

Massachusetts Forest Health Highlights 2022

Dept. of Conservation and Recreation
Forest Health Program
November 2022

Aerial Survey Results

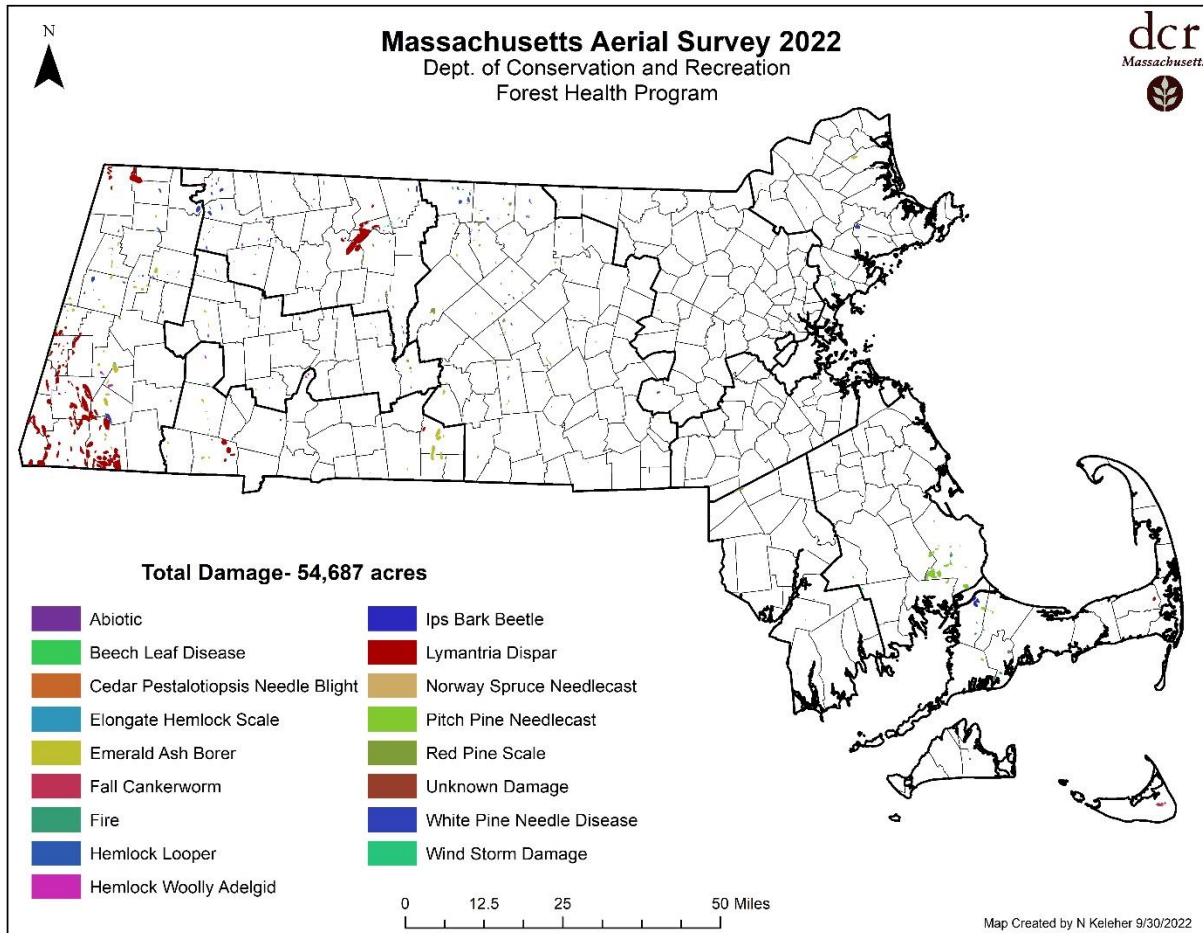


Figure 1. DCR Forest Health Program aerial survey results 2022.

