

Emerald Ash Borer Presentation Notes

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Hello and thank you for having me today. My name is ___ and I am a volunteer Forest Pest First Detector, a program of UVM Extension and Vermont Department of Forests, Parks & Recreation. Today we'll cover the basics of emerald ash borer, including identification, biology, signs & symptoms, and what you can do to help limit the spread of this invasive species.

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But first, let's review what we mean by invasive species so that we are all on the same page with our terminology.

You can see that to be an invasive species and organism has to meet two requirements. It has to first not be from a local ecosystem, and second, cause some kind of harm to the economy, environment and/or human health.

There are many species of plants and animals in the US that are not from here, are not native, but are not considered invasive because they have found a balance and do not caused significant harm.

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So, what does the emerald ash borer look like?

The adult beetle is only about half an inch long. About the size of a cooked grain of rice. It has a distinctive bullet shaped body, flattened head, and metallic green color.

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Let's take a look at the story of emerald ash borer and how we got to where we are today.

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The emerald ash borer is native to east Asia. In its native range, this insect has co-evolved.

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How did they come to the United States?

The emerald ash borer, like other tree pests, was brought to this country in solid-wood packing material. Once in the country, it has been rapidly moved around by transporting wood material, especially firewood. One of the main things people can do to address the issue of invasive species is to stop moving wood material, such as firewood.

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Emerald ash borer was first discovered in Detroit in 2002 and since then it has spread to over 30 states and 3 Canadian provinces. Each red dot represents a county that has found EAB and the blue line is the legal quarantine area around the infestation.

Now one of the interesting things about this map are the isolated populations in far flung counties like the ones in Colorado and Arkansas. These populations demonstrate that humans are the primary means of transport for the EAB. It is likely that someone brought EAB to Colorado in infected firewood and started a satellite population. Emerald ash borers are not strong fliers, only able to fly an average of 1-2 miles. At that rate it should have taken them over 200 years to get to New Hampshire, but they have gotten there in 12 years, because humans have been giving them a ride.

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Emerald ash borer was confirmed in northern Orange County in February 2018. This is the first emerald ash borer infestation discovered in Vermont. It also has been detected in Caledonia and Washington counties.

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There are numerous species of ash trees in North America, and can be found throughout most of the continental United States. Here in Vermont we have three different species of native ash; white, green and black, along with ornamental ash trees. Ash trees are distinctive by their pinnately compound leaves, opposite twigs, fruit samaras, and grey, diamond shaped bark.

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White Fringtree has been confirmed as an alternate host for the EAB – they are able to complete a full life cycle within the tree.

Before this discovery we thought that EAB only infested the genus of Ash (*Fraxinus*) but white fringtree is in a different genus within the same family (*Oleaceae*). White Fringtree is NOT native to Vermont (it only grows in the wild as far north as NJ) but it is planted as an ornamental in VT.

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The economic impact of the emerald ash borer has been greater than that of any other invasive forest pest in North America. \$10.7 billion spent so far on treatment, removal, and replacement.

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Emerald ash borer kills ash trees by girdling them, leading to almost complete mortality in urban and forested environments. Here is a street scape in Ohio before and after an EAB infestation. An irony of this issue is that in the mid 1900's Dutch elm disease killed almost all of the American elm trees, which were common and beloved street trees in the United States. After they died, ash trees were commonly planted in their stead because ash trees can tolerate the harsh urban environments, grow quickly and provide good shade. In some cities ash makes up to 40% of their urban canopy, so unfortunately many of our communities will experience another deforestation event similar to the Dutch elm disease disaster. Hopefully this time around we can learn from our mistakes and focus on planting a diversity of species in our communities so they aren't as vulnerable to future disease and insect invasions.

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Not only is the emerald ash borer a quick killing insect, but it is a "sure-killer" and kills 99.7% of North American ash trees.

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Here in Vermont ash trees can be found throughout the state. Ash is generally an early successional species, growing well in disturbed areas, wetlands and are commonly found along road ways (in Johnson, 2,200 along backroads). Landscape wide, 5% of trees in Vermont are an ash, over 150 million. In some communities though, it could be upwards of 20-40%.

