ENY-327

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Insect Borers of Trees and Shrubs[1]

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Insect borers can be serious aesthetic, economic, and structural pests of trees and shrubs. Their tunneling damages wood, creates "hazard" trees, and lowers the wood's value for lumber and veneer. Infested nursery stock may have poor form, reduced growth rates, or be impossible to sell.

Borer larvae (immatures) and adults make tunnels in the shoots, branches, trunks, or roots of woody plants of all ages and sizes. Eggs of most borer species are laid on or in the bark and larvae chew into the plant tissue. Most borers are larvae of beetles or moths, but some are wasps or flies. Most insect borers are considered “secondary pests” because they attack only after a plant has been weakened or killed by another stress. Some, however, are “primary pests” and are able to attack and develop in fairly healthy trees and shrubs. Knowing whether insects are primary or secondary pests is critical to assessing and treating plant problems.

Damage

The presence of borers is hard to detect until plants or plant parts become damaged or die. Sawdust-like frass (excrement) may be around an exit hole or in a pile on the ground. Sap may ooze from the wounded site. There may be round, oval, or D-shaped holes randomly located on the plant. Insect exit holes can be distinguished from woodpecker holes by the absence of frass. The chewing of some species may be heard by someone standing near the tree.

The severity of plant damage depends on the number and location of insects in the plant tissue. Phloem feeders destroy tissues that transport food and produce new wood and bark. Feeding by a few individuals may produce necrotic lesions, whereas feeding that encircles the stem may kill a branch or the entire tree. Xylem borers make holes in the sapwood that disrupt the flow of nutrients and water as well as structurally weakening the plant. Twig and shoot borers decrease fruit, nut, and seed production by causing branch dieback. Borers may also feed in the succulent callus tissue around grafts, thus preventing the connection of scion and stock. Dead branches, pitch masses, and wood and bark riddled with holes decrease the aesthetic value of plants.

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Types of Insect Borers

Bark Beetles (Coleoptera: Curculionidae: Scolytinae)

Beetles in this group tunnel beneath the bark of trees. Adult beetles are small, somewhat cylindrical, and reddish-brown to black (Figure 1). Larvae are cream-colored and legless. Signs of infestation include a red or white powdery dust that collects around the entrance holes and in bark crevices. Sap may flow from entrance holes and form small “pitch masses.” Over time, the bark looks like its been riddled with "shot" from the small beetle exit holes.

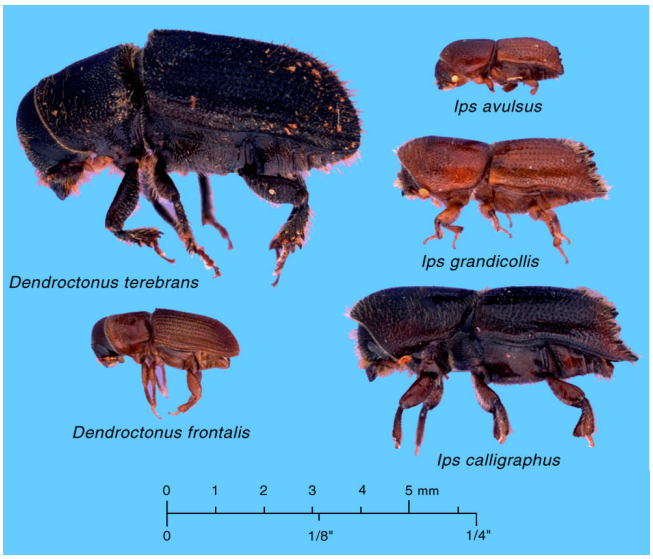

Figure 1. Five species of bark beetles commonly found in southern pines. Credits: J. L. Foltz, University of Florida

Southern Pine Beetle (*Dendroctonus frontalis*)

Southern pine beetle is one of the most serious pests of pines in the United States, but normally is a scavenger of dying pines. It becomes a pest when its populations increase. Dendroctonus beetles are distinguished by round posteriors, in contrast to Ips beetles, the abdomens of which are concave posteriorly and have small spines on the wing covers (Figure 1). Adult beetles, active throughout the year whenever temperatures are above 58°F, disperse widely to infest injured, weakened or stressed trees. When abundant, they can attack and overwhelm healthy trees. The presence of pitch masses on the tree trunk may indicate an attack. Adults tunnel beneath the bark constructing frass-packed egg galleries in patterns resembling the letter “S” (Figure 2). The tunneling quickly destroys the phloem and kills the tree. One to 3 months later, the needles of the dead tree turn reddish-brown. Seven or more generations may occur each year.

