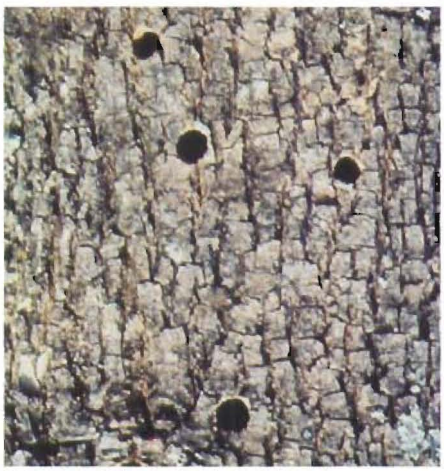
Borers of Landscape Trees

by John C. Fech and Frederick P. Baxendale

Borers are the invisible pest, because the damaging life stages are inside the tree and the adults are rarely seen. Most commonly, the visible evidence of borer damage is only seen when a dead tree is cut down and the bark is peeled off. Under the bark, winding borer tunnels or galleries are noticeable. Through their feeding, the borer larvae have destroyed the cambium layer, preventing translocation of water and nutrients throughout the tree.

Unfortunately, tree-boring insects are rarely benign. Because of the damage they do (destroying the transport system of the tree) and where they do it (usually the trunk and lower scaffold branches), recovery from a borer infestation is quite difficult. Borer management requires a comprehensive approach, proper timing of control measures and persistence.



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Exit holes of the redheaded ash borer.

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Borers tend to seek out weakened trees. They do this through various methods, including chemo-receptors to sense changes in plant chemistry and acoustic receptors to detect the sounds of collapsing cells and breaks in stem water columns. In addition, the bark, sapwood and heartwood of trees with internal decay or cankered stems have softer tissues than healthy trees, making it easier for borers to become established.

Considering their tendencies, it makes good pest management sense to minimize stressful growing conditions for your client's trees. When trees are planted in soils containing appropriate amounts of organic matter, humus and nutrients, as well as having good porosity and suitable pH levels, they are better able to resist borer attack. Location in the landscape is crucial, as well. Trees growing in locations with limited root systems are more likely to become infested, such as within 5 feet of a house foundation or close to a driveway.

Likewise, it's best to keep trees healthy by providing proper care. This involves providing the appropriate amounts of water, nutrients and mulch. Too much or little of any of these can cause the tree's defense system to weaken and become more susceptible to borer infestation.

Many drought-related factors are responsible for increased borer susceptibility, including high temperatures, sound emissions of cell disruption, increased concentration of sugars and increased minerals (Mg, K, Ca, Cl) in plant tissues. Trees that are adapted for low optimal levels of nitrogen (most landscape trees) often are overdosed by well-meaning homeowners and unscrupulous arborists. When this occurs, the resulting growth is sugar-rich and weak, making it highly attractive to insects, including borers.

PHOTO BY JAMES KALISCH, UNL

Emerald ash borer tunneling damage.

Borer control

Borer control is best accomplished in four distinct phases:

1. Prevention: Select well-adapted trees and promote tree health.

2. Inspection: Regularly inspect your client's trees for possible insect infestations and other problems.

3. Sanitation: Trees that have been infested with borers can be pruned to remove injured limbs of shade trees. Look for dead and dying branches with wilted leaves, 1/8 to .25-inch holes, and coarse, sawdust-like debris.

4. Insecticide applications: Apply products as preventive or rescue treatments.

There are two basic insecticidal approaches for borer control: preventive treatments to reduce the risk of future borer infestations and rescue treatments applied after the tree is infested. These treatments can be applied as trunk sprays, soil applications around the base of the infested tree or as injections directly into the tree trunk. Each of these application methods requires specific product formulations and application techniques.

For trunk sprays, liquid formulations containing bifenthrin, carbaryl, chlorantraniliprole, chlorpyrifos (nursery only), cyfluthrin, dinotefuran, endosulfan and permethrin should be applied to the bark to the point of runoff from ground level up to, and including, the bases of the lower branches.

Systemic soil treatments containing chlothianidin, imidacloprid or thiametham can be applied as a drench around the base of the tree. These materials are absorbed by the roots and move systemically through the conductive vessels of the tree or shrub. This approach can be effective for borers already in the tree, but feeding by borers may have destroyed the conductive vessels, limiting product uptake.

A third approach involves injecting the insecticide directly into the inner tissues of the tree trunk. Unfortunately, trunk injections can cause injury to the tree when the insecticide is inserted through the bark. Insecticides labeled for tree injection include acephate, dicrotophos, emamectin benzoate and imidacloprid.

PHOTO BY BARRY LYONS, CANADA FOREST SERVICE

An adult emerald ash borer.

Common borer species

Redheaded ash borer (*Neoclytus acuminatus*): This roundheaded borer attacks several species of shade trees, but causes the most serious damage to green ash. The adult is a long-horned beetle that is .5 to 1 inch long and reddish-brown to black with transverse white or yellow stripes on the wing covers. They are attracted to weakened trees where they deposit eggs in cracks in the bark. The newly hatched larvae initially feed under the bark and later tunnel into the sapwood. The redheaded ash borer has a one-year life cycle.

