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

Leptopilina japonica

Photo: W. H. L. Wong
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

Fruits:
Apples, pears, peach, plum, cherry

Berries:
Raspberry, strawberry, blueberry, grape

Vegetables:
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
  - 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
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, cauliflower, 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.
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.
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
Invasive Fish & Aquatic Wildlife

• What is an invasive species?

• Species highlights

• Upcoming work & program development

• Data & reporting
Northern Pike & Muskellunge
Black Crappie & Bluegill
Invasive Aquatic Wildlife

Photo: Trevor Persons

Photo: Donald F. McAlpine

STOP THE SPREAD of Spiny water fleas

Photo: Minnesota Aquatic Invasive Species Research Center
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

Aquatic Invasive Fish or Wildlife Report

What species did you observe? *
Please make certain the species is not in the list before choosing "Other"

How did you detect this fish/wildlife species? *
- Angling catch
- Physically handled (non-angling)
- Visual observation only
- Found dead
- Other

Observation Date

Date
IFW.AIS@maine.gov
Dakota.Stankowski@maine.gov
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-Arasas, Texas

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

Pacific
28. Heceta, Hawaii

Caribbean
29. Jobos Bay, Puerto Rico
The Maine Coastal Ecology Center

- Fisheries- habitat-monitoring
- Ocean and coastal climate change

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!!
• Estuaries and coasts are most heavily invaded.
  • Vectors – shipping/aquaculture/etc.
  • Impacts from climate change “extreme effects” on estuaries.
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)
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)
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“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!

State of CASCO BAY

Invasive species are animals, algae, and other organisms that are not native to a region but arrive there through human activity and become self-sustaining. They may harm ecosystem processes, the economy, and public health.

The highly invasive European green crab, Carcinus maenas, was first observed in Casco Bay in 1914. It has harmed the prey erost.

But a color of th surf nativ and

Invasive Species Persist in a Warming Casco Bay
Tunicates Are Especially Abundant and May Displace Other Species

WHY IT MATTERS

Invasive species are animals, algae, and other organisms that are not native to a region but arrive there through human activity and become self-sustaining. They may harm ecosystem processes, the economy, and public health.

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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. 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.

Almost every site visit identified at least one invasive species. From 2016 through 2020, typically two to eight invasive species were observed on docks and as few as one to four on tidepools.

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 occurs in docks and piers in Casco Bay.

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 Long Island.

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.
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)
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*
SO..... WHAT ARE WE SEEING?!
2023 New England Rapid Assessment!!

New England RAS


Logos of participating institutions

Photo: Alex Shure, Wells Reserve

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

Approximate native distribution

Approximate introduced distribution

2023 RAS sightings

Journey’s End Marina
Rockland, ME

Sandwich Marina
Sandwich, MA

Slides courtesy of Alexis Nefflinger: MA CZM
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
Work Around the State!
(by no means, a complete list...)

no meaning, a complete list...
BIOLOGICAL IMPACTS
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.
Three Techniques:

- Visual Cues
- UV Light
- Blood Draws
Manomet Intertidal Green Crab Project (2018-present)

Submit A Blue Crab Sighting

Monthly Sampling May - November

Update from Others:
A DILEMA??

- Invasions Vs. Range Expansions
One Crab, Two Crab, Green Crab…. **BLUE CRAB**?!?

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

Green Crab (*C. Meanas*)

**Does Range Expansion = Invasive Species?**

Climate change/warming waters, impacts to native species, etc.
Blue crab (Callinectes sapidus) is a beautiful and savory species that is part of a lucrative fishery in Chesapeake Bay and the Gulf of Mexico. It is caught commercially and recreationally.

The Backstory:

- **2019**: 1 dead crab
- **2020**: Live crabs in marsh!
- **2020**: Larvae found in historical samples!
- **2020-present**: Start Trapping!
IMPACTS TO LOBSTERS!!!

