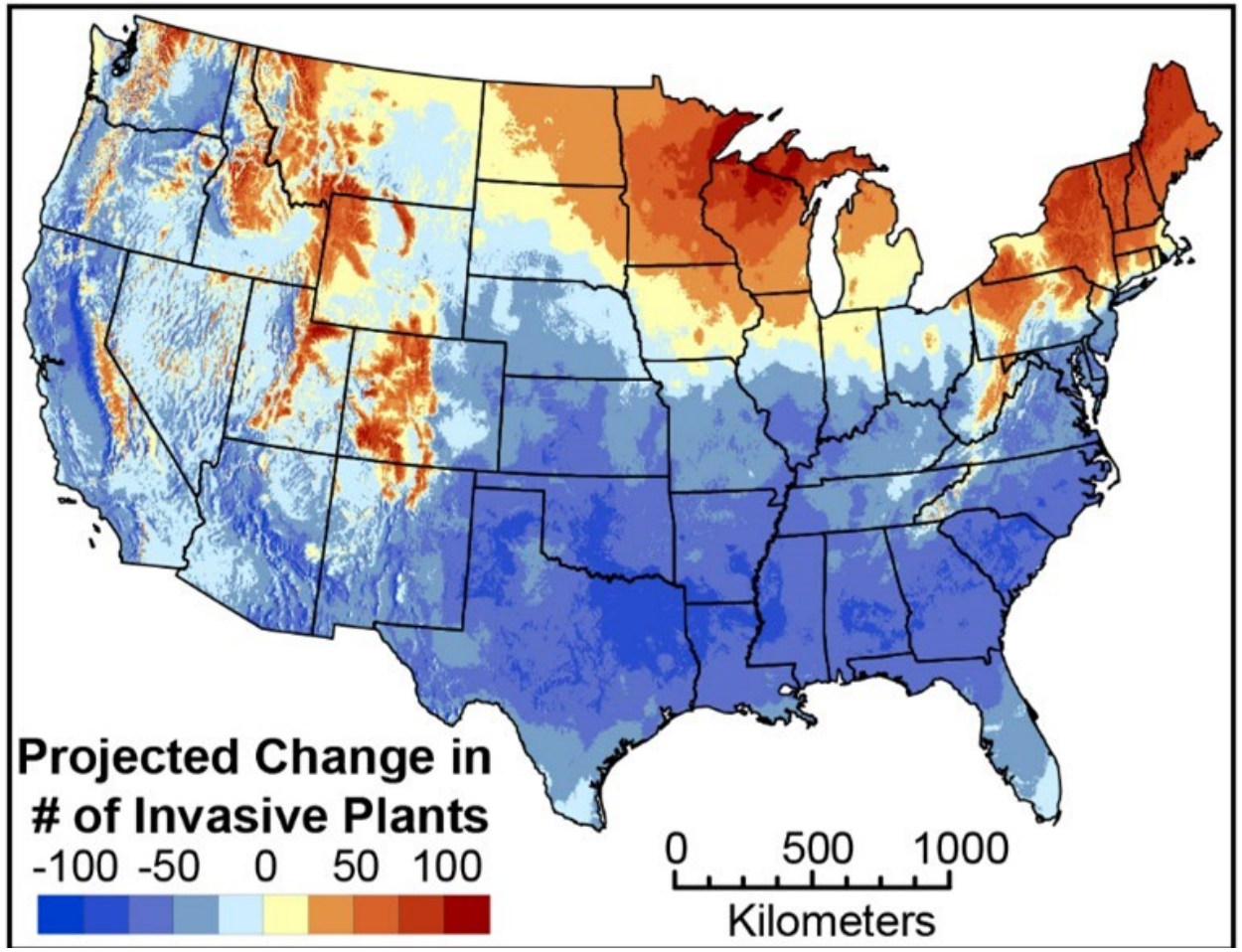


Network identified priority information needs



Beaury et al. 2020

Modeled ranges for ~900 terrestrial invasive plants



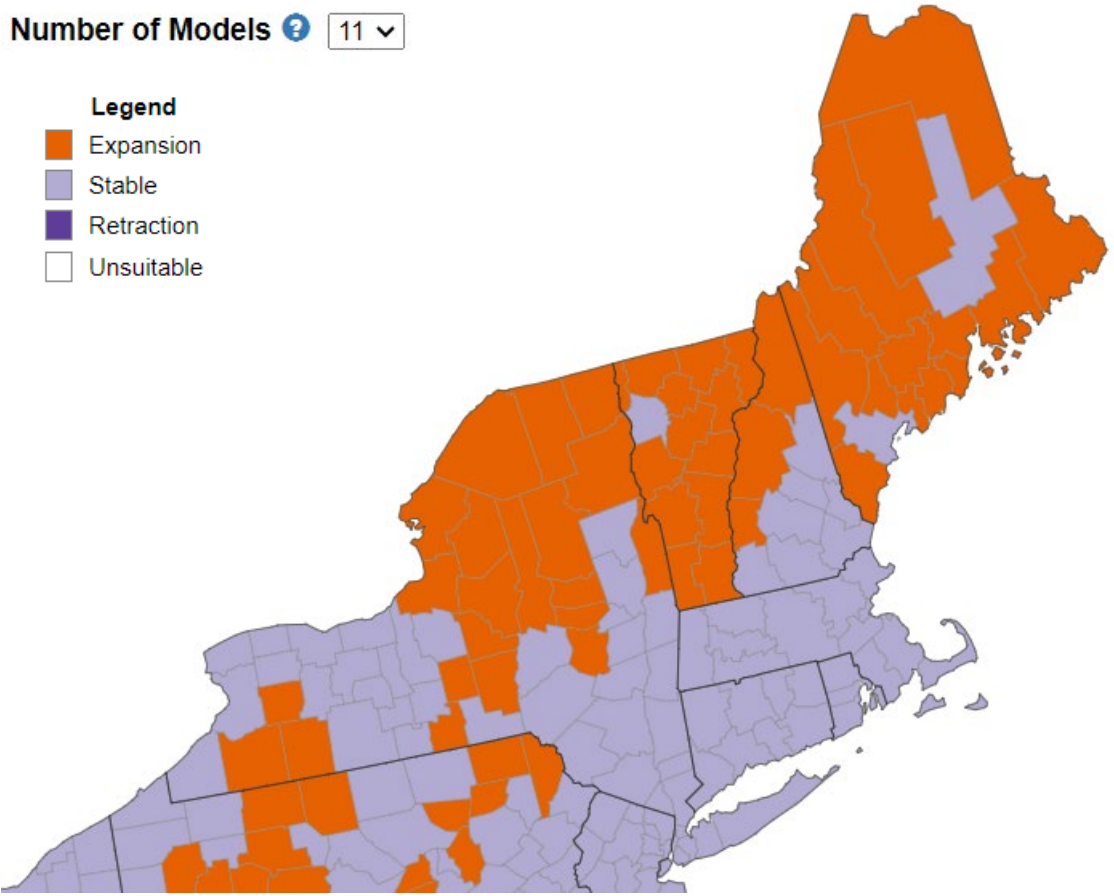
Allen & Bradley, 2016

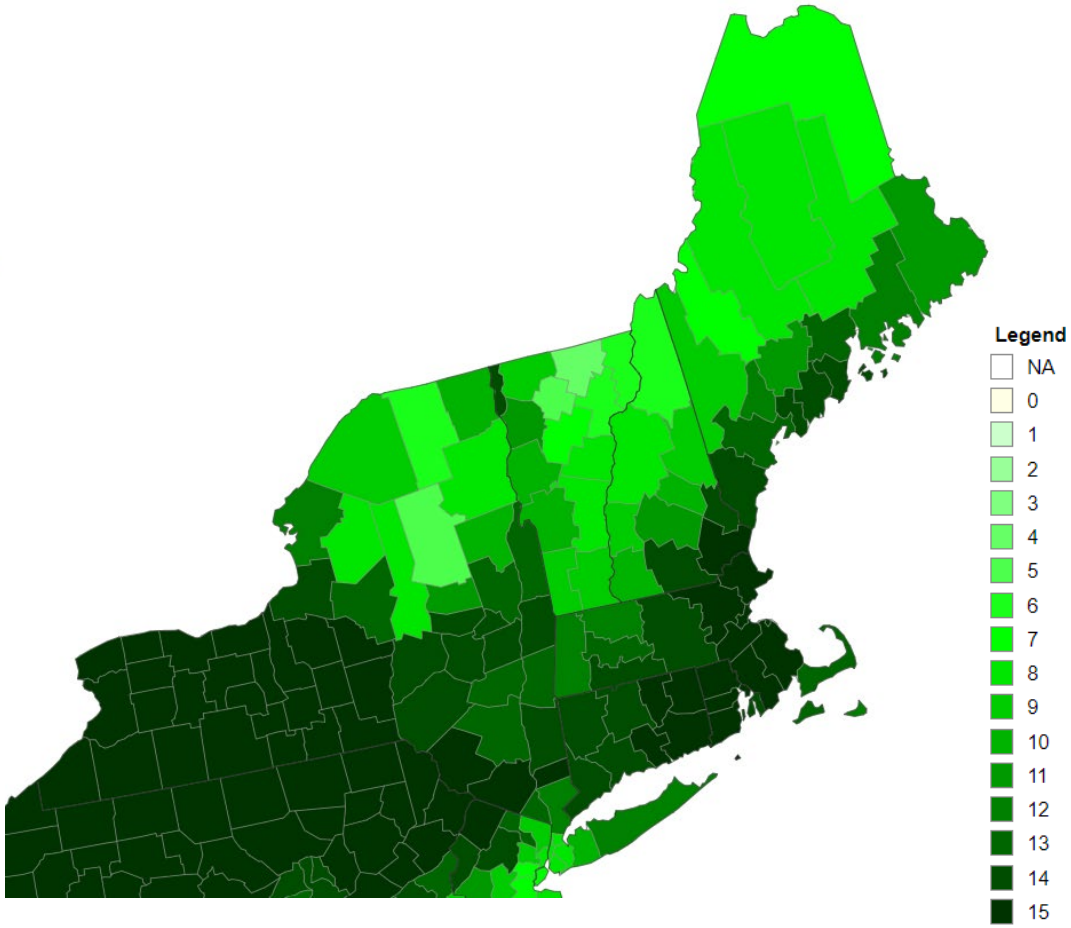
Species Range Shift Maps

States | Counties | Points | List | Species Info

Distribution | Record Density | Literature vs Observation | Future Range | Future Certainty | Future Abundance Habitat

Project funded by the Northeastern IPM Center through Grant #2014-70006-22484 from the National Institute of Food and Agriculture, Crop Protection and Pest Management, Regional Coordination Program and by the U.S. Geological Survey and the Northeast Climate Adaptation Science Center through grant # G21AC10233-01.





