



Vermont Forest Health

Ash Management Guidance for Forest Managers



Department of Forests, Parks & Recreation
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Executive Summary

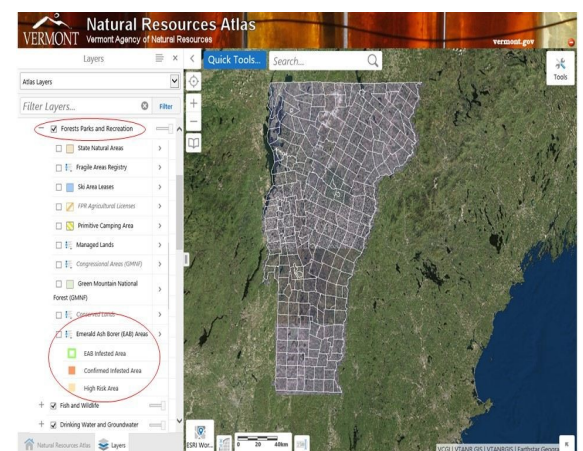
Emerald Ash Borer (EAB), a non-native wood-boring beetle, attacks all native ash (*Fraxinus*) species. Control options for EAB in forestland are limited. Research is being conducted to develop new management tools and understand why some individual trees persist following the arrival of EAB. Experimental integrated pest management techniques, including parasitoid wasps released for bio-control, show promise in reducing EAB populations and delaying ash mortality. As already experienced in other states, EAB will not be eliminated through widespread ash tree removal.

Symptoms of EAB infestation include woodpecker activity, dead branches near the top of a tree, D-shaped exit holes, bark splits exposing S-shaped tunnels, and epicormic shoot growth on the trunk. A complete overview of EAB identification, biology, regulation and general resources are available at vtinvasives.org.

Management considerations

Below is a summary of suggested forest management considerations based on a review of over a decade of scientific research and experience gained from other areas already infested with EAB (EAB was first identified in North America in 2002 and was found in over 30 states before it was found in Vermont).

- Stay up-to-date on the location of known EAB infestations in and around Vermont, recognizing they will change over time. Vermont's detection maps are regularly updated at vtinvasives.org.
- Management practices that eliminate ash could be as great a threat to ash as EAB itself. Survival of ash species ultimately depends on retaining genetic diversity within ash populations, and allowing potential resistance to EAB to express itself. Consider ash retention both as a seed source (trees >6" DBH) and advance regeneration.
- Know where ash trees exist on properties you manage. Evaluate the condition of ash regularly.
- Focus growth on a variety of species. Where ash exceeds 20% of basal area, reduce the ash component. Outside of the Infested Area, residual stand basal area targets should be consistent with appropriate silvicultural guides. Within the Infested Area attempt to meet the stocking recommendations through retention of the non-ash component. Retained ash should be in addition to this target.
- Consider legitimate long and short-term risks. Natural spread of EAB is only 1-2 miles per year, meaning that many areas of Vermont may have over a decade of growth before EAB arrives.
- Slowing the spread of EAB can give other landowners time to respond, the forest time to adapt, and the forestry community time to develop and improve controls of EAB. Ensure that harvests are conducted using [Slow the Spread Recommendations](#). If you think you may have seen signs of EAB, report it on vtinvasives.org, or call the EAB hotline at 1-866-322-4512.



The location of EAB in Vermont is not static and will change over time. The most current map of the EAB Infested Area in Vermont is available through vtinvasives.org and the [ANR Atlas](#).

The Department of Forests, Parks and Recreation has a policy statement regarding EAB and ash management on properties that are enrolled in Vermont's Use Value Appraisal Program. See [Use Value Appraisal Standards for Forest Management Related to Emerald Ash Borer Infestations](#).

Monitor the Location of EAB Infestations

Because EAB will continue to spread, the known Infested Area will change over time. In addition, EAB surveys and public reporting will help state officials identify new infestations.

Vermont's map of the EAB Infested Area is regularly updated and is downloadable from vtinvasives.org. The Infested Area location is also available on the ANR Atlas <http://anrmaps.vermont.gov/websites/anra5/>. 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. It allows you to print a map or download a shapefile of the Infested Area, as described in this [How-to Guide](#).