Released
7/15/21

0.9 km

Detected
10/3/21
8 m depth
ECONOMIC IMPACTS

Preliminary 2023 Commercial Maine Landings By Ex-vessel Value
Total: $611,277,692 as of 2/8/2024

- lobster: 76%
- other species: 10%
- groundfish: 1%
- blue mussels: 1%
- Atlantic herring: 1%
- oysters: 2%
- soft clams: 2%
- scallop: 2%
- menhaden: 1%
- bloodworms: 1%
- elver: 3%

*Other species include confidential species and other species that make up less than 1% of total catch.
Conclusions:

- Warming GOM is biggest driver of invasive species success
  - RISCC Symposia
  - 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!!
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*
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

- Queen lays egg
- Worker feeds larva and seals cell once larva reaches full growth

- Egg: day 6
- Larva: day 10
- Pupa: day 15, day 18, adult day 21

© 2013 Encyclopædia Britannica, Inc.
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

**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
North America Social Wasps

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    • 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 markings
  - 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

[https://commons.wikimedia.org](https://commons.wikimedia.org)
Northern Giant Hornet
Family Vespidae
_Vespa mandarinia_

- 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
- Nests:
  - Almost exclusively subterranean
  - Created by digging, co-opting abandoned rodent tunnels, or occupying spaces under tree roots
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 (115°F) the hornet and raise carbon dioxide to a lethal level
  • Some of the bees die but the hive survives

https://commons.wikimedia.org
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: 1\textsuperscript{st} 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
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%)

<table>
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<th>County</th>
<th>N</th>
<th>Summer Loss (%)</th>
<th>Winter Loss (%)</th>
<th>Total Loss (%)</th>
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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

- *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

***Number 1 cause of fall/winter deaths in Maine***
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
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?

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 japonica*), 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 host 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.

“Invader 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.”
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 sign up 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

Invasive Species Field Guide for PGC’s Northwest Region

Get to know some established, emerging, and potential invasive threats in northwestern Pennsylvania and learn how to report your findings!

Created by Western PA Conservancy PGC Invasive Species Program - Spring 2021
Funding 2022

Based on work and recommendations of the Council, PDA submitted a budget request to the Governor’s Office in 2021.
Funding 2022

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

- Agricultural
- Urban community
- Suburban community
- Roadside
- Park, forest, or other...
- Stream, river, lake...
- Building grounds
- Other (please specify):
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.

- Lack of funding for...
- Lack of trained personnel
- Not enough staff/volunteers
- Limited time
- Lack of education/awareness
- Grants aren’t a practical option
- Other (please specify)
Pennsylvania Invasive Species Impacts Survey 2022

Example location of impact:

Harrisburg PA Allegheny River Monroe County Huntington locations Northern Harrisburg
Washington Luzerne Clarion Statewide Cambria Borough Bucks County Lebanon
Chester County Everywhere Pike roadsides Dauphin Philadelphia Trail wide Along East
Lancaster Tree Elks County Erie State game lands Carlisle PA Lehigh
Grove Furnace State Montgomery County Adams County
Allegheny County Doylestown Pa Lancaster County
Cameron Counties Creek Jefferson York County line
State Park Armstrong Rd entire County Mountain PA
Lower Road west Park Central Township Beaver County area
Franklin County Co Wayne County Dauphin County Pine Grove Furnace
Cumberland County Pittsburgh PA York York Pa throughout Montgomery
Cumberland Emmaus home Community Elk Valley Berks County Northampton Forest
Martin Tarp Pennsylvania SGL widespread Westmoreland County elizabeth
Park Allegheny County public McKean Sea Lymonging Southern South Cooksburg Lake
Woodlands Delaware County neighboring properties Furnace State Park butler

woodland canopy great manage fishing river residence water spread corridor
open space tying birds neighborhood land district tourism Many people local
wooded areas provides lake watershed town Significant family Community
hiking plants much Impact part PA green space recreational site
many biodiversity County trail use preserved State Park
major live etc park stream recreation affects area
people home make forest businesses trees resource large
high important access public conservation lot state forest One riparian
species acres property damage state well habitat small region
invasive species farm important habitat native species native brook trout wildlife
residents native support native plants insects location work taken directly timber
recreate also limited knotweed popular natural areas along
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
Funding 2023-24

New Administration – starting from scratch

Continue to submit recommendations and budget request

Current priorities are economic development and job creation
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.
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 the state.
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
Invasive Species by Legislative District Online ArcGIS Dashboard

Noxious Weeds Observed in District

- **Amur Honeysuckle** *Lonicera maackii*
  - iMap Record Count: 10
- **Bohemian Knotweed** *Reynoutria x bohemica*
  - iMap Record Count: 25
- **Bull Thistle** *Cirsium vulgare*
  - iMap Record Count: 3
- **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*
  - iMap Record Count: 3
- **Japanese Angelica Tree** *Aralia elata*
  - iMap Record Count: 1
- **Japanese Barberry** *Berberis thunbergii*
  - iMap Record Count: 1