Annette Evans

Range Shift Tool: State watch lists

Invasive Range Expanders Listing Tool

Select State: New York

Select County: All Counties

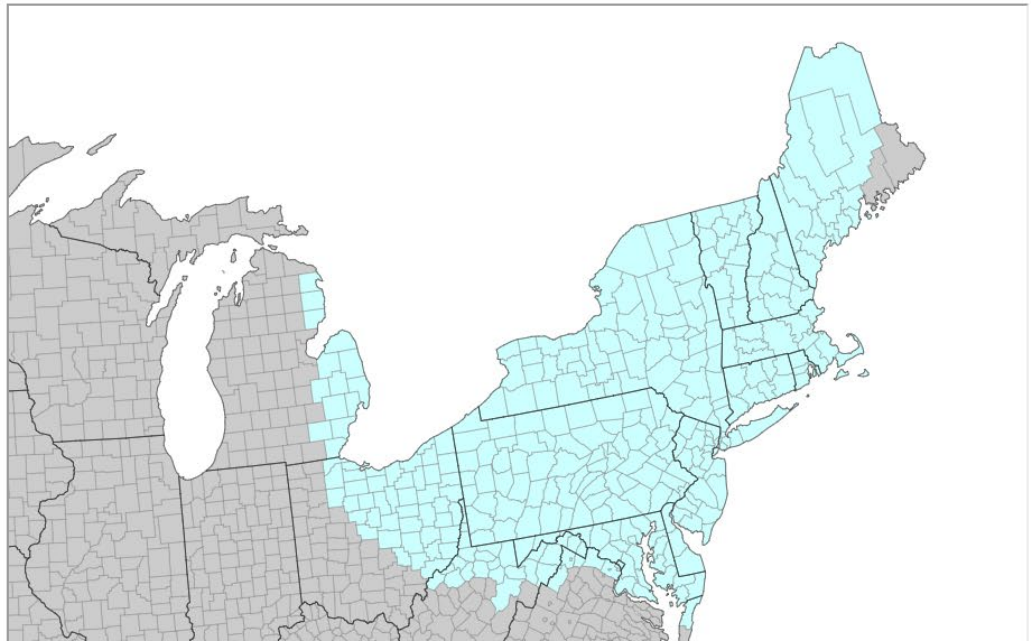
Choose Number of Models: 11

Refine List by: Species observed within a radius

Range Expansion Definition: Range expansion with climate change

Radius : 200 miles

REGIONS WHERE THE SPECIES HAS BEEN FOUND



LIST OF SPECIES WITHIN CURRENT CLIMATE

Download

Sear

Scientific Name	Common Name
Araujia sericifera	white bladderflower
Arundo donax	giant reed
Asclepias curassavica	bloodflower milkweed
Avena barbata	slender oat
Brachypodium distachyon	annual false-brome
Canna indica	Indian shot
Carthamus lanatus	woolly distaff thistle
Cestrum diurnum	day jessamine
Conyza bonariensis	hairy fleabane

https://www.eddmaps.org/rangeshiftlisting/

Data source: Allen & Bradley 2016

Northeastern IPM Center

Project funded by the Northeastern IPM Center through Grant #2014-70006-22484 from the National Institute of Food and Agriculture, Crop Protection and Pest Management, Regional Coordination Program.

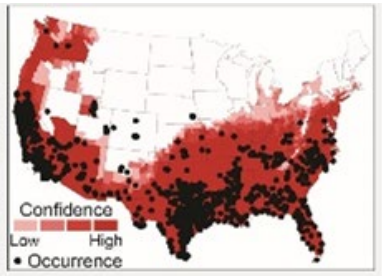
Wait, how many species do we have to look out for?!?

Prioritizing Watch Lists: Impact assessments

Arundo donax (giant reed)

HIGH Impact: Outcompetes native wetland plants, alters wetland structure, increases fire frequency., acts as a hosts for crop pests and pathogens.

HIGH Vulnerability: Invades rivers, streams, wetlands, and coastal areas. Widely introduced as a biofuel crop, so introduction could be fast. Difficult to control and spreads by rhizomes along waterways.



Avena barbata (slender wild oat)

HIGH Impact: Outcompetes native grassland species. Hosts crop pathogens (wheat crown rust)

HIGH Vulnerability: Invades grasslands, crop systems, and disturbed fields. Introduced as a fodder crop and as a crop contaminant. Some chemical controls and mechanical removal prior to seed production can be effective.

Ludwigia grandiflora (water primrose)

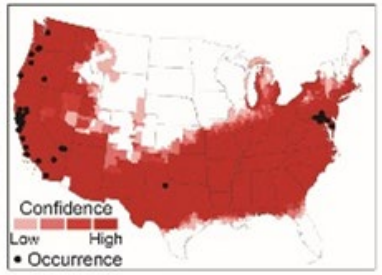
HIGH Impact: Outcompetes native plants, creates anoxic conditions in water bodies, increases flood risk.

HIGH Vulnerability: Invades wetlands and water bodies. Introduced as an ornamental, so arrival could be fast and already identified in New York. Propagules spread easily through waterways, boats, and wildlife. Chemical control can be locally effective.

Rubus ulmifolius (elmleaf blackberry)

HIGH Impact: Outcompetes natives, creates dense thickets, threatens native endemic *Rubus* species through hybridization, and hosts crop diseases.

HIGH Vulnerability: Invades forests and pastures, including in the Northeast (populations in Delaware). Introduced as an ornamental; arrival could be fast. Mechanical and chemical control somewhat effective.



Northeast RISCC Management

Regional Invasive Species & Climate Change
Management Challenge

Prioritizing range-shifting invasive plants

High-impact species coming to the Northeast

NE CASC Northeast Climate Adaptation Science Center

Northeastern IPM Center

Appendix 1. Database of impact assessments for 100 range-shifting invasive plants

Download Data (591 KB) Download Data

README.txt (2 KB) Download

Mei Rockwell-Postel, *University of Massachusetts Amherst*
Bethany A. Bradley, *University of Massachusetts Amherst* Follow

Publication Date
2020

Project funded by the Northeastern IPM Center through Grant #2014-70006-22484 from the National Institute of Food and Agriculture, Crop Protection and Pest Management, Regional Coordination Program.

Mei Rockwell-Postel

Will Coville

Identifying high-impact invasive plants likely to shift into northern New England with climate change

Published online by Cambridge University Press: **31 March 2021**

William Coville, Bridget J. Griffin and Bethany A. Bradley

Show author details

Ornamental invasive plants remain a problem

Invaders for sale: the ongoing spread of invasive species by the plant trade industry

Evelyn M Beaury[1*], Madeline Patrick[2], and Bethany A Bradley[1,2]

61% of 1,285 invasive plants in the U.S. are still available for sale

SUNJOY NEO Barberry - Berberis...

2-Pack (Obsession Nandina...

Miscanthus sinensis 'Morning...

Proactive Regulation Potential: Ornamental plants

Northeast RISCC Management

Regional Invasive Species & Climate Change

Management Challenge

Do Not Sell!

Ornamental invasive plants to avoid with climate change

Summary

Climate change is likely to bring dozens of new invasive plants to the Northeast. Despite their invasive tendencies, many of these species are sold as ornamental plants in slightly warmer climates, but are not yet a large part of nursery sales in the Northeast. By avoiding these species, we protect our native ecosystems from future invasive species impacts. We also present alternative native plants that provide similar aesthetics while also supporting biodiversity.

Ornamentals as Invasives

About 50% of invasive plants were introduced via horticultural trade, including the majority of Northeast invasive plants. The past is a good indicator of the future unless behaviors change.