Because EAB is usually present in a location for several years before it is first detected, the map indicates the boundaries of a "Confirmed Infested Area" and a "High Risk Area." The Confirmed Infested Area is within 5 miles of any known infestation. While symptoms may not be obvious, it is likely that EAB is present in much of this area. The High Risk Area extends 5 miles from the outer edge of a Confirmed Infested Area. EAB is likely expanding into, and present in some of this area. These areas combined are referred to as the "Infested Area" or "EAB Infested Area."

Apply management and Slow-the-Spread recommendations for the Infested Area when ash originates from either the Confirmed or High-Risk Areas. For properties within ten miles of the state line, consult infestation maps from [New Hampshire](#), [Massachusetts](#), [New York](#), and [Quebec](#).

For the earliest detection of EAB on a property, consider installing [trap trees](#). Trap trees are girdled in the spring, cut in late fall, and peeled to look for signs of the insect. **If you think you might have EAB, report it.** Collect and/or photograph any suspect insects. Go to vtinvasives.org and click [REPORT IT](#). Collected specimens can be stored in the freezer. You can also call the EAB hotline at 1-866-322-4512.

Information on "How to Legally Transport Wood Products from New Hampshire and Vermont to Maine" is available at: <https://www.agriculture.nh.gov/publications-forms/documents/eab-ash-in-nh-and-vt-to-me.pdf>.

Management Goals

For landowners within the Infested Area, now is the time to act, as ash trees in these areas are likely to be affected within a few years. However, for landowners outside of the Infested Area, action is not as urgent and there is time to plan ahead, evaluate potential impacts, and develop management strategies accordingly. Forest management should focus on mitigating potential effects of EAB on ecosystem health and stand productivity, and maintaining a diverse forest in both structure and species composition.

The goals of all silvicultural treatments include maintaining site quality, protecting water resources, and attending to forest health and productivity. In intermediate treatments, improving the proportion of acceptable growing stock is a primary objective. Treating an area to reduce exposure to loss by removing ash trees is not a reason to ignore the many other benefits of careful stewardship. With that said, now that EAB has been detected in Vermont, it is prudent to re-evaluate individual forest management goals. Forest landowners should consider incorporating the following long-term management objectives:

- 1) *Maintain ash as a component of the forest;*
- 2) *Promote a diversity of native species;*
- 3) *Conserve the economic value of ash; and,*
- 4) *Slow the spread of EAB.*

The recommendations in this document were developed with timber management in mind. Where timber is not an objective, such as on sites with limited access or sensitive natural communities like forested swamps, seepage swamps or floodplain forests, some management actions may still be warranted. Control of non-native invasive plants in particular may offer significant benefits to sensitive or unique areas. Considerations of ecological consequences of increased light resulting from ash mortality in these natural communities is important. For more information about management of these sites, contact your [county forester](#).



Regeneration of ash trees promotes genetic diversity and is critical to maintaining ash within our forests, which, among many values, is an important food source for wildlife
Photo Credit K. Decker

An abundance of resources are aggregated at vtinvasives.org, including resources that may be helpful for foresters looking to provide information to landowners.

Goal #1 – Maintain ash as a component of the forest.

Management practices that eliminate ash could be as great a threat to ash as EAB itself. Survival of ash species ultimately depends on retaining genes that help trees tolerate EAB infestation, and seedlings or a fresh seedbank to initiate future generations of ash trees.

Though there is substantial mortality in states that have been infested with EAB, some ash trees have survived. It's possible that the next generation will fare better. By the time regenerating trees have grown to 1 inch or more in diameter (large enough to be infested), EAB populations will be lower and introduced natural enemies should be more widely established. Early data on the impact of introduced wasp parasites suggest that these biocontrols help to reduce EAB populations, and could allow the survival of more EAB-tolerant ash.

Within the Infested Area or during management in preparation of the arrival of EAB, ash trees 6-10" DBH or less should be considered for retention wherever their eventual mortality is unlikely to pose safety hazards. Retention of some larger ash trees should be considered as they will contribute to ash seed production and structural diversity. Almost all retained ash trees will likely be killed by EAB. However, during their decline they will continue to produce seed necessary for establishment of ash regeneration, which helps retain genetic diversity within ash populations.

