



# Forest Pest Fact Sheet

## Western Spruce Budworm (*Choristoneura freemani*)

### Hosts

Western spruce budworm (WSBW) is a defoliating caterpillar that feeds on grand fir, subalpine fir and Douglas-fir as the preferred hosts. Engelmann spruce and western hemlock are infrequently damaged as well, and western larch is an occasional host, but damage is usually minor and confined to new growth. Pines are rarely damaged by this insect, though there is a related species (*Choristoneura lambertiana* - western pine budworm) that feeds on pines.



**Figure 1.** Female moth laying eggs on Douglas-fir needle. Photo L. Livingston bugwood.org

### Distribution

WSBW occurs throughout the West, wherever the hosts grow. In Idaho, most long-term outbreaks occur in the southern part of the state (**Figure 5**). All of the National Forests of southern Idaho have experienced WSBW outbreaks, but the Payette, Boise, and Sawtooth National Forests have probably seen the most activity historically.



**Figure 2.** WSBW late instar caterpillar. Photo W. Ciesla bugwood.org

### Life Cycle

Adult mating and egg laying takes place in late summer (**Figure 1**) and recently hatched caterpillars find protected places on the trunk or branches to overwinter. In the spring, overwintering caterpillars emerge and begin to feed inside developing buds. WSBW has one generation per year and the caterpillars (**Figure 2**) go through six molts or growth stages. As they grow, caterpillars feed on expanding needles and spin webbing on the ends of branches. Caterpillars spin cocoons and enter the pupal (resting) stage in late summer and adults usually emerge in August to repeat the cycle.



**Figure 3.** Light defoliation of grand fir new growth caused by WSBW larvae.

### Damage

Feeding is most severe and noticeable on new growth at the tops of trees and the outer branches (**Figures 3 and 6**). Feeding inside cones can negatively impact seed production and regeneration. Trees defoliated less than 50% often fully recover. However, repeated heavy defoliation, or more than 90% needle loss in one year can kill trees. Heavy defoliation can also render trees more susceptible to subsequent bark beetle attack. Moth outbreaks can be cyclical and collapse on their own due to natural enemies. However, in drier parts of Idaho and the West, chronic outbreaks lasting many years are common and have resulted in substantial tree mortality from subsequent bark beetle attacks by Douglas-fir beetle and fir engraver.



**Figure 4.** WSBW adults resting on cars in a car dealership in the early morning, attracted by lights from the night before.

### Recognition

Older caterpillars are largely hairless and greenish brown (**Figure 2**) and are most likely to be observed by landowners. Male and female moths are small, reddish brown and look similar (**Figure 1**). Both sexes can fly as adult moths, and are attracted to lights, often in large numbers during outbreaks (**Figure 4**).



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## Western Spruce Budworm Management

**Predisposing Factors** WSBW occurs throughout Idaho (Figure 5), but long-term outbreaks are most common in the drier forests of southern Idaho. The most serious outbreaks in Idaho have occurred in the vicinity of McCall and Cascade (Payette and Boise National Forests), and on the Sawtooth and Salmon-Challis National Forests. Periodic outbreaks have also occurred in northern Idaho, but significant defoliation has not occurred in since 2011. Defoliation tends to be worse in stands that have a high proportion of grand fir, stands on ridges, and drier aspects. Multistoried stands of grand fir and Douglas-fir allow larvae in infested trees to drop onto susceptible understory trees. Dense stands also aid larval movement and can suffer heavier damage.

**Short-term Insect Management** There are several insecticides currently labeled for control of WSBW, but product registration and labels are constantly changing. *Bacillus thuringiensis* (Bt) is a selective biological insecticide that is effective against WSBW and other moths, but proper application timing is critical. Government-administered aerial spray programs are rarely used for this insect in Idaho, and the high cost and recent regulations are often inhibiting. Protection of small, high value trees is possible using ground based spray equipment. When properly applied, insecticides will protect trees for one season, but it is important to remember that spraying will not reduce stand susceptibility to defoliators. Please contact Idaho Department of Lands entomologists for product recommendations before considering spraying.

**Long-term Management Through Silviculture** WSBW causes the most damage on grand fir, subalpine fir and Douglas-fir in Idaho. In chronic problem areas, two storied stands with susceptible understory should be avoided (Figure 6). Past management and fire suppression have allowed shade tolerant species to increase in areas better suited to pines, larch or other species. Pines, western larch, and Engelmann spruce are less favored by WSBW in Idaho. Harvest that retains these species will minimize future damage from WSBW (Figure 7B). Where landowner objectives dictate retention of susceptible hosts, thinning dense stands may decrease damage and allow for better recovery after an outbreak.

**Figure 7.** Photo A shows a grand fir/ Douglas-fir stand in southern Idaho in 2013 after the foreground was harvested and replanted to ponderosa pine (nonhost) after repeated WSBW-caused defoliation. Photo B shows the same stand six years later (2019) after the pines have grown to approximately 5 feet. The discolored trees in the background were defoliated by Douglas-fir tussock moth, a different species of moth that feeds on the same hosts as WSBW.

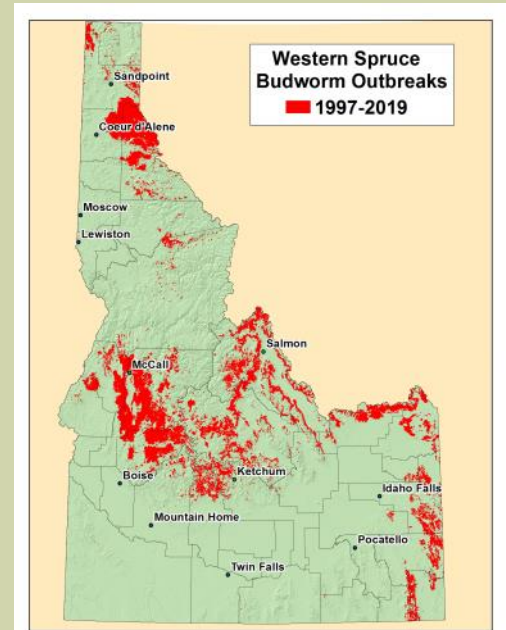


Figure 5. Historical WSBW outbreak areas



Figure 6. Young grand fir heavily defoliated by caterpillars dropping from taller infested trees. Note heavy webbing.

