EMERALD ASH BORER (EAB)

Guilford Conservation Commission
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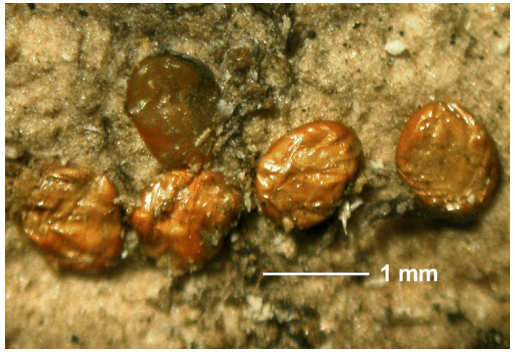
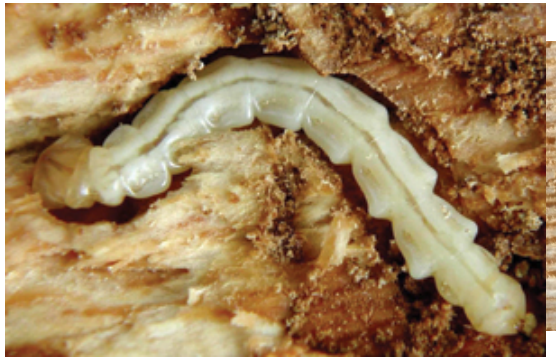
Emerald Ash Borer (EAB)

The emerald ash borer (EAB). (Agrilus planipennis) is an invasive beetle from Asia that infests and kills North American ash species (Fraxinus sp.) including green, white, black and blue ash. All of Vermont's native ash trees are susceptible to EAB.

EAB Identification

The emerald ash borer is a very small but very destructive beetle. It has four life stages: adult, egg, larva and pupa. The adult beetle has a shiny emerald green body with a coppery red or purple abdomen. The beetle can measure 1/2 inch long and 1/8 inch wide. Adult beetles leave distinctive D-shaped exit holes in the outer bark of the branches and the trunk. Adults are roughly 3/8 to 5/8 inch long with metallic green wing covers and a coppery red or purple abdomen. They may be present from late May through early September but are most common in June and July.





Signs of infestation

General Symptoms

Increased woodpecker activity is often the first sign of an EAB infestation. Trees being attacked by ALB often have wilted foliage and canopy dieback, but the main signs to look for include:

Trees can decline for a number of reasons: insects, disease, soil compaction, winter injury, droughtstress, and many other factors. Trees declining from many of these reasons may show general symptoms of tree stress (shown below) and these do not specifically indicate EAB. However, these indicators can be early signs of although such symptoms will occur when EAB attacks ash trees.

Canopy Thinning and Crown Dieback

As larvae feed beneath the bark they damage tissues responsible for transporting water and nutrients. Initial damage appears as thinning in the upper canopy of the tree and branches can die over time.

Other conditions (disease, soil compaction, etc.) can cause canopy die-back in ash trees, so canopy thinning alone does not definitively indicate EAB.

Epicormic Sprouting

When trees are stressed, they may try to grow new branches and leaves wherever they still can (suckering). Stressed ash trees may have new growth at the base of the trunk or on main branches.

As with canopy thinning, other sources of stress can cause suckering around the base of ash trees, and this symptoms does not specifically indicate EAB.

Woodpecker Damage

In addition to the two symptoms above, trees infested with EAB are often sought out and attacked by woodpeckers.

However, woodpeckers will attack just about any tree full of insect larvae. Thus, while woodpecker activity can be an indicator of EAB, it does not specifically confirm an EAB infestation. Extensive woodpecker damage is sometimes referred to as "flecking" or "bronzing"

Specific Signs of EAB:

D-Shaped Exit Holes:

As EABs emerge from ash trees in June and July, adult emerald ash borers leave behind distinct D shaped exit holes. These holes are approximately 1/8" wide and can be oriented in any direction (i.e., the flat side may be facing upwards, downwards, etc.). These D-shaped holes are a strong indicator of EAB.