Fig. 1. Northeastern invasive plants with ornamental origins. (A) *Pyrus calleryana* (Callery pear) and (B) *Euonymus alatus* (burning bush) are commonly planted in landscapes and readily escape cultivation.

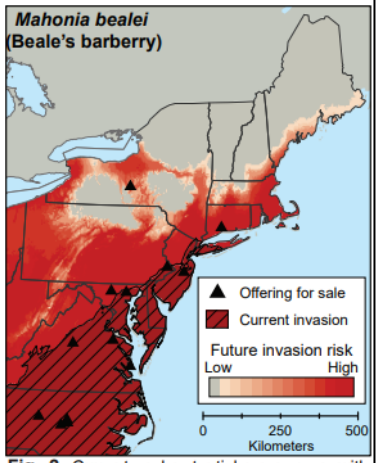


Fig. 2. Current and potential range map with climate change along with nursery locations offering sales of *Mahonia bealei* (Beale's barberry) which is invasive in the southeastern U.S.

A substantial portion of ornamental plants offered for sale in the U.S. are invasive. Expanding native plant offerings reduces risk and supports ecosystems.

Non-Native	Invasive	Native
Non-Native, ornamental plants constitute about 60% of species circulated through horticulture. Of this pool, 10-25% have been identified as **invasive**.		**Native** ornamental plants have minimal risk of becoming invasive and support pollinators and wildlife.

Authors: Jenica M. Allen*, Evelyn Beaury, Julia Mazzuchi, Michael Nelson, Ayodele O'Uhuru, Bethany Bradley

*jenica.allen@gmail.com

https://doi.org (ADD ONCE SUBMITTED)

Learn more at: risccnetwork.org

NECASC NYISRI UMASS AMHERST

Planting natives is optimal, but what about cultivars?

Cultivars of native plants lack the genetic variabllity present in seed grown plants of the wild type. Reduced genetic variability in cultivars limits their resilience to climate change. Many cultivars also change flower and leaf characteristics of the wild type species in ways that make the plant unavailable or unrecognizable to native insects and other wildlife.

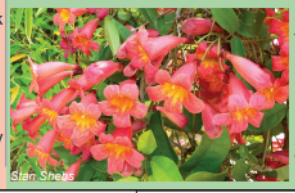
Recommendations:

- Choose wild type (non-cultivar) species grown from seed when possible
- Select cultivars that retain the leaf color, flower shape, and flower timing of the wild type

Fig. 3. *Echinacea purpurea* (purple coneflower) is sold as (A) wild type and cultivars that change (B) flower color, and (C) shape.

Do Not Sell List and Native Alternatives

The Do Not Sell list includes non-native plants that are invasive in other regions of the U.S. and which are currently offered for sale in at least 5 U.S.-based wholesale, retail and/or online nurseries. These species have well-documented negative ecological impacts and will have suitable habitat in vulnerable Northeast ecosystems with future climate change. The Do Not Sell species are not yet part of the ornamental plant trade throughout the Northeast, so we have an opportunity to prevent or reduce their introduction. In other words, these are the problematic species that are coming our way, vectored by the horticulture industry. Learning to recognize and avoid these species now, in favor of native alternatives, will provide ecological and climate-smart benefits.

Do Not Sell	Native Alternative
Akebia quinata (chocolate vine)	*Lonicera sempervirens* (coral honeysuckle)
 **Ecological Impacts:** Crowds out native understory species as a thick ground cover, can over top shrubs and trees. **Vulnerable Ecosystems:** Forest edges, wetlands.	 Zones 4 - 9
Ampelopsis brevipedunculata (porcelain berry)	*Bignonia capreolata* (cross vine)
 **Ecological Impacts:** Forms thick mats of vegetation when established. Can outgrow natives and shade out seedlings and low growing young trees. **Vulnerable Ecosystems:** Sunny forest edges, open habitats.	 Zones 6 - 9

KEY: Dry | Medium | Wet | Part shade | Full sun | Zones: Range of Hardiness Zones

References: Allen & Bradley 2016 Biol. Cons.; Beaury et al. 2021 Front. in Ecol. & Env.; Beaury et al. 2021 J .App. Ecol.; Baisden et al. 2018 Hort. tech.; Bradley et al. 2020 RISCC Mngmnt Chall; Corbet et al. 2001 Ann. Bot.; Coville et al. 2021 Inv. Plant Sci. & Manag.;Harris et al. 2009 Journal of Torrey Bot Soc.; Jeschke & Strayer 2005 PNAS; Lady Bird Johnson Wildflower Center Plant Database; Missouri Botanical Garden Plant Finder; NC State Extentsion Gardener Plant Toolbox; Ricker et al. 2019 Hort. Sci.; Rockwell-Postel et al. 2020 Biol. Inv.; Simberloff et al. 2012 Ecology; White 2016 UVM Diss.

Received: 26 May 2021 | Revised: 28 October 2021 | Accepted: 3 December 2021

DOI: 10.1002/ecs2.4014

ECOSPHERE
AN ESA OPEN ACCESS JOURNAL

ARTICLE

Socio-Ecological Systems

Breaking down barriers to consistent, climate-smart regulation of invasive plants: A case study of US Northeast states