**Selected Species: Bohemian Knotweed (Reynoutria x bohemica)**

**Impact Photo**

**Impact Video**

**Species Identification Photo**

**Selected Species Impacts:**

*This list of impacts is not comprehensive*

**Economic:** Overtakes fields, pastures, along roadsides and railways (Naturalist)
Questions or Comments?

Kristopher Abell
PDA Harrisburg
krabell@pa.gov

Next PISC Meeting
June 7, 2024
10:00-12:30
Partnerships for Invasive Species Management and Response in New York

Maine Invasive Species Network
April 2024
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.
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
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.
A Program Matures

• Formation of the Partnerships for Invasive Species Management (PRISMS).

• Adoption of Part 575- New York’s Comprehensive Invasive Species Regulation.
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.
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
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.
Acknowledgements

• USDA, APHIS PPQ
• NYS Invasive Species Council
• Cornell University
• Cornell Cooperative Extension
• NYS PRISMS
• NYS DOT
• NYSDEC
PRISMS In New York
Adding Value to IS Management Success
Maine Invasive Species Network community engagement session
April 2024
History of Invasive Species Management in New York

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- Concept of invasive species is relatively new in the state
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• NYS Canal Corporation
• Adirondack Park Agency
A Program Matures

• Formation of the Partnerships for Invasive Species Management (PRISMS).

• Adoption of Part 575- New York’s Comprehensive Invasive Species Regulation.
Detector Dogs and Treatments
Spotted Lanternfly Summit and 101

• Several hundred participants over multiple days.
• Outreach, research and regulatory topics.
• Hosted by Cornell IPM Program.
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
Unstaffed aerial vehicles (UAV) for Inspection
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.
Acknowledgements

• USDA, APHIS PPQ
• NYS Invasive Species Council
• Cornell University
• Cornell Cooperative Extension
• NYS PRISMS
• NYS DOT
• NYSDEC
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
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/brown ash being most competitive in both riparian areas and the saturated soils of forested wetlands.
Cultural Significance

- Gabe Frey splitting
- Tyler Everett harvesting
- Richard Silliboy weaving
- Richard Silliboy basket
- Gabe Frey baskets
Ecological significance of ash forests

There are 98 invertebrate species that specialize in feeding on the leaves of North American ash.
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
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
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
**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
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
Common Invasive Plants

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

A

B

J. Plunkett

C

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

- competes with native vegetation
- confuses monarch butterflies
- 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
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

18 Elkins Lane
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

What Happens to the Woods?

Lightly Infested
- Plant Diversity
- Healthy Leaf Layer
- Thick & Spongy
- Undisturbed Soil Layers

Heavily Infested
- Few Plants Remain
- Exposed Roots
- Leaf Litter Almost Gone
- Soil Compaction
- Plant Nutrients Lost

Healthy vs. Unhealthy Forest Floor and Soil.

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?
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

Photo: Brittany Schappach, Maine Forest Service
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
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

Jumping/Snake (Amythnas) Worms in Maine

On this page:
- What are Amythnas Worms?
- History in Maine
- Why are Amythnas Worms a problem?
- Amythnas Worm Identification
- What can you do?

What are Amythnas Worms?

Due to our history of glaciation, there are no native earthworms in Maine. Non-native earthworms from Europe (such as nightcrawlers) have become well established here through early colonial trading. Though they are beneficial to our gardens, earthworms can have

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.
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
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.
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
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.
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
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.
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.
Hemlock Woolly Adelgid Detections In Maine's Forest

Department of Agriculture, Conservation and Forestry
Maine Forest Service
Forest Health & Monitoring

January 10, 2023

HWA Quaratined Towns

HWA Detections by Discovery
- 2000-2004
- 2010-2019
- 2020-2021
- 2022
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.
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)
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.
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

Out of every 100 exotic species introduced to North America, about 10 become established, and about 1-5 becomes invasive. “Naturalized,” can be weeds Beyond “weedy”
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
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 -

► NE RISCC Network impactful range shifting species

► Plants listed by other Northeast states

► Plants nominated through the online form
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.
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