Exit holes of native borers will be round or oval and can vary in size.

S-Shaped Galleries & Splitting Bark

Trees attacked by EAB have distinct S-shaped or "serpentine" galleries (tunnels) beneath the bark.

These tunnels are approximately 1/8 inch wide and are packed with frass (a fine mixture of sawdust and insect excrement).

As EAB larvae feed, trees attempt to create callus tissue around larval galleries, which can cause the bark to split vertically. The S-shaped galleries and larvae can often be seen beneath split bark.

Presence of EAB Eggs, Larvae, Pupae, Insects

How to Manage EAB
Should I cut my ash trees now?

- **Not necessarily. The answer depends on a lot of variables. However, you should plan for EAB now if you have ash**.

It may take a while to carry out any plan, especially on large ownerships. Know what's at risk: how much ash you have, its size and quality, and where it's located. Think about what you want from your forest in the long term, and how your response to EAB will fit in to achieving your goals. For some, doing nothing may be a viable approach.

- **The closer your trees are to the infestation, the sooner they are likely to be affected.**

Expect that the edge of a known infestation will naturally expand about 1—2 miles every year. Consider the ecological, aesthetic, and economic value of your ash, your tolerance of risk, and your objectives for ownership. Stay abreast of new information to avoid short-sighted decisions. Visit www.vtinvasives.org for the latest news on EAB.

Should I cut my ash trees now?

- **Work with a licensed forester to protect your interests and your forest**.

Studies have shown that woodland owners who use professional forestry services before they cut make more money and are more satisfied with the results than owners who sell timber on their own. For more information, see the "Working With Foresters and Loggers" guidance from the Landowner Guides to a Successful Timber Harvest at vtcutwithconfidence.com.

- **Ash Trees in the Forest**

In forested situations, where trees will not become a hazard to public safety, there are good reasons to leave ash trees in place. Dead trees provide important wildlife benefits and some trees might turn out to show resistance or tolerance to EAB (termed "lingering ash"), which can benefit the species genome and can assist with hybrid and cross-breeding initiatives.

Use Value Appraisal program (UVA)

If your land is enrolled in the Use Value Appraisal program (UVA), you must follow your approved forest management plan or an approved amendment.

Contact your county forester or consulting forester if you have questions. If you wish to change your planned activities, treatment schedule, or management objectives your consulting forester may be able to amend your forest management plan. Remember that the county forester needs to approve any changes before the management activity begins. Information related to UVA and EAB can be found on the FPR website.

Systemic insecticide

Insecticides

Insecticides with active ingredients such as azadirachtin, imidacloprid, emamectin benzoate, and dinotefuran are currently used since they are systemic (i.e., incorporated into the tree) and remain effective for one to three years depending on the product. Insecticides are typically only considered a viable option in urban areas with high value trees near an infestation. Ash trees are primarily treated by direct injection into the tree or soil drench. Some insecticides cannot be applied by homeowners and must be applied by licensed applicators. Damage from emerald ash borer can continue to increase over time even with insecticide applications. Insecticide treatments are not feasible for large forested areas outside of urban areas.

CFS researchers, in partnership with BioForest Technologies Inc., developed TreeAzin™, a systemic insecticide to protect individual high-value ash trees and trees in isolated infestations. TreeAzin™ is formulated from an oil derived from seeds of the neem tree (a member of the mahogany family), and was granted full registration in 2012. Now commercially available, TreeAzin™ is being used by numerous municipalities and tree care companies as one component of their emerald ash borer management strategy.

Pollinator Alert

There are limited pesticide options to effectively treat ash trees.

There are significant public concerns about using neonicotinoid insecticides, which are those that contain the active ingredients: imidacloprid, dinotefuran, and clothianidin.

To mitigate the risk to pollinators, other products should be used. Foliar sprays are also not recommended.

Review the resource Options for Protecting Ash Trees from Emerald Ash Borer with Insecticide Treatments for the Vermont Urban & Community Forestry Program's recommendations pertaining to treatment options.

