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# Western Spruce Budworm Activity in the Southern Bighorn Mountains

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## Introduction

The western spruce budworm is the most damaging defoliator in western North America (Furniss & Carolin 1977). Budworm is widely distributed and occurs from southern British Columbia to New Mexico (Furniss & Carolin 1977). Principal hosts are Douglas-fir and true firs, and occasionally Engelmann spruce (Fellin & Dewey 1982). Budworm feeding is identified by mined buds, missing new growth, and often reddish-brown needle pieces webbed together especially at branch tips. Stands affected by budworm typically have a reddish hue and trees appear singed as new growth is eaten and webbed needle pieces dry. Typically, smaller trees in the understory show the most damage first. After multiple years of budworm infestation however, overstory trees can have the tops and even entire trees defoliated.

Budworms have a one year life cycle (Fellin & Dewey 1982). Adult moths emerge, mate, and lay egg masses in July or August (Furniss & Carolin 1977, Brooks et al 1985). Eggs hatch within several days, but larvae do not feed in the fall; instead they create silk shelters (hibernacula) among bark scales in which they overwinter (Furniss & Carolin 1977). Larval feeding in the spring starts inside old needles until new buds are available. When buds begin to expand, the larvae bore into them and feed on the new foliage (Furniss & Carolin 1977). Larvae may also feed on developing seed and pollen conelets. Larvae complete development in 30-40 days and pupate (Brooks et al 1985). Larval dispersal is dropping on silk threads within the tree or to the understory in May and June (Brooks et al 1985). Adult moths fly and lay eggs in late July to early August.

Depending on defoliation levels, stands can recover (Brooks et al 1985). However, repeated defoliation over a number of years can lead to trees with no remaining foliage, decreased growth, deformity, top kill and tree death (Furniss & Carolin 1977), or may increase tree susceptibility to other insects, such as bark beetles.

## