

---

# CARPENTERWORM

---

*Integrated Pest Management for Home Gardeners and Landscape Professionals*

---

Carpenterworm, *Prionoxystus robiniae*, is a common wood-boring insect that can cause significant damage to several species of ornamental and fruit trees. Trees most commonly infested by carpenterworms include willow, ash, ornamental pears, black locust, cottonwood, maple, apricot, fruiting pear, birch, oak, and American elms. Locations near riparian areas are more susceptible to infestation.

## IDENTIFICATION

The larval stage of the carpenterworm is a large, wood-boring caterpillar that feeds within a tree's inner bark on the sapwood. The earliest signs of an infestation are dark sap spots on the tree trunk. As the larvae feed within the sapwood, they expel frass (excrement) and sawdust out of the gallery entrance hole. This material is readily observable on infested tree trunks. As the larvae grow, galleries are expanded. By the time the larvae are mature, the galleries measure about ½ inch in diameter and 6 to 10 inches long; most of the gallery is vertical, except for the entrance area (Fig. 1). Gallery entrances are often found in crotch areas of trees or in cracks and crevices in the bark. Eggs are frequently laid in areas of the tree that are already infested, and multiple galleries may arise in the same area, leading to extensive scarring on the corky bark tissue.

When mature, the larva may measure up to ½ inch in diameter and 2 to 3 inches long. It is usually greenish white in color with a dark brown head. It also has prominent hairs on the body and distinctive abdominal prolegs and sharp, hooked legs on the thorax.

The adult carpenterworm is a large, robust moth with a wing expanse of about 3 inches. The forewings are mottled black and gray, making the moths difficult to see when they are resting on the trunk of trees. The male moth is somewhat smaller than the female and its hind wings have an orange coloration while those of the female are off-white.

## LIFE CYCLE

Adult female moths lay anywhere from three to six eggs in a sticky mass on the outer bark of an appropriate host tree. Eggs are usually laid in bark cracks and crevices or near existing gallery entrances and other wounded bark surfaces. Female carpenter moths cannot fly far so they tend to lay eggs on trees close to the one from which they emerged. When the eggs hatch, the larvae immediately begin to bore into the sapwood. Larvae remain in the sapwood until they begin to reach maturity, at which time they bore into the heartwood. The entrance hole that the newly hatched caterpillar creates starts out as a small, rectangular opening but increases in size over time. As the larvae grow, they use the entrance holes to periodically expel frass and sawdust. There are anywhere from 8 to 31 instars (molts), and the larva takes from 2 to 4 years to complete its development in California (Fig. 2). The mature pupa wiggles to the entrance hole surface of the gallery. Adults emerge from the protruding pupal cases and soon mate. Moth emergence is erratic but typically occurs May-July with mating occurring shortly after emergence.

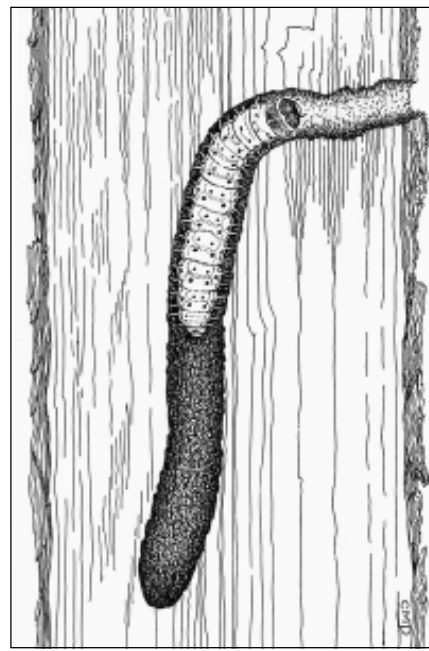


Figure 1. Mature carpenterworm in its tree gallery.

## DAMAGE

The extensive feeding of carpenterworms in large branches can cause branches to weaken and break in high winds. The potential for dropping limbs is a major hazard in urban settings. Branch girdling by carpenterworms may also cause dieback of branches.