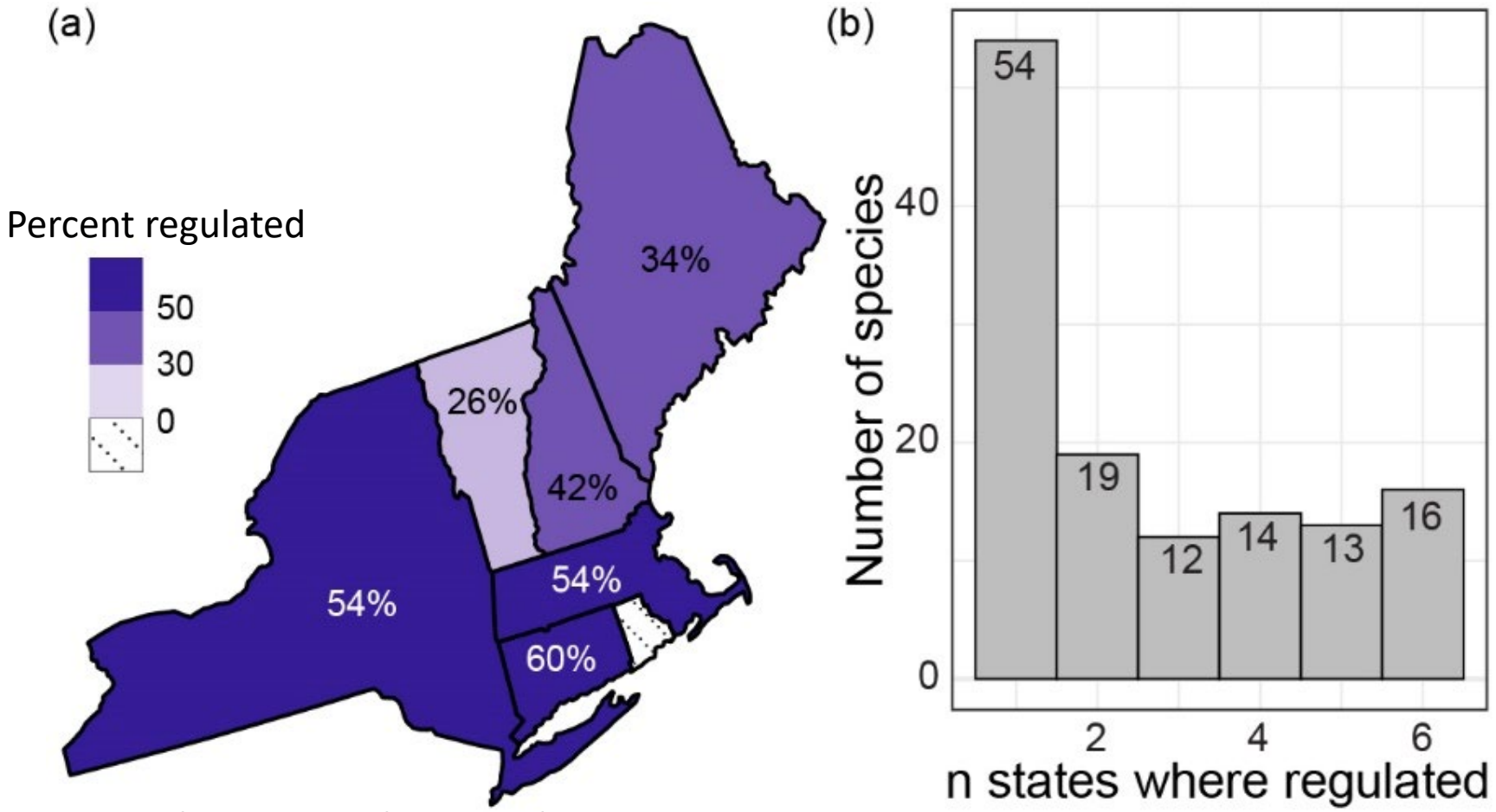
Bethany A. Bradley[1] | Evelyn M. Beaury[1,2] | Emily J. Fusco[1] | Lara Munro[1] | Carrie Brown-Lima[3] | William Coville[1] | Benjamin Kesler[1] | Nancy Olmstead[4] | Jocelyn Parker[5]

Includes: Connecticut, Maine, Massachusetts, New Hampshire, New York, Vermont

Lists and protocols as of 30 April 2021

Excludes seed law (applicable to ME, NH, and RI)

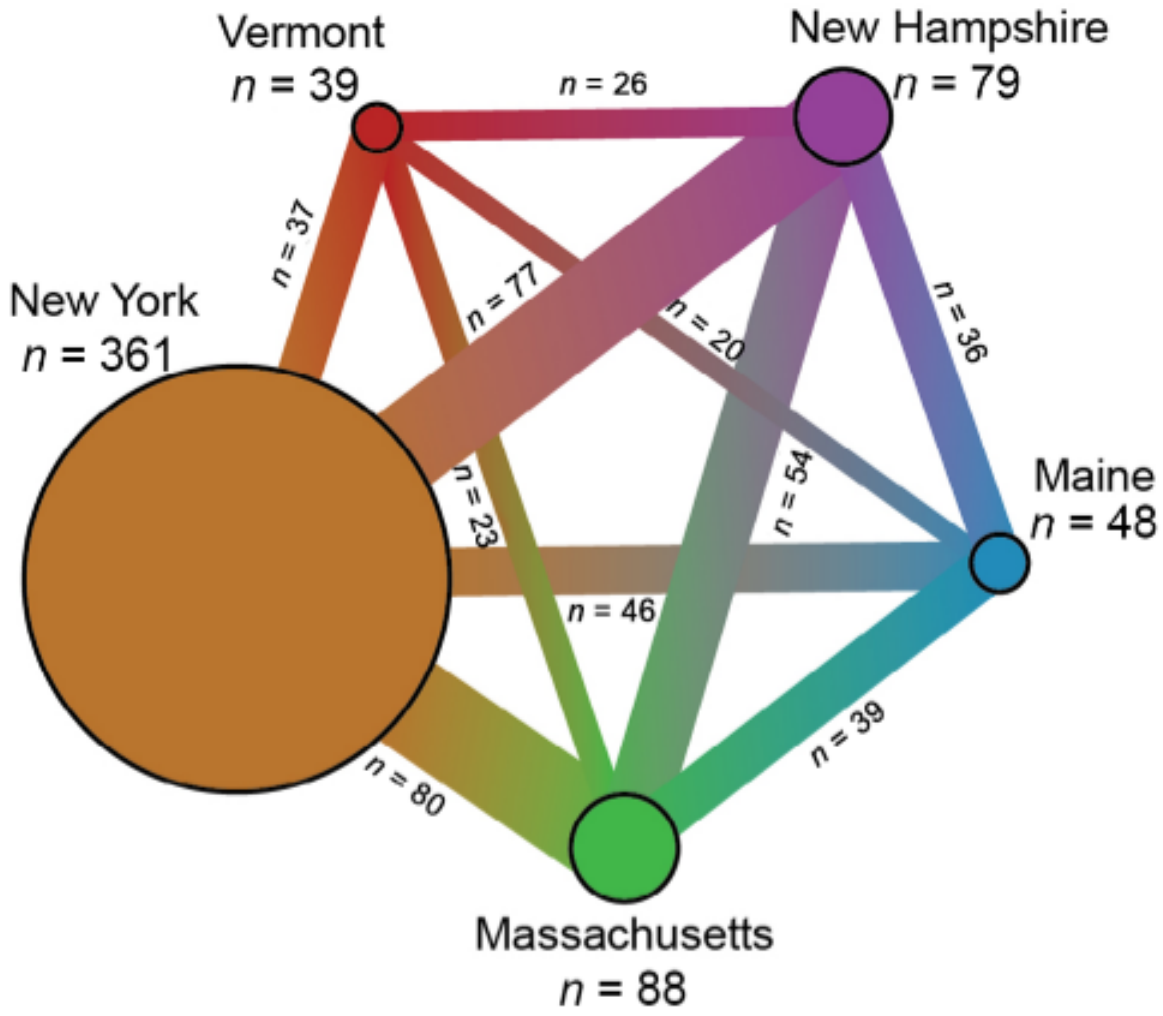
Overlap in regulated invasive plant lists