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

<table>
<thead>
<tr>
<th>Species Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acer ginnala (Amur maple)</td>
<td>Acer pseudoplatanus (yellow flag iris)</td>
</tr>
<tr>
<td>Aegopodium podagraria (Bishop’s weed)</td>
<td>Ligustrum obtusifolium (border privet)</td>
</tr>
<tr>
<td>Althaea rosea (love-in-a-mist)</td>
<td>Lavatera japonica (Japanese hydrangea)</td>
</tr>
<tr>
<td>Altaria petraeae (pparky mustard)</td>
<td>Lavatera maritima (amur or bush honeysuckle)</td>
</tr>
<tr>
<td>Alnus glutinosa (European alder)</td>
<td>Lavatera morrowii (Morrow’s hydrangea)</td>
</tr>
<tr>
<td>Amorpha fruticosa (false indigo bush)</td>
<td>Lavatera stolonica (Tatarian honeysuckle)</td>
</tr>
<tr>
<td>Ampelopsis arborea (porcelain berry)</td>
<td>Lavatera xylosteum (false honeysuckle)</td>
</tr>
<tr>
<td>Angelica archangelica (woodland angelica)</td>
<td>Lythrum salicaria (purple loosestrife)</td>
</tr>
<tr>
<td>Anemone sylvestris (wild chervil)</td>
<td>Lythrum virgatum (European wool loosestrife)</td>
</tr>
<tr>
<td>Aralia elata (Japanese angelica tree)</td>
<td>Microstegium vimineum (little bluestem)</td>
</tr>
<tr>
<td>Artemisia vulgaris (common mugwort)</td>
<td>Miscanthus sinensis (foris) (silver silvergrass)</td>
</tr>
<tr>
<td>Berberis thunbergii (Japanese barberry)</td>
<td>Paulownia tomentosa (paowotwa, princess tree)</td>
</tr>
<tr>
<td>Berberis vulgaris (common barberry)</td>
<td>Persicaria perfoliata (mile-a-minute)</td>
</tr>
<tr>
<td>Botrychium umbilicatum (flowering rush)</td>
<td>Persicaria japonica (hiki, butterbur)</td>
</tr>
<tr>
<td>Camelia sinensis (Japanese camellia)</td>
<td>Phyllostachys aureosulcata (golden bamboo)</td>
</tr>
<tr>
<td>Clethra alnifolia (bush willow)</td>
<td>Phyllostachys viridiglaucescens (black bamboo)</td>
</tr>
<tr>
<td>Clethra umbellata (Autumn olive)</td>
<td>Pycnanthemum virginianum (mountain mint)</td>
</tr>
<tr>
<td>Euonymus alatus (burning bush)</td>
<td>Pycnanthemum discolor (narrowleaf mountain mint)</td>
</tr>
<tr>
<td>Euonymus fortunei (wintercreeper)</td>
<td>Prytisostachys aurea (golden bamboo)</td>
</tr>
<tr>
<td>Euphorbia esula var. pygmaea (cypress spurge)</td>
<td>Pyrus salicifolia var. pygmaea (golden bamboo)</td>
</tr>
<tr>
<td>Fallopia baccata (Russian olive)</td>
<td>Populus alba (white cottonwood, white poplar)</td>
</tr>
<tr>
<td>Fallopia japonica (Japanese knotweed)</td>
<td>Puccoon (larkspur) (tall meadow)</td>
</tr>
<tr>
<td>Festuca rubra (four-leaved sheep's fescue)</td>
<td>Ranunculus repens (creeping buttercup)</td>
</tr>
<tr>
<td>Ficus varia (lesser celandine)</td>
<td>Rhus vernodiflora (black locust)</td>
</tr>
<tr>
<td>Forsythia x intermedia (snowbush)</td>
<td>Rosa multiflora (multiflower rose)</td>
</tr>
<tr>
<td>Glaucidium flavum (yellow hopoempsy)</td>
<td>Rubus plicatus (blackberry)</td>
</tr>
<tr>
<td>Glechoma hederacea (creeping charlie)</td>
<td>Salix alba (white willow)</td>
</tr>
<tr>
<td>Glycyrrhiza maxima (red/great mannanin)</td>
<td>Stachys byzantina (greek valerian)</td>
</tr>
<tr>
<td>Hesperis matronalis (dame’s rocket)</td>
<td>Thalictrum aquilegifolium (pitcher plant)</td>
</tr>
<tr>
<td>Hypericum perforatum (tea bush)</td>
<td>Valeriana officinalis (valerian)</td>
</tr>
<tr>
<td>Impatiens glandulifera (ornamental jewelweed)</td>
<td>Valeriana officinalis (valerian)</td>
</tr>
</tbody>
</table>