Biological control

The native range of emerald ash borer in Asia was surveyed for parasitoid species that parasitize emerald ash borer and do not attack other insect species in the hope they would suppress populations when released in North America.

Three species imported from China were approved for release by the USDA in 2007 and in Canada in 2013: *Spathius agrili*, *Tetrastichus planipennisi*, and *Oobius agrili*, while *Spathius galinae* was approved for release in 2015. Excluding *Spathius galinae*, which has only recently been released, the other three species have been documented parasitizing emerald ash borer larvae one year after release, indicating that they survived the winter, but establishment varied among species and locations.

Tetrastichus planipennisi and *Oobius agrili* established and have had increasing populations in Michigan since 2008; *Spathius agrili* has had lower establishment success in North America, which could be due to a lack of available emerald ash borer larvae at the time of adult emergence in spring, limited cold tolerance, and better suitability to regions of North America below the 40th parallel.

The USDA is also assessing the application of *Beauveria bassiana*, an insect fungal pathogen, for controlling emerald ash borer in conjunction with parasitoid wasps.

Emerald Ash Borer Cost Calculator 3.0

Get the January 2017 article in Arboriculture and Urban Forestry that describes how this calculator shows why it is more economical to protect ash trees than to replace them. This version is driven by an EAB invasion wave model that assumes it takes 8 years from the time EAB is detected in your city until all the untreated ash can no longer be saved with a pesticide application. In this new version you can: Stage your response to an EAB invasion based on the percentage of ash trees that have lost more than 30% of their canopy.

- Evaluate management plans that reduce the frequency of ash treatment after the initial wave of EAB has passed through your forest.
- Compare the annual and cumulative costs and the size of the remaining forest over a 25 year period for ANY management strategy that includes a mixture of tree removal, replacement, and insecticide treatment.
- Generate and share electronic and printed reports of projected costs of up to 3 management strategies at a time.

Emerald Ash Borer Management

Dead and dying ash trees along the public right-of-way and in public places, such as parks and schools, pose a significant risk to public safety.

The loss of ash trees will leave gaps, impacting the ecological, economic, and aesthetic benefits provided by the urban forest. Municipalities will bear the responsibility and costs of removing and/or treating public ash trees, as well as any replanting efforts.

To support your planning efforts, you may want to refer to VT Urban & Community Forestry Council Municipal Ash Management Strategy overview, use our step-by-step EAB Management Worksheet, or refer to an existing EAB Preparedness or Management Plan as a template. Here are general steps and associated resources that can help your community reduce the impact of EAB.

https://vtcommunityforestry.org/sites/default/files/pictures/eab_municipal_management_worksheet_jan2019.pdf