Outside of the Infested Area, the timeframe for planning and action expands and additional considerations may be appropriate. Where the threat of EAB is not imminent and other silvicultural considerations don't preclude it, delayed harvesting may allow for continued growth of ash, likely increasing value while also producing more seed, before eventual harvest prior to EAB infestation.

Small gaps created by ash mortality will often be insufficient to support establishment and growth of the next generation of ash trees. Ash seedlings are somewhat shade tolerant and may survive for a few years in the understory, but saplings are less tolerant and cannot compete under shade. To best support regeneration of ash it is recommended to retain ash as a seed source and create gaps to support the growth of young ash.

Choose Healthy Ash on Good Sites for Retention

- Don't forget silvics. Focus retention on sites where ash species thrive (i.e. deeper soils not prone to drought, areas with calcium enrichment, etc.).
- Uninfested, rapidly growing trees will increase in volume and/or grade.
- Vigorous trees greater than 6" in diameter can produce seed, helping to establish regeneration. Larger diameter ash trees will likely die when EAB arrives, but will continue to produce seed as they decline from EAB.
- Remember that ash are dioecious. Because of variability in timing of flowering of female ash trees and pollen release by male trees, several male ash trees are required for every female for reliable production of ash seed.

Where EAB Has Caused Ash Mortality, monitor the property for healthy ash. Ash that tolerate EAB can be identified when mortality of ash trees exceeds 90%. Retain these trees as they may be valuable in ash breeding programs, so monitor healthy survivors and report possible candidates for breeding.



As the crowns of non-ash species expand following a recent silvicultural treatment, it is unlikely that the eventual mortality of ash will create sufficient light to release the regeneration. If the success of regeneration is desirable, then additional activity may be warranted.



As EAB populations grow, stressed ash trees will be targeted first by EAB, delaying impact to vigorous trees. Some vigorous ash trees should be considered for retention.

Goal #2 – Promote a diversity of native species.

Many woodlands can benefit from a well-planned harvest in which native tree species diversity is maintained or enhanced. This will promote development of a forest that will remain ecologically and economically productive when ash mortality occurs.

Control non-native invasive plants

As ash trees in the overstory die, plants in the understory respond to additional sunlight reaching the forest floor. Focus on establishing desirable species prior to the arrival of EAB. Because ash enriches the sites it occupies and breaks bud late and drops leaves early, conditions beneath ash canopies favor understory development. Cover and abundance of invasive plants tends to be higher beneath canopies of white ash than most other tree species.

- Survey for invasive plants and incorporate invasive plant management strategies into forest management plans.
- Remove new invasive plant populations before they spread. Treatment is cheaper and more effective when populations are still small and isolated.
- Pre-treat invasive plant infestations before conducting timber harvest or salvage activities and after when necessary. The ability of the harvest area to regenerate to forest in a reasonable timeframe may depend on it. For more information on invasive plant identification and treatment visit <https://www.vtinvasives.org/gallery-of-land-invasives>.



Left: Honeysuckle is released in the understory following the death of an overstory white ash in Comstock Park, MI. Center: Overstory ash trees die, releasing the understory in Voorheesville, NY (see right). Right: Common buckthorn thrives beneath the declining overstory of EAB-infested ash trees in New Hampshire, reducing the diversity and resilience of the forest.

- **Promote native tree species diversity in all diameter classes.**
- **Encourage regeneration of a variety of native species.** Release advance regeneration of desirable native species under pockets of ash. Consider silvicultural options for establishing regeneration where appropriate regeneration is lacking.
- Base decisions on accurate, up-to-date stand inventories. When updating management plans include ash regeneration data when collecting inventory data.
- Remove low vigor trees to improve overall stand productivity.
- Where ash exceeds 20% of basal area, reduce the ash component to increase growing space for a variety of species.
- **Outside of the Infested Area:** Residual stand-wide basal area targets should be consistent with appropriate silvicultural guides. Multiple harvest cycles may be appropriate to reduce the ash component to desired levels in stands or portions of stands with high concentrations of ash.
- **Within the Infested Area:** Where non-ash stocking is sufficient, residual stand-wide basal area targets should be consistent with appropriate silvicultural guides **and** should be achieved through retention of the non-ash component; retention of ash is recommended but should be in addition to the residual stocking targets. This will help maintain adequate stocking when the majority of the ash component is killed by EAB.

Goal #3 – Conserve the economic value of ash growing outside of the Infested Area.