54,687 acres of forest damage documented statewide from the annual aerial survey

30,895 acres of spongy moth defoliation

6,213 acres of emerald ash borer caused ash decline and mortality

5,999 acres of white pine needle damage

3,709 acres of red pine scale caused red pine decline and mortality

Beech Leaf Disease

Beech leaf disease (BLD) was first found in Massachusetts in 2020 in Plymouth, MA. Since that time, BLD has been confirmed in all Massachusetts counties. BLD has been detected in 72 new communities in 2022, for a total of 93 communities with confirmed infections. Infected communities have been detected through ground surveys performed by DCR Forest Health staff and from public reports. Foresters confirm all new community reports through site visits involving symptom identification and foliage sampling. The Forest Health Program was flooded with public reports, questions, and concerns throughout the spring and summer; we received the highest numbers of calls and emails in June.

Beech leaf disease progression is advanced and the impact very severe in areas in Eastern Massachusetts. Foresters identified multiple sites where infection was so severe that nearly all buds aborted and only thin, secondary flush foliage was present.

The DCR Forest Health Program participated in a regional BLD monitoring effort. Permanent monitoring plots were established in 2021 and once again assessed in 2022. Monitoring plot surveys were complete at 11 sites across the Commonwealth in June and July of 2022; foresters collected data on site composition, tree health metrics, and severity of BLD leaf symptoms. Results from these efforts will help provide us with more information about how beech leaf disease progresses in our forests and the long-term impact it will have on our beech resources.



Figure 2. BLD infected American beech tree exhibiting severe symptoms including aborted buds and darkened, withered leaves. Plymouth, MA; June 2022

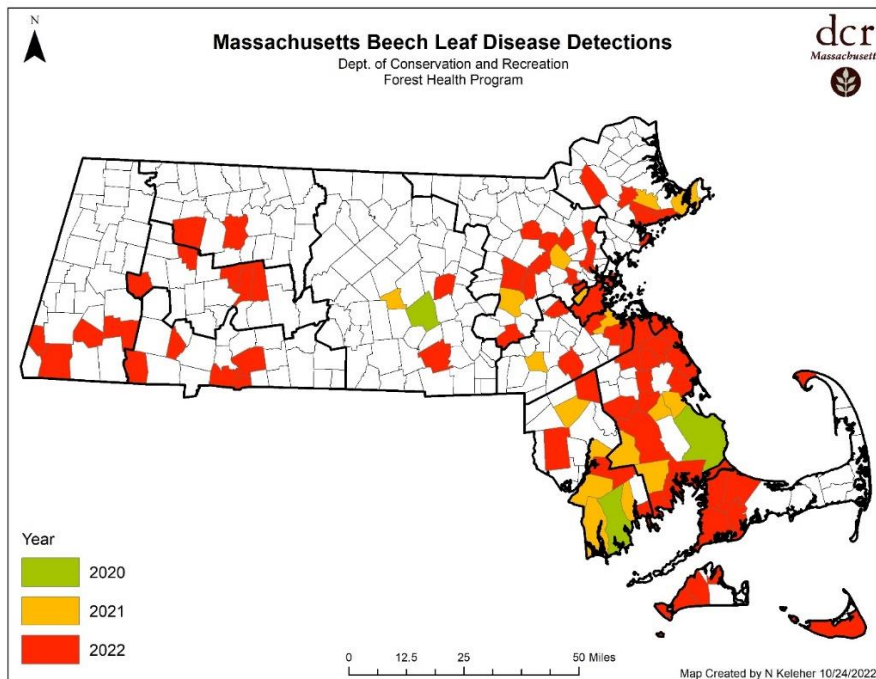


Figure 3. Massachusetts communities with confirmed beech leaf disease infections.

