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Forest Health Note

"STEWARDSHIP IN FORESTRY"

What's damaging Western Larch in Oregon?

Descriptions of major insects & diseases

Western Larch occurs naturally in eastern Oregon, growing in either pure stands or as an important component of Douglas-fir and western white pine forest types. It shows rapid initial growth, is windfirm and fire-resistant, making it a preferred species in terms of both forest management and timber production. Recently, there has been concern regarding the amount of defoliation occurring in western larch in Oregon, and the following provides descriptions of the major insects and diseases that can affect larch and how to distinguish these from one another.

Larch Casebearer

The Larch casebearer, *Coleophora laricella*, was introduced into North America from Europe in 1886 on planting stock. This moth now infests almost all species of larch in the U.S. It was first found on western larch (*Larix occidentalis*) in Idaho in 1957, and is now considered to be the most serious pest of larch in the western states. Larch casebearer larvae consume needle tissues, causing defoliation. Sustained, severe infestations can substantially reduce tree growth. While tree mortality is generally rare, young trees growing in the open or along forest edges can be killed.

Outbreaks have occurred periodically since the 1970s, but have not been well-documented. Aerial survey records indicate that damage from larch casebearer in eastern Oregon has been detected every year since 1997, with the largest recent outbreak occurring in 1999 on 15,000 acres.

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(Note: Aerial surveys are flown from July-August each year, and thus underestimate larch casebearer damage due to secondary needle flushes.)

Life History

Adults are tiny, silvery-grey moths with narrow fringed wings that fold along the body when at rest (Figure 1). Eggs are laid singly on needles from late May until early July and natural dispersal occurs by moth flights until August. Hatching occurs in 2-3 weeks and the newly emerged larvae begin to mine the needles. Older larvae cut off a portion of the hollowed needles and line these with silk to form a light-brown, cigar-shaped case (Figure 2).

Photo: Ian Kimber, Bugwood.org

Figure 1: Larch casebearer adults are small (1/4 in) silvery-gray moths with narrow fringed wings that fold along the body at rest.

From then on, they live, feed and develop inside the case. Larvae overwinter within their cases, which are attached to the base of buds at branch tips after the tree has shed its foliage. When temperatures increase in early spring, the larvae become active and

Photo: Ian Kimber, Bugwood.org

Figure 2: Larch casebearer larvae inside its case. Mature larvae are small (1/4 in) and reddish-brown in color with a black head. The cigar-shaped cases are attached to needles with silk.

resume development. It is the 3-4 weeks of feeding by the maturing larvae that is the most destructive to the needles. Larvae then develop into a pupa, from which the adults later emerge. There is one generation per year.

Distinguishing Damage

Damage is usually greatest in the **upper crown** and lightest in the lower crown (Figure 3). Severe attacks will produce more red-colored needles that cause the tree to take on a fire-scorched appearance. The new foliage of lightly-attacked needles turns straw-colored and curls at the end.

Photo: William Ciesla, FHM Intl, Bugwood.org

Figure 3: Damage from larch casebearer becomes visible in early spring and is usually greatest in the upper crown. Severe attacks can produce red-colored needles that take on a fire-scorched appearance.

Often, an emergence hole can also be seen (Figure 4). Perhaps the best indicator is the presence of cases, which can be found on needles or twigs from August to June. The cases are initially straw-colored and rectangular, but become light gray and cigar-shaped (Figure 4).

Western larch is relatively resistant to the effect of defoliation, and will often send out a second flush of needles in late summer. After five or more years of severe defoliation, annual terminal and radial growth may be seriously reduced. Reduced cone production may also decrease the amount of natural regeneration occurring at affected sites. Younger trees suffering >85% defoliation over several years may be killed by larch casebearer.

Photo: Petr Kapitola, Bugwood.org

Figure 4: New foliage attacked by larch casebearer is initially straw-colored and curls at the end, with an emergence hole often visible. The cigar-shaped case is located in the center.

Management

Control of this pest has relied upon environmental factors and natural enemies, both native and introduced. Prolonged cold, wet springs, with frosts, can lead to significant mortality of larch casebearer, while droughts that last into the summer can also reduce populations by causing premature needle drop. While there are many native predators and parasitoids that attack larch casebearer, these do not appear sufficient to control expanding populations. Therefore, two European parasitic wasps, *Agathis pumila* and *Chrysocharis laricinellae* (Figure 5), have been introduced into larch stands in North America since 1960.

Recently, these biological control agents have been credited with controlling larch casebearer in eastern Canada and the northeastern U.S. Western populations of these wasps

Photo: Scott Tunnock, USDA FS, Bugwood.org

Figure 5: The parasitic wasp, Chrysocharis laricinellae, introduced from Europe is one of the important biological control agents for management of larch casebearer infestations.

appear to be increasing in number and distribution, and it is hoped that they, along with environmental factors, may be able to reduce severe damage and future outbreaks. Chemical sprays have been used for ornamental plantings of larch in the past, but there are currently no pesticides registered for use in Oregon on larch casebearer.

