Forest Insect
& Disease
Leaflet 96

U.S. Department
of Agriculture
Forest Service

Larch Casebearer in Western Larch

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The larch casebearer (*Coleophora laricella* (Hübner)), a native of Europe, was introduced into North America in 1886. The insect, which probably entered on planting stock, now infests almost all species of larch and tamarack in the United States.

During the early 1900's, the casebearer spread from Massachusetts, where it had been introduced, throughout the range of tamarack in the Northeastern United States and Southeastern Canada. It reached the Lake States in the 1950's; and in 1957, the casebearer was discovered in western larch around St. Maries, ID.

Once established in the West, the insect had abundant and concentrated stands of larch and few natural enemies. Populations increased dramatically. By 1970, *half* the western larch

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range was infested; by 1982, the moth had spread into all the western larch range in the United States and most of southern Canada (fig. 1).

The larch casebearer larvae eat the inside tissue of needles. Severe defoliation—85 to 100 percent of the needles killed year after year—kills trees or reduces their potential growth as much as 95 percent.

Hosts

In North America, the larch casebearer infests tamarack (*Larix laricina* (Du Roi) K. Koch) and western larch (*Larix occidentalis* Nutt.). Any species of *Larix* imported from other countries is a potential host. However, the larvae have not been found on subalpine larch, probably because subalpine larch grows at elevations where late spring and early fall frosts cause larval mortality.

Unlike most conifers, which are evergreens, western larch is deciduous and loses its leaves in the fall.

A large, fast-growing tree, western larch is the most important timber species of *Larix*. In the Western United States, there are about 2.7 million acres (1.1 million ha) of commercial western larch forests on Federal, State, and private lands.

Life History

The larch casebearer produces one generation per year and has four life stages; adult, egg, larva, and pupa (fig. 2).

The adults, emerging from pupal cases in late May through early July, are silvery to grayish-brown moths with no conspicuous markings. Their narrow wings are fringed with slender, hairlike scales. At rest, their wings folded, the moths are about 0.25 inch (6 mm) long. (See cover photo.)

A female moth produces from 50 to 70 eggs, which she always deposits singly, usually on the underside of needles (fig. 3). At first, the eggs are yellowish, but later they turn cinnamon. When populations are dense, moths may lay 10 or more eggs on the same needle. The eggs hatch in about 2 weeks.

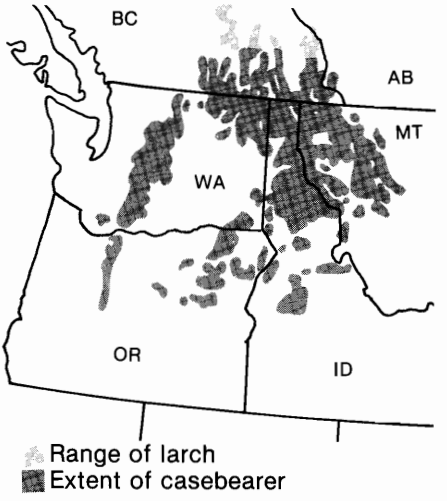

Figure 1—*Botanical range of western larch and larch casebearer infestation within that range in 1982.*