Emerald Ash Borer (*Agrilus planipennis*)

Emerald ash borer (EAB) is present in nearly all ash resources in Massachusetts. At this time, EAB has been detected in 11 Massachusetts counties in a total of 256 communities. EAB was detected in 41 new communities in 2022. The Forest Health Program has taken a step back from active EAB detection surveys. New community detections are driven by public reports. Forest Health Program staff visit suspicious report sites and confirm EAB presence through visual inspections and bark peeling.

The EAB population throughout the state has reached the threshold where ash decline is prevalent. We are observing significant ash mortality across the state. Approximately 6,213 acres of ash mortality and dieback were mapped during the annual aerial survey.

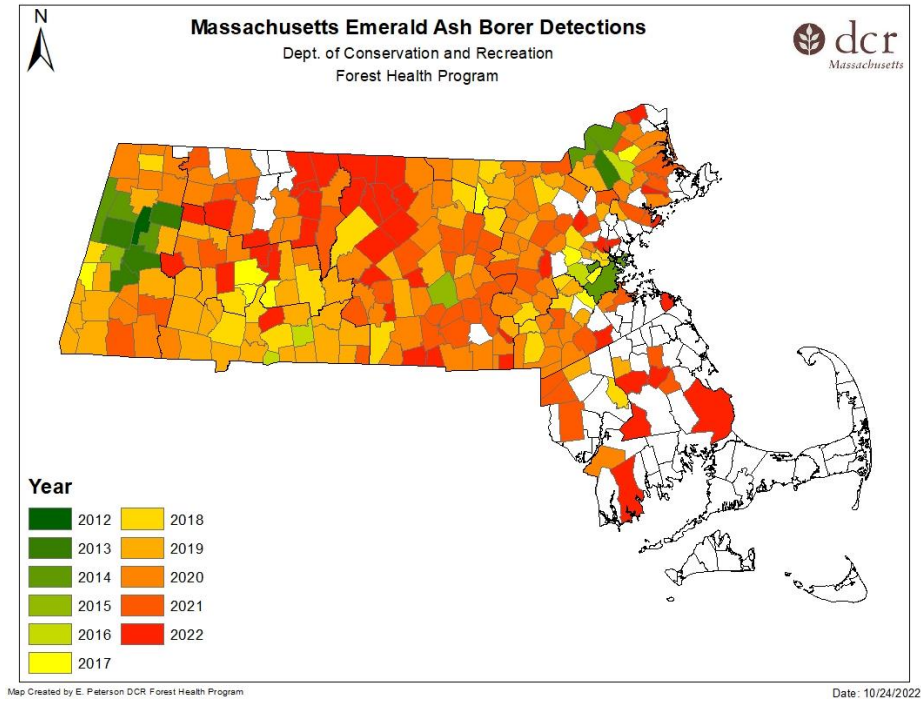


Figure 4. Massachusetts communities with confirmed EAB infestations.

In an effort to slow EAB population spread and growth, the Forest Health Program is part of the national effort to establish EAB host specific parasitic wasp biocontrol species. The Forest Health Program receives parasitoids from the USDA APHIS rearing facility in Brighton, MI. Three species were released in Massachusetts in 2022: *Spathius galinae*, *Oobius agrili*, and *Tetrastichus planipennis*. Biocontrol species were released at 5 sites in 2022: Reading (Middlesex County), Oakham (Worcester County), Plainville (Norfolk County), West Bridgewater (Plymouth County), and Charlemont (Franklin County). For all sites, these were second- or third-year supplemental releases at a previous release site.

Table 1. DCR Forest Health Program EAB biocontrol release summary 2022.