Larch Needle Diseases

The premature needle discoloration on western larch that is not attributable to larch casebearer is often the result of needle diseases. The two most common diseases in Oregon are larch needle cast, caused by the fungus *Meria laricis* and larch needle blight, caused by the fungus *Hypodermella laricis*. Needle cast was introduced to North America from Europe in the early 1900s, while needle blight is native to the U.S.

Needle cast was first identified on western larch in 1942, and since that time the disease has appeared sporadically in native stands and nurseries. Damage is greatest on seedlings in nursery settings with tree-killing commonly occurring after successive years of infection.

Needle blight is generally considered less damaging overall, but frequently occurs in stands infected with needle cast. Combined damage from these agents is often spectacular in spring and summer; however, trees in forest settings rarely experience serious damage or mortality. Aerial survey records indicate that damage from needle cast in Oregon has been detected since 1993, with the largest recent outbreak occurring in 1998 on 18,000 acres (Figure 6).

Photo: USDA FS Archives, Bugwood.org

Figure 6: Larch needle cast is consistently observed in eastern Oregon with outbreaks occurring periodically.

Life History

The causal fungi for these diseases overwinter on needles on the ground or in infected trees. Spores are produced in early spring around the time of bud-break, and are disseminated by wind or rain splash to newly emerging needles. Long distance spread occurs by transplanting infected stock into new areas. Higher moisture levels favor fungal growth and spread, and outbreaks usually last for only 1-2 years until drier conditions return. Infected crowns usually refoliate the following year, but repeated infection can cause some growth loss and predispose trees to damage by other agents, including root disease and abiotic disorders.

Distinguishing Damage

Photo: Ken Gibson, USDA FS, Bugwood.org

Figure 7: Larch needle cast causes discoloration that begins at the tip or middle of the needle in late spring and spreads downward. Affected areas turn yellow, wilt and become reddish-brown, with only some of the needles on each spur shoot affected.

Larch needle cast and needle blight frequently occur together because they require similar conditions for infection. The severity of infection varies greatly from year to year not only in response to weather conditions, but also among trees within a stand, reflecting possible genetic differences in susceptibility. In contrast to larch casebearer, infections by needle diseases are usually greatest in the lower crown.

Needle cast causes needle discoloration and browning that begins at the tips or middle of the needle in late spring and spreads downward. Affected areas turn yellow, wilt, and become reddish-brown, with only some of the needles on each spur shoot affected (Figure 7). The infection and accompanying discoloration eventually cover the entire needle, causing needles to drop within one month. Spore clusters are found in and emerging from openings on the underside of needles, but are difficult to see without staining and magnification.

Needle blight infected needles rapidly turn reddish-brown in early summer over their entire needle length, as if fire-scorched, and take on a "drooping" appearance (Figure 8). In contrast to needle cast, all needles on a spur are usually affected, with dead needles remaining attached to shoots even after healthy foliage is shed in the fall. Small, black fruiting bodies are formed on dead needles in late fall and often merge to form narrow rows.

Management

There are generally no recommended treatments available or needed for control of needle diseases in forest settings. Control in forest nurseries can be achieved by a combination of silvicultural and chemical treatments. Avoiding introduction of diseased stock can be accomp-

lished by growing larch from seed. Transplants of seedlings to seedbeds where larch have not been grown will prevent re-infection by fungi on fallen needles. Fungicide applications at 3 week intervals from bud swell until the end of July has also been shown to reduce seedling infections.

Photo: USDA FS Archives, Bugwood.org

Figure 8: Larch needle blight infected needles rapidly turn reddish-brown in early summer over their entire needle length and take on a "drooping" appearance. All needles on a spur are usually affected and dead needles remain attached to shoots even after healthy foliage is shed in the fall. Small, black fruiting bodies are often visible on the needles.

Other Damaging Agents

In addition to the above damaging agents, defoliation of western larch may also result from feeding by larch sawfly (*Pristiphora erichsonii*) (Figure 9) or larch budmoth (*Zeiraphera improbana*) (Figure 10). Sawfly damage can be distinguished by the "chewed" appearance and large pieces of older foliage that are consumed by larve. Damage from budmoth larvae, in addition to consuming needles, is distinguished by the partial severing that occurs along one side of the shoot. Frost damage to larch is also common, and can be distinguished due to its effects on the shoots in addition to young needles. In contrast to needle diseases, frost damage often occurs in the upper crown and fungal fruiting bodies are absent.

Photo: Scott Tunnock, USDA FS, Bugwood.org

Figure 9: A colony of larch sawfly larvae feeding on western larch.

Photo: Daniel Adam, Bugwood.org

Figure 10: A larch budmoth larvae feeding on western larch.

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