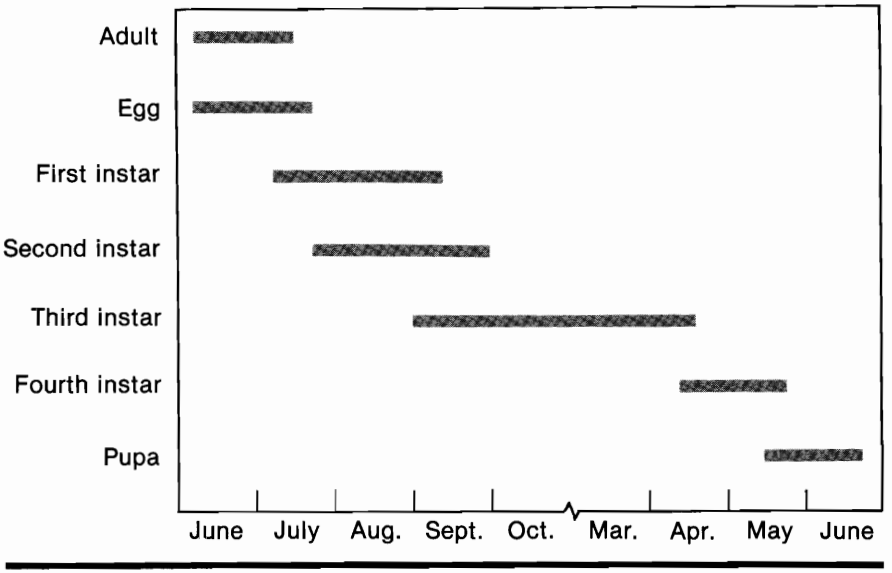

Figure 2—*Seasonal life cycle of larch casebearer in western larch.*

Figure 3—*A single egg. Under magnification, the egg resembles an inverted jello mold; each egg has 12 to 14 lateral ridges extending from apex to base.*

The larval stage lasts about 11 months: larvae hatch in July and pupate the following spring. During this time, the larvae go through four instars, or growth stages between molts, shedding their skins and growing larger. First and second instars live inside the needles. Third and fourth instars live on the surface of the needles in tubelike shelters.

When the first instars hatch, they bore directly through the bottom of the eggs into the needles. For about 2 months, they mine totally inside the needles. As they feed, the larvae pack excrement behind them. If a needle dries out prematurely, which occurs when several larvae occupy the same needle, a larva may chew an exit hole and move to another needle.

Between late August and mid-October, larvae convert the mined needles into cases. The cases are made from sections of hollowed out needles and are open at both ends. Cases made from western larch needles are straw colored and rectangular. Inside their cases, the third and fourth instars live, feed, and, later, pupate.

Third and fourth instars use a pad of silk to fasten their cases to needles and mine interiors as far as they can reach without leaving their cases. Excrement is pushed out the open end of the case. After mining one needle, larvae chew their cases free and crawl to another (fig. 4).

They continue feeding throughout the fall. About October, the larvae prepare for hibernation by attaching their cases to twigs and, sometimes, to the bark of limbs or the trunk. When populations are dense, clusters of overwintering larvae can be seen around the bases of buds (fig. 5).

In the spring when larch refoliates (near the end of April below 3,500 feet (1,067 m)), the larvae molt to fourth instars and resume feeding. Casebearer larvae reach maturity and pupate by late May or early June. By this time, the cases made from western larch needles have become light gray and cigar shaped (fig. 6). The pupal stage lasts about 2 weeks.

Figure 4—*Partially concealed by its case, a mature larva, about 0.2 inch (5 mm) long, crawls by extending its head and thorax outside the case, which is either dragged behind or lifted slightly.*

Figure 5—*A cluster of overwintering larvae, their cases attached around a bud at the tip of a larch twig.*

Damage

Casebearer larvae injure trees by mining within the needles during spring, summer, and fall; but spring feeding on the new foliage causes the most damage (fig. 7). The hollowed-out needles turn yellowish-green; and by early summer, severely defoliated trees take on a reddish-brown cast

Figure 6—*Two cigar-shaped pupal cases fastened in the center of a needle whorl.*

Figure 7—*Needles mined by fourth instars. During outbreaks, especially when the weather is warm and fairly dry, the fourth instars destroy the foliage soon after it appears.*

(fig. 8). From mid-June to mid-September, however, western larch can lose its brownish color and look greener when new shoots elongate or if a tree grows a second crop of needles. Mining in late September may brown the trees again; but by then, the tree has completed its growth, so damage is minor.

Larch can withstand repeated defoliations better than most other conifers because it drops its leaves in the fall, refoliates each spring, and can produce two crops of needles during a growing season. After 4 or more years of severe defoliation, however, stressed larch grow shorter needles and fewer second-crop needles per fascicle—that is, fewer needles grow out of one bud. When this happens, instead of feeding on the average 24 needles it usually mines, each larva needs to feed on about 76 needles to complete its development.

Eventually, repeated defoliation causes branch tips to die back. Within a few years, entire branches begin dying; by the next season, epicormic branching can occur along the trunk; and within another 1 or 2 years, the tops of trees may die. Tops of dominant trees, which usually contain higher concentrations of larvae, are damaged the most. Soon after these symptoms appear, some tree mortality may occur in deteriorating larch stands. Usually, younger trees growing in the open or along the edges of openings are the ones to die.