Site	Town	County	<i>O. agrili</i>	<i>S. galinae</i>	<i>T. planipennis</i>
Camp Curtis Guild	Reading	Middlesex	1,200	1,433	0
Hockomock Swamp WMA	West Bridgewater	Plymouth	1,200	1,455	0
Mohawk Trail State Forest	Charlemont	Franklin	1,200	1,432	0
Plainville Conservation Area	Plainville	Norfolk	1,200	1,429	4,379
Ware River Watershed	Oakham	Worcester	1,200	1,420	0
2022 Release Total			6,000	7,169	4,379

Spongy Moth (*Lymantria dispar*)

Spongy Moth has experienced a population resurgence in Western Massachusetts. Large areas of severe defoliation were observed in spring 2022 in Berkshire and Franklin Counties. Smaller pockets of defoliation were identified in Hampden, Hampshire, and Barnstable Counties. Statewide, 30,895 acres of defoliation were mapped during aerial survey efforts. Historically, large-scale outbreaks have been infrequent and short lived on our western landscape. However, a changing climate may alter the population dynamics in our forests.

There were some public reports of areas with severe caterpillar mortality events from the fungal pathogen *Entomophaga maimaiga*. However, across the defoliated area we did not see a widespread pathogen impact. There was also minimal population impact from predators, parasites, and other diseases. We observed high rates of pupation and maturation to the adult moth life stage this summer and expect significant defoliation once again in 2023. The Forest Health Program will complete an extensive winter spongy moth egg mass survey to identify areas at risk of defoliation in 2023. Foresters will survey randomized sampling points in locations with either detected defoliation in the last three years or historic high-risk areas that have frequently experienced outbreak reoccurrence.



Figure 5. Spongy moth defoliation observed during annual aerial survey. Franklin County; June 2022.

Fall Cankerworm (*Alsophila pomataria*)

Fall cankerworm is a native caterpillar defoliator that has occasional population outbreaks that cause significant damage to hardwood forests in Massachusetts, particularly in our eastern coastal areas. There has been an ongoing outbreak in Nantucket County since 2018 which has impacted the oak shrub barrens of the island's interior. The population seems to be decreasing, but fall cankerworm still caused pockets of notable defoliation in 2022. The defoliated area was decreased from previous years and less severe. Collaborators have confirmed that the ongoing pressure from this outbreak event has caused tree mortality. Forest Health staff will assess stand impact and population density in the spring of 2023.



Figure 6. Comparing 2021 (left) and 2022 (right) oak defoliation caused by fall cankerworm. Nantucket, MA; June 2022.

Hemlock Woolly Adelgid (*Adelges tsugae*) and other Hemlock Pests

Hemlock woolly adelgid (HWA) is a persistent pest to eastern hemlocks statewide. HWA has been identified in all Massachusetts counties and in all communities with significant hemlock resources. However, the population has greatly fluctuated over the last three decades. HWA is vulnerable to the harsh winter conditions in New England. Population densities crash during cold winters or years with extreme temperature changes and build in mild or warm winters.

Following several mild winters, HWA population densities remain high across the state in 2022. The DCR Forest Health Program tracks HWA population densities across the state and monitors population trends through winter and summer sisten generation mortality surveys. This year, we observed levels of winter HWA mortality lower than typical for the region. There was an average HWA winter mortality rate of 47% across 15 sites surveyed in February 2022.

In addition to HWA, hemlocks in Massachusetts are commonly impacted by the invasive pest elongate hemlock scale (*Fiorinia externa*; EHS). EHS has become prevalent in hemlocks statewide and is causing widespread needle damage. HWA stress on trees fluctuates with the highly climate influenced pest populations and provides the trees periods of recovery in low HWA density years. However, EHS stress appears to be more persistent year after year once a stand becomes infested. In 2022, 264 acres of hemlock decline was attributed to elongate hemlock scale. But hemlock stand decline and mortality is observed in the highest rates in stands with HWA and an additional stressor, such as EHS, fungal pathogens, or drought.

Targeted pesticide treatment program is implemented by the Forest Health Program in ecologically and culturally significant eastern hemlock stands on state forests to reduce infestation levels of hemlock woolly adelgid and elongate hemlock scale. Treatments occur at 12 sites across the state on a 3-year rotating schedule. In 2022, a total of 652 trees were treated at four DCR State Forests. Hemlocks at Mt Wachusett State Reservation, Tolland State Forest, Purgatory Chasm State Reservation, and Walden Pond State reservation were treated with dinotefuran this May. Two application methods were used. The majority of trees were treated with a basal bark spray (Safari applied at rate of 20oz product / gallon of solution). For hemlock trees close to water resources, they were treated with direct trunk injections (Dinocide applied at a rate of 2 oz product/ inch of DBH).

Tree growth, health metrics, and pest population density values were collected by forest health staff in a subset of treated hemlocks and untreated control trees. The survey is completed at the end of the growing season each year, after HWA sisten generation break aestivation, at all sites that have been treated in the last three years. The survey results allow us to assess and quantify the beneficial impact of treatments on overall hemlock health.

Table 2. Summary of hemlock treatments performed by DCR Forest Health Program in 2022.

Site	DBH	Trees	Area
Mt Wachusett State Reservation	1,842 inches	100 trees	2 acres
Purgatory Chasm State Reservation	3,658 inches	231 trees	7 acres
Tolland State Forest	3,860 inches	186 trees	21 acres
Walden Pond State Reservation	2,790 inches	135 trees	9 acres
2022 Total	12,150 inches	652 trees	39 acres



Figure 7. Forest Health Specialists surveying hemlock stands for biocontrol species. Sutton, MA; October 2022

The DCR Forest Health Program has worked to establish biocontrol species to mitigate the impact of HWA. Predatory beetles *Sasajiscymnus tsugae* and *Laricobius nigrinus* had been released in numerous sites previous years. In 2022, 500 *L. nigrinus* were released at Federated Women’s Club State Forest. This was a secondary release to supplement the population of beetles released in 2020. Additionally, two new biocontrol species were releases in the state in 2022, *Laricobius osakensis* and *Leucopis spp.* DCR Forest Health Program released 500 *L. osakensis* at Mt Tom State Reservation in Holyoke, MA and UMass Amherst researchers released 500 at Mt Toby in Sunderland, MA in October 2022. The *L. osakensis* and *L. nigrinus* beetles were provided

from the Virginia Tech rearing lab with facilitation by the U.S. Forest Service. UMass Amherst released *Leucopis spp.* at 5 sites in the spring of 2022. These biocontrols were provided by the rearing lab at Cornell University.

In Massachusetts, there has been limited recovery or confirmed establishment of the HWA biocontrol species. The Forest Health Program continues to monitor hemlock stands where *Sasajiscymnus tsugae* and *Laricobius nigrinus* predators were previously released. A foliage collection method was used at 3 sites in the spring to survey for larval predators. Beat sheeting survey method was used at 18 sites in November in an effort to recovery adult beetles. No predators were recovered in 2022.

There was a hemlock mortality event this year in northern Franklin and Worcester Counties attributed to the native caterpillar hemlock looper (*Lambdina fiscellaria*). Hemlock looper feeding in spring/summer caused severe defoliation and eventual mortality throughout hemlock stands. Some areas experienced a near total loss of all understory and midstory hemlocks and loss of a significant number of mature overstory trees. This looper population has been building and expanding for the last three years, and we expect to see feeding once again in 2023.



Figure 8. Hemlock mortality damage caused by hemlock looper feeding. Winchendon, MA; July 2022

Red Pine Scale (*Matsucoccus matsumarae*)

Statewide, the Forest Health Program continues to observe the rapid decline of red pine stands caused by red pine scale. Large areas of mortality and crown discoloration in red pine plantations are being mapped annually; a total of 3,709 acres of red pine scale damage was detected in 2022. All counties with substantial red pine stands are impacted by this insect. Due to the plantation style stands that have received minimal management, many red pine stands also exhibit symptoms of needle and root fungal pathogens that create a severe decline complex. Forest health staff collect foliage samples and analyze red pine scale densities when requested by DCR foresters, park staff, or other resource managers.



Figure 9. Declining red pine stand at Howe State Park, Spencer, MA; September 2022.