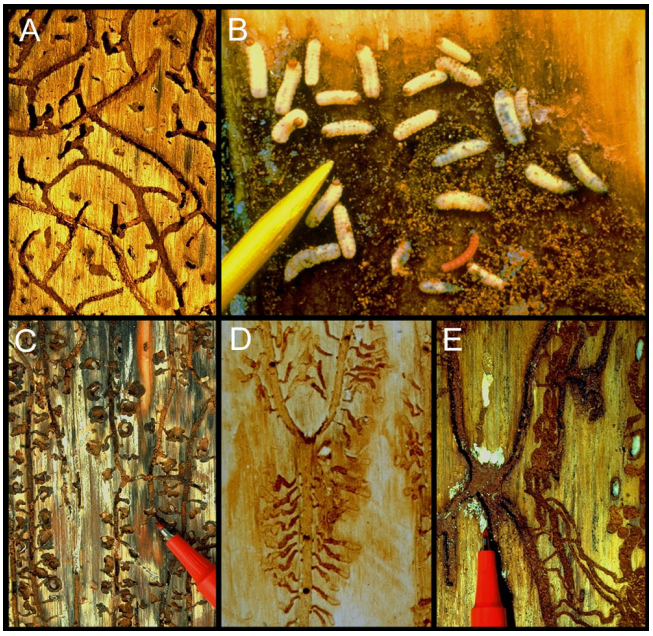

Figure 2. Gallery patterns for the five species of bark beetles commonly found in southern pines. A, *Dendroctonus frontalis*. B, *D. terebrans*. C, *Ips avulsus*. D, *I. grandicollis*. E, *I. calligraphus*. Credits: J. L. Foltz, University of Florida

Black Turpentine Beetles (*Dendroctonus terebrans*)

Black turpentine beetles attack fresh stumps and the lower trunk of living pines, usually below a height of 10 feet. Adult beetles bore into the phloem and make galleries that extend downward. Galleries in the inner bark may be vertical, D-shaped, or fan-shaped. All pine species native to the southeastern U.S. are known to be hosts. Attacks are identified by white to reddish-brown pitch masses about the size of a half dollar. The adult insect is dark brown to black and 3/8 inch long (Figure 1). The posterior end is rounded. The life cycle takes from 2 1/2 to 4 months and there are 2-4 generations a year in Florida.

Ips Engravers (*Ips* spp.)

Ips engravers (Figure 1) are normally secondary pests, attacking pines stressed by factors such as lightning strikes, root damage, and drought.

Occasionally, however, large populations attack and kill young, healthy pines and the tops of older pines. Signs of infestation also include pitch masses and fading foliage color, similar to that of the southern pine beetle. However, their frass-free egg galleries radiate out from a common entrance hole (Figure 2). Ips beetles also transmit bluestain fungi, which disrupt the water transport system of trees. Egg-to-adult development occurs in as little as 4 weeks, so these beetles may also have 7-10 generations per year in Florida.

Ambrosia Beetles (Coleoptera: Curculionidae: Scolytinae and Platypodinae)

Ambrosia beetle females bore into twigs, branches, or trunks of apparently healthy, stressed, or freshly cut host material. Attacks on living plants are often near ground level on saplings or at bark wounds on larger trees. Visible symptoms of an infestation include wilted foliage and strings of boring dust from numerous small holes (Figure 3). Ambrosia beetles feed on symbiotic fungi that they introduce into their tunnels and cultivate. Eggs, larvae, and pupae occur together in the tunnels - there are no individual egg niches, larval tunnels, or pupal chambers. Two common species in Florida are *Xylosandrus crassiusculus* and *Euplatypus compositus*. A beetle of special concern is *Xyleborus glabratus*, a newly-arrived Asian beetle whose ambrosia fungus is killing redbays (*Persea borbonia*) and is a threat to avocado.

Figure 3. Solid frass "straws" produced by ambrosia beetles as they bore into a tree. Credits: Russ Mizell, University of Florida

Long-horned Beetles or Round-headed Borers (Coleoptera: Cerambycidae)

Adults of this family are called long-horned beetles because their antennae are usually long (Figure 4). Larvae (round-headed borers) tunnel underneath bark and into the wood (Figure 5). The tunnels are oval to almost round in cross section, conforming to the cylindrical shape of the larvae. Larvae of some species are legless, but most have three pairs of small legs. While tunneling, larvae continually pack their tunnels with frass, which looks like compressed wood fibers, or push frass out of the holes they make. This frass, along with the sap exuded by the plant in response to the damage, is often visible on the outside of infested trunks or branches.

