PennState Extension

White Pine Weevils

White pine weevil adults have long snouts and elbowed antenna with terminal knobs. Damage includes a typical "shepherd's crook" wilt.

ARTICLES | **UPDATED: NOVEMBER 21, 2017**

Typical “shepherd’s crook” symptomatic of white pine weevil infestation. Courtesy of PDA

***Pissodes strobi* (Peck)**

Hosts

In some areas, the pest is called the Sitka spruce weevil or Engelmann spruce weevil because of preference for these hosts:

- Spruce
- Pine
- Douglas-fir
- Fir (occasionally)

Damage Potential

- Moderate–high

(depending on stand age and species of host)

Symptoms and Signs

Spring

- Adult weevils resting on terminal bud or on bark of previous year's terminal; mating pairs are common; may drop to ground when approached
- Pin-sized holes in the bark of terminal leader; clear droplets of sap oozing from holes; best observed on dry, sunny mornings on eastern white pine

- Oval, cream-colored eggs in depression under feeding site

Summer

- Spongy, softened area under bark of last year's terminal (bark may be discolored in this area)
- White, legless grubs with medium brown head feeding in cambium tissue under bark of leader; multiple larvae usually present, often feeding in a ring around terminal; tissue above larvae reddish brown
- By July, new terminal growth wilting or drooping, forming characteristic shepherd's crook; Douglas-fir generally wilts first, followed by eastern white pine; spruce damage usually last to be noticeable
- Terminal dead down to second or third whorl of branches
- Oval areas filled with shredded wood located under bark or inside the dying terminal; whitish pupae under wood shreds
- In late summer, round adult emergence holes about 2⁄25 inch (2 mm) in diameter in bark on trunk below dead terminal

Throughout the Year

- Tends to attack a tree in successive years, resulting in deformed or forked trees

Causes of Similar Symptoms

- Frost injury
- Bird damage
- White pine blister rust
- Eastern pine shoot borer
- Zimmerman pine moth

Identification

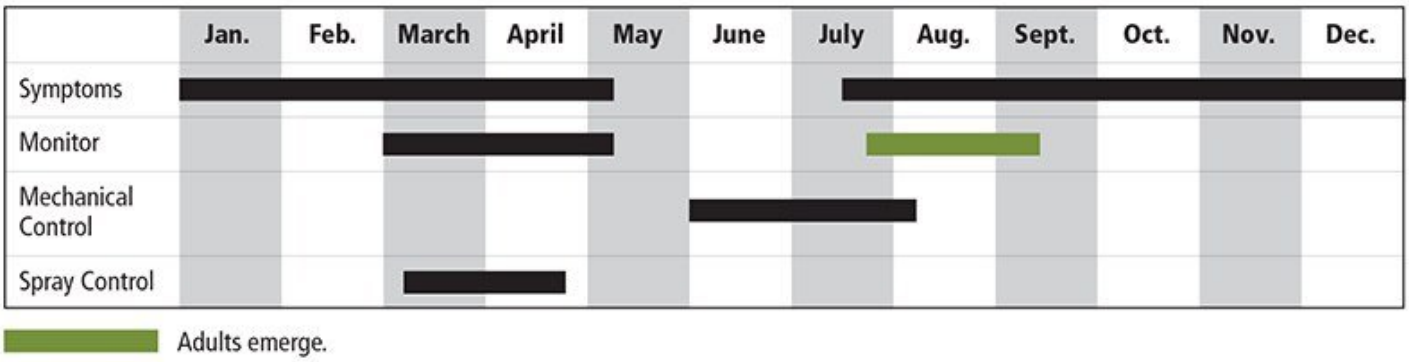
White pine weevil adults have long snouts typical of all weevils. Elbowed antenna with terminal knobs is another identifying characteristic for weevils. The body of white pine weevil is covered with broad, scalelike hairs that vary from medium brown to almost black. Patches of white and gold scales are noticeable on their wing coverings. In appearance, they are almost identical to eastern pine weevil, differing only in size. White pine weevil is the smaller of the two pests, measuring

about ¼ inch (6–7 mm) long; males are slightly smaller than females. The larvae are white, legless, C-shaped grubs with a medium brown head and several long, silken hairs on the body.

It is difficult to see weevils on many of the host trees because of their color, which blends well with most conifer bark. Adults are easiest to find on the smooth bark of eastern white pine terminals. White pine weevil can also be diagnosed by the damage and chip cocoons under the bark of the dead terminal. No other weevil species feeds and pupates in the terminal of healthy trees.

White pine weevil tends to attack a tree in successive years, resulting in deformed or forked trees. However, young trees may be affected if found next to fields with high pressure. Scouting reports in Pennsylvania have shown fields infested at all ages.

Calendar of Activities



Biology and Life Cycle

White pine weevils overwinter as adults in the ground litter, or duff, under trees (Figure 1). As the weather warms in mid-March or April, adults emerge from overwintering areas. Since attacks commonly occur in subsequent years on the same tree, the overwintering site is frequently under the same tree that will be attacked in the spring. When weevils become active, they crawl up the trunk until they reach a healthy leader (Figure 2). On warm days, they often fl y at canopy level to other trees. For 2–3 weeks, both males and females feed just below the terminal bud by chewing through the bark to make a pin-sized hole. With their strong mouthparts, they feed by scooping out the cambial layer surrounding this hole.

Figure 1. Adult weevils. Courtesy of Dave Powell, USDA Forest Service, Bugwood.org (#1207040)

Figure 2. Adult weevil (circled)on Colorado blue spruce. Courtesy of Sandy Gardosik, PDA

Overwintering females were generally mated the previous fall and many retain viable sperm through the winter. However, on warm spring days, mating pairs are frequently found on terminal shoots. When eggs are mature, the female chews a fresh hole in the bark and scoops out cambial tissue to create a small egg niche. She usually deposits a single egg and seals the hole with dark brown frass before moving to another nearby site and repeating the process. Egg sites will have a droplet of clear sap (Figure 3). Female white pine weevils deposit an average of 100 eggs, which hatch 6–14 days later. The whitish, oblong eggs measure 1⁄25 inches (1 mm) long (Figures 4 and 5).

Figure 3. Sap droplets seeping from feeding or egg holes. Courtesy of Sandy Gardosik, PDA

Figure 4. Two weevil eggs sharing an egg niche. Courtesy of Sandy Gardosik, PDA

Figure 5. Pale, 1-millimeter, oblong eggs under the bark and cambium layers. Courtesy of Rayanne D. Lehman, PDA

When the larva emerges from the egg, it tunnels upward toward the bud before turning and moving downward (Figure 6). This feeding is generally restricted to the previous year's growth. It is common to have several larvae feeding in a ring around the terminal (Figure 7). This effectively cuts off all fl ow of nutrients and moisture to the new growth, causing it to wilt and die. If the number of larvae is too high, competition will result in death of some larvae; if too low, the larvae may drown in pitch. When larvae drown in pitch, the terminal will survive but be deformed. Larvae from eggs deposited later in the season frequently do not survive because of lack of food.

Figure 6. Larvae feeding on vascular tissue. Courtesy of Sandy Gardosik, PDA

Figure 7. Larvae feeding around the terminal. Courtesy of Daniel Herms, The Ohio State University, Bugwood.org (#1523051)

By midsummer, mature larvae are 2⁄5 inch (1 cm) long. Each larva creates a pupal cell under the bark or in the pith of thinner terminals. The larvae use wood strands to form characteristic chip cocoons before they pupate (Fig. 8). Pupation takes several weeks, and the weevil may remain in this cell for as long as 6 weeks (Fig. 9). When adults first emerge, they are very pale and soft and referred to as callow adults. These callow adults can be found in the chip cocoon until their body has hardened, at which time they chew a round hole in the bark and emerge (Fig. 10). Adult emergence usually starts in mid-July and may continue into early September. Weevils will feed on branches of the host tree and mate before moving to the ground litter to overwinter. Most adults only overwinter one time, but reports of adults living for several years can be found in the literature.