Southern Pine Beetle (*Dendroctonus frontalis*)

The DCR Forest Health Program deployed southern pine beetle (SPB) traps at 24 sites in 2022. The survey utilized black 12-funnel lindgren survey traps with wet collection. The traps were baited with Frontalin lure, alpha pinene lure, and Endo-brevicomin lure. Trap collection results produced the highest levels of SPB ever detected in Massachusetts. A total of 19 sites had SPB in the trap catch. The number of beetles caught at each site was much higher than previous years efforts.



Figure 10. Pitch tubes visible on SPB infested pitch pine. Mashpee, MA; August 2022

SPB infested trees were identified for the first time in Massachusetts this year. Two pitch pine near a trap site in Mashpee were confirmed to be infested with SPB. DCR Forest Health Program staff noticed multiple pitch tubes on the trees in June 2022. Samples were taken from the trees and SPB were found within the pitch and tunnels. It was determined to be a low-level infestation, each tree had less than 10 visible pitch tubes and there was no noticeable decline or other damage. In an abundance of caution, both trees were removed and destroyed in October 2022 by the DCR Forest Health hazard tree crew.

While the results of this year's SPB surveys are concerning, we are not yet at the levels of an outbreak event. Proactive monitoring, development of response plans, and the ability to take swift action will help protect our pitch pine resources from this forest pest. Enhanced surveys are planned in 2023. Forest Health field staff will be completing visual ground surveys this winter in buffers around positive trap locations. Furthermore, we will be expanding our trapping efforts including adding additional sites and a second round of trapping in the fall.

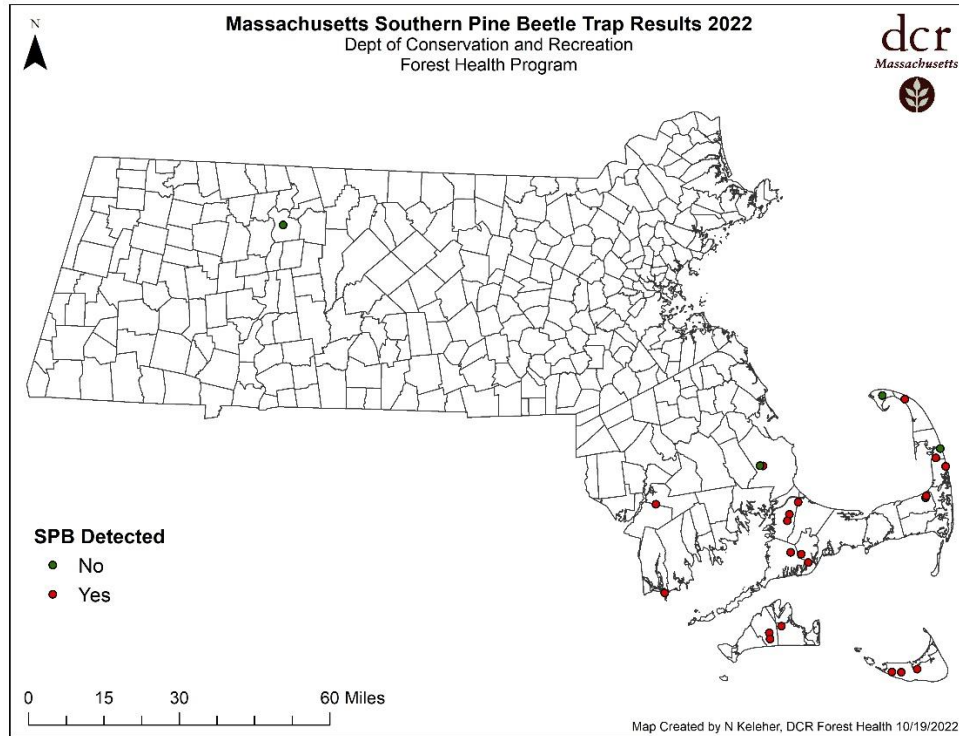


Figure 11. Massachusetts SPB trapping survey results 2022.