## MONITORING

When monitoring for carpenterworm, look for dark sap spots on tree trunks, large quantities of frass and sawdust that have been expelled from galleries, or scarred bark. In older infestations, pupal cases may be seen protruding

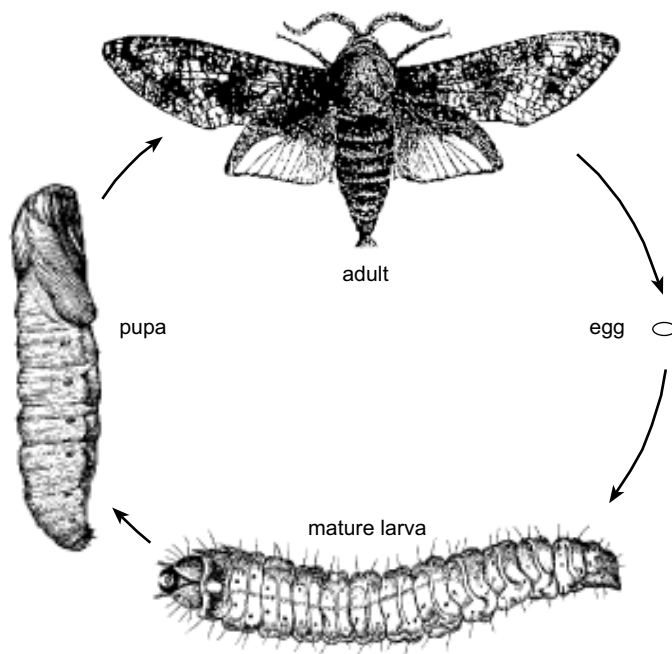


Figure 2. Life cycle of the carpenterworm (actual size).

about two-thirds out of the tree bark. Discolored or oozing bark and limb dieback can have other causes, including inappropriate cultural practices, pathogens, and other types of wood-boring insects, including bark beetles (family Scolytidae), clearwing moths (Sesiidae), flatheaded borers (Buprestidae), and longhorned borers (Cerambycidae). Each of these pests requires different management practices. Avoid ineffective control efforts by accurately identifying the cause of unhealthy trees before taking action.

## MANAGEMENT

Provide trees with proper cultural care and protect them from injuries. Appropriate irrigation is especially important. Trees are better able to tolerate a few carpenterworms if they are kept vigorous.

If heavy carpenterworm infestations are suspected, have the trees inspected by a qualified arborist. Because of the strong possibility of limb breakage as a result of carpenterworm feeding,

heavily infested branches should be removed back to the point of attachment. In some cases, tree removal may be the best option.

It may be possible to kill the larva by poking a long, sharp wire into the gallery, because the larva keeps the gallery open to the outside. This method is most practical when the infestation is small. Also, it is difficult to know if the wire has penetrated far enough in to kill the larva. To see if there is further larval activity after attempting to kill the larva, clear away any frass and sawdust material and mark the gallery site with a daub of paint. Recheck the site weekly to see if new frass material has been expelled. If so, the larva is still alive.

## Treating an Infestation

A very successful biocontrol option is the use of a single treatment of the beneficial nematodes *Steinernema feltiae* or *S. carpocapsae*. While using nematodes may require additional monitoring and perhaps retreatment, they can

be very effective in controlling carpenterworm infestations.

Except for nematodes, available insecticides are not effective against larvae beneath bark. Any other sprays must be aimed at adults and successful control is difficult to achieve. Carefully monitor the tree bark at least once a week beginning in late winter, then promptly spray bark with a persistent insecticide labeled for trunk and bark treatment when the first new pupal case appears. These treatments can kill emerging and egg-laying adults. However, because of the prolonged life cycle and varying development rates among individual carpenterworms, it will be necessary to repeatedly inspect bark and respray at intervals over a period of about 4 years or longer. Do not spray trees unless the extraordinary resources required over the long-term can be provided, including improving cultural care and the tree's growing environment to reduce the likelihood that trees will become reinfested.

