



## Natural Resources Canada

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### White pine weevil



**Latin name:** *Pissodes strobi* (Peck)

**French name:** Charançon du pin blanc

**Order:** Coleoptera

**Family:** Curculionidae

**Synonym(s):** *Pissodes sitchensis* Hopkins,  
*Pissodes engelmanni* Hopkins

#### Diet and feeding behaviour

- **Phloeophagous:** Feeds on phloem.
  - **Borer:** Bores into and feeds on the woody and non-woody portions of plants.

#### Micro-habitat(s)

Twig, Terminal shoot, Bud

#### Distribution

Canada

Native to North America, the white pine weevil occurs throughout the range of white pine in eastern Canada. In western Canada, its distribution coincides with that of various species of spruce. This insect was first described in 1817 by W. D. Peck, a professor at Harvard University.

#### Damage, symptoms and biology

Damage from the pest was first reported in the early 20th century in eastern Canada. Damage was variable, depending on the region. With the years, the insect became very common due to the increased number of plantations and the absence of control methods. Since then, regular outbreaks have occurred. Populations are monitored by the provincial departments.

Damage is caused mainly by the larvae, which feed under the bark of the tree's terminal leader. Feeding punctures made by the adult weevils can also damage the leader.

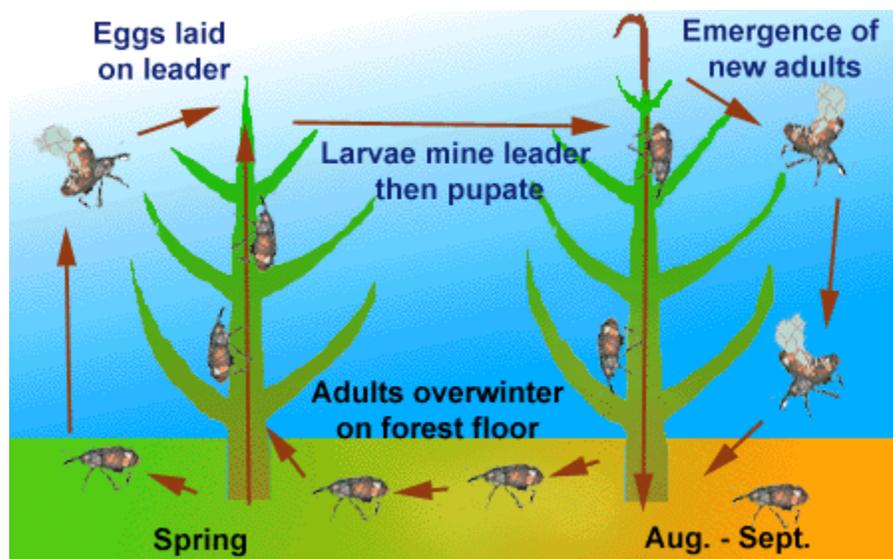
The first symptom of weevil attack is resin oozing from small (0.5-1.0 mm) feeding punctures in the spring. The presence of the insect is easily detected by the drooping, wilted appearance of the current year's leader, which resembles a shepherd's crook. The leader is eventually killed. Symptoms are usually noticeable by late June. Small oviposition punctures covered by blackish fecal caps can also be seen, usually near the top of the previous year's leader.

Tree mortality due to the white pine weevil is rare, however. During outbreaks, the combined damage caused by adults and larvae results in reduced growth and usually in the total loss of the previous and current years' terminal shoots. In white pine with recurring annual damage, wood quality is affected, reducing merchantable timber volume by sometimes up to 60%. Studies have shown, however, that in Norway spruce, the impact on volume productivity can be negligible when the trees reach commercial size. Infected ornamental specimens lose their aesthetic value.

## Biology

The white pine weevil has only one generation per year, but the adults can live and continue laying eggs for several years. Adults overwinter in the forest litter and, in early spring, they emerge when the temperature rises to 2-4°C. They crawl up the trunks of nearby host trees to the terminal shoot and begin to feed before mating. Weevils also disperse by flying on warm sunny days. The female lays her eggs in feeding cavities in the bark made with her rostrum. After the eggs hatch, in about 10 days, the larvae burrow into the bark, feeding on the cortex (inner bark). At the end of their feeding period, the larvae burrow in the pith or directly under the bark, forming pupal cells lined with strands of wood chips.

To emerge, the adults chew small round emergence holes through the bark. They remain on the host tree to feed until the temperature drops in fall, when they seek shelter in the litter to overwinter.



## Detection and methods of control

In young plantations, trees should be inspected annually as soon as they reach 1m, to ensure early detection of the pest. Indeed, early detection is the most effective way of preventing outbreaks. Plantations on unproductive sites are the most susceptible to outbreaks.

Mechanical control, which entails the pruning and destruction of infested leaders, is considered effective and is being used increasingly in private plantations. It is also very effective for ornamental trees. Pruning should be done while the larvae are still active under the bark and before the emergence of the new generation of adults. Pruning of infested terminals should begin as soon as wilting (i.e., the characteristic shepherd's crook) is detected. This usually coincides with the ripening of wild raspberries around mid-July.

Infested leaders should be cut back at the level of the topmost whorl of unaffected branches. The

lateral branches on the whorl will compete for apical dominance. The following year, pruning should be done to restore the shape of the tree.

## **Epidemiology of the weevil**

Where habitat conditions are suitable for the weevil, outbreaks develop in pine or spruce regeneration after the overstory is removed by natural (fire, windthrow, bark beetle) or man-made disturbance (harvesting).

First a few trees are attacked, then the population grows rapidly, resulting in rates of 20-50% of trees attacked per year. The rapid increase in this initial stage is due to the large proportion of trees available for attack and to the fact that many attacks result in multiple leaders. These extra leaders increase oviposition sites and food supply. After this initial period of invasion, the rate of attack diminishes and the percentage of trees attacked each year stabilizes at relatively high levels, with annual fluctuation due to the variable effects of mortality factors operating on the population: weather, natural enemies, larval crowding, and others. This stability phase may last 10 to 20 years and is caused by equilibrium between the weevil population and the number of attackable leaders. Gradually, by plantation age 30-40 years, this equilibrium gives way to a population decline phase, in which the rate of attack drops to about 5% per year. This epidemiology may vary in different host species and different parts of the country.

## **Natural mortality factors**

During the weevil life-cycle, different mortality factors affect the eggs, larvae, pupae and adults. Initially, a portion of the egg population is destroyed by resin. This resin originates from special structures called resin canals found in the bark of the leader. Trees also produce a special type of resin (traumatic resin) in response to wounding by the weevil adults and larvae. The weevil must lay a sufficient number of eggs to overcome this resin defense and to form an effective "feeding ring", which girdles the leader. However, when too many eggs are laid, there is intense larval competition and mortality occurs. Other biological control agents, such as predators and parasitoids, play an important role in additional brood mortality. During the summer, predation by larvae of the fly *Lonchaea corticis* may cause the death of up to 85% of the new generation.

Overwintering mortality of the weevil is considered a key factor in the reduction of the weevil population in white pine plantations. Winter mortality due to poor litter quality and ground predation was also observed in jack pine plantations.

## **Canadian Forest Service Publications**

Although it occurs naturally in our forests, in eastern Canada, it is considered to be the most serious pest of white pine, jack pine and Norway spruce plantations. The white pine weevil may significantly hinder the growth of young trees. In British Columbia, it hinders the regeneration of Sitka spruce, white spruce and Engelmann spruce and is considered a major pest of most other species of spruce.

