



Middlebury Emerald Ash Borer Preparedness Plan

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Introduction

Trees. They provide shade, enhance aesthetics, reduce storm water run-off, clean the air, store carbon dioxide, conserve energy, provide a canopy and habitat for wildlife, and increase property values.

Now, one in twelve trees in Vermont are threatened. The emerald ash borer (EAB), a beetle that has devastated ash trees in 26 state and costing communities millions of dollars, has been detected in every state surrounding Vermont. This destructive insect has been steadily working its way toward Vermont, and, when it arrives will feed on and kill all of the ash trees that are not treated with insecticides. Our communities will be faced with severe risk from a sudden wave of hazard trees if no planning is taken.



EAB has been responsible for the premature death of tens of millions of ash trees in the United States (<http://northernwoodlands.org>) The potential costs to Vermont municipalities from EAB will be considerable. It has been announced that no state or federal monies will be made available for municipalities dealing with EAB and that the cost burden of EAB management will be on local governments. An as yet, incomplete public tree inventory shows that Middlebury and East Middlebury combine to have over 70 ash trees just in town right of ways, and all are at risk from EAB.

Although EAB has not yet been detected in Middlebury an eventual infestation is inevitable. Ash trees can be found throughout our area, along community streets, in public parks, in Battell and Means Woods and along the “Trail Around Middlebury”. Infested trees rapidly decline and die within 3-5 years. The dead ash trees are prone to drop large limbs and pose a significant public safety and personal property hazard.

The purpose of this plan is to provide information and guidance *prior* to an EAB infestation and to continue providing information and guidance once EAB arrives and intensifies. This plan reinforces the urgency to take action and promote proactive planning and management for EAB. The plan recommends management of the ash trees in Middlebury in order to achieve the following goals:

1. Reduce potential public health, safety and property hazards associated with EAB.
2. Mitigate the economic, social and environmental costs associated with control efforts and damage.
3. Prevent further unintended human-caused spread of EAB.

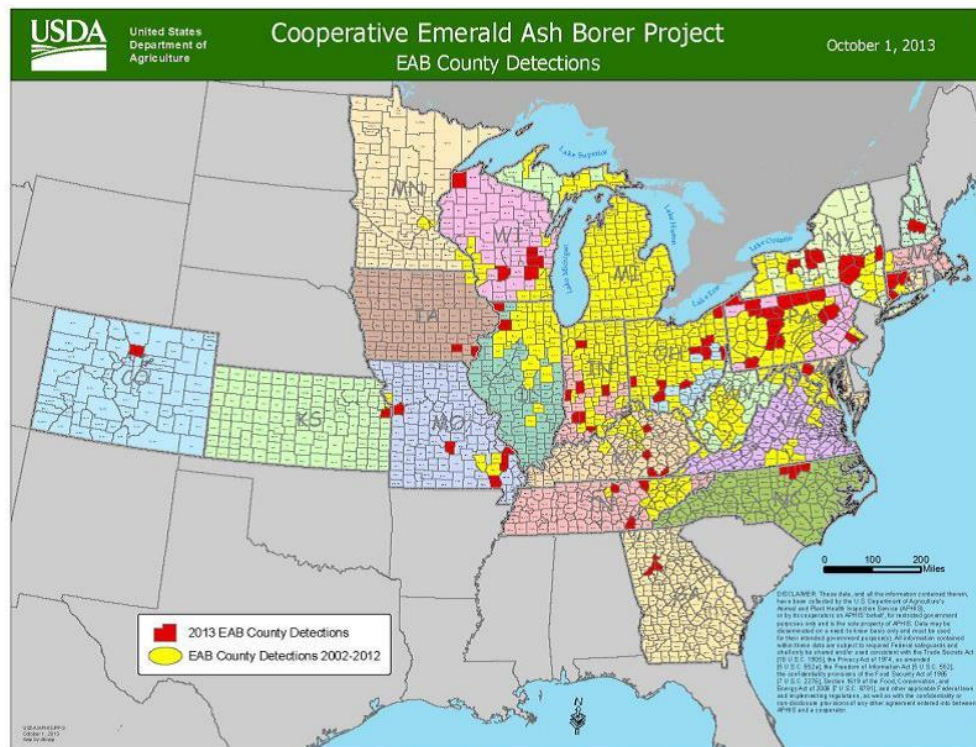
4. Align Middlebury's preparedness plan with the most recent research on EAB management and control.

