

PINE ROOT COLLAR WEEVIL

Hylobius radialis
Buchanan

Hosts

- Scotch, Austrian, and red pine common breeding sites; scotch pine is the least tolerant of attack; eastern white pine generally resistant due to excessive sap flow
- Open-grown, healthy trees from 2 to 20 feet (0.61–6.1 m) tall preferred; trees one inch or less in diameter at root collar are not suitable hosts
- Adults readily feed on bark of eastern white, Scotch, and red pine

Damage Potential

- Moderate–severe

Symptoms and Signs

- First external symptoms: trees loose in soil, leaning, or dying (entire tree may be yellowed; infested trees may live several years before turning brown and dying)
- Presence of blackened, pitch-soaked soil and/or white resin around the root collar
- Root collar at or below soil line restricted or entire trunk broken off
- Active infestations will have one or more white, legless larvae or pupae in the soil or under bark

Causes of Similar Symptoms

- Root rot diseases
- Mechanical damage
- Rodent damage

Identification

The legless, C-shaped larvae have brown heads and whitish bodies. They closely resemble larvae of other weevil species that also attack pines. Mature larvae are $\frac{1}{2}$ – $\frac{2}{3}$ inch (14–17 mm) in length. A good field identification tip for this pest is the location of the larvae. Pine root collar immatures are only found in the root collar area below ground level. To locate larvae, remove soil down to the first root flare. They may be in the cambial layer of the host or in the surrounding pitch-soaked soil. Occasionally, pitch tubes extending from the root collar into the soil will be found.

Pine root collar weevils never pupate in a typical chip cocoon, unlike other conifer weevil pests. Instead, they create their pupal cell surrounded by soil or pupate in their gallery in the bark of the root collar area.

Adults are typical weevils with elongated snouts and elbowed antennae. They are dark brown with small patches of fine, pale hairs on the wing covers. The adults resemble pales weevil adults but are slightly larger, ranging from $\frac{1}{3}$ to $\frac{1}{2}$ inch long (10.0–12.5 mm) (Fig. 1). Consult a plant inspector or entomologist to confirm identification.



Figure 1. Adult pine root collar weevil (left); pales weevil (right). Courtesy of Jim Stimmel, PDA

Biology and Life Cycle

Only adults are active above the soil line, where they will feed on tender bark of pine twigs. They are nocturnal feeders and prefer to feed on the underside of lower branches. Adults also move from tree to tree at night but crawl on the ground since they are weak fliers. They must be careful of their movements during the summer because a soil surface temperature greater than 104°F will kill them. Adults also feed with the larvae on the inner bark of the root crown.

The life cycle of pine root collar weevil is completed in two seasons. In early May,



Dying tree with pine root collar weevil infestation. Courtesy of Sandy Gardosik, PDA

Calendar of Activities

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Symptoms					■	■	■	■	■			
Monitor					■	■	■	■	■			
Mechanical Control	■	■	■	■	■	■	■	■	■	■	■	■
Spray Control					■			■	■			



Figure 2. Egg laying and larval feeding within the root collar just below the soil. *Courtesy of Rayanne D. Lehman, PDA*



Figure 3. Larva feeding on the root collar. *Courtesy of James B. Hanson, USDA Forest Service, Bugwood.org (#1394091)*



Figure 4. Excessive pitch in the soil surrounding the root collar resulting from larval feeding. *Courtesy of Sandy Gardosik, PDA*



Figure 5. Pupa in soil near the root collar. *Courtesy of Sandy Gardosik, PDA*

young overwintering adults emerge. Mating and egg laying occur at the base of the tree during the day and egg laying may continue into September. Eggs are deposited in feeding wounds made by an adult in the inner bark of the root collar (Fig. 2) or a few centimeters away from a root in the soil. Two weeks later, the eggs hatch and young larvae start feeding on the inner bark of the root collar area (Fig. 3). This causes pitch (or sap) to flow into the surrounding soil, eventually reaching 15–20 inches (40–50 cm) from the trunk (Fig. 4). Larvae create tubes in this pitch-soaked soil to drain excess pitch away from the wound area. They may also use the pitch tubes for molting and pupating.

The majority of larvae overwinter in the root collar as third and last instars. However, with the length of egg laying, early eggs may produce adults in the same season. Overwintered larvae become active the following spring, complete development, and pupate in late June to mid-August (Fig. 5). The new adults begin to emerge in late summer and feed on pine bark before overwintering in litter under the tree or under the bark. These adults emerge the following spring to mate and lay eggs and may overwinter a second winter. Second-year adults will emerge in the spring to continue feeding, mate, and lay eggs before dying in early summer.

All life stages of this weevil can be found during the growing season. During the winter, only large larvae and possibly pupae and adults will be present. Vigorously growing trees respond to larval feeding injuries by producing massive amounts of resin under the bark at and near the site of injury (Fig. 6). Affected trees continue to live an average of 2–4 years after the initial attack (Fig. 7).



Figure 6. Infected root collar soaked with resin. *Courtesy of Steven Katovich, USDA Forest Service, Bugwood.org (#1199001)*

Monitoring and Management Strategies

Plantation Establishment

- Establish fields at least one mile away from any known infestations.
- Plant least resistant varieties such as Scotch pine in small, single-species blocks.
- Interplant pines only with fir, spruce, or deciduous trees; do not interplant Scotch pine with other pines.

Preseason

- Examine off-color trees for symptoms. Rocking trees by hand will reveal any loose in the soil. Follow up with an examination of the root collar area for other symptoms.

Growing Season

- Threshold level: No threshold has been established.
- At the end of the season, evaluate results and update records.



Figure 7. Mixed pine stand with varying degrees of infestation; damage is worst along the block's edge where trees are stressed from grass competition. *Courtesy of Steven Katovich, USDA Forest Service, Bugwood.org (#1199002)*

Control Options

Biological

- Use of parasites is not practical because larvae are below the soil and usually protected by pine pitch.

Mechanical

- To increase soil temperature and therefore decrease existing populations and lessen the risk of infestations, butt-prune trees a minimum of 12 inches (30.48 cm) high.
- Remove leaf litter from under the tree, allowing the sun to heat and dry the soil.
- Remove 1–2 inches (2.54–5.08 cm) of soil away from the trunk base, aiding in creating an undesirable environment for adult activity and egg laying.

Biorational

- No recommendations are available at this time.

Chemical

- Insecticide applications are only effective against adults when they are active at the base of the host tree.
 - Make an application in mid-May to control adults before egg laying.
 - Make a second application in mid-August to mid-September to kill newly emerging adults.
 - Both applications are required for successful control.
- Apply only registered products for your state. Follow the directions on the label thoroughly.

