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Insect Borers of Trees and Shrubs

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Wood-boring insects are among the most destructive pests of ornamental trees and shrubs. Borers are the larvae, or immature stage, of certain moths and beetles. They tunnel and feed under the bark in living wood, destroying water- and sap-conducting tissues. This causes girdling, branch dieback, structural weakness, and decline and eventual death of susceptible plants. Infestation sites also provide entry points for plant pathogens.

Clearwing and flatheaded borers are the two main types that attack woody ornamentals. These groups differ somewhat in their habits and host preferences, but similar management tactics are used for both. The keys to controlling these pests are to keep plants healthy and, if necessary, to treat during those brief times of the year when the insects are vulnerable to insecticides.

Infestation and Damage

Borers rarely infest healthy plants growing in their natural environments. However, when trees or shrubs are transplanted into the landscape, stresses such as drought, soil compaction, sun scald, or injuries can weaken them and make them more susceptible to attack. Research has shown that the adults may locate suitable egg-laying sites by responding to volatile chemicals that emanate from stressed trees.

Adult borers emerge from infested trees in the spring or summer. After mating, the females fly to a suitable host and lay eggs on the bark, often in crevices or around wounds. Hatching occurs about 10 days to 2 weeks later, and the young larvae quickly tunnel beneath the bark where they feed and grow. Once inside the tree, borer larvae are no longer vulnerable to insecticide sprays and are seldom detected until serious damage has been done.

Several species of clearwing and flatheaded borers can infest landscape plants. While some are attracted to a wide range of hosts, most attack only particular kinds of trees and shrubs. In order for treatment to be effective, it is important to know when the adults of each species are active and which plants are vulnerable.

Clearwing Borers

Adult clearwing borers are delicate, day-flying moths that resemble small wasps. The moths feed only on nectar or not at all, so they do not cause damage. The larvae are whitish, hairless caterpillars with a brown head. There are a number of different species, but the most damaging clearwing borers are associated with dogwood, lilac, ash, oak, rhododendron, and ornamental *Prunus* species, including flowering peach, plums, and cherries.

Detection

Early signs of clearwing borer infestation are off-color foliage, wilting of terminal shoots, and crown dieback. Infestation sites often are marked by cankers, calluses, or cracked bark. Large limbs may die or become so weakened that they are easily broken in the wind. Established trees may persist in poor condition and be reinfested year after year.

Clearwing borers expel coarse, brown frass (sawdust-like fecal material) from cracks in the bark. In some hosts, especially

Figure 1 a, b. Symptoms of clearwing borer infestation include crown dieback (a) and coarse, sawdust-like frass exuding from cracks in the bark (b).

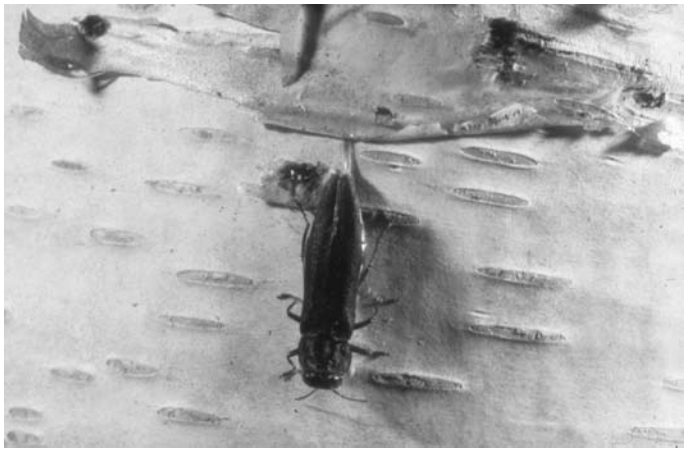

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Figure 2a, b. Clearwing borer moths, such as this adult dogwood borer (a), resemble a stinging wasp. Flatheaded borer adults, such as this bronze birch borer (b), are beetles.

Prunus species, the frass may be mixed with oozing sap or gum. When the adult moths emerge, they leave behind an empty, tan-colored shell (the pupal skin) that protrudes from the bark. Feeding holes left by woodpeckers or other birds may indicate that a tree is infested with borers.

Insecticides

Bark sprays with pyrethroids will provide good preventive control of clearwing borers on woody ornamentals. Onyx® (bifenthrin) and Astro® (permethrin) work well; Talstar® (bifenthrin) also can be used. Some Dursban formulations (an organophosphate) can still be use in commercial nurseries. Read and follow all label directions. The trunk and main scaffold limbs should be sprayed to runoff, but the foliage need not be sprayed. Systemic insecticides, applied either as injections or as soil treatments, generally have not given reliable borer control.