It is important for Middlebury to take a proactive approach and plan for the impact EAB will have on its community and municipality. Identifying the potential impacts and developing a plan and management strategy are the most effective ways to minimize the costs and mitigate the negative impacts of EAB.

What is EAB?

EAB is an invasive insect that feeds on, and eventually cause the death of all species of ash (genus *Fraxinus*) trees. Originating from Asia, the small metallic wood-boring beetle (family *Buprestidae*) is named for the brilliant emerald/green color of the adult.

Since its introduction into North America, EAB has spread into 26 states (Arkansas, Colorado, Connecticut, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Texas, Virginia, West Virginia and Wisconsin) and two Canadian provinces (Ontario and Quebec). EAB has not yet been detected in Vermont, but as there are infestations on all sides it is only a matter of time before an infestation occurs in Vermont.



Left to its own devices, a single EAB can travel a half mile per year, with the potential to expand the range of an infestation up to several miles per year during the adult beetles' June to August flight period. **Human transport, however, has led to the spread of the EAB over much greater distances.** Shipments of infested nursery stock and firewood have been inadvertently responsible for the majority of new EAB introductions.

Signs and Symptoms

EAB infestations are very difficult to detect in the early stages and at low densities. The upper crowns of the ash trees are infested first; making the entrance cracks and exit holes in the bark nearly impossible to see early on. The best indicator of EAB is evidence of woodpecker foraging, which can be visible from long distances. It is important to remember that once woodpecker damage is visible the infestation is usually well established. When the tree begins to decline rapidly signs may include bark splitting, canopy thinning, and epicormic sprouting (water sprouts), although these symptoms can also be caused by other problems, including the common disease ash yellows.

Unfortunately it has been typical that by the time symptoms of the EAB are recognized the infestation is usually well under way and often even a few years old. For example, in the city of Concord, NH, when the signs of the EAB were noticed it has been estimated that the infestation was already over four years old. Up until that point it was assumed that there was no EAB in New Hampshire at all. At this time many Vermont officials believe that EAB is already present here, but has yet to be detected.

Most of the distinguishing indicators are also the least visible. Because the upper parts of the tree are infested first, all of the early indicators are very difficult to see from the ground. When the larva feeds on the cambium (the nutrient transport tissue below the bark), it kills the bark on top. The next year, as the new bark is formed under the old, the old is pushed out, and where it is dead, it cracks.



Thinning and dying crown

Suckers on infested tree

Galleries under the bark

D-shaped exit hole

Larvae on the wood

Detection

Currently four methods are being employed in Vermont to detect the presence of EAB.

1. Visual – seeing characteristic signs and symptoms.
2. Traps – catching insects in the classic purple prism trap or the new, green funnel trap.
3. Trap trees – girdling trees in order to attract EAB. The insects are sensitive to chemicals released by stressed trees.
4. Biomonitoring – using *Cerceris fumipennis* (native ground wasp)

Impact of EAB on Middlebury

The arrival of EAB and the death of the town's ash trees could have a variety of adverse impacts on Middlebury. These impacts include:

- The public health hazard posed by the dead ash trees. Without treatment, EAB can potentially kill all the ash trees in an infested area in a relatively short timeframe. The dead trees rapidly begin falling apart and, depending on where the trees are located, can pose a threat to Middlebury's residents and tourists.
- Trees that are dead or dying are more dangerous for arborists to work in, resulting in greater costs associated with removing dead trees.
- The upper branches of the ash trees will die and can fall first, meaning live trees can still pose significant threat.
- The simultaneous death of multiple trees also compounds the problem if no preemptive measures are taken to identify, remove, and/or treat ash trees.
- The presence of so many dead and dying trees will be aesthetically damaging to a town known for the beauty of its wooded hills.

Middlebury will also experience less direct effects of an EAB infestation. These more subtle effects include:

- Other species will be dramatically affected by the loss of the area's ash trees.
- Invasive, non-native plant species may take over areas once inhabited by ash as a result of increased lower canopy light.
- Native species such as maple and birch that are used to less light may be crowded out.
- Native animals that depend on ash trees for food and shelter including ground beetles, spiders, butterflies, moths, birds and mammals will be adversely affected.
- The local ecology and soil chemistry will change from the mass die-off of ash. An increased number of dead trees left on the ground will alter soil pH, water content, mineral composition and nutrient availability.

