

Wood Boring Insects of Ash Trees

Ash is one of the most widely planted trees in Colorado, with most plantings either involving green ash (*Fraxinus pennsylvanica*) or white ash (*F. americana*). Several insects are associated with these plants, including leafcurling aphids, various caterpillars and sawflies that chew the leaves, and wood borers and bark beetles that develop within the trunk and limbs of the tree.

The wood borers and bark beetles can be particularly difficult to identify since there is minimal evidence of their activity on the surface of the plant and there is some overlap in the injuries that different species produce. Furthermore, there is increased interest in these insects since the discovery of a new wood borer, the emerald ash borer, in central Boulder in September 2013. With the addition of this species there are six types of wood boring insects that may be found in ash trees growing in Colorado: lilac/ash borer, flatheaded appletree borer, emerald ash borer, redheaded ash borer, pigeon tremex and the ash bark beetles.

Major Wood Borers of Ash

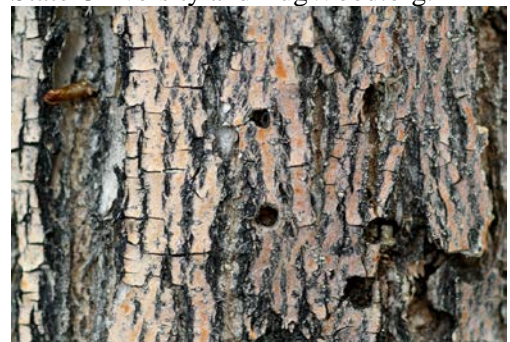
Lilac/ash borer. The lilac/ash borer (*Podosesia syringae*) is a native insect to North America and is the most commonly encountered wood borer in ash throughout Colorado. It is a type of moth in the “clearwing borer” family Sesiidae.

Adults of this insect emerge from trees during warm days in mid spring. In warmer areas and during warm seasons emergence may begin to occur in April, although the adults are more commonly encountered in May and early June. After mating, the females will lay eggs in cracks on the bark of ash trees. Most egg laying is concentrated in the lower trunk, sometimes extending into the lower scaffold limbs and a bit above. Lilac/ash borer adults do not possess chewing mouthparts so they do not feed on leaves.

Upon egg hatch the newly emerged larvae tunnel into the trunks or limbs producing irregular gouging wounds just under the bark. Later stage larvae may extend the tunnels deeply into the trunk and lilac/ash borer will produce more generalized riddling of the trunk and limbs than do the other borers associated with ash. Larvae of lilac/ash borer are cream colored with a dark head and can be distinguished from the other wood borers by a series of short, paired prolegs on the underside of abdomen, each tipped with a series of small hook (crochets).



Larva of the lilac/ash borer. Photograph courtesy of David Cappaert/Michigan State University and BugWood.org.



Exit holes produced when the adult lilac/ash borer emerges in spring.

External symptoms of lilac/ash borer injury often include some areas of swelling on the trunk and some epicormic branching. Also, when adults emerge from the tree the pupal skin is often pulled out and will remain for some time partially extruded from the trunk. The hole through which the adults emerge is generally round and somewhat irregular. Late stage larvae may also expel sawdust from the hole in the trunk, and lilac/ash borer is the only wood boring insect on ash that produces sawdust visible on the outside of the trunk.



Pupal skin of the lilac/ash borer extruding from exit hole in trunk.

Emerald ash borer. The emerald ash borer (*Agrilus plannipennis*) is an introduced insect to North America and is native to Asia. It is a type of beetle in the “flatheaded borer” (larval name) or “metallic wood borer” (adult name) family Buprestidae.

Adults of this insect emerge from trees during May and June, cutting their way through the bark. They then move to the crown of ash trees and for a period of weeks will feed on the foliage. After mating and maturation of the eggs, the females will lay eggs on the surface of the bark of ash trees. Originally, most egg laying is concentrated in the upper crown of the tree and areas near branch crotches appear to be a favored site of egg laying. Later, as the infestation



Larva of the lilac/ash borer showing prolegs tipped with hooked crochets on the abdomen. Photograph courtesy of Stanton Gill/University of Maryland.



Larva of the emerald ash borer. Photograph courtesy of David Cappaert/Michigan State University and BugWood.org.



D-shaped exit hole produced by emerald ash borer (and flatheaded appletree borer). Photograph courtesy of David Cappaert/Michigan State University and BugWood.org.

elongate and somewhat flattened body.

As emerald ash borer infestations progress a thinning of the crown is one of the more easily observed external symptoms. Epicormic branching may also occur. Also present are D-shaped exit holes in branches and, in advanced stages, the trunk that are cut by the emerging adults. No external sawdust is expelled by emerald ash borer.

progresses, the tree is more extensively colonized and egg laying will occur on the all areas of the trunk and larger limbs.

Upon egg hatch the newly emerged larvae tunnel into the trunks or limbs. Feeding occurs shallowly, in the cambium, although they may be found as deeply as about ½-inch below the bark. Tunnels have a meandering form, gradually increasing in diameter as the insects grow, and are packed with fine sawdust-like excrement (frass). Just prior to pupation the larvae bore a bit more deeply into the trunk and form a cell within which they will pupate, head end facing outward. Larvae of emerald ash borer are cream colored, have a small head with pronounced dark jaws, feature a slightly flattened area behind the head, and have a very



Meandering tracks produced during larval feeding of the emerald ash borer. Photograph courtesy of Eric Day/VPI & SU and BugWood.org.

Minor Wood Borers of Ash

Flatheaded appletree borer. The flatheaded appletree borer (*Chrysobothris femorata*) is a native insect to North America and is associated with several hardwood trees in Colorado including oak, maple, ash, and apple. It is a type of beetle in the “flatheaded borer” (larval name) or “metallic wood borer” (adult name) family Buprestidae – as is the emerald ash borer.

Adults of this insect emerge from trees during May and June, cutting their way through the bark. They then move to the crown of ash trees and for a period of weeks will feed on the foliage. After mating and maturation of the eggs, the females will lay eggs on the surface of the bark of host trees, with egg laying concentrated on limbs that are showing decline or injury.

Upon egg hatch the newly emerged larvae tunnel into the trunks or limbs. Feeding occurs shallowly, in the cambium. Tunnels have a meandering form, gradually increasing in diameter as the insects grow, and are packed with fine, somewhat granular, sawdust-like excrement (frass). Just prior to pupation the larvae bore a bit more deeply into the trunk and form a cell within which they will pupate. Larvae of the flatheaded appletree borer are cream colored, have a small head with pronounced dark jaws, feature a broadly flattened area in the behind the head, and have a very elongate and somewhat flattened body. The broad area behind the head, wider in the flatheaded appletree borer, can generally be used to distinguish this insect from emerald ash borer. However, when the question of proper identification of flatheaded borers in ash is necessary, larvae should be sent for expert identification.



Larva of a flatheaded appletree borer.
Photograph courtesy of James Solomon/USDA-FS and BugWood.org.



Exit holes produced by flatheaded appletree borer.



Tunneling in a dying ash limb produced by larva of the flatheaded appletree borer.

Redheaded ash borer. The redheaded ash borer (*Neoclytus acuminatus*) is a native insect to North America. It is a type of beetle in the “roundheaded borer” (larval name) or “longhorned beetle” (adult name) family Cerambycidae. The redheaded ash borer develops in a wide range of hardwood and, despite its common name, is infrequently found in ash; fruit trees are more common hosts of this insect in Colorado.

Adults of this insect emerge from trees from June through August, cutting their way through the bark. They feed for a brief period on foliage of host plants and, after mating and maturation of the eggs, the females will lay eggs in small pits that they chew into the bark of host trees.