Application Timing

Because the insecticides currently registered for borer control have limited residual toxicity, spray timing is crucial. The spray residue must be on the bark during the brief period between egg hatch and the borers' entry into the tree. This assures that the newly hatched larvae receive a lethal dose as they crawl over or tunnel into the treated bark.

Table 1 includes a list of approximate spray treatment dates based on several years of monitoring borer flight periods in Kentucky. In any given year, these target dates may vary by days or weeks, depending on spring temperatures (i.e., earlier treatment dates in warmer years, later in cooler years). Since both plant and insect development are temperature-dependent, the bloom times of other plants in the landscape often are more accurate scheduling tools for spraying than calendar dates. These so-called "indicator plants" (which are listed in Table 1 under particular borer species) can further aid in scheduling insecticide applications.

Synthetic sex attractants are also available for monitoring the appearance of important clearwing species. These chemicals mimic the scent or pheromone produced by the virgin female moth when she is ready to mate. Male moths detect the airborne scent from a considerable distance, and they follow the chemical trail upwind to its source.

Sticky traps baited with these synthetic pheromones reveal when adult borers are in flight, which allows fine-tuning of spray schedules. Trapping does not increase risk of infestation because only males are attracted. Commercial trap kits come with several cardboard traps, instructions, enough bait to last a season, and picture keys for distinguishing the various captured borers. Some borers respond to particular baits, so when ordering traps, specify the borer or tree species that concerns you. [Pheromone traps are available from: Gempler's, P.O. Box 270, 211 Blue Mounds Road, Mt. Horeb, WI 53572 (1-800-382-8473); Great Lakes IPM, 10220 Church Road NE, Vestaburg, MI 48891 (517-268-5693).]

Hang the trap in a convenient tree or shrub in early spring, and check it weekly until flight begins. Apply your spray 10 to 14 days after the first males are caught, which will coincide with the beginning of the larval hatching period. This provides a protective residue that intercepts the young borers before they can tunnel through the bark. Apply a second spray if males are still being captured after 6 weeks.

Types of Clearwing Borers

The **dogwood borer**, *Synanthedon scitula*, prefers flowering dogwood *(Cornus florida)* as its host. Infestations in young trees usually occur in the main trunk, often around lawn mower injuries. Infestations in older trees are likely to be higher up in limb crotches or main limbs and associated with pruning scars, cankers, or cracked bark. Dogwood trees planted in the sun are more susceptible than trees in the shade. Symptoms include dieback of branches and coarse, sawdust-like frass expelled from cracks in the bark. This insect species is widely distributed wherever dogwoods are cultivated. Optimal spray timing based on calendar date is about late May to early June; spray timing based on indicator plants is about a month after flowering dogwood comes into full bloom, or about 1 week after first bloom of Washington hawthorn *(Crataegus phaenopyrum)*, little-leaf linden *(Tilia cordata)*, or northern catalpa *(Catalpa speciosa)*.

The **lilac borer**, *Podosesia syringae*, is a severe pest of lilac, ash, and privet throughout the United States east of the Rockies. Most infestations occur from the root crown up to about 3 feet. This species begins to fly in late April or May. A single spray, applied about a week after common lilac *(Syringa vulgaris)*, flowering dogwood *(Cornus florida)*, or Sargent crab apple *(Malus sargentii)* is in full bloom will protect susceptible plants from infestation.

The **banded ash borer**, *Podosesia aureocincta*, attacks only ash, especially green ash *(Fraxinus pennsylvanica)*, from ground level up to 9 feet or more. The adults resemble lilac borers and may be monitored with the same pheromone lures, but they are active in August and September—well after the lilac borers' flight is finished. Banded ash borer can be controlled with a single spray in late August. To prevent infestation by lilac borers, ash trees may need to be sprayed in spring as well.

The **peachtree borer**, *Synanthedon exitiosa*, and the lesser peachtree borer, *Synanthedon pictipes*, are pests of peach, plum, cherry, and other *Prunus* species, including both fruit and ornamental varieties. Peachtree borer larvae attack mainly young trees, feeding under the bark from the root crown to about 2 feet above ground level.

The **lesser peachtree borer** prefers older trees, infesting the upper trunk and main branches, often around wounds, cankers, or other damaged areas. It is less likely than the peachtree borer to be a primary pest. Infestation sites are marked by accumulations of coarse, brown frass mixed with sap and gum.