Trees weakened by defoliation are susceptible to other insects and diseases. A 1968 study in northern Idaho indicated that the western larch borer,

various scavenger bark beetles, and armillaria root disease probably killed many casebearer-stressed larch.

This same study showed that after 5 years of severe defoliation, annual radial growth in many trees decreased from 3 millimeters per year to 0.1 millimeter. In other words, severe defoliation for 5 years reduced the trees' growth 97 percent.

Natural Control

Natural control factors, such as weather, needle diseases, and native predators and parasites, help reduce populations.

Probably everywhere that larch and tamarack grow, prolonged cold, wet weather in the spring, with frosts after the larvae have come out of hibernation, can cause considerable mortality. Droughts that last into late summer, causing the needles to dry out and fall off the tree, also reduce populations.

Periodically, there are widespread epidemics of two needle diseases. These diseases reduce the larvae's food supply by causing the needles to dry. Hypodermella blight (*Hypodermella laricis* Tub.) damages needles when the larvae start mining in the spring. A second disease, *Meria laricis* Vuill., affects needles during the summer.

Predators eat primarily eggs, larvae, and pupae. A large red mite and mirid bugs prey on the eggs. Pentatomid bugs, spiders, ants, yellow jackets, and four species of birds (mountain chickadee, dark-eyed junco, chipping sparrow, and orange-crowned warbler) feed on the larvae and the pupae.

About 30 species of native parasitic wasps have been found to attack the casebearer. Only a few of these parasites are ever more than of minor importance.

These natural controls will not always prevent outbreaks. Fortunately, casebearer populations can be reduced with imported insect parasites.

In the Eastern United States, two European parasites, *Agathis pumila* (Ratz.) and *Chrysocharis laricinellae* (Ratz.) (fig. 9), have been credited with keeping casebearer populations at tolerable levels.

Since 1960, these two parasites have been introduced into western larch stands. Both parasites are widespread, and they have been pivotal in reducing casebearer populations. Random samples indicate that either one can parasitize over 90 percent of the casebearer population in an area. By 1981–82, the introduced parasites, coupled with needle diseases and other mortality factors, had reduced outbreak populations of larch casebearer in Idaho and Montana to a point where it was difficult to detect one larva per branch.

Direct Control

Over large areas, the application of insecticides is usually not practical because western larch grows with other species in scattered patterns of stands, groups, and individual trees.

However, high-value trees, that is, trees managed for seed production, recreation, or esthetics, can be treated with malathion, which is registered by the U.S. Environmental Protection Agency for larval control.

Figure 8—*A western larch stand after heavy needle mining.*

Figure 9—*An introduced parasite,* Chrysocharis laricinellae, *ovipositing into a larva, seen protruding from its case.*

Silvicultural Control

No silvicultural controls have been developed, although some research has been done on silvicultural treatment. One study showed that casebearer populations increased on saplings as the space between the larch increased. Other data suggest that above 4,000 feet (1,122 m) casebearer populations cannot remain dense enough to affect the radial growth of infested larch, even though browning was observed for several years in stands at 4,728 feet (1,441 m) on Lookout Pass, ID.

Information

Landowners can get information about larch casebearer control from a Cooperative Extension agent, a county Extension office, the local State forestry office, or the Forest Pest Management staff, U.S. Department of Agriculture, Forest Service.

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Apply pesticides so that they do not endanger humans, livestock, crops, beneficial insects, fish, and wildlife. Do not apply pesticides where there is danger of drift when honey bees or other pollinating insects are visiting plants, or in ways that may contaminate water or leave illegal residues.

Avoid prolonged inhalation of pesticide sprays or dusts; wear protective clothing and equipment, if specified on the label.

If your hands become contaminated with a pesticide, do not eat or drink until you have washed. In case a pesticide is swallowed or gets in the eyes, follow the first aid treatment given on the label, and get prompt medical attention. If a pesticide is spilled on your skin or clothing, remove clothing immediately and wash skin thoroughly.

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Revised September 1985

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