STEPS TO PLANNING FOR THE EMERALD ASH BORER MANAGEMENT

Organize for Action

1. Identify key people.

2. Host an informational meeting.

3. Form an EAB management planning team.

4. Gather town-specific documents and information.

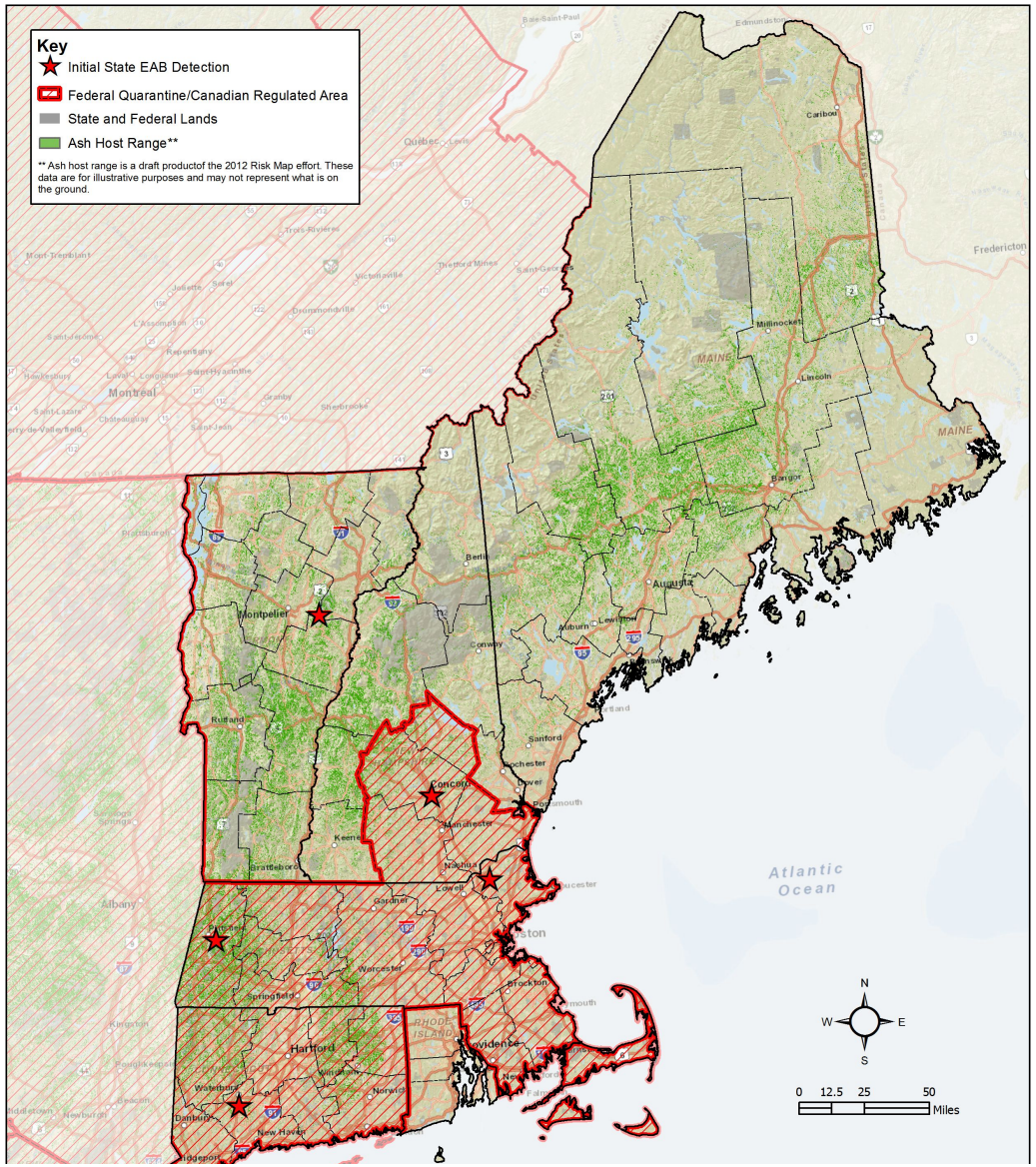
5. Develop public outreach strategies

Determine the Quantity and Distribution of Public Ash Trees

1. Determine the need for inventorying ash trees.

2. If you don't have an inventory of your public ash trees, make a plan to conduct one.

Emerald Ash Borer Quarantine in New England



Emerald Ash Borer (EAB) Infested Area in Vermont

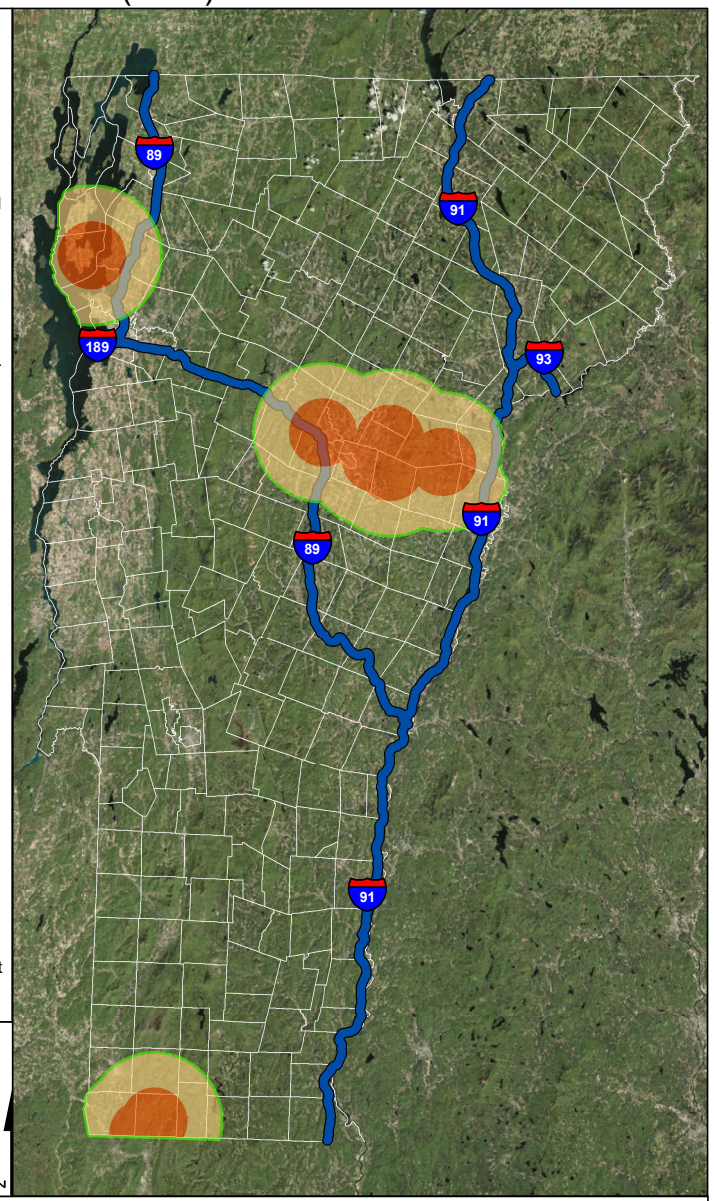
The green line on this map delineates the EAB Infested Area in Vermont. This is the area to which the Slow the Spread Recommendations refer. It should not be confused with the federal quarantine.

This map will be updated as new locations of EAB are detected in and near Vermont. The map was last modified on **10/5/2018.**

The EAB Infested Area includes both the Confirmed Infested Areas and the High Risk Areas. Confirmed Infested Areas (shaded in red) are within 5 miles of a known infestation. While symptoms may not be obvious, it is likely that EAB is present in much of this area. High Risk Areas (shaded in yellow) extend 5 miles from the outer edge of a Confirmed Infested Area. EAB is likely expanding into, and present in some of this area.

The Infested Area location is also available on the ANR Atlas. The "EAB Infested Area" layer is under the Forests, Parks and Recreation tab in the Atlas Layers. This mapping function allows you to look at the Infested Area in conjunction with other layers like parcels or roads.

All ash in Vermont is within the federal EAB quarantine boundary. It is your responsibility to know where the current boundaries of the federal EAB quarantine are located. Moving material outside of the federal EAB quarantine without a compliance agreement can result in penalties. For more information on moving wood outside of the federal quarantine contact Tony Slowik - Plant Health Safeguarding Specialist USDA APHIS (802) 224-1405.



This map of the EAB Infested Area was accurate as of **10/5/2018.** The Infested Area will expand. Prior to basing action on the location of the Infested Area, visit vtinvasives.org/eab to confirm the current status of the EAB Infested Area.

Determine the Timeline for EAB Management in Your Community

Has EAB been found in your town?

1. **If you don't have an inventory of your public ash trees, make a plan to conduct one.**

2. **Determine the likely timeline for the arrival of EAB in your town.**

EAB will spread throughout Vermont. In fact, it is expected that the number of trees in a community that are infested with EAB will double every year until most, if not all, ash trees are infested. Also, for a community that is adjacent to an infested town but in which EAB has not yet been found, it is very likely that EAB is in fact already there, infesting 1% - 2% of the ash population. The following chart will help to determine where your community stands with regards to the extent of an EAB infestation. The chart assumes that in a heavy infestation, all infested trees will die within three years of becoming infested. By the end of 12 years, all untreated ash trees within a community are anticipated to be dead.