Figure 8. Chip cocoon. Courtesy of Rayanne D. Lehman, PDA

Figure 9. Pupae maturing in chip cocoons. Courtesy of Sandy Gardosik, PDA

Figure 10. Adult weevil emerging from bark. Courtesy of Rayanne D. Lehman, PDA

Monitoring and Management Strategies

Plantation Establishment

- Remove any unmanaged trees that may act as pest reservoirs.
- Preferred attack sites include open-grown trees in full sunlight. Terminals that are 1⁄5 inch (5 mm) in diameter are preferred. Planting in partial shade may reduce attack by keeping the temperature lower, inhibiting weevil activity.

Preseason

- Train new tree leaders for last year's damaged trees by using a healthy lateral branch from the previous season's growth.
- Late winter/early spring: Place modified Tedder's traps (see Appendix E) in the field before adult weevils become active on a daily basis. Place traps in the row near trees that sustained weevil damage the year before (Figure 11). Check traps regularly to monitor weevil activity (Figure 12). Traps must be baited with denatured alcohol and turpentine to be attractive to weevils.

Figure 11. Tedder's trap placed among previously damaged trees. Courtesy of Rayanne D. Lehman, PDA

Figure 12. Adult weevils caught in a Tedder's trap (plastic top has been removed). Courtesy of Sandy Gardosik, PDA

- Although trapping is the preferred detection method, do not overlook scouting on sunny days by examining leaders for adults or droplets of clear sap. Droplets will glisten in the sunlight (see Figure 3).
- Using binoculars is helpful for those short in stature.
- When resin droplets are found, scrape away the sap to reveal if there is a circular feeding site.
- Growing degree days: Adults generally become active from 7 to 58 GDDs.
- Ground temperatures: After a 3-year monitoring project in Pennsylvania, it was determined that adult white pine weevils become active when ground temperatures are above 50°F. Insert a probe thermometer 2 inches into the soil to collect soil temperature readings (Figure 13). This must be monitored on the sunny side of the tree, in warmer fields, or on south-facing slopes first.

Figure 13. Soil thermometer. Courtesy of Cathy Thomas, PDA

Growing Season

- Threshold level: No threshold has been established for this pest in Christmas trees. In forestry, 2–5 percent of trees damaged in the previous season is used as a treatment threshold.
- Check leaders for continued feeding to determine the need for additional sprays.
- When the injury becomes too severe to manage with pruning, treat the entire plantation.
- At the end of the season, evaluate results and update records.

Control Options

Biological

- White pine weevil has several naturally occurring parasitoids, such as Lonchaeid flies and wasps, but they do not provide adequate control.
- Birds may feed on larvae and pupae.

- Rodents will consume overwintering adults.

Mechanical

- Prune damaged leaders as soon as wilting is detected but before adults emerge in mid-July. Leaders must be pruned down to healthy, green wood.
- Damaged leaders should not be used to train new leaders.
- Damaged tissue containing larvae or pupae should be removed from the field and destroyed. Depending on the time of year and weather following pruning, adults may still be able to emerge from leaders dropped to the ground after pruning.

Biorational

- No recommendations are available at this time.

Chemical

- Chemical controls should begin as soon as the first white pine weevil is trapped or feeding sites or adults are seen on terminals.
- Spray applications must be made promptly. Delaying treatments results in poor control.
- If a sharp drop in temperature is forecast following the first emergence of the weevils, wait to apply sprays until the next set of weevils is found in traps.
- Controls should only be applied to the top third of the tree.

Next Crop/Prevention

- Remove any damaged or highly susceptible trees surrounding the plantation before planting.