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GUIDELINES FOR PRESERVING TREES IN THE PRESENCE OF THE EMERALD ASH BORER

The emerald ash borer (EAB) is a small (1/3 to ½-inch), bright metallic green beetle (Fig. 1), in the beetle family Buprestidae, native to eastern Asia. Since its detection in the Detroit, Michigan area in 2002, it has rapidly expanded its range and caused the loss of millions of ash trees from the mid-west to New York and south to Tennessee. The EAB only attacks true ash, species in the Genus *Fraxinus*, such as green ash, white ash, and black ash. Range expansion has been attributed to flight by beetles (a few miles per year) assisted by unintended longer distance transport of larvae infesting firewood or nursery stock. In 2010, the EAB was detected in Saugerties, NY on the west side of the Hudson River. This infestation is relatively large and known detections now encompass four counties. More recently, several EAB larvae were detected in girdled, attractive "trap-trees" just on the east side of the Hudson River. The emerald ash borer was detected in Connecticut on July 16, 2012 in the town of Prospect in New Haven County by The Connecticut Agricultural Experiment Station (CAES). Although EAB is still a federal and state regulated pest, the beetle is clearly established in the United States, eradication is impractical, and efforts are now directed towards a slow-the-spread program by limiting the movement of infested ash and related wood materials like firewood and by protecting trees with insecticides. This guide summarizes the experience from researchers and municipal arborists in the Midwest regarding the dynamics of infestation and the ability to preserve valued ash trees.

EAB adults emerge and are active in June and July. Female beetles lay eggs in cracks in the bark on ash. The larvae feed on the inner bark creating serpentine galleries (Fig. 2) that eventually girdle and kill the tree. A heavy infestation can kill the tree in 3-5 years. Their distinctive sinuous galleries get larger as the larvae grow. Fully developed larvae are about 25 – 32 mm long (~ 1 inch), and overwinter doubled over into a J-shape prior to pupating in the spring. Larvae are called flatheaded borers for the greatly expanded but flattened thorax (Fig. 3), in which the head is mostly hidden. They typically require 1 – 2 years to complete development while consuming phloem tissues and outer sapwood under the bark. Newly molted adults chew a D-shaped hole (Fig. 4) to exit the tree.

Ash makes up about 4% of the trees in Connecticut and up to 20% of the urban trees in some communities. Some of these are already under varying degree of decline from a disease and/or other environmental stressors. While three parasitic wasps are being reared, have been released, and have become established in some areas to provide biological control, it is still too early to know what impact these parasitic wasps may have in controlling EAB. A permit for their release has been obtained for Connecticut. Nevertheless, EAB will result in the loss of additional trees, particularly those already under stress and particularly attractive to the beetles. Communities and individual homeowners already face the expense of removing some dead, hazardous ash trees and this will increase with EAB. Once damage symptoms are observed, such as crown dieback in excess of 30% and proliferation of shoots at the base of the trunk, it is not likely that the tree can be saved. However, trees can be treated with systemic insecticides to protect valuable, uninfested trees or control EAB in lightly infested trees before severe injury symptoms are observed. Trees within 15 miles of a known EAB detection or within an EAB quarantine area are those generally considered suitable for treatment.

Individuals and communities should plan ahead to decide what measures they are willing to take to manage their ash resources. Each tree should be analyzed for its value and for the relative cost of removal versus preservation. Ultimately, a plan can be used to optimize the number of preserved trees and to spread out the costs related to EAB infestation over a longer and more manageable interval of time.

Step 1: Inventory the quantity and quality of ash trees on your property. A useful tree value calculator is available online (http://extension.entm.purdue.edu/treecomputer/). Consider a triage process: the following are characteristics that range from placing high value on preserving a tree to considering the tree a current liability. Are the ash trees of historical or special aesthetic value? Does the tree provide shade that is important for reducing air conditioning expenses? Are there other species of trees that would be better suited for the site? Does the tree have structural defects or is already in decline for other reasons that would signal considering removal? Foresters have calculated that an ash tree can provide benefits from shade and reduced need for air conditioning in an urban environment greater than the cost of protecting that tree with a systemic insecticide.