Figure 4. Twig girdler adult. Credits: L. J. Buss, University of Florida

Figure 5. Round-headed borer. Credits: L. J. Buss, University of Florida

Twig Girdler (*Oncideres cingulata*)

Twig girdlers are important long-horned beetles. Their damage occurs primarily from egg laying. The grayish-brown adult females (1 1/16 inch long) are active from September to November (Figure 4). They girdle limbs by chewing a V-shaped groove entirely around twigs, branches or terminals. Eggs are inserted into the bark on the girdled part of the branch away from the tree. Girdled limbs eventually break

and fall to the ground. Larvae cannot develop in healthy sapwood. Damage can disfigure a young tree and leads to secondary branching, especially if the terminal is attacked. Oak, persimmon, hickory and pecan are common hosts.

Metallic Wood-boring Beetles of Flat-headed Borers (Coleoptera: Buprestidae)

Adult beetles are flattened, hard-bodied and bullet-shaped with short antennae (Figure 6). These beetles often have distinctive metallic colors (green, blue, bronze, copper). Larvae (Figure 7) are cream-colored and legless with widened, flattened body segments just behind the head. Thus, when these larvae tunnel beneath bark or in the sapwood they make oval or flattened tunnels in cross section. Galleries are often winding and packed with frass. These beetles are often associated with stressed or wounded trees.

Figure 6. Metallic wood-boring beetle adult. Credits: J. Castner, University of Florida

Figure 7. Larva of *Chrysobothris femorata*. Credits: James Solomon, USDA Forest Service

Weevils (Coleoptera: Curculionidae)

Few weevils are wood borers. The most common weevils in Florida ornamental plants are the cypress weevil and palmetto weevil. The cypress weevil (Figure 8) infests weakened or wounded bald, pond and Leyland cypress, arborvitae, and Japanese cedar. The palmetto weevil (Figure 9) is the largest weevil in North America, and it infests cabbage palmetto, Canary Island date palm, royal palms, coconut palm, and other palm species.

Figure 8. Cypress weevil. Credits: L. Buss, University of Florida

Figure 9. Palmetto weevils. Credits: L. Buss, University of Florida

Caterpillars (Lepidoptera)

These insects are the immature stages of several kinds of moths.

Carpenterworms (Cossidae)

Carpenterworms (Figure 10) are large caterpillars that tunnel through the trunks of many tree species. These larvae develop over 1 or 2 years, initially feeding underneath the bark but later tunneling into the sapwood. Outward signs of attack include large piles of sawdust and frass. In the spring, large adult moths (Figure 10) with mottled wings emerge.

Clearwing Borers (Sesiidae)

These daytime fliers are called clearwing moths and they look superficially like wasps (Figure 11).

Figure 10. Carpenterworm adult.

Eggs are laid at the margins of insect holes, lawnmower cuts, on galls, and other wounds. Newly hatched larvae bore into the phloem and feed beneath the bark. Signs of infestation include wet spots, ejected frass, and masses of sap around damage sites. Infestations can kill branches or entire trees. There are 41 species in Florida.

Figure 11. Peach tree borer (*Synthedon exitiosa*). Credits: J. Castner, University of Florida

Prevention

Keeping plants healthy can minimize damage from secondary pests like insect borers. Place trees and shrubs in properly prepared areas protected from extreme weather conditions. Follow recommended irrigation and fertilization guidelines.

Because many borers are attracted to recent wounds, avoid pruning during adult activity periods. Avoid other physical injury or stress to tree trunks or roots (e.g., lawn mowers, weed trimmers, digging building foundations, septic tanks, soil compaction, soil added or removed above the roots, drought, flooding, or lightening). Mulch around the trunk to increase the distance between machinery and the plant.

Non-Chemical Control

Monitoring susceptible plants is important to minimizing infestations. Use pheromone traps to monitor adult activity and disrupt the mating and egg-laying of clearwing borers. Pheromone traps often only attract males. Use ultraviolet blacklight traps to monitor adult insects, which are drawn to the light and die in the bucket. Blacklight traps attract both males and females.

After trees and shrubs are infested with borers, non-chemical controls are limited. Consider inserting a flexible, small gauge wire into borer entry holes to puncture and kill the tunneling insect. Remove and destroy (burn or chip) infested, dying or dead plants or plant parts, including fallen limbs. Severely infested trees (“brood trees”) only produce more pests that can attack neighboring trees.

Several natural enemies attack insect borers, including predatory beetles, parasitic wasps or flies, and birds, especially woodpeckers. Insect parasitic nematodes may help suppress clearwing borers (e.g., peachtree borer) and other wood borer species. They are most effective for borers that occur in moist habitats, such as below ground, because the nematodes need moisture to find and infect their hosts. Additional moisture may be needed if using nematodes against above ground borers.

