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Emerald Ash Borer: A Potential Threat to Idaho Urban Landscapes

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Introduction and Description

THE EMERALD ASH BORER (EAB), *Agrilus planipennis* Fairmaire, is an invasive metallic wood-boring beetle (Order: Coleoptera; Family: Buprestidae) originally native to northeastern Asia. It was first discovered in Michigan in 2002 and has since spread and expanded its range to include thirty-six of the fifty United States and five of the ten southern Canadian provinces (Haack et al. 2002 and United States Department of Agriculture–Animal and Plant Health Inspection Service [USDA-APHIS] 2024). To date, EAB has decimated millions of ash trees in the Midwest, northeast, southern, and western portions of the United States and Canada as it continues to expand its range westward.

Adults are small, bright-green elongated beetles that are ⅓"– ½" in length and 1/16" in width (Figure 1). Adults may also have a blueish or reddish hue. The larvae are white or cream-colored in general appearance with flattened heads and bell-shaped protrusions from abdominal body segments.

Figure 1. Adult emerald ash borer (EAB). Courtesy of John Obermeyer, College of Agriculture, Purdue University.

The larvae can reach a total length of about 1″ when fully mature (Figure 2). Pupae are ½″ in length (about the same size as the adult beetle) and they can be found pupating in the sapwood or directly beneath the bark of infested host trees. Idaho has 102 metallic wood-boring beetle species (Buprestidae), some of which resemble those in the genus *Agrilus*. However, EAB differs physically from these other species, including its size; also, it has a very specific host plant.

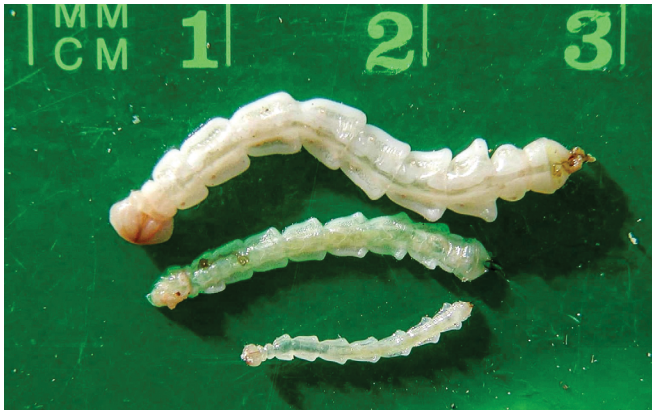

Figure 2. Larvae of the EAB at different stages of maturity. Note the characteristic bell-shaped protrusions on the abdominal segments. Courtesy of David Cappaert, Bugwood.org, CC By-NC 3.0 US, no changes made.

Life Cycle, Host Plants, and Signs and Symptoms of Infestation

An EAB goes through complete metamorphosis (holometabolous development) with four distinct life stages (egg → larva → pupa → adult) typically in one generation per year in temperate regions. Depending mainly upon host-plant quality and environmental conditions, an entire EAB generation may take up to two years to complete the cycle, especially those inhabiting cooler, more northern climates. Adult beetles emerge from distinctive D-shaped exit holes (⅛″ size) in host trees in mid- to late-May, depending upon specific climactic variables (four hundred accumulated degree-days, base temperature = 50°F) (Figure 3).

After emergence, adults minimally feed on ash tree foliage and mate; afterward female beetles lay the eggs in bark crevices on host trees. A single mated female may lay up to two hundred eggs. Eggs mature in a few weeks with larvae chewing through the bark into the phloem and sapwood.

As they feed, larvae leave characteristic S-shaped galleries (Figure 4), which disrupt the upward and downward movement of water, nutrients, and accumulated photosynthates (sugars), eventually leading to extensive tree damage and death. Larvae have a total of four instars, each instar creating a bigger gallery in the cambial tissue before finally pupating in the sapwood or beneath the bark of the host tree. Larvae feed within the tree for one or two years until fully prepared to overwinter as prepupae or as mature pupae the following spring (Figure 5). After pupating, newly formed adults remain in the tree for a few weeks before chewing D-shaped exit holes in the bark through which they emerge and the life cycle repeats. Phenological and emergence forecast models for EAB are available through the USA National Phenology Network (https://www.usanpn.org/data/maps/forecasts/emerald_ash_borer).

Figure 3. The characteristic D-shaped exit hole (⅛″) from an adult EAB. Courtesy of Kathleen Alexander, City of Boulder, Colorado.

Figure 4. S-shaped larval galleries of the EAB in an infested ash tree. Courtesy of Tom Eckberg, Idaho Department of Lands.

Figure 5. The pupa of the EAB within an ash tree. Courtesy of Ryan Bohannon, Graduate Student, Forestry and Environmental Conservation Department, Clemson University.

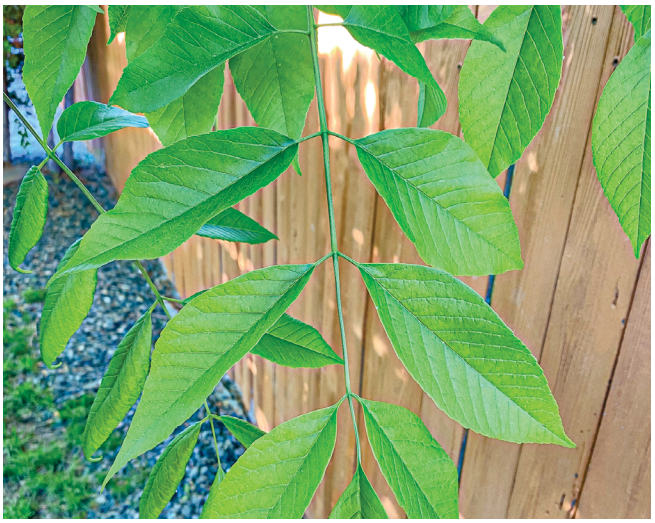

Figure 6. Ash (*Fraxinus* spp.) tree leaf, showing the compound leaf with nine leaflets.