White pine decline

Eastern white pine needle damage disease continues to cause a significant impact across our landscape. The high infection rates of fungal needle pathogens have become common in our white pine stands over the last decade. Eastern white pines in all counties of the state suffer from crown discoloration, thinning canopies, and general decline caused by the stress of the fungal needle pathogens.



Figure 12. White pine mortality in Harold Parker Campground. Andover, MA; September 2022.

In 2022, approximately 5,999 acres of white pine stands with white pine needle damage was documented during our aerial survey.

DCR Forest Health staff have identified areas where the persistent stress of the needle cast disease has led to tree decline and eventual mortality. White pines have become more vulnerable to decline caused other stressors, including attack by native pests and pathogens that are typically of minor concern. These instances of white pine mortality have mostly been isolated individual trees on taxing sites (e.g., along roadways, disturbed/ construction areas, soils more vulnerable to drought/ extreme rain events), but we are beginning to observe larger pockets of mortality in historically suitable white pine sites.

DCR Foresters identified a pocket of approximately 25 mature white pines in Harold Parker Campground that all died suddenly during the summer this year. When the site and trees were assessed, it seemed likely that a fungal pathogen was the driver in the decline. Samples were sent to UMass Extension pathologist, Nick Brazee, for analysis and it was determined that

symptoms were caused by black stain root disease (*Leptographium procerum*). The fungus is a native species, widespread in our forests, and usually not a very aggressive but compounding stressors allowed it to infect and kill this stand of pines.

Asian Longhorned Beetle (*Anoplophora glabripennis*)

The DCR Forest Health Program continues to severe as the lead state agency and work in cooperation with USDA APHIS on Asian Longhorned Beetle Eradication efforts in Worcester County. The 110 sq mile quarantine area enforcement remains in all of Worcester, West Boylston, Boylston, and Shrewsbury, and portions of Holden and Auburn. Collaborative DCR and USDA teams complete ground and climbing visual inspection progressive surveys. No infested trees have been found in 2022.

The Asian Longhorned Beetle (ALB) trapping program placed 300 black flight interception traps with wet collection in 2022. Survey strategy was focused on placing traps in model derived high-risk infestation areas and areas of regulatory concern for host material movement. The majority of traps were placed within the ALB Regulatory area; approximately 15% of the traps were set outside the regulated boundary. All traps were baited with lures that consisted of Z-3-Hexenol, Linalool, Trans-Caryophyllene, 4-(n-Heptyloxy) Butanol, 4-(n-Heptyloxy) Butanal. No ALB were found in any of the 2022 traps. However, significant, and diverse cerambycid bycatch was collected.



Figure 13. ALB trapping team checking survey traps. Worcester, MA; July 2022.

Early Detection Rapid Response Survey

The DCR Forest Health Program participated in the national U.S. Forest Service lead Early Detection Rapid Response (EDRR) program. The goal of the survey is to use lured traps to target bark beetle species. The traps are set in wooded areas near high-risk introduction pathways in the hopes of identifying previously unknown non-native species.

Forest Health staff set traps at 12 sites across the state. Each site had a set of three funnel traps: ethanol lure trap in deciduous hosts, alpha-pinene and ethanol lure trap in conifer hosts, and three-component exotic *Ips* lure trap in conifer host. All trap samples were sent to Forest Service taxonomist, Marc DiGirolomo, for processing and identification.

The EDRR survey identified 69 total bark beetle species. Of those species collected, 13 were first official detections in Massachusetts. There was also a new to North America species detection, one *Molorchus minor* specimen was collected in Worcester, MA. This is a longhorn beetle native to Europe commonly found in declining and weakened conifer trees. None of the species found are of concern at this time.



Figure 14. *Molorchus minor* specimen collected in EDRR trap. Worcester, MA; August 2022. Credit M.DiGirolomo USFS