Regional invasive plant pool = 128 species

Bradley et al. 2022

Overlap in invasive plants evaluated



Evaluations unavailable for CT and RI

Bradley et al. 2022

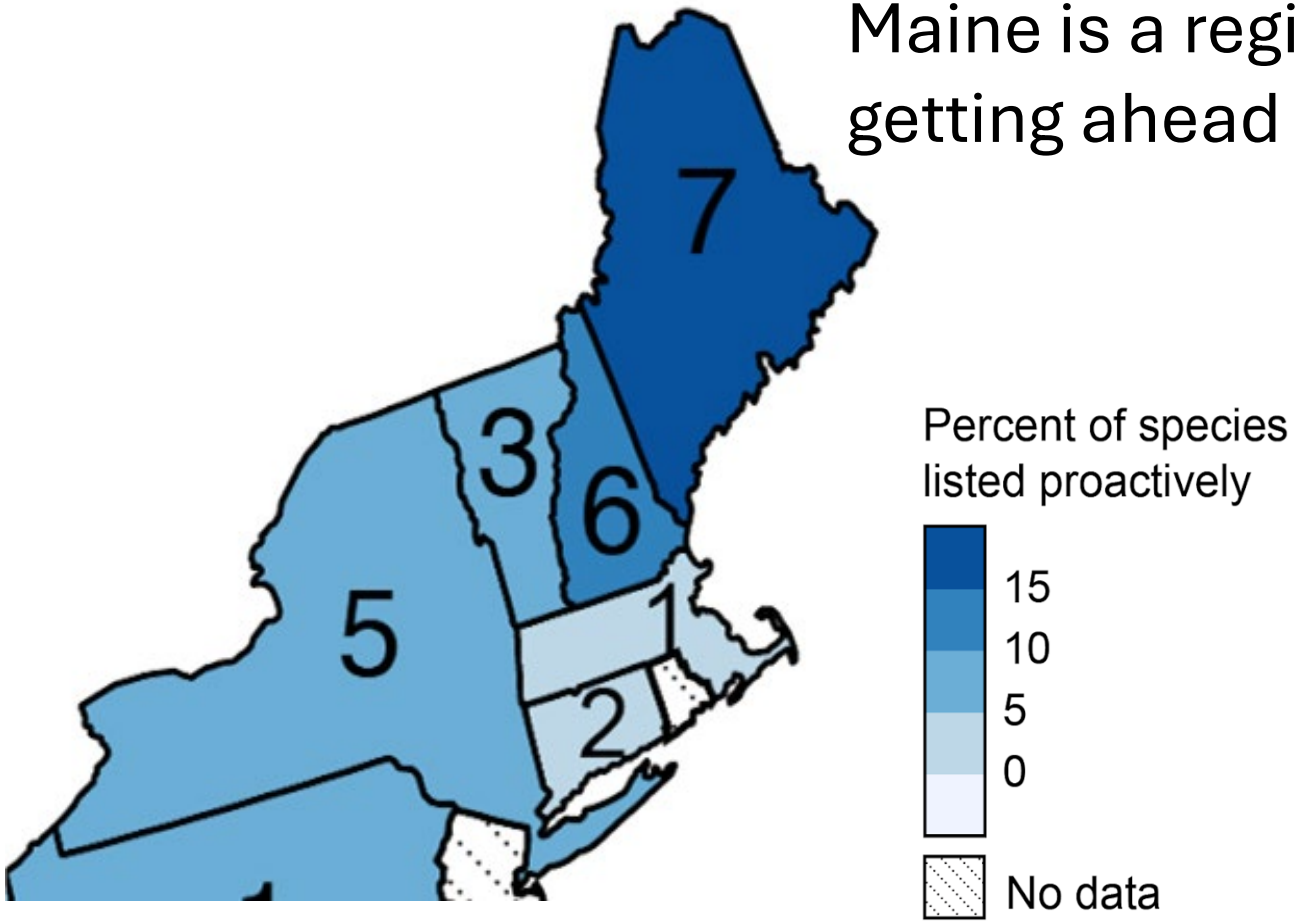
Overlap in scope of evaluations

Category	Subcategory	CT	MA	ME	NH	NY	VT
Impacts	ecological- general						X
	community composition	X	X		X	X	X
	community structure				X	X	X
	ecosystem processes				X	X	X
	fauna		X	X	X	X	X
	flora	X	X	X	X	X	X
	priority habitat				X	X	X
	socioeconomic- general					X	X
	socioeconomic- cultural					X	
	socioeconomic- positive					X	X
	socioeconomic- safety					X	X
Invasive trait	dispersal	X	X	X	X	X	X
	disturbance responsive					X	
	growth form					X	
	hardy		X			X	X
	human dispersed				X	X	X
	life history	X	X	X		X	X
	reproduction	X			X	X	X
	seed bank					X	

Category	Subcategory	CT	MA	ME	NH	NY	VT
Abundance	general information	X					
	natural areas		X				
	regional					X	
	state		X	X			
Distribution	general information						X
	potential invasion	X	X	X		X	X
	potential naturalization	X	X	X		X	
	potential- natural areas	X	X	X			
	presence- natural areas	X		X	X	X	X
	presence- region			X		X	X
	state naturalized	X	X	X	X	X	X
	state non-native	X	X	X			
	trend				X		X
	widespread	X	X	X	X	X	
Management	feasibility				X	X	X
	impacts				X		
Niche comparison	climate matching					X	
	habitat matching	X			X	X	
Other	assessing uncertainty						X
	invasive elsewhere		X	X		X	X