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These insects will also cause direct expenditure of money in order to deal with the results of their presence. These costs will largely be borne by homeowners and municipal governments. We have been doing ash tree inventories around Vermont to estimate the impact of emerald ash borer and have estimated that...

Burlington: 1,000 ash trees in ROW

Remove and Replace: **\$500,000**

Johnson: 440 ash trees along back roads.

Removal: **\$132,000**

The average cost of removal and replacement of the 1000 ash trees in the Burlington ROW alone is \$500,000-\$600,000. (\$400 removal and stumping plus \$200 replacement)

In Johnson over 2,200 ash trees line the back roads. About 440 of those (20%) are hanging over the road and would be an immediate hazard. If they hired it out (\$300 each) the removal cost would be roughly \$132,000. A town that typically removes a couple trees/year will have a whole lot more hazardous trees to deal with within a short period of time.

Even towns with small, or no, urban areas will have roadside ash growing in the town ROWs that they are legally responsible for under Vermont Tree Law.

Towns will need to respond; at a minimum to remove trees that become public safety hazards.

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In addition to the economic cost, there's an environmental impact. Pheromone trapping has indicated that one species of moth is no longer appearing on ash.

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Before we get any further, let's take a moment and learn how to identify ash trees.

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Ash trees have opposite branching and twigs are very "thick" compared to other tree species.

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Ash trees have distinctive deep diamond grooves.

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Ash trees have compound leaves with 5-11 leaflets and "oar like" samaras.

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The EAB has one generation per year and goes through complete metamorphosis.

The adults lay the egg on the bark of the trunk or branches in the summer.

Eggs hatch in 7-10 days.

EAB larvae do their damage by tunneling in the inner bark and outer wood and that this kills the tree by interrupting the flow of food and water.

Pre-pupae larvae overwinter in shallow chambers in the outer sapwood or in the bark of thick-barked trees.

Pupation begins in late April or May.

Adults chew D-shaped exit holes are 3-4 mm wide.

Adults feed on the tree's leaves between June and August.

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It spends most of its lifecycle inside the tree as a larvae. The larvae are also rather small, growing up to an inch long and are distinctive by the bell-shaped body segments. They live just under the bark of the tree, feeding primarily on the phloem, and cambium layers.

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The bug's life cycle leaves a few marks on the tree that are very distinctive. Under the bark the larvae chew characteristic S-shaped galleries. There are many wood boring insects that feed under a tree's bark, but the S shape of the galleries are characteristic of EAB.

It is this feeding of the larvae that ultimately kills the tree.

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Here are the things to look for, when trying to identify emerald ash borer. We will start with canopy thinning. The upper branches of trees tend to die back first, so a thinning in the top of the crown is characteristic. Ash decline for a variety of reasons, so this is not the only identifying characteristic.

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Stressed ash trees will also start sending out side branches, which are called epicormic branching. Again, this symptom on its own does not indicate emerald ash borer.

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One of the best, most obvious symptoms is intense woodpecker activity as they go after the larvae under the bark. This creates a blanding appearance on the bark that can be visible from the ground.

Because the insect spends most of its life inside the tree and its exit holes are so small, it can be very hard to detect an EAB infestation until it is fairly well established. Detroit didn't notice its infestation for about 10 years.

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Feeding of EAB larvae often leads to bark splits, which exposes the S-shaped galleries.

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The adults exit the tree through D-shaped exit holes that are also characteristic of EAB. These exit holes are very small however, only 3-4 mm, so they are very hard to spot.

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There are a number of native insects to Vermont that are easily confused with the emerald ash borer.

Green Ground beetles, specifically Six spotted tiger beetle on the bottom right, are the most commonly confused species. Remember, emerald ash borer is bullet shaped and only half an inch long.

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If you think you've found the emerald ash borer, please report it on Vtinvasives.org. It is the go-to place for invasive species in Vermont.