Current Efforts

During the summer of 2014 the VT Urban and Community Forestry Program, (VT UFC), coordinated and funded an individual street tree inventory of all trees, including ash, within the public right-of-way and on public land in the downtown centers of Middlebury and East Middlebury. Data obtained on the trees included their location, DBH (diameter at breast height), condition, distance to the street, and presence of electrical wires. The following table summarizes the data for public ash trees by DBH and current condition.

Public Ash Trees in Middlebury and East Middlebury

DBH*	# of Dead Trees	# of Trees in Poor Condition	# of Trees in Fair Condition	# of Trees in Good Condition
0 – 3"	0	1	0	5
3 – 6"	0	1	1	20
6 – 12"	0	4	4	26
12 – 18"	0	1	1	7
18 – 24"	0	1	1	12
24 – 30"	0	0	0	4
30+"	0	1	0	2
Total	0	9	7	76
Total Number of Ash Trees				92

Ultimately the purpose of locating trees on public property and within the town right of way is to enumerate the population of ash trees in Middlebury and to allow for estimates of the economic impacts of the impending infestation on the town as well as to inform the most appropriate management activities.

Currently the Middlebury Tree Committee is working to continue and/or complete Middlebury's public tree inventory with an especial interest in the municipality's ash trees. As new data is collected the committee will also update information on costs of the various management options.

EAB Management Options

Currently there are three management options for dealing EAB. These options are as follows –

- Remove ash trees (reactively or proactively)
- Remove ash trees and replace them with resistant, native shade trees
- Treat trees with insecticides

Ash tree removal can be implemented one of two ways. An ash tree can be removed after infestation. However, it has been the experience of all other infested towns that once one ash tree is infested virtually all other ash trees will be infested also. This would result in the need for all infested trees to be removed within a relatively short amount of time, increasing the financial burden on the community and reducing the aesthetics of the area.

A public ash tree can also be removed prior to EAB infestation. This strategy provides time for project planning, as well as an opportunity to plan for and distribute costs. It is important to note implementation of this strategy is cheaper and safer as healthy trees fall in a more predictable manner and are easier to remove.

Ash tree removal prior to infestation has several important disadvantages to consider. These disadvantages include:

- Removal of healthy ash trees will have an immediate impact to the tree canopy and aesthetics.
- Removal of healthy trees may require a public hearing and could result in public opposition.
- Removal of these trees significantly reduces genetic variation including possible resistance to EAB.
- Ash trees play an important ecological role in local food webs.

The third option, preventative treatment with insecticide, can provide significant and consistent protection against EAB. Treatment can be accomplished using a soil-applied systemic insecticide, a trunk-injected systemic insecticide, a noninvasive systemic basal trunk spray or a protective cover spray. As with ash tree removal there are certain disadvantages to using insecticides, ones that differ depending on the treatment applied. Both the soil-applied systemic insecticide and the trunk-injected systemic insecticide have yielded inconsistent results in both the field and controlled experiments. Results of the protective cover spray can vary with tree diameter and canopy size. “Drift” of the spray onto other non-target trees can also be problematic. Trunk injection requires holes to be drilled that may provide an avenue for other disease-causing organisms and cause wounds that do not heal. Some trunk-injected pesticides are toxic to other wildlife, including bees and birds, and have the potential for groundwater contamination.

It is worth mentioning that new research on EAB and strategies to deal with it are frequently becoming available at various places around the country. Just recently researchers for the National Forest Service and Ohio State University identified what they refer to as “lingering ash”. ([EAB - recent research](#)) “Lingering ash” are ash trees that remain in an area following an infestation. This is important to note in order to understand that a preparedness plan written now is subject to change.

Proposed Middlebury EAB Management Plan

The Middlebury Tree Committee proposes the following actions in preparation for EAB.