**Nematode Application.** Apply nematodes with a squeeze-bottle applicator or 20-ounce oil can at a concentration of 1,000,000 or more nematodes per ounce of distilled water (Fig. 3). First clear the tunnel entrance of frass and then insert the applicator nozzle as far as possible into each gallery. Inject the suspension until the gallery is filled or liquid runs out another hole; then plug the entrances with rope putty or grafting wax. Agitate the applicator frequently to keep nematodes suspended in the liquid. By adding 2% red or orange latex pigment, you can mark treated galleries. Thoroughly drenching bark with a nematode spray is more convenient than injecting tunnels, but spraying probably is less effective because nematodes die on dry surfaces.

Make nematode applications during warm weather (at least 60°F) in spring or fall when carpenterworm larvae are actively feeding. Applications are most

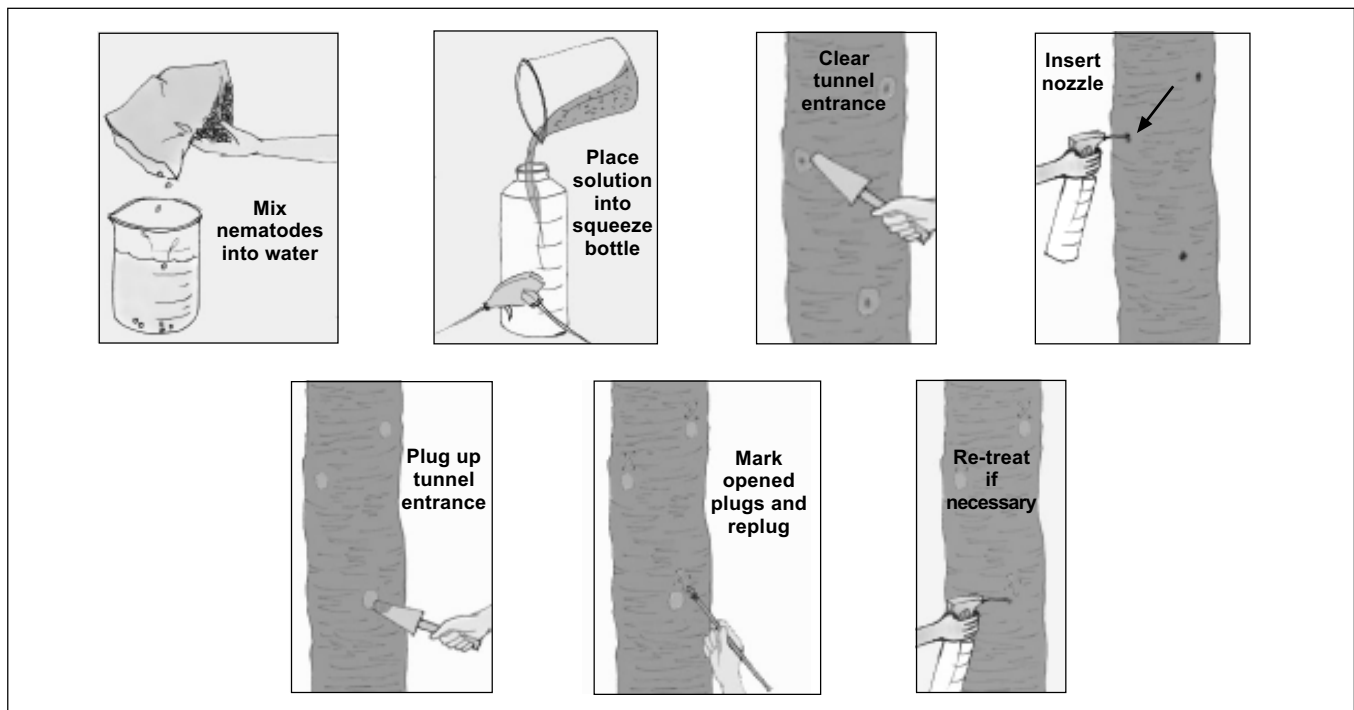


Figure 3. Applying beneficial nematodes for the control of tree borers.

