

FOREST VULNERABILITY SPOTLIGHTS

INVASIVE SPECIES

Climate change is creating more attractive conditions for invasive plants, pests, and pathogens in Massachusetts. The increased temperatures, earlier springs, and reduced snow all allow invasive species to outcompete native species for space, habitat, sunlight, water, and nutrients, which can have a significant effect on forest health, biodiversity, resilience, and regeneration. Stressed forests are more susceptible to damage from invasive species, even when climate change is not the direct cause of the spread.



Round leaf bitterweet

Celastrus orbiculatus

Oriental bitterweet is a perennial deciduous, climbing vine, introduced as an ornamental plant, climbs trees as it grows frequently pulling down branches and limbs and blocking light from forest trees and shrubs. This vine can grow lengths of 60 feet and up to 4 inches in diameter. This vine produces seeds, which birds and other wildlife eat, then carry these fruits away, depositing digested, but still-viable seed sprouts. Exotic, invasive plants create severe environmental damage, invading open fields, forests, wetlands, meadows, and backyards, and crowding out native plants. Bittersweet can even kill mature trees through strangulation.



Multiflora rose

Rosa multiflora

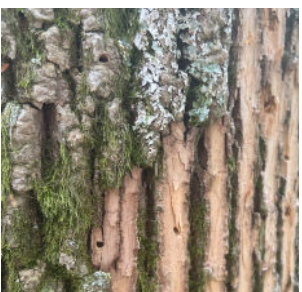
Multiflora rose is a deciduous shrub with white flowers and red fruit. It can grow to 10 feet high or more and is typically wider than it is tall. It was initially introduced and planted to act as a living fence, for erosion control, and to provide food and cover for wildlife. However, this plant can quickly carpet forest edges, open areas in wetlands and forests, outcompeting native species for space, light, water, and other resources. This plant is particularly good at outcompeting native vegetation, which can result in the degradation of sites, with reduced biodiversity and a reduced capacity for resilience.



Hemlock woolly adelgid

Adelges tsugae; HWA

Hemlock woolly adelgid are non-native aphid-like insects that specifically target Eastern hemlock (*Tsuga canadensis*). Infestations of woolly adelgid are recognizable by the "cotton balls" that surround their eggs at the base of hemlock needles. When the larva hatch, they suck the nutrients from the needles. When left untreated, the hemlock woolly adelgid will weaken the tree, eventually leading to mortality. Northern winters have been able to keep this adelgid's populations in check, due to their inability to withstand extreme cold, but warming temperatures are now creating more favorable conditions for their survivability and ability to reproduce.



Emerald ash borer

Agilus planipennis; EAB

The emerald ash borer is a non-native wood-boring insect that targets all ash species (*Fraxinus* spp.). Common, native host species in the region are white ash, green ash, and black ash. Once introduced to an individual tree, the beetle lays eggs on the bark, which hatch into larvae that feed on the inner layers of tree below the bark. This weakens the tree and attracts woodpeckers that do further damage feeding on the larvae, leading to mortality. If not for this pest, ash trees were predicted to have done well as the climate continues to change.

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INVASIVE SPECIES: MANAGEMENT OPTIONS

There are a variety of management options to combat the establishment of invasive plants and non-native insects. Management options vary and are customized based on species abundance, landowner objectives, site location, and timing. Below are some common, but not exclusive, management options for common invasive species in the region. Consider getting a [forest stewardship plan](#) for your land, which can assist in managing and preventing new invasive species.

INVASIVE PLANTS

Round leaf bittersweet

- For young vines, hand-pulling can successfully eliminate the presence of bittersweet.
- Repeated mowing may be effective to eliminate bittersweet in fields.
- When vines become large enough, a systemic herbicide may be used to combat its presence in a system.

Multiflora rose

- If established in an edge environment or in a field, mowing the affected area 3 to 6 times a year, for several years.
- In a forested landscape or wetland, pulling or repeated cutting may be feasible.
- Large populations may require a systemic herbicide.

When treating invasive plants, whether that be bittersweet, multiflora rose, or another variety, it is recommended to do so when fruits are not present.

INVASIVE INSECTS

Hemlock woolly adelgid

- If there is a confirmed population of hemlock woolly adelgid on one or more Eastern hemlock trees, a systemic insecticide is most commonly considered.
 - Types of applications:
 - Soil drench
 - Granular
 - Common active ingredients:
 - Imidacloprid
 - Dinotefuran

Emerald ash borer

- Systemic-type insecticides are commonly used to control emerald ash borer and protect individual trees.
 - Types of applications:
 - Soil drench
 - Injections
 - Common active ingredients:
 - Imidacloprid
 - Dinotefuran
 - Emamectin benzoate
 - Azadirachtin

Pesticide application should be performed by a licensed pesticide applicator; pesticide applications carry risks to the native insect community.

