

BARK BEETLES

Integrated Pest Management for Home Gardeners and Landscape Professionals

Bark beetles, family Scolytidae, are common pests of conifers and some attack broadleaf trees. Several hundred species occur in the United States. The most common species infesting pines in California are the western pine beetle (*Dendroctonus brevicomis*) (Fig. 1), engraver beetles (*Ips* spp.), and the red turpentine beetle (*Dendroctonus valens*). Cedar and cypress bark beetles (*Phloeosinus* spp.) attack arborvitae, *Chamaecyparis*, cypress, and redwoods. Oak ambrosia beetles (*Monarthrum* spp.) and oak bark beetles (*Pseudopityophthorus* spp.) attack oaks and certain other broadleaves including California buckeye and tanbark oak. Shothole borer (*Scolytus rugulosus*) attacks damaged trunks of many broadleaved tree species, including English laurel, fruit

trees, and hawthorn. The European elm bark beetle (*Scolytus multistriatus*) feeds only on elms and vectors the Dutch elm disease fungus. Other common wood-boring pests in landscapes include clearwing moths (family Sesiidae) (for more information, see *Pest Notes: Clearwing Moths*, listed in Suggested Reading), longhorned borers (Cerambycidae), and roundheaded borers (Buprestidae).

IDENTIFICATION

Adults are small, cylindrical, hard-bodied beetles about the size of a grain of rice. Most species are dark red, brown, or black. Their antennae are elbowed and the outer segments are enlarged and clublike. When viewed from above, the head is partly or com-

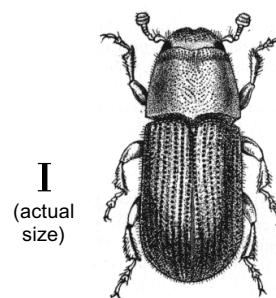


Figure 1. Adult western pine beetle.

pletely hidden by the thorax. They have strong, scooplake jaws (mandibles) for chewing. A buckshot pattern of holes is apparent on infested branches or on the trunks where the new adults have emerged. Larvae of most species are

Table 1. Bark Beetles Common in Landscapes.

Species	Trees affected	Generations per year	Comments
Red turpentine beetle (<i>Dendroctonus valens</i>)	larch, pines, spruce, and white fir	0.5 to 3	attacks lowest 2–8 ft of trunk and large roots; pitch tubes appear on bark; overwinters as adults and larvae; rarely kills tree
Western pine beetle (<i>Dendroctonus brevicomis</i>)	Coulter and Ponderosa pines	2 to 4	attacks midtrunk, then spreads up and down; larva feeds on inner bark, completes development in outer bark; attacks in conjunction with other pests
Engraver beetles (<i>Ips emarginatus</i> , <i>I. mexicanus</i> , <i>I. paraconfusus</i> , <i>I. pini</i> , and <i>I. plastographus</i>)	pines	1 to 5	overwinters as adult; often makes wishbone-shaped tunnels; attacks pines near top
Cedar and cypress beetles (<i>Phloeosinus</i> spp.)	arborvitae, <i>Chamaecyparis</i> , cypress, and redwoods	1 to 2	tunnels resemble centipede on inner and outer bark; adult feeds on twigs, causing discolored and dead tips; egg-laying female attracted to trunk of dead or dying trees
Oak ambrosia beetles (<i>Monarthrum</i> spp.) Oak bark beetles (<i>Pseudopityophthorus</i> spp.)	oaks; also California buckeye and tanbark oak	2 or more	overwinters beneath bark; bleeding, frothy, bubbling holes with boring dust indicate damage; attacks stressed trees
Shothole borer (<i>Scolytus rugulosus</i>)	English laurel, fruit trees, hawthorn, and other woody plants	2 or more	infestation indicated by gumming of woody parts, appearance of boring dust, or twig dieback; remove and destroy infested parts
European elm bark beetle (<i>Scolytus multistriatus</i>)	elms	2	overwinters as fully grown larva in bark; shotholes in bark indicate damage; lays eggs in limbs and trunk of injured, weakened, or recently cut elms; vectors Dutch elm disease fungus