All true ash tree species (*Fraxinus* spp.) are typical targets for EABs. The three most commonly abundant urban and residential ash tree species in Idaho areas include the white ash (*F. americana*), green ash (*F. pennsylvanica*), and black ash (*F. nigra*). Ash trees are readily and easily identifiable by the growth characteristics associated with them. They have branches that grow directly across from each other (opposite branching), compound leaves (typically with an odd number of leaflets, 7–11, Figures 6 and 7), smooth or finely toothed margins on the leaflets, and the presence of samaras (flat, one-seeded "helicopter" wings) during seed set in the fall. Mountain ash (*Sorbus* spp.) is a common tree species planted throughout Idaho forest settings; given it is not a true ash species, it is not a host for EAB.

Figure 7. The finely toothed margin of an ash leaflet.

Symptoms of an EAB infestation in ash trees are notoriously difficult to detect early on. Damage from larvae tunneling through the phloem and sapwood may take a few years to become readily apparent: branch dieback in the upper crown (top of the tree), yellowing (chlorosis) or wilting of leaves, excessive water sprouts (epicormic sprouts) on the trunk of the tree, bark splitting, or, in heavily infested trees, woodpecker damage because these birds seek out numerous larvae as a food source under the bark (Figure 8). Reach out to your local county University of Idaho Extension office, the Idaho Department of Lands, the Idaho State Department of Agriculture, or call (toll-free) the Idaho Invasive Species Hotline (1-877-336-8676) at the first sign of an EAB infestation in a true ash tree.

Figure 8. Ash tree decline from an EAB infestation, starting in the upper portion of the canopy. Courtesy of Kathleen Alexander, City of Boulder, Colorado.

Pest Status, Detection Methods, and Control Options

At press time, no one has yet discovered EAB in Idaho, but in 2022 a biologist reported a sighting in Washington County, Oregon (Cantu-Schomus 2022). The beetle is an extraordinarily destructive invasive insect, in that it ravages extremely valuable ash trees throughout the continental United States. The estimated loss of ash trees to date in the country is 30–90 million trees, equating to a total economic loss of between $20–$60 billion (McPartlan et al. 2006). Despite increased awareness, EAB will almost certainly kill ash trees in urban and suburban environments throughout Idaho, since ash is a popular landscape tree. Idaho has an abundance of ash trees planted throughout the state, typically near suburban or urban areas. These trees are valued at millions of dollars and are at serious risk from attack and destruction by EAB.

Since EAB's introduction, it has rapidly spread throughout the country by human-vectored mechanisms, most presumably the movement of infested firewood or by other means. Adults are moderately good fliers and can distribute their population across a wide range (a few hundred yards to over twelve miles), but naturally this occurs at a much slower pace than US scientists observed in 2006 (Taylor et al. 2010).

Early detection of EAB is difficult. **Pheromone (bait/lure) traps** exist on the market and are readily available, but they are not as effective as other means of detection. Consequently, pheromone trapping for EAB has been limited in Idaho. However, **branch sampling**, which involves peeling and inspecting pruned ash tree branches, is a superior method for early detection of EAB infestations, even in asymptomatic ash trees. The sampler whittles back branch bark in 1 mm strips and then looks for the identifiable S-shaped galleries to confirm infestation. More branch-sampling details and educational information can be found at https://linktr.ee/eabinfo.idl. **Cultural-control** options can also be helpful and include not moving firewood, logs, or nursery stock that are infested as well as the timely removal of EAB-infested trees. Additionally, planting landscape trees that are not ash is a recommended cultural-control tactic.

Biological control agents for EAB exist—tiny, specialist parasitoid wasps that prey on and kill EAB eggs or larvae. Four wasp species (*Oobius agrili*, *Tetrastichus planipennisi*, *Spathius agrili*, and *S. galinae*) have been studied for quarantine regulations and intentionally released by USDA-APHIS into known infested EAB areas since 2007 (USDA-APHIS 2024). In combination with other Integrated Pest Management tactics, the biological control agents have established, parasitized, reproduced, and increased their biological-control populations. Another important EAB biological control are woodpeckers, which prey on EAB larvae in heavily infested trees. Although biological controls like parasitoid wasps and woodpeckers don't protect an individual tree from EAB, they lower total populations in an area, potentially slowing overall ash tree mortality and EAB spread over a large geographical area.

Although large-scale control options for EAB are limited, a number of insecticides for individual tree protection against EAB are available. Those approved for use by homeowners include preventive systemic soil drenches, granular insecticide treatments around the drip line, systemic basal bark sprays, and contact insecticides, all of which may protect the tree from larvae that have hatched from eggs on the bark. Professional applicators also offer several formulations of effective tree-trunk injections. Contact your local county UI Extension office for more details and recommendations about specific insecticides and their active ingredients. More information on insecticide options for EAB control can also be found at https://www.emeraldashborer.info/documents/Multistate_EAB_Insecticide_Fact_Sheet.pdf.

Further Reading

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