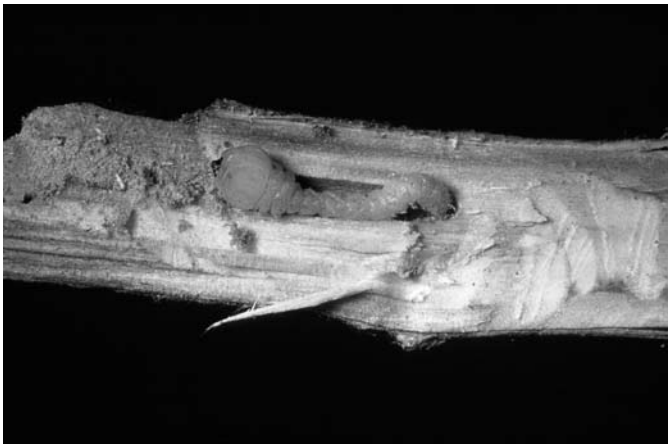

Figure 3. The flatheaded appletree borer larva makes winding tunnels beneath the bark, destroying the phloem, cambium, and outer xylem and girdling the trunk of young trees.

Because these borers have long flight periods, two sprays are necessary to prevent infestation. Apply the first spray for the lesser peachtree borer about 2 weeks after first bloom of Kousa dogwood *(Cornus kousa)* or Winter King hawthorn *(Crataegus viridis)*, or 1 week after full bloom of doublefile viburnum *(Viburnum plicatum* var. *tomentosum)*. For the peachtree borer, apply the first spray about 2 weeks after first bloom of southern magnolia *(Magnolia grandiflora)* or a week after full bloom

Table 1. Spray Schedule for Tree Borers

Borer	Principal hosts	Number of treatments[1]	Treatment Timing	
			Calendar Date[2]	Indicator Plants[3]
Dogwood borer	Flowering dogwood	1	May 31-June 4	Flowering dogwood—1 month after full bloom Washington hawthorn—1 week after 1st bloom Little-leaf linden—1 week after 1st bloom Northern catalpa—1 week after 1st bloom
Lilac borer	Lilac, privet, ash	1	May 8-12	Common lilac—1 week after full bloom Flowering dogwood—1 week after full bloom Sargent crab apple—1 week after full bloom
Banded ash borer	Ash	1	August 20-24	
Peachtree borer	Peach, plum, flowering cherry	2	June 18-22 July 30-August 4	Southern magnolia—2 weeks after 1st bloom Little-leaf linden—1 week after full bloom Oakleaf hydrangea—1 week after full bloom
Lesser peachtree borer	Peach, plum, flowering cherry	2	May 11-15 July 5-9	Kousa dogwood—2 weeks after 1st bloom Winter King hawthorn—2 weeks after 1st bloom Doublefile viburnum—1 week after full bloom
Bronze birch borer	White birch	2	May 18-22 June 10-15	Washington hawthorn—1st bloom Little-leaf linden—1st bloom Northern catalpa—1st bloom
Flatheaded appletree borer	Various trees, especially flowering crab apples, hawthorn, red maple	2	May 22-26 June 18-22	Southern magnolia—1st bloom Washington hawthorn—full bloom Northern catalpa—full bloom Tree lilac—full bloom Oakleaf hydrangea—full bloom

[1] See text for insecticide guidelines. Always read and follow directions on the insecticide label.
[2] Treatment dates listed are appropriate for the latitude of central Kentucky. Dates should be adjusted earlier or later for more northern or southern locations.
[3] For pests requiring two treatments, the indicator plant information pertains to the timing of the initial spray.


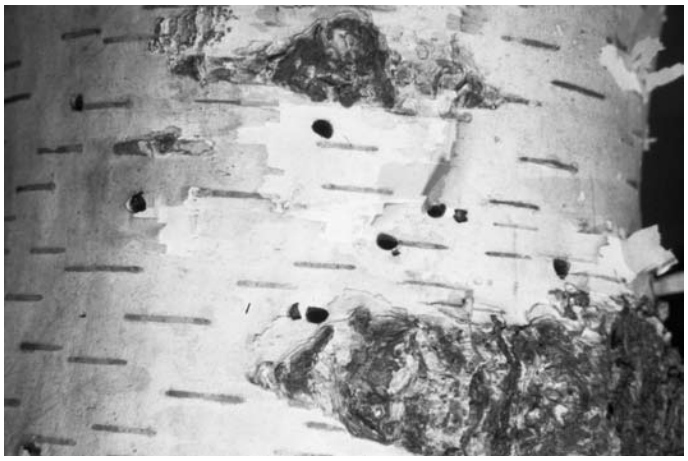

Figure 4 a, b. Symptoms of bronze birch borer attack include crown dieback (a) and D-shaped holes left by the adult beetles as they emerge from limbs or trunks (b).

of little-leaf linden *(Tilia cordata)* or oakleaf hydrangea *(Hydrangea quercifolia)*. For either borer species, follow up with a second spray about 6 weeks after the first application.