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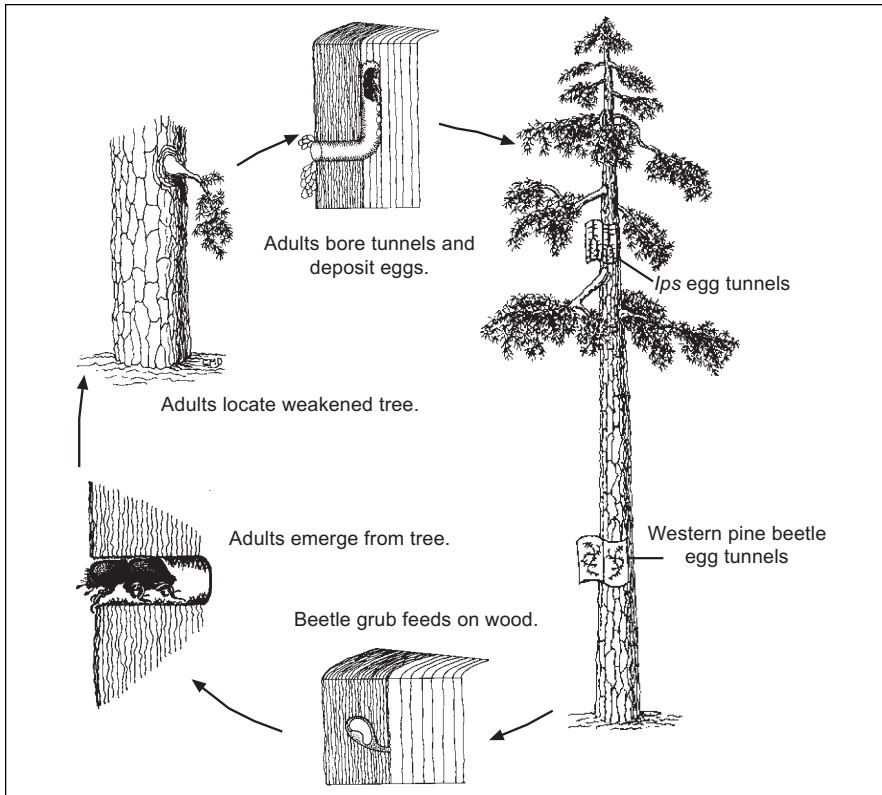


Figure 2. Life cycle of a bark beetle.

off-white, robust, grublike, and may have a dark head.

The species of tree attacked and the location of damage on the bark help in identifying the bark beetle species present (Table 1). On pines, for example, engraver beetles usually attack trees near the top, while red turpentine beetles attack pine trunks near the ground as well as below ground on the large roots. Engraver beetles are dark brown, cylindrical, and have a scooplike depression lined with stout spines at the end of the abdomen. Red turpentine beetles are larger than engraver beetles and reddish brown; their presence is indicated by large, pinkish brown to white pitch tubes, a mixture of pine sap and beetle boring dust that appears on the lower trunk.

Peeling off a portion of infested bark to reveal beetle galleries is also helpful in identifying the beetle species present. Red turpentine beetle and western pine beetle adults usually pack about 60% of their egg-laying galleries with boring dust while engraver beetles maintain clean, open adult galleries. Larval galleries of all species are packed with sawdustlike boring dust called "frass" and most radiate out perpendicularly to the parent tunnels.