GETTING STARTED

[Learn more about invasive species:](https://www.massaudubon.org/nature-wildlife/invasive-plants-in-massachusetts/) <https://www.massaudubon.org/nature-wildlife/invasive-plants-in-massachusetts/>

[Find out more about the distribution of invasives in the region:](https://www.eddmaps.org/) <https://www.eddmaps.org/>

[More information on herbicides use:](https://www.massaudubon.org/nature-wildlife/invasive-plants-in-massachusetts/herbicides) <https://www.massaudubon.org/nature-wildlife/invasive-plants-in-massachusetts/herbicides>

Before using herbicides or pesticides, first review the Massachusetts Wetlands Protection Act; anyone planning control measures in wetlands should first check with the local conservation commission, and use only herbicides registered for use in these areas. Always read and follow the directions on the label when using herbicide.

FOREST VULNERABILITY SPOTLIGHTS

BARRIERS TO YOUNG TREE ESTABLISHMENT

To recover from a disturbance and remain a healthy forest, trees and understory plants must be able to successfully regrow after a loss. Young tree establishment (i.e., regeneration) requires: 1.) available seed stock ready to take root once a gap in the canopy is created from the loss of a larger, dominant or co-dominant tree, and 2.) the ability for those seedlings to live long enough to grow into replacement plants and trees. Therefore, anything that disrupts one or both of these processes will lead to decreased regeneration and forest resilience.



Invasive species

When introduced, invasive plants can significantly reduce the establishment of young, native trees. Plants like round leaf bittersweet (*Celastrus orbiculatus*) that grow in dense mats or Japanese barberry (*Berberis thunbergii*) that grows in the form of thick, impenetrable, thorny bushes, block native seed that lies dormant in the soil from receiving the nutrients and space they need to establish, survive, and thrive. As the climate continues to change and temperatures increase, conditions for invasive species also becomes more attractive; characteristics and traits of invasives allow them to out-compete native species for both space and resources (e.g., sunlight, water, nutrients), creating even more challenges for young tree establishment.



Deer browse

Due to past harmful human practices, there has been a loss of large predators in the region, which has led to an overpopulation of deer across Massachusetts and the region. The effects of an overpopulation of deer results in low regeneration/reduced young tree establishment of new native forest plants. Deer prefer the tender shoots of young plants and will often browse on these small trees before they can become well-established. Selective deer browsing can decrease tree and plant biodiversity throughout a forest as they eat preferred species and their nuts (e.g., acorns) and leave the less palatable species. While the feeding habits and preferences of deer change throughout the year, overall, overpopulation of deer results in a decrease in the overall health and resilience of a forest.



Climate change

Climate change is considered a threat-multiplier. This means that one threat can exacerbate another (e.g., increased temperature and drought can lead to increased invasive insect populations, which can result in larger, more intense wildfires). Climate change multiplying the negative impacts on forests can discourage the establishment of the next generation of young, desirable trees. Some examples of climate change impacts being experienced on forests in the region that are limiting young tree establishment are decreasing soil moisture, flooding that washes away seed stock (i.e., seed stored in the soil), and increasing pests and pathogens that are adapted to higher temperatures that can weaken young trees.

FOREST VULNERABILITY SPOTLIGHTS

SOLUTIONS FOR YOUNG TREE ESTABLISHMENT

Getting to the root cause of why young trees are not establishing across a site is the first step in finding a regeneration solution. Once identified whether the barrier is the presence of invasives, deer and/or moose, and/or climate change impacts, this can help direct you in the direction of an appropriate solution. Below are some common, but not exclusive, solutions for young tree establishment.

INVASIVE SPECIES: MATCHING SCALE TO SOLUTION

The presence of invasive species across a stand or an entire forest can vary drastically from site to site. Depending on the level of invasion depends on the intensity of a mitigation strategy; the greater the presence of an invasive, the greater the management strategy. With a minimal presence of an invasive plant, hand-pulling may be suitable. However, many forests in the region experience high levels of invasive plant establishment, and frequently, there is more than one invasive species present. Often, the best solution to combatting a well-established invasive plant population is to speak with a licensed forestry professional, who can assist in removing the plants at a large-scale.

BROWSE: ADDRESSING DEER AND MOOSE

Deer and moose browse greatly diminishes the establishment of the next generation of trees in forests. There are several ways to address browse across the landscape, all which vary in both monetary cost and intensity. These methods can include granting hunting access to your forestland; consider partnering with Native Peoples as part of your deer and moose browse mitigation strategy. Another method to combatting damage to young trees to browse is exclude deer by using tree tubing, utilizing deer fencing, and/ or creating a slash wall; both of these options can be cost-intensive, but the end goal of each is to protect individual trees, or by excluding them from a set area, either with fencing or with slash (i.e., branches, tops, and cull trees left on the ground following a harvest) as part of a management plan/ timber harvest operation.

CLIMATE CHANGE: A SPECTRUM OF APPROACHES

Depending on your personal goals for your land and the specific climate change effects impacting your land, this can guide you towards an approach that is most suited towards establishing young trees throughout your woodlot. Some options include, speaking to a licensed forester and implementing a [Forest Stewardship Climate Plan](#) or implementing a resilience harvest, which may involve an aspect of activating planting in the understory. Other options include tackling the above issues as well; as temperatures warm and become more favorable to invasive insects, controlling their populations will be critical for not only the health of established trees, but also the establishment of the next generation of young species.

GETTING STARTED

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