Chemical Control

Stressed, unhealthy trees may be repeatedly attacked and need repeated insecticide treatments. This is often expensive and not environmentally friendly. The first priority is to improve overall tree health and use insecticides as a last resort. In addition, most chemicals can only be obtained and applied by licensed professionals with specialized equipment.

Insecticide products registered for borer control are listed in Table 1 . Most of these products are applied as sprays to the trunks and branches and are contact, residual insecticides (e.g., carbaryl,

chlorpyrifos, lindane, permethrin). While these products do not kill larvae that have already penetrated the sapwood or heartwood, they will kill adults and larvae tunneling through the treated bark layer. These products are applied preventively and may be effective for 3 to 10 weeks.

Complete spray coverage of all trunk and branch surfaces is necessary for preventive control of borers. Treating only the base of the tree trunk is enough to protect the tree only from a few insects such as the black turpentine beetle and the peachtree borer. Thorough coverage may be difficult on large trees and may result in drift to non-target areas. To minimize drift, spray only on non-windy days. Read the insecticide lable for the proper protective clothing requirements.

Only two **systemic insecticides** are currently available as a soil drench against borers. Imidacloprid can provide control as a soil drench against flatheaded borers that are feeding just under the bark, but it is ineffective against moth larvae (e.g., clearwing borers, carpenterworms) and insects that bore into the heartwood of a tree (e.g., roundheaded borers). It provides the best control when applied just before or during early egg hatch. Dinotefuran appears to be effective against flatheaded, roundheaded, and clearwing borers.

Trunk injections (e.g., Mauget, Arborjet, Wedgle) work by delivering pressurized and concentrated insecticides into the tree (Figure 12). However, these injections are most effective against sap-feeding insects and rarely affect woodborer larvae. The process of injecting the insecticide through a narrow tube and into the drilled hole may result in sap staining and could allow pathogens an entry point. Translocation of the insecticide is unlikely in partially girdled areas. The use of these products has not been studied in Florida.

Fumigants (e.g., paradichloro-benzene (PDB) moth crystals) can kill caterpillar larvae at the base of trunks if the crystals are inserted into tunnels with external openings, such as for carpenterworms or clearwing borers.

Figure 12. Mauget injection is one of several methods for applying systemic insecticides. Credits: E. A. Buss, University of Florida

Useful References

Drooz, A. T. 1985. Insects of eastern forests. Misc. Publ. 1426. Washington, DC: U.S. Department of Agriculture, Forest Service. 608 pp.

Johnson, W. T. and H. H. Lyon. 1991. Insects that feed on trees and shrubs. Comstock Publishing Associates, Ithaca, NY. 560 pp.

Solomon, J. D. 1995. Guide to insect borers of North American broadleaf trees and shrubs. Agric. Handbk. 706. Washington, DC: U.S. Department of Agriculture, Forest Service. 735 pp.

Featured Creatures Web site: http://entomology.ifas.ufl.edu/creatures

Southern pine beetle in Florida (EDIS publication): http://edis.ifas.ufl.edu/IG147

WoodyBug Website: http://entomology.ifas.ufl.edu/fasulo/woodypest

Table 1. Chemical names, trade names, and formulations of insecticides available for professional use on trees and shrubs.

Active Ingredient	Florida Registered Products	Use Sites	Chemical Class	Signal Word
Bifenthrin	Onyx	O, T	Pyrethroid	Warning
	Talstar Lawn & Tree Flowable	I, O, T		Caution
	Talstar F	I, O, T		Caution
	Talstar GC Flowable	O, T		Caution
Carbaryl	Sevin SL	O, T	Carbamate	Caution
	Sevin 80 WSP	N, O, S, T		Warning
Chlorpyrifos	Chlorpyrifos Pro 4	G, N, O, S	Organophosphate	Warning
	Cyren 4E*	N		Warning
	Dursban 50W*	N		Danger
Cypermethrin	Demon TC	O, T	Pyrethroid	Warning
Dinotefuran	Safari 2G	G, I, N, O, S, T	Neonicotinoid	Caution
	Safari 20 SG	G, I, N, O, S, T		
Imidacloprid	Merit 75 WP, WSP	I, S, T	Neonicotinoid	Caution
	Imicide (Mauget injection)	T		Caution
Permethrin	Astro	O, S, T	Pyrethroid	Caution
*Restricted use insecticide.				
Site abbreviations: G = greenhouse; I = interiorscape; N = nurseries; O = ornamentals; S = shrubs; T = trees				