Bradley et al. 2022

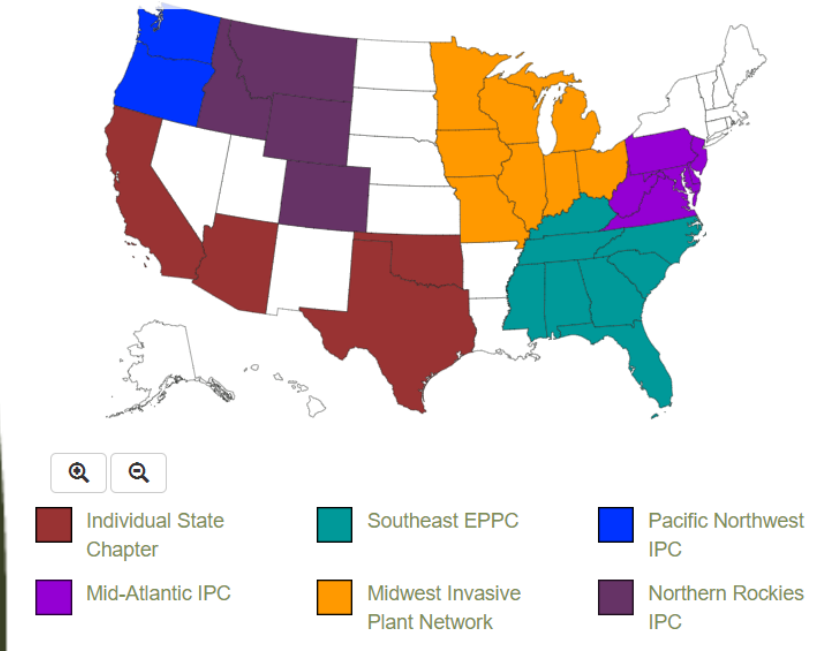
Proactive regulation is not common (yet)



Maine is a regional leader in getting ahead of invasive plants

Bradley et al. 2022

Northeast Invasive Plant Councils Working Group



- Initiated in 2020 and facilitated by NE RISCC
- Aimed at information sharing and regional collaboration
- Representatives from 12 northeastern and mid-Atlantic IPCs (U.S. & Canada)
- Meets ~2x/year

- Actionable outcomes include
  1) updates to regulatory processes to explicitly include climate range shifters
  2) proactive regulation of invasive species
  3) enhanced information sharing among states to lower the evaluation burden

Climate-smart native plants are part of the solution

Landscaping that fails to promote environmental stewardship:
Lawns and non-native gardens introduce invasives and fail to adapt to climate change.

Landscaping that promotes native flora and fauna:
Ecological landscaping reduces the risk of introducing invasive species and supports surrounding ecosystems.

Climate-smart native gardening:
Assisting the range shifts of native plants helps surrounding ecosystems 'keep up' with climate change.

Win-Lose → Win-Neutral → Win-Win

Bradley et al. 2023

In person & online sales

native, neonative, non-native

Availability limits species use

native, neonative

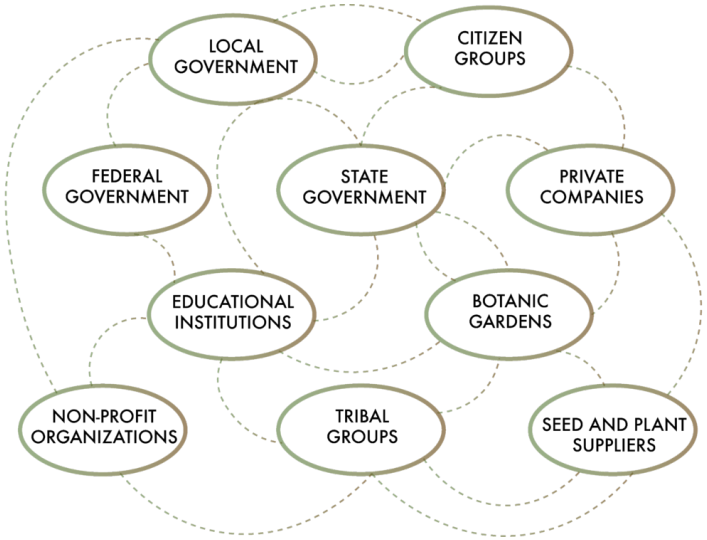
new invasions

climate adaptation

1. Native Plant End-user Survey

Northeast Seed Network: Vision, Action, Stakeholders

First steps in building a network



2. Climate-smart native plants for landscaping

NY Climate Adapted Native Species Candidates

Cacti/Succulents

Scientific Name	Common Name	Feedback
Agave virginica	American agave	
Opuntia humifusa	prickly-pear	
Yucca filamentosa	Adam's needle	

Ferns

Scientific Name	Common Name	Feedback
Adiantum pedatum	Northern maidenhair fern	
Dryopteris marginalis	marginal wood fern	
Polystichum acrostichoides	Christmas fern	
Woodwardia areolata	netted chain fern	

Grasses

Scientific Name	Common Name	Feedback
Andropogon gerardii	big blue stem	
Andropogon glomeratus	bushy bluestem	
Arundinaria gigantea	giant cane bamboo	noted with ??
Chasmanthium	northern sea oats	

Anemone cylindrica	windflower	
Aquilegia canadensis	columbine	
Aralia racemosa	American spikenard	
Arisaema dracontium	dragon root	
Arisaema triphyllum	jack-in-the-pulpit	
Asarum canadense	wild ginger	
Asclepias incarnata	swamp milkweed	aggressive?
Asclepias sullivantii	prairie milkweed	aggressive?
Asclepias syriaca	common milkweed	Already common, needs no help; aggressive
Asclepias tuberosa	butterfly weed	aggressive?; ; marked
Asclepias verticillata	whorled milkweed	aggressive?
Astragalus canadensis	milk vetch	All forms of vetch are quite aggressive

Recruiting botanists & ecologists to provide feedback!