LIFE CYCLE

Females lay small, oval, whitish eggs at the interface of the bark and wood (Fig. 2). After eggs hatch, the tiny larvae mine galleries that branch out from the egg-laying gallery. At first the larval mines are very small, but they gradually increase in diameter as the larvae grow. The winding pattern of these galleries is helpful in identifying a bark beetle infestation and in distinguishing among the different species (Fig. 3). Pupation occurs in enlarged chambers at the ends of the larval tunnels or in the outer bark. Pupae are usually whitish and occur within or beneath bark. Adults can emerge at any time of year, weather permitting, but emergence is most common in late spring and again in late summer to early fall. After emergence, adults generally disperse to attack susceptible trees elsewhere. Most bark beetle species have two or more generations a year in California, de-

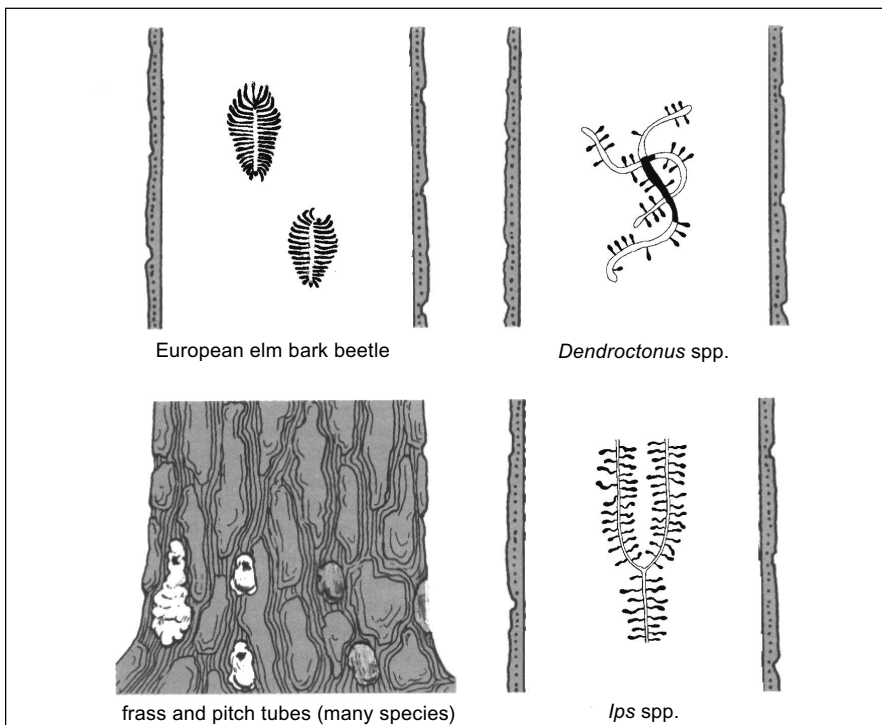


Figure 3. Comparison of bark beetle galleries. Tunnels filled with frass (excrement) are shown in black, while open portions of galleries are white.

pending on temperature. At warmer locations, the season of attack is usually longer and beetles have more generations per year in comparison with cooler locations.

DAMAGE

The important pest species of bark beetles mine the inner bark (the phloem-cambial region) on twigs, branches, or trunks of trees and shrubs. This activity often starts a flow of tree pitch in conifers and is accompanied by a sawdustlike material (frass). Frass accumulates in bark crevices or may drop and be visible on the ground or in spider webs. Small emergence holes in the bark with sap weeping out of the holes are a good indication that bark beetles have been present. Bark beetles commonly attack trees weakened or predisposed to infestation by drought, disease, injuries, or other factors that may stress the tree. Beetles can contribute to the decline and eventual death of trees but with a few exceptions usually are not the initial cause.

In addition to attacking larger limbs, cedar and cypress bark beetles feed by mining twigs up to 6 inches back from their tips, resulting in dead tips or "flags" hanging on the tree. The adult European elm bark beetle also feeds on twig bark before laying eggs. If the adult has emerged from infested elm wood, its body will be contaminated with Dutch elm disease spores. The beetle then infects healthy elms with the Dutch elm disease fungus during feeding; it is during this pre-ovipositional (before egg laying) feeding, which usually takes place in limb crotches, that the fungus is transmitted. Elms showing yellowing or wilting in spring are suspect and should be reported to the county agricultural commissioner.