Rhododendron borer, *Synanthedon rhododendri*, attacks rhododendrons and, occasionally, mountain laurel and flowering azaleas. Spray timing is the same as for the dogwood borer.

Flatheaded Borers

Flatheaded borers are so named because their first body segment, behind the head, is flattened laterally. The adults are fast-moving, flattened, metallic-colored beetles with short antennae.

The whitish, legless larvae make winding tunnels beneath the bark, destroying phloem and cambium and girdling the trunk or branches. The tunnels may be visible externally as spiral ridges or cankers on the limbs or trunks. Unlike clearwing borers, which expel frass from cracks in the bark, flatheaded borers pack their fine, sawdust-like frass in their tunnels.

Detection and Control

When the adults emerge, they leave characteristic *D*-shaped holes. Such holes are a sure sign that a tree has been infested. With some species (such as the flatheaded appletree borer), the bark becomes cracked or cankered at the site of attack.

Adult flatheaded borers emerge in spring or summer, then mate and lay eggs on the bark of their preferred host trees. However, unlike young clearwing borers, newly hatched flatheaded borers do not crawl over the bark in search of entry points. Instead, they chew directly through the bottom of the egg shell into the tree. Therefore, sprays for flatheaded borers should be applied so that a residue is on the bark when the eggs are being laid. Insecticides mentioned for clearwing borers also are effective for flatheaded borers.

Pheromone traps are not available for flatheaded borers. However, approximate spray dates and indicator plants can be used for spray timing (see Table 1).

Types of Flatheaded Borers

The **bronze birch borer**, *Agrilus anxius*, is a severe pest of white or paper birch, especially cultivated or stressed trees. Early symptoms include sparse foliage and chlorotic leaves in the upper crown, followed by twig and branch dieback from the top down. With successive years of attack, the tree becomes progressively weaker until it is killed.

Dead or dying limbs will have numerous *D*-shaped adult exit holes, each about the size of a BB shot. Adult bronze birch borers are slender, olive-bronze beetles about ½-inch long. In Kentucky, adults begin emerging and laying eggs in mid-May. Native white-barked birches (e.g., *Betula papyrifera, B. populifolia*) are somewhat less susceptible than European white birch *(B. pendula)* and other exotic birches.

To prevent infestation, spray susceptible birches twice at 3-week intervals, beginning about the time of first bloom of Washington hawthorn *(Crataegus phaenopyrum)*, little-leaf linden *(Tilia cordata)*, tree lilac *(Syringa reticulata)*, or northern catalpa *(Catalpa speciosa)*. River birch, *Betula nigra*, is not susceptible to this pest.

The **flatheaded appletree borer**, *Chrysobothris femorata*, is a severe pest of landscape trees, especially flowering crab apples, hawthorns, and red maples. This borer may attack almost any hardwood tree that has been stressed by defoliation, sun scald, drought, soil compaction, or mechanical injury. Young trees are especially vulnerable for the first two years after transplanting.

The full-grown borers are about an inch long, legless, and yellow-white. A single borer can girdle and kill a small tree. The adult beetle is flattened, about ½-inch long, bronze-colored above, and brassy underneath. It leaves a large, 3/16-inch, *D*-shaped hole when it emerges from the tree. The adults emerge and begin to lay eggs in late May or early June in Kentucky.

The first spray should be applied on susceptible crab apples, hawthorns, and red maples about the time of first bloom of southern magnolia *(Magnolia grandiflora)* or full bloom of Washington hawthorn, northern catalpa, tree lilac, or oakleaf hydrangea *(Hydrangea quercifolia)*. A second spray, 3 weeks after the first one, provides extended protection.

Preventive Management

As mentioned earlier, borers are much more likely to infest plants which are stressed. Management practices designed to promote overall plant health will also help to minimize problems with borers.

- Avoid planting native understory species such as dogwoods and rhododendrons in full sun.
- Plant hardy, well-adapted cultivars for your region.
- Maintain tree vigor through proper planting, balanced fertilization, and adequate irrigation during drought periods.
- Transplanted trees need extra water until they become established.
- Control other insect and disease-producing pests that contribute to tree stress.
- Use lawn mower guards or place mulch around trees to prevent bark injuries. Wounds inflicted by lawn mowers or string trimmers are attractive to egg-laying adult borers.
- Avoid pruning just before or during borer flight periods.
- Consider tree wraps carefully because they may actually encourage borer attacks by delaying proper hardening of the bark.
- Time preventive sprays properly during the first two growing seasons after planting because newly planted or stressed trees are especially vulnerable to borers.
- Detect and treat borer problems early. Remove badly infested trees that serve as reservoirs of infestation.
- Inspect susceptible tree species regularly for the telltale symptoms, and apply insecticides only during those periods when borers are vulnerable.

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