- All dead ash trees and those ash trees in poor/fair condition should be removed as soon as possible.
- Larger ash trees with a DBH > 24" should be treated with _____ .
- All other ash trees – those in good condition, should be removed and replaced with alternative **native** trees.
- Two native trees should replace each ash tree removed. Special attention should be given to increasing species diversity.
- Information on EAB should be communicated to members of the community as soon as is feasible.
- A line item should be designated for EAB plan preparedness in the 2017 budget and each year thereafter until EAB is no longer deemed a threat.

Estimated costs associated with the above proposals are as follows:

Tree Removal – Dead trees or trees in poor or fair

DBH	Ave. DBH	Price/DBH	# of Trees	Cost
0 - 6"	3	\$14.00	3	\$126.00
6 – 12"	9	\$14.75	8	\$1062.00
12 – 18"	15	\$18.00	2	\$540.00
18 – 24"	21	\$21.75	2	\$913.50
24 – 30"	27	\$25.10	0	0
30 – 36"	33	\$30.50	1	\$1006.50
Totals			16	\$3648.00*

* Price will vary based on condition of tree, proximity to overhanging wires, etc.

Scheduled Tree Removal* – Trees in good condition, 0-24" DBH

DBH	Ave. DBH	Price/DBH	# of Trees	Cost
0 - 6"	3	\$14.00	25	\$1050.00
6 – 12"	9	\$14.75	26	\$3451.50
12 – 18"	15	\$18.00	7	\$1890.00
18 – 24"	21	\$21.75	12	\$5481.00
Totals			70	\$11,872.50*

* Price will vary based on condition of tree, proximity to overhanging wires, etc.

* Removal of healthy trees would be scheduled over a ten-year period

Preventative Treatment – Trees over 24”DBH

DBH	Average DBH	# of trees	cost
24 – 30”	27”	3	\$810
30+”	33”	1	\$330
Totals		22	\$1140*

* treatment costs are either every year or every two years depending upon the insecticide used

Replacement for 86 Trees*

- replacing each ash tree removed with two native trees
- using an average replacement cost of \$250/tree
- planting new trees = (86)(2)(250) = \$43,000

* plant replacement trees before taking down the ash tree

Summary of Costs:

Description of Cost	Cost
preemptive immediate removal of all ash trees judged to be in fair or poor condition as identified in the inventory (currently 16 trees)	\$3648.00
scheduled removal of healthy ash trees <24" DBH (currently 70 trees)	\$11872.00
treatment with systemic insecticide of trees > 24" DBH or of particular aesthetic or historic value (currently 6 trees) starting when EAB has been detected within 10-15 miles of Addison County	\$1140.00
replacement with appropriate native species 2 for 1 at \$250.00/tree	\$43,000.00
Total	\$59,660.00

Community Education and Outreach

Due to the impending EAB infestation and the costly nature of this preparedness plan we strongly recommend starting community education and outreach as soon as possible.

Outreach and education strategies might include:

- Community presentations detailing the nature and extent of the problem, the impact on Middlebury and the proposed EAB preparedness plan.
- Notification of community members well in advance of ash tree removal.
- Utilization of existing community communication networks – FPF, Town’s website, newspapers, etc.
- Provide information on certified arborists, tree removal services and tree replacement options for homeowners.
- Work with schools and community groups to “spread the word”.

References

[Emerald ash borer aftermath forests: the future of ash ecosystems](#)

[Emerald ash borer invasion of North American forests](#)

[Emerald Ash Borer Information Network](#)

<https://epress.earlham.edu/sustainability/files/2015/11/maxresdefault.jpg>

[Coalition for Urban Ash Tree Conservation](#)

[Insecticide Options for Protecting Ash Trees from Emerald Ash Borer](#)

[Evaluation of Insecticides to Control Emerald Ash Borer Adults and Larvae](#)

[Preparing Vermont Communities for EAB](#)

[What EAB looks like](#)

[EAB Cost Calculator](#)

Local Resources

- Vermont Agency of Agriculture
- USDA APHIS – Plant Protection & Quarantine
- VT Department of Environmental Conservation
- Vermont Department of Forests, Parks and Recreation
- Urban and Community Forestry Program
- VT Forest Pest First Detector Program
- University of Vermont Extension
- Middlebury Tree Committee
- Middlebury College – *Trees and the Urban Forest*, Winter 2013
- Tim Parsons – Landscape Horticulturist, Middlebury College