MANAGEMENT

Except for general cultural practices that improve tree vigor, little can be done to control most bark beetles beneath bark once trees have been attacked. Prune and dispose of bark beetle-infested limbs. Promptly remove the entire tree if its main trunk is extensively attacked by bark beetles. Unless infested trees are quickly removed,

large numbers of beetles can emerge and kill nearby host trees if they are weakened or predisposed by other factors. The exception is when pines are attacked by a few red turpentine beetles. Trees can often survive low-density attacks by this species. Valuable, uninfested host trees near infested trees may be protected from bark beetles by spraying the trunk with a persistent insecticide in spring; however, do not substitute preventive sprays for proper cultural care.

Plant only species properly adapted to the area. Learn the cultural requirements of trees, and provide proper care to keep them growing vigorously. Healthy trees are less likely to be attacked and are better able to survive the damage from a few bark beetles. Rapid, vigorous growth encourages host resistance.

Pay particular attention to old, slow-growing trees, crowded groups of trees, and newly planted trees in the landscape. Large nursery stock or transplanted trees, notably oaks and pines, can become highly susceptible to bark beetles after replanting. Transplanting success depends on the tree species and its condition, appropriate tree and site selection, characteristics of the planting site, the season of the year, the transplanting method, and follow-up care. Stresses placed on a tree caused by poor planting or planting at the wrong time of year, lack of proper care afterwards, or the planting of an inappropriate species for the site will increase the tree's susceptibility to bark beetle invasion.

Biological Control

Woodpeckers, several predaceous beetles such as the blackbellied clerid (*Enoclerus lecontei*) and trogossitid beetles (especially *Temnochila chlorodia*), a predaceous fly (*Medetera aldrichii*), and parasitic wasps are natural enemies of the western pine beetle, but rarely control it. Predators are more important in regulating bark beetle populations than parasites. When bark beetles attack and kill some trees, natural enemies are attracted and may eventually limit the infestation.

Cultural Control

Prevention is the most effective method of managing wood-boring insects; in most instances it is the only available control. Avoid injuries to roots and trunks, and protect trees from sunscald and other abiotic disorders. Irrigation may be important during dry summer months in drought years, especially with tree species that are native to regions where summer rain is common. Also, dense stands of susceptible trees should be thinned to increase their vigor and ability to withstand an attack.

Irrigate when appropriate around the outer canopy, not near the trunk. Avoid the frequent, shallow type of watering that is often used for lawns. The specific amount and frequency of water needed varies greatly depending on the site and tree species (i.e., whether trees are adapted to summer drought or regular rainfall).

Properly prune infested limbs, and remove and dispose of dying trees so that wood-boring insects do not emerge and attack other nearby trees. Timing of pruning is important; avoid creating fresh pruning wounds during the adult beetles' flight season. Do not prune elm trees from March to September or pines during February to mid-October. Do not pile unseasoned, freshly cut wood near woody landscape plants. Freshly cut wood and trees that are dying or have recently died provide an abundant breeding source for some wood-boring beetles. Tightly seal firewood beneath clear plastic in a sunny location for several months to exclude attacking beetles, and kill any beetles already infesting the wood.

Plant resistant species where bark beetles have been a problem. For instance, engraver beetles and red turpentine beetles do not attack redwoods or atlas cedars.

Chemical Control

Unless trees are monitored regularly so that borer attack can be detected early, any spraying is likely to be too late and ineffective. No insecticide kills larvae tunneling beneath the bark. Treatment must target the adults by spraying the

bark so that they are killed when they land on trees and attempt to bore into the bark to lay eggs. If the tree was attacked during a previous year and no longer contains beetles because they have completed development and flown away, spraying that tree will provide no benefit and could kill beneficial insects. Seriously infested trees, or trees that are dead or dying due to previous beetle attacks, cannot be saved with insecticide treatments and should be removed. Systemic insecticides implanted or injected through the bark or applied to soil beneath trees do not control or prevent attack by bark beetles.