### 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 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 signs and tag requirements.
- Varieties 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/invasive/index.html
- More information is available at www.maine.gov/dep 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 (beach rose, rose rugosa)
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*
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
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
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

5 known major populations
Perennial Pepperweed  
(*Lepidium latifolium*)

*MNAP & Rachel Carson National Wildlife Refuge staff*

**Kittery Point/Gerrish Island (2014-2023)**
- 7 bags removed in 2014
- Private beach

**Ogunquit Beach (2021-2023)**
- Rocky dunes/parking lot area/mulched garden

**Crescent Surf Beach, Kennebunk (2013-2022)**
- Salt marsh/beach

5 known major populations
**Perennial Pepperweed**  
(*Lepidium latifolium*)

**Biddeford (2020-2023)**  
- Median of (1-95) 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

**Nursery 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
What Can We Do?

Report!
www.imapinvasives.org
- Horizon scanning

Invasives.MNAP@maine.gov
- Photos

Early Detection is Critical
Invasive Plant Academy:
Coming Fall 2024

10-10,000 acres
Private woodland owners and woodlot managers
  • Land trusts
  • SWCD’s
  • And more…
Maine Invasive Plant Field Guide

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

Event Pricing: $20
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
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*)
Restricted Plants Added In 2023

- Giant salvinia (Salvinia molesta)
- Water soldier (Stratiotes aloides)
- Swollen bladderwort (Utricularia inflata)
- Starry stonewort (Nitellopsis obtusa)
Also Prohibited…

All *Cabomba* species
All *Trapa* species
All *Myriophyllum* species non-digenous to Maine
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.

Draining bill became law June 2023
Clean Drain Dry

STOP THE SPREAD OF AQUATIC INVASIVE SPECIES

CLEAN
gear, boat, trailer, and vehicle of plants, fish, animals, debris, and mud.

DRAIN
bilege, ballast, wells and buckets away from the water before you leave.

DRY
equipment before launching watercraft into another body of water.

ALL IN FOR THE MAINE OUTDOORS
mefishwildlife.com/invasives

MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION
www.main.gov/dep
Funding Increase

- Carry-over bill became law yesterday, April 10, 2024

- Increased fees to motorized watercraft:

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<td>Starting 2028</td>
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•
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
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
Invasive species and climate change in the Northeast

Jenica Allen
Senior Research Fellow
University of Massachusetts, Amherst
... 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
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.”
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
But invasives get a bigger boost than natives

Elevated CO$_2$ (45) (46)

Elevated temperature (31) (20)

Effect Size

Liu et al. 2017
But invasives get a bigger boost than natives

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
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 $\text{CO}_2$ may lower herbicide efficacy (on more vigorous plants)

Canada thistle

Ziska et al. 2004
Rising $\text{CO}_2$ and temperature can alter biocontrol efficacy, but changes are not reliably predictable (yet?).

Tropical soda apple grew larger and beetles ate less leaf area with elevated $\text{CO}_2$.

Diaz et al. 2012

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

Western US:
Forest die-off linked to drought

Eastern US:
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

The Northeast is a hotspot of future plant invasion

FUTURE FRESHWATER INVADERS OF THE NORTHEAST

October 11th, 2023
11am-12pm ET
How could climate change and natural history bring Southern and Western aquatic invasive species north?

Join this Zoom webinar to learn more

Grace Henderson

Projected Rise in # of Invasive Plants

Allen & Bradley 2016
Science Synthesis

Communicating practitioner needs

Building practitioner-researcher communities

Conducting priority research

Management Challenges, Research Summaries

Surveys, Workshops

Symposium, Webinars, Networking events

Scientific papers, presentations
Translational Invasion Ecology Model

1. Identify problem
2. Identify stakeholders*
3A. Implement strategies
3B. Synthesize and conduct research
4. Meet, discuss needs, identify solutions

5A. Evaluate
5B. Improve

Outcomes and outputs

* Policy makers and the public may be involved in the TE process as researchers, practitioners, and/or end users.

Best management practices
Outreach materials, policy recommendations
Peer-reviewed research, tools

Stakeholders
Practitioners
Researchers
Boundary Spanning

Morelli et al. 2021
Stakeholder engagement is key
Network identified priority information needs

Beaury et al. 2020
Modeled ranges for ~900 terrestrial invasive plants

Allen & Bradley, 2016
Species Range Shift Maps

Number of Models: 11

Legend:
- Expansion
- Stable
- Retraction
- Unsuitable

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

Radius : 200 miles

Regions where the species has been found

List of species within current climate

<table>
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<tr>
<th>Scientific Name</th>
<th>Common Name</th>
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<td>Araujia sericifera</td>
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Data source: Allen & Bradley 2016

https://www.eddmaps.org/rangeshiftlisting/
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 host 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 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 (ealmeleaf 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.