Cottonwood borer (*Plectrodera scalator*): Cottonwood borers infest the trunks of cottonwood and willow trees. Adults of this long-horned beetle are 1 to 1 3/8 inch long and black with numerous patches and transverse white stripes. Beetles emerge in late spring and early summer and feed on tender, new shoots of young trees. They deposit eggs in openings chewed into the bark at the bases of trees below the soil line. The larvae burrow into the bases and roots of trees, pushing out frass, a sawdust-like excrement, at the entry points. Cottonwood borers generally have a two-year life cycle.

Poplar borer (*Saperda calcarata*): This borer attacks cottonwood, poplar and willow trees. The adults are approximately 1 inch long and are dark gray with small orange spots on the wing covers. They emerge in summer and lay eggs in slits cut in bark, usually near the middle portion of trees. The larvae, which are white and about 1.25 inch long, bore into the heartwood. They take about three years to mature. Damage appears as swollen areas on trunks and larger branches. Holes where larval excrement is pushed out and where adults have emerged are also signs of infestation.

Pine sawyers (*Monochamus spp.*): This group of long-horned beetles is relatively common, with several species in the group. Adults are mottled gray and brown. Sawyers get their name from the noisy, saw-like sound that feeding larvae make as they gnaw away at the wood, producing coarse fragments that they often pack into their galleries or may push outside. Adults emerge continuously during the summer, and all stages of the life cycle are present throughout the growing season. This makes the timing of control actions difficult. As feeding beetles chew into the bark of both healthy and weakened trees, they transmit the immature stages of pine wood nematodes, causing the pine wilt disease that has destroyed plantings of Scotch and other pines in the Midwest and southern Plains states.

Bronze birch borer (*Agrilus anxius*): Adult borers are slender, metallic-coppery beetles about 3/8 inch long. Larvae exist underneath the bark and are white, segmented, legless grubs with an enlarged area behind the head. They are about .5 inch long when mature. When a tree initially becomes infested, the foliage on some branches in the upper crown begins to yellow in midsummer, which progresses to browned or dead leaves. This results in the death of smaller branches in the upper crown. Over time, large branches begin to die back, and eventually the entire tree may die. After repeated feeding activity, ridges begin to appear on the bark of the trunk and larger branches as the cambium tissue is damaged.

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A good indicator of bronze birch borer activity is when D-shaped exit holes where adult borers have emerged from the tree begin to appear on the trunk and larger branches.

Emerald ash borer (*Agrilus planipennis*): The EAB is an exotic, .5-inch-long, metallic-green beetle from Asia that has already destroyed over 30 million ash trees in the upper Midwest since its introduction in 2002. Nearly all ash species are susceptible to EAB. An early sign of infestation is the appearance of weak and dying stems and branches in the crown of the tree. Closer inspections will reveal 1/8-inch D-shaped holes on the trunk where adult borers have exited and zigzag tunnels packed with frass (insect excrement and sawdust) under the bark. Later symptoms may include water sprouts and suckers around the trunk, split or loose bark and increased woodpecker activity. While most borer species are only attracted to weakened or dying trees, EAB will attack young and old, healthy and stressed trees. EABs generally have one generation a year, but may require two years to complete their life cycle in cooler regions.

Lilac and ash borers (*Podosesia spp.*): Adults of both of these species are day-flying, clear-winged moths that resemble wasps. Ash/lilac borers spend the winter as larvae in the heartwood and sapwood of infested trees and shrubs. In spring, they change into pupae, and eventually emerge as moths with a wing span of about 1.5 inches. After mating in June and July, females deposit their eggs in cracks and crevices in the bark. The newly hatched caterpillars bore into the tree trunk or lower scaffold limbs. On some trees, a sawdust-like material can be found around the entrance holes. When a tree is repeatedly infested, the bark swells and cracks, causing the limb or trunk to become weakened at the feeding area. If the summer rains are inadequate or the customer fails to water properly, it's not uncommon for terminal shoots of infested plants to wilt. There is one generation per year.

Pine moths (*Dioryctria spp.*): Pine moth caterpillars cause significant damage to Scotch, Austrian and red pines. The first obvious symptoms are the presence of large resin or pitch masses on the tree trunks where the larvae are feeding beneath the bark. Pitch masses are usually golf ball size and are usually located at branch whorls where the branches join the main trunk. Fresh pitch masses where the larvae are active will be white, soft and shiny. Pitch masses from earlier generations will be hard, gray and dull. In mid to late summer, females lay their eggs on tree trunks, usually near wounds such as old borer damage or yellowbellied sapsucker feeding holes. The larvae hatch from the eggs by late August and crawl under loose bark scales or into wounds to spend the winter. In spring, the larvae enter the bark and feed for the next few months. Full-grown larvae are about .75 inch long, have a brown head with pink to greenish bodies covered with numerous tiny dark spots. In late summer, the larvae pupate at the end of the larval tunnel and two weeks later emerge as moths to start the cycle over.

Carpenterworm (*Prionoxystus robiniae*): Cottonwood and ash are the preferred hosts, but this insect will attack many shade and fruit trees and shrubs. Adult moths are active from June through July. Female moths deposit their eggs on the bark of trees, usually on the lower trunk. After hatching, young carpenterworms tunnel directly into the inner bark and later bore into the heartwood. Heavily infested trees are structurally weakened and may be broken during high winds. The caterpillars require more than one year to complete their feeding and may be up to 2 inches long at maturity.

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