Healthy specimen or high-value trees may be protected with an insecticide if they are stressed or near infested trees that are a source of beetles. Because each bark beetle species attacks only certain tree species (for example, pine bark beetles do not attack oaks and oak

bark beetles do not attack pines) spray only healthy trees that are susceptible to the beetle species attacking nearby trees. It is not clear if products available to home gardeners can adequately prevent bark beetle attack. Most home gardeners also lack the high-pressure spray equipment and experience to effectively treat large trees. When hiring a professional applicator, discuss the specific pesticide to be applied.

Thoroughly drenching the main trunk with a pyrethroid (e.g., Astro or Drag-net) or the carbamate carbaryl can prevent new bark beetle infestations if applied when adults are flying. Be sure to use a product labeled for trunk applications and apply it at the proper rate for trunk treatments. Label rates for foliage treatments will not be effective. Effective products may not be available to home users, but are available to licensed pesticide applicators. Regardless of the insecticide used, mix only what you need. Apply the entire mix according to the label to avoid leftover insecticide, which should never be poured down a sink or storm drain. Take special care to keep pesticides from running off-site and into drains or waterways.

Remember that treatments must be applied to kill adults before they lay eggs. Treatment at any other time will not be effective. Spray the bark in spring when beetles begin to emerge, which is in early spring in warm areas

of the state and late spring in cooler and high elevation areas. Depending on local conditions and the pesticide used, a second application may be needed several months later to provide season-long control.

The red turpentine beetle can have as many as three generations a year and engraver beetles can have up to five generations a year; apply the first spray for them about mid-February. Sprays made later will protect only against attack of later generations.

Insecticide sprays are not recommended against shothole borer and cedar or cypress bark beetles.

SUGGESTED READING

Dreistadt, S. H., J. K. Clark, and M. L. Flint. 2004. *Pests of Landscape Trees and Shrubs: An Integrated Pest Management Guide*. 2nd ed. Oakland: Univ. Calif. Agric. Nat. Res. Publ. 3359.

Dreistadt, S. H., and E. J. Perry. April 2004. *Pest Notes: Clearwing Moths*. Oakland: Univ. Calif. Agric. Nat. Res. Publ. 7477.

Koehler, C. S. 1987. *Insect Pest Management Guidelines for California Landscape Ornamentals*. Oakland: Univ. Calif. Agric. Nat. Res. Publ. 3317.

Marer, P. J., and M. Grimes. 1995. *Forest and Right-of-Way Pest Control*. Oakland: Univ. Calif. Agric. Nat. Res. Publ. 3336.

For more information contact the University of California Cooperative Extension or agricultural commissioner's office in your county. See your phone book for addresses and phone numbers.

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WARNING ON THE USE OF CHEMICALS

Pesticides are poisonous. Always read and carefully follow all precautions and safety recommendations given on the container label. Store all chemicals in the original labeled containers in a locked cabinet or shed, away from food or feeds, and out of the reach of children, unauthorized persons, pets, and livestock.

Confine chemicals to the property being treated. Avoid drift onto neighboring properties, especially gardens containing fruits or vegetables ready to be picked.

Do not place containers containing pesticide in the trash nor pour pesticides down sink or toilet. Either use the pesticide according to the label or take unwanted pesticides to a Household Hazardous Waste Collection site. Contact your county agricultural commissioner for additional information on safe container disposal and for the location of the Household Hazardous Waste Collection site nearest you. Dispose of empty containers by following label directions. Never reuse or burn the containers or dispose of them in such a manner that they may contaminate water supplies or natural waterways.

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