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.
Ornamental invasive plants remain a problem

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

Evelyn M Beaury¹, Madeline Patrick², and Bethany A Bradley¹,²

61% of 1,285 invasive plants in the U.S. are still available for sale
Proactive Regulation Potential: Ornamental plants

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 can protect our native ecosystems from future invasive species impacts. We also present alternative native plants that provide similar aesthetics while also supporting biodiversity.

Ornamental 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) Euryonymus arillus (burning bush) are commonly planted in landscapes and ready escape cultivation. A substantial portion of ornamental plants offered for sale in the U.S. are invasive. Expanding native plant offerings reduces risk and supports ecosystems.

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
Akebia quinata (chocolate vine)

Ecological Impacts: Crows out native understory species as a thick ground cover, can over top shrubs and trees.

Vulnerable Ecosystems: Forest edges, wetlands.

Native Alternative
Lonicera sempervirens (coral honeysuckle)

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.

Ampelopsis brevipedunculata (porcelain berry)

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.

Bignonia capreolata (cross vine)

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

KEY: Dry Medium Wet Part shade Full sun Zones: Range of Hardiness Zones
Breaking down barriers to consistent, climate-smart regulation of invasive plants: A case study of US Northeast states

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

Percent regulated

- 54%
- 54%
- 34%
- 26%
- 42%

Number of species

- 54
- 19
- 12
- 14
- 13
- 16

n states where regulated

Bradley et al. 2022
Overlap in invasive plants evaluated

Evaluations unavailable for CT and RI

Bradley et al. 2022
### Overlap in scope of evaluations

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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.
In person & online sales
native, neonative, non-native

Plant nursery

Availability limits
species use
native, neonative

new invasions

Gardens

Minimally managed habitats
climate adaptation

Restoration
1. Native Plant End-user Survey

Recruiting botanists & ecologists to provide feedback!

2. Climate-smart native plants for landscaping

NY Climate Adapted Native Species Candidates

Certi/End-users

Scientific Name | Common Name | Feedback
--- | --- | ---
Agave americana | American agave | 
Opuntia humifusa | prickly-pear | 
Tussilago farfara | coltsfoot | 

Ferns

Scientific Name | Common Name | Feedback
--- | --- | ---
Adiantum pedatum | northern maidenhair fern | 
Drynaria quercifolia | marginal wood fern | 
Polystichum acrostichoides | Christmas fern | 
Woodwardia virginica | netted chain fern |

Grasses

Scientific Name | Common Name | Feedback
--- | --- | ---
Andropogon gerardii | big bluestem | 
Andropogon virginicus | bushy bluestem | 
Arundinaria gigantea | giant cane | 
Chamaecrista norfolcensis | northern sea oats |

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

Recruiting botanists & ecologists to provide feedback!
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)
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 (Pond Ecology)
- Range Expansion
- Changing Biotic Interactions (Competitiveness)
- Management Efficacy
- Climate-Smart Restoration & Assisted Migration
- Impact Studies

Novel Introduction Pathways


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


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 (biocentral 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 "paradox" that would reduce biocontrol efficacy. This management challenge highlights case studies and management implications associated with recent evidence of climate change impacts on the survival, reproduction, and performance of biocontrol agents and target hosts.

Original Research

Browse research projects led by the RISCC leadership team:

- Interactions between Invasive Species and Global Environmental Changes
- Climate change affecting biodiversity
- Impacts of climate change on invasive species

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 presenters tuned in to our program that covered management and research perspectives from terrestrial, freshwater, and marine habitats. Recordings are available here.

Past Symposia

RISCC Symposium 2023

The 2023 RISCC management symposium took place virtually via Zoom on February 14-15, 2023. We had a record turnout of 357 participants over two days of important discussions. Recordings are available here.

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.

risccnetwork.org/northeast
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)
Connect with us!

Visit us online: risccnetwork.org/northeast

Join our listserv:
Visit our website OR email ne_riscc-l-request@cornell.edu with the subject “join”

Email: risccmanagement@gmail.com
Direct: jenicaa@umass.edu