effective when larval openings are relatively large and moist. Because nematodes are killed by light and heat, make applications in the evening, especially in hot areas and sunny locations. Nematode-infected larvae can continue to feed and push frass from their tunnels for about 1 week before dying. A second application 1 or 2 weeks after the first can increase the likelihood that carpenterworm larvae will become infected. To monitor the effectiveness of the treatment, check that the opening of each gallery is still plugged 1 week after application. Replug any that have been opened and spray the plugged openings with bright-colored paint. Wait another week and check to see if these plugs are intact. If the gallery opening is no

longer covered with paint, the larva has not died. Re-treat the gallery.

Nematodes are not commonly available in garden supply centers and must usually be mail ordered. They are perishable, so store them as directed by the label. For a complete, up-to-date list of reputable sources, consult *Suppliers of Beneficial Organisms in North America*, available on the World Wide Web at <http://www.cdpr.ca.gov/docs/ipminov/bensuppl.htm>. Other suppliers and more details on nematode use are available at <http://www2.oardc.ohio-state.edu/nematodes>. More information about nematodes and their application is also available in *Pest Notes: Clearwing Moths*, listed in References.

## REFERENCES

- Dreistadt, S. H. 1994. *Pests of Landscape Trees and Shrubs, an Integrated Pest Management Guide*. Oakland: Univ. Calif. Agric. Nat. Res. Publ. 3359.
- Dreistadt, S. H., and E. J. Perry. June 2000. *Pest Notes: Clearwing Moths*. Oakland: Univ. Calif. Agric. Nat. Res. Publ. 7477. Also available online at <http://www.ipm.ucdavis.edu/PMG/selectnewpest.home.html>
- Johnson, W. T. and Lyon, H. H. 1991. *Insects that Feed on Trees and Shrubs*. 2nd ed. Ithaca: Cornell Univ. Press.

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.

AUTHOR: P. M. Geisel  
 EDITOR: B. Ohlendorf  
 TECHNICAL EDITOR: M. L. Flint  
 DESIGN AND PRODUCTION: M. Brush  
 ILLUSTRATIONS: Fig. 1: Christine M. Dewees; Fig. 2: adapted from <http://bugs.osu.edu/~bugdoc/Shetlar/462/pdf/Ent462Ornamentalborersbw.PDF>  
 Fig. 3: Karin Ling

Produced by IPM Education and Publications, UC Statewide IPM Program, University of California, Davis, CA 95616-8620

**This Pest Note is available on the World Wide Web (<http://www.ipm.ucdavis.edu>)**



This publication has been anonymously peer reviewed for technical accuracy by University of California scientists and other qualified professionals. This review process was managed by the ANR Associate Editor for Pest Management.

To simplify information, trade names of products have been used. No endorsement of named products is intended, nor is criticism implied of similar products that are not mentioned.

This material is partially based upon work supported by the Extension Service, U.S. Department of Agriculture, under special project Section 3(d), Integrated Pest Management.

#### 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.

The University of California prohibits discrimination against or harassment of any person employed by or seeking employment with the University on the basis of race, color, national origin, religion, sex, physical or mental disability, medical condition (cancer-related or genetic characteristics), ancestry, marital status, age, sexual orientation, citizenship, or status as a covered veteran (covered veterans are special disabled veterans, recently separated veterans, Vietnam-era veterans, or any other veterans who served on active duty during a war or in a campaign or expedition for which a campaign badge has been authorized). University policy is intended to be consistent with the provisions of applicable State and Federal laws. Inquiries regarding the University's equal employment opportunity policies may be directed to the Affirmative Action/Staff Personnel Services Director, University of California, Agriculture and Natural Resources, 300 Lakeside Drive, 6<sup>th</sup> Floor, Oakland, CA 94612-3550, (510) 987-0096.