3. Building a climate-smart natives working group to identify and key information and outreach needs and guide resource development. Interested? Let's connect.

Upcoming Events

Marine and Coastal Invasives in a Changing Climate: Virtual Networking

April 30, 2024 (12 – 1:15 pm)

Co-hosted with the MA Ecosystem Climate Adaptation Network

Guidelines for Climate-Smart Invasive Species Management coffee talk

May 16, 2024 (12 – 1 pm)

Presented by Eva Colberg (Cornell University)

risccnetwork.org/northeast

Research Summaries

Read summaries of scientific articles that include management implications - you can browse or search by topic

NOVEL INTRODUCTION PATHWAYS | CLIMATE EXTREMES | SHIFTING SEASONS (PHENOLOGY)

RANGE EXPANSION | CHANGING BIOTIC INTERACTIONS (COMPETITIVENESS) | MANAGEMENT EFFICACY

CLIMATE-SMART RESTORATION & ASSISTED MIGRATION | IMPACT STUDIES

Novel Introduction Pathways

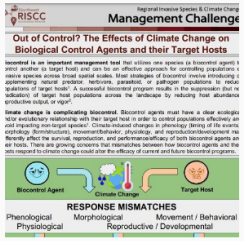
Hellman et. al. (2008) **Five potential consequences of climate change for invasive species.** Conservation Biology, 22(3), 534-543.

Keywords: Novel Introduction Pathways; Range Expansion; Competitiveness; Review; Risk Assessment

Pyke et al. (2008) **Current Practices and Future Opportunities for Policy on Climate Change and Invasive Species.** Conservation Biology 22:585–592.

Management Challenges

Management challenges are two-page documents that synthesize the current state of knowledge about a topic related to invasive species and climate change. These management challenges are designed to help share our knowledge about these topics to practitioners and stakeholders.



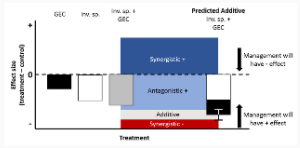
OUT OF CONTROL?

Biocontrol, the practice of using one species (biocontrol agents) to control another (target invasive host) is an important tool for managing invasive species, particularly over large spatial scales. There are growing concerns that climate change may disrupt relationships between biocontrol agents and their target hosts, creating a "mismatch" that would reduce biocontrol efficacy. This management challenge highlights case studies and management implications associated with current evidence of climate change impacts on the survival, reproduction, and performance of biocontrol agents and target hosts.

DOWNLOAD

Original Research

Browse research projects led by the RISCC leadership team



INTERACTING INVASION AND GLOBAL ENVIRONMENTAL CHANGE

This meta-analysis demonstrates that the combined effects of invasions and global environmental changes (such as warming, drought, and nitrogen addition) sometimes interact to produce worse than expected outcomes for native systems, but only in about 13% of cases. Typically, invasive species impacts tended to be more consistently detrimental than abiotic global environmental changes, highlighting the importance of invasive species management in the face of global environmental changes.

Recent Symposia

NE RISCC Symposium 2024

The 2024 NE RISCC symposium was held via Zoom on February 27 and 28, 2024. Over 400 participants and panelists tuned in to our program that covered management and research perspectives from terrestrial, freshwater, and marine habitats. Recordings are available here.

SUMMARY

Past Symposia

RISCC Symposium 2023

The 2023 RISCC management symposium took place virtually via Zoom on February 14-15th, 2023. We had a record turnout of 397 participants over two days of important discussions. Recordings are available here.

SUMMARY

Past Webinars

Out of Control? Coffee Talk

How does climate change affect biocontrol agents and their hosts? On December 14, 2023, the Northeast RISCC hosted a coffee talk discussion on our new Management Challenge, *Out of Control? The Effects of Climate Change on Biological Control Agents and their Target Hosts*. Our brief summary of the ways climate change can impact biocontrol agents and their target hosts was followed by a Q&A.

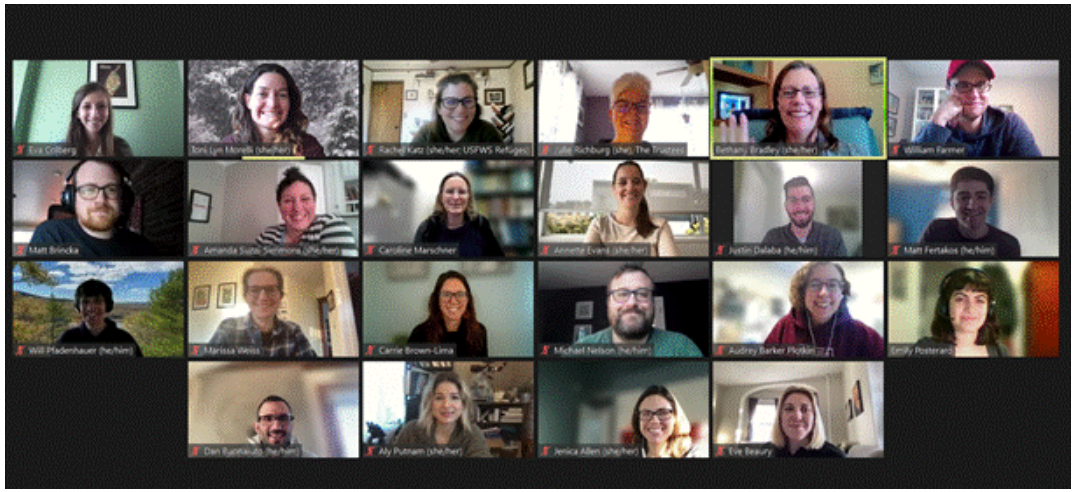
VIEW WEBINAR

Actionable Steps for Natural Resource Professionals

- Prevent new invasions
  - Example: Assess range shifting ornamental invasive plants for potential regulation BEFORE they come to market in our region
- Use climate-smart invasive management strategies
  - Example: Follow *Guidelines for climate-smart invasive species management* (coming in May)
- Share your knowledge and experiences
  - Example: present at a conference so that other practitioners and researchers can learn from your successes and challenges incorporating climate change into invasive species work (or vice versa)

Northeast RISCC MANAGEMENT NETWORK

Connect with us!



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