Management activity outside of the Infested Area requires thoughtful decisions on how to promote long-term forest health and productivity after the arrival of EAB. Well-timed harvesting can maximize the ecologic and economic potential of ash trees, while preventing losses from EAB and premature harvesting. Frequent monitoring for EAB, in conjunction with a response plan, can enable landowners to respond quickly when EAB is found nearby.

- Small sawtimber trees with good form and vigor have the greatest potential to increase in grade and value. In order to achieve the highest economic value for ash logs, tree DBH must often be 16-20" or larger. For many Vermont mills, the minimum scaling diameter for the top ash sawlog grade is 14-16" on the small end.
- Base diameter objectives on the silvicultural system being used, site quality, stand condition, management objectives, and markets. While specifics will likely change, markets at the time of publishing these recommendations suggest that a clear, straight ash tree that is able to grow from 12" to 16" DBH (possible in 15 years), could nearly quadruple in value.

Goal #4 – Slow the spread of EAB from the Infested Area.

Don't spread potentially infested ash materials. Forestry operations that are timed and executed in a manner that slows the spread of EAB can give other landowners time to respond, the forest time to adapt, and the forestry community time to develop and improve controls of EAB.

SLOW THE SPREAD Recommendations

Material to be Moved	Optimal Practices NON-FLIGHT SEASON October 1 – May 31	FLIGHT SEASON June 1 – September 30
Ash sawlogs	<ul style="list-style-type: none"> • Notify purchaser of origin. • Purchaser utilizes prior to May 31 and treats* bark properly – see <i>recommendations for bark below</i>. 	<ul style="list-style-type: none"> • Delay harvest until October 1. • If harvesting must occur, notify purchaser of origin. Purchaser processes immediately and treats* infested bark properly – see <i>recommendations for bark below</i>.
Ash roundwood (pulpwood, log length firewood, bole wood)	<ul style="list-style-type: none"> • Notify purchaser of the origin. • Move to a purchaser that will process or treat* by May 31. • Do Not sell for use as homeowner-firewood outside the infested area. 	<ul style="list-style-type: none"> • Delay harvest until October 1. • If harvesting must occur, delay movement until after October 1. • If movement is unavoidable before October 1, notify purchaser of origin. Purchaser processes and/or treats* immediately. • Do Not sell as homeowner firewood or bole wood outside the infested area.
Whole tree chips	<ul style="list-style-type: none"> • Notify purchaser of the origin. 	<ul style="list-style-type: none"> • Notify purchaser of the origin.
Bark treatments	<ul style="list-style-type: none"> • Burn in boilers onsite. • Grind before May 31. 	<ul style="list-style-type: none"> • Burn in boilers onsite immediately. • Grind immediately.
Split ash firewood	<ul style="list-style-type: none"> • Do not move ash firewood, that has not been heat treated*, outside the infested area. 	<ul style="list-style-type: none"> • Do not move ash firewood, that has not been heat treated*, outside the infested area.
Visibly infested trees (flaking bark, galleries)	<ul style="list-style-type: none"> • Leave on site or treat as above. 	<ul style="list-style-type: none"> • Leave or treat on site.

Optimal practices are to move ash from the Infested Area only during the "Non-flight Season" for EAB. Movement of visibly infested ash that is not in compliance with the "Slow the Spread" recommendations can be subject to enforcement action from the Agency of Agriculture, Food and Markets.

Consider the risk of moving EAB vs. the economic benefit, especially when harvesting low-value products. EAB can survive for over a year in air-dried firewood, which is a common pathway for EAB to spread beyond its natural flight range.

Recommendations to slow the spread of emerald ash borer can be found at vtinvasives.org. Available resources include Recommendations when Moving Ash from the Infested Area, Processing Options and recommendations specifically targeted for forest landowners and those involved in tree care and clearing.



**For more information,
contact the Forest
Biology Laboratory
at 802-879-5687 or:**

Windsor & Windham Counties
Bennington & Rutland Counties
Addison, Chittenden, Franklin & Grand Isle Counties
Lamoille, Orange & Washington Counties
Caledonia, Orleans & Essex Counties

Springfield (802) 289-0613
Rutland (802) 786-0060
Essex Junction (802) 879-6565
Barre (802) 476-0170
St. Johnsbury (802) 751-0110