Upon egg hatch the newly emerged larvae tunnel into the trunks or limbs. Feeding occurs deeply into the wood, producing riddling that may extend into the center of the plant and these tunnels are semicircular in cross section. Larvae of the redheaded ash borer are cream colored with a small head marked with pronounced dark jaws. The general body form is somewhat cylindrical. They can be distinguished from larvae of the lilac/ash borer in that they lack the small prolegs on the underside of the abdomen.

In ash trees flatheaded appletree borer is almost entirely restricted to limbs that are previously injured or in decline and it is not a primary pest of ash. Adults also produce D-shaped exit holes in branches which resemble those made by emerald ash borer.



The redheaded ash borer is an insect found in many kinds of hardwoods in decline or that have been recently killed. Larval picture (above) by Dan Herms/The Ohio State University; Adult photograph (lower) by David Leatherman.

Redheaded ash borer is almost entirely restricted to ash trees that are seriously injured or in advanced decline and it is not a primary pest of ash. Adults produce generally round, slightly semicircular, holes when exiting through the bark.

Pigeon tremex. The pigeon tremex (*Tremex columba*) is a native insect to North America. It is a type of wood boring wasp in the horntail family Siricidae. The pigeon tremex develops in a wide range of hardwood trees that are in advanced stages of decline, including elm, maple, and ash.

Adults of this insect emerge from trees in midsummer. The females, which are large, brown cylindrical bodied wasps, can sometime be observed as they search the bark of host plants. Periodically females will drill into trees with a long ovipositor and, when the plant is suitable, will lay eggs into the wood. Pigeon tremex also introduces white rot fungi when laying eggs, which will produce decay in the area where the young wasps develop.

Feeding occurs deeply into the wood, producing riddling that may extend into the center of the plant and these tunnels are round in cross section. Larvae of the pigeon tremex are cream colored with a cylindrical body. The head is large, compared to the other wood borers, but, except for the jaws, it is not darkened.

Pigeon tremex is restricted to ash trees that are in advanced decline and it is not a primary pest of ash. Adults produce round, smoothly cut holes when exiting through the bark.



Larvae of the pigeon tremex, a type of horntail wasp.



Perfectly round exit holes are produced when the adult of the pigeon tremex horntail emerges from the trunk.

Bark Beetles

Ash bark beetles. Three species of ash bark beetles (*Hylesinus* species) are associated with ash in Colorado. Bark beetles are members (subfamily Scolytinae) of the “snout beetle” or “weevil” family Curculionidae. At least three species occur in Colorado, *Hylesinus californicus* appears to predominate in the western areas and *H. aculeatus* in the east. In addition, *H. criddlei* has been found in several eastern Colorado locations.

Adult bark beetles cut egg galleries under the bark and larvae tunnel perpendicular to the gallery. These injuries can girdle and sometimes kill branches. On rare occasions entire trees are killed by these insects. Injured limbs and heavily shaded branches in the interior of the tree are most commonly attacked. Transplanted trees can be at special risk. Ash bark beetles may infest almost the entire tree, from finger-diameter branches to the main trunk.



Exit holes produced by ash bark beetles.



Larval galleries produced by ash bark beetles.

Egg galleries run across the grain and often have two "arms" with a central chamber in the middle. Also characteristic of these insects are that small "ventilation holes" perforate the bark above the egg galleries. The tunnels are almost invariably colonized by fungi that stain the wood a rich brown color around the feeding sites. The larvae are pale, legless grubs that develop by feeding under the bark. Sap may ooze from wounds in twigs, staining the bark.

Overwintering can occur as either late-instar larvae under the bark or as adults that winter within niches cut into green bark of the outer trunk. Adults begin to become active in early to mid-spring and females construct girdling tunnels under the bark that may encircle twigs and small branches. During this tunneling small ventilation holes are also constructed through the bark surface that are visible; sap may ooze from the wounds. These tunnels are the main egg galleries characterized by running at right angles to branch length. Brown wood-staining fungi are commonly associated with the galleries.