Evaluate Your Community's Public Policies

1. Determine if your town has the authority needed to respond to EAB effectively and efficiently.

(e.g. ability to order the removal of infected tree(s) on private property that may affect the public ROW)

1. Tree Wardens and Tree Ordinances

A tree warden is an appointed individual in town responsible for making determinations about the trees on public property. You can learn more about Vermont tree wardens on the tree wardens page (vtcommunityforestry.org/resources/vermont-tree-wardens-0) on our website. We also have resources available to help you develop a tree ordinance or policy, including examples from VT cities and towns. You can find them on the public policies page on our website (vtcommunityforestry.org/resources/public-policy).

Determine if there are Trees to Preserve

Develop a list of priority trees for preservation.

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2. Determine the plan for preserving priority ash trees using insecticides.

3. Develop a list of trees that are worth saving and that the municipality can afford to preserve.

Treatment Costs

Current estimates for treatment range from **$3-$13 per inch of DBH** depending on product and application method. Confirm approximate costs with a local arborist before making your calculations.

Determine what removing individual trees will cost.

1. Local estimates are preferred. However, an estimate derived by the USDA Forest Service for the Northeast region suggested $18.33 per inch DBH as a guide for removal costs plus $6.50 per inch DBH for removal and grinding of the stump. This estimate works well for street and shade trees in developed areas. You will most likely be able to reduce the cost along rural roads.

   Because of the increased risks involved with removing standing dead trees, the cost of removing an ash tree that has already succumbed to EAB may be double or even triple the cost of removing a live ash tree. Some tree companies will not work on dead ash trees.

Consider private property trees.

1. The decision to treat, remove, or retain private trees rests with the property owner**, unless a private tree poses a threat to public safety or public property**. A municipality should consider how to manage the risk posed by trees on private property that threaten public property or a public right-of way.

2. You may want to explore options for residents who wish to save right-of-way trees through insecticide treatment. Some towns in other states have incentivized treatment with a cost-share program. For example, residents are reimbursed 50% of the treatment costs up to $50 per ash tree if they agree to treat the tree with the preferred method.

Determine how Infested Wood will be Disposed of or Utilized

1. Stay informed on the State's Slow the Spread Recommendations

2. Locate at least one wood disposal site in your town or nearby.

3. Develop a communication strategy to let residents and businesses know where they can drop off material.

4. Consider how to best utilize the wood to minimize environmental impact, offset disposal costs, or even create a value-added product.

Facilities Collecting Yard Waste

In support of the Universal Recycling Law, the Department of Environment Conservation manages an online and interactive materials management map. The map indicates recycling and drop off facilities and whether or not a facility collects yard waste.

https://vtinvasives.org/land/emerald-ash-borer-vermont
http://vtcommunityforestry.org/wood-utilization

Determine Your Community's Replanting Efforts

1. Identify which areas are important for replanting.

2. Fill vacant planting spaces with a diversity of species.

https://vtcommunityforestry.org/resources/tree-selection

Create An EAB Management Plan For Your Town

1. **Estimate total costs and resources needed.**

2. **How will the town fund the implementation of the plan?**

3. **Develop your EAB management plan.**

Your plan should include the:

- **Current condition,** documenting the number of public ash trees and costs associated with removing and/or treating these trees.
- **Course of action** that should be taken over the next few years to address the needs resulting from the presence of EAB and the identified resources and limitations.
- **Expected results** stemming from these actions, both during the course of implementation and at the end of the period of time outlined.
- **Individuals or organizations responsible** for each action identified in the report.
- **Specific timelines** for all actions to be taken.

https://vtcommunityforestry.org/EABplans_casestudies