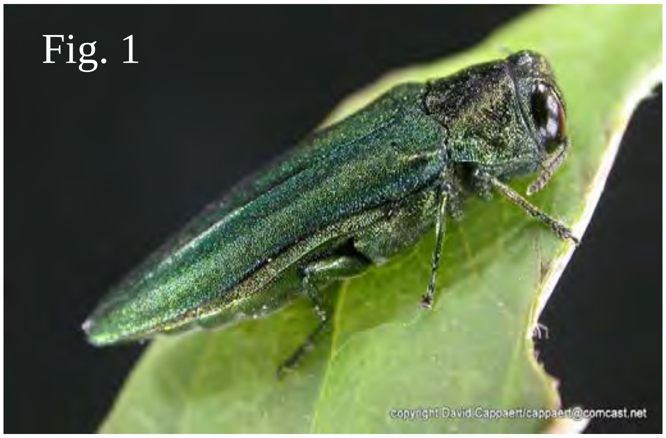
Step 2: Assess the options suitable for preserving trees. Trees can be kept healthy, with judicious and timely use of various insecticides. Options available include contact insecticides (bifenthrin, carbaryl, cyfluthrin, or permethrin) to kill adult beetles as they arrive on the treated plant surfaces, and systemic insecticides, which move throughout the tree in sap to protect phloem from larval feeding. Systemic insecticides also kill adults as they feed on foliage before laying eggs. Contact insecticides are relatively inexpensive and are effective, but usually require hiring arborists with hydraulic sprayers, for which application costs are relatively high. Spraying can lead to hazards to non-target organisms from spray drift; for example, spray landing on open flowers is lethal to visiting pollinators, including honey bees. Contact insecticides can be expected to perform moderately well irrespective of the tree size, as long as the entire tree can be sprayed. Treatment programs with contact insecticides usually involve two sprays, one in late-May and another in early July.

Systemic insecticides include (1) imidacloprid, which is a relatively inexpensive non-restricted insecticide easily applied by a homeowner or arborist as a basal soil drench, (2) dinotefuran, with intermediate cost, applied as a granular soil treatment (homeowner marketed product), basal soil drench or trunk spray, (3) clothianidin, similar in mobility to dinotefuran, but with longer insecticidal effects (not labeled for forest use) or (4) emamectin benzoate, which is a more costly restricted use pesticide that must be applied via trunk injection by a licensed arborist. Systemic insecticides are diluted within the volume of the tree's living tissues, and so effectiveness is known to decrease as tree size increases, unless the dosage of insecticide is adjusted to compensate for this effect. Imidacloprid tends not to be sufficiently effective with products and dosages available to homeowners for protecting trees larger than 15 inches in diameter at breast height; professional arborists have products available that permit higher dosages to be used on larger trees. Imidacloprid moves relatively slowly into trees, and should always be used to prevent infestation; it can be effective if applied in the fall or from April to early May. Springtime application is slightly more effective. Dinotefuran and clothianidin are much more mobile within trees. Dinotefuran has effectively been used later in the season after infestations have been detected. Imidacloprid, clothianidin, or dinotefuran should be applied once per year while there are local threats to infestation. Emamectin benzoate has been the most effective active ingredient to target larvae within trees; a single application can be effective for 2 – 3 years. For extremely large trees, the dilution, even at the highest labeled dosages, of systemic insecticides may be so extreme that the combined use of a contact insecticide spray and systemic treatment may be warranted.

The impact of systemic insecticides on pollinators, especially of native and honey bees, is an important consideration, because ash produces abundant pollen which is avidly harvested by bees in April. The risk to bees from ash trees treated with systemic insecticides has not been quantified. Risk assessment will require knowledge of the insecticide concentration in pollen, the proportion of ash pollen in the bees' diet, and the sensitivity of various stages of bees and the entire colony to these insecticides. Application of the systemic insecticide with the shortest residual (dinotefuran) *after* ash trees have bloomed should minimize the exposure of bees to insecticides and consequently their risk. Imidacloprid and emamectin benzoate are known to be present in significant concentrations in the year following an application. These products and clothianidin may pose higher risk to bees than post-bloom applied dinotefuran, especially where systemic insecticide treated trees constitute a significant early-season pollen source.

Treatment guidelines may change with new research results. To stay informed of the latest information, please see www.emeraldashborer.info/files/multistate_EAB_Insecticide_Fact_Sheet.pdf

The use of trade names of insecticides does not constitute an endorsement of that product to the exclusion of similar products. Always read and follow label instructions.



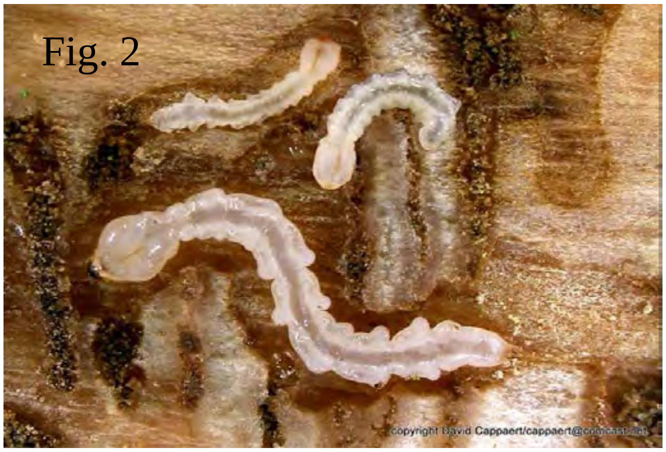


Fig. 1. Emerald ash borer adult

Fig. 2. EAB larvae

Fig. 3. S-shaped galleries formed by larvae

Fig. 4. D-shaped exit hole in bark.

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