



Forest Health Note

Western Spruce Budworm (*Choristoneura occidentalis*)

Hosts:

Douglas-fir, white fir, grand fir, subalpine fir, and western larch.

Importance:

The western spruce budworm is the most destructive defoliator of conifers in central and northeast Oregon. Major outbreaks can last for more than a decade and impact millions of acres of forests. The five types of tree damage associated with budworm defoliation are growth loss, top-kill (Figure 1), deformity, reduced seed production, and tree mortality. Host trees that survive major budworm outbreaks in a weakened condition are often killed later by bark beetles.

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Look For:

May – June

As new shoot growth starts, budworm larvae (Figure 2) web together adjacent shoots, producing a twisted or stunted appearance.



Figure 1: Large Douglas-fir and true fir trees infested by the spruce budworm have thin upper crowns.

July

Reddish-brown branch tips give an infested stand a scorched appearance (Figure 3). The very upper crown often appears bare, with only a few needles remaining after several years of budworm feeding.

August – April

Missing needles on year-old shoots can indicate budworm-feeding activity during the previous year.

Biology:

Budworm larvae feed in buds and on foliage from May–July (Figure 4). Older larvae have dark heads and an olive-brown body with whitish spots. Pupal cases are attached to damaged shoots.

The orange to gray-brown moths are extremely abundant in late July and August during an outbreak.

Infestation Characteristics:

Budworm larvae feed on the new foliage as buds swell and burst in the spring. Larvae eat older needles only if nothing else is available. Consuming older foliage usually signals a declining budworm population. The longer budworm defoliation occurs, the more damage is done to host trees. It usually takes three



Figure 2: Western spruce budworm larvae.





Figure 3: Western spruce budworm feed on and web together Douglas-fir needles in June. By early July the severed needles turn reddish brown, giving infested trees a scorched appearance.

to five years of tree defoliation to cause top kill, reduced radial growth, and some tree mortality. Smaller diameter hosts (5" to 8" dbh) and seedlings are more likely to suffer severe damage (Figure 5). Bark beetle infestations in larger trees weakened by defoliation are common near the end of a budworm outbreak.

Control:

Natural

Ants and birds are the major predators of budworm larvae. Leaving woody debris on the ground for ants and snags as nesting sites for birds may contribute to predator abundance, but these agents are insufficient to control large populations.

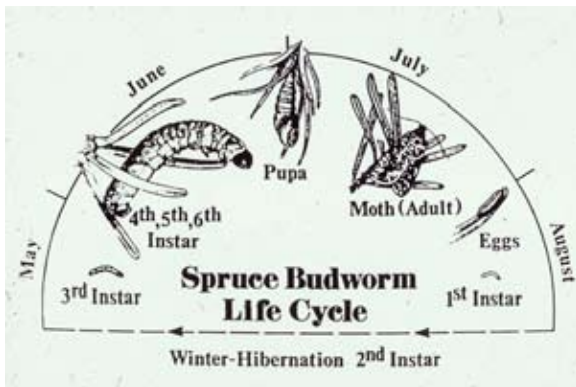


Figure 4: Life cycle of the western spruce budworm in Oregon.

Silvicultural

Silvicultural practices that reduce budworm damage are best applied during the years between major outbreaks.

- Stocking levels of budworm hosts seem to be a good indicator of how stands might be damaged during an outbreak. If landowners keep the stocking level of budworm host trees to <50% of the stand, the level of damage over the course of a major outbreak

is generally low. This is a strong argument for maintaining species diversity in stands.

- Convert stands back to pine or larch where fire suppression and logging practices have allowed Douglas-fir and true fir to become dominant. Although larch is considered a budworm host, it usually suffers little damage from defoliation.
- Do not thin stands during or immediately after an outbreak. There is no way to identify which trees will fully recover from defoliation and escape bark beetle attack. Also, opening up stands may cause the loss of shade tolerant foliage, further weakening the remaining trees.



Figure 5: Seedlings and small diameter Douglas-fir and true fir can suffer complete defoliation.

Predicting Defoliation

There are occasions when knowing the future course of stand defoliation will aid in management decisions. This is particularly true whenever an insecticide treatment is under consideration. A technique is available that relates the number of moths caught in pheromone baited traps to stand defoliation the next year. Contact the Oregon Department of Forestry Forest Health Program for more information.

Insecticides

Insecticides are most effective in early summer when most budworm larvae are in the fourth instar, approximately 3/4" long (Figure 4). As a result of this late application timing, little foliage maybe saved in the year of treatment. Large scale applications of insecticides proved ineffective

during the last major budworm outbreak in Oregon, due to re-invasion from surrounding areas. Therefore, only small scale treatments over targeted areas are recommended, with the focus on retaining foliage until harvest or other stand management activities can be completed.

The following insecticides are registered for western spruce budworm control:

- **Aerial application to forest trees:**

Bacillus thuringiensis (B.t.)

carbaryl

tebufenozide

- **Ground application to ornamental trees**

Bacillus thuringiensis (B.t.)

cyfluthrin

carbaryl

tebufenozide

spinosad

Remember, when using pesticides, always read and follow the label.

For further information about the Oregon Department of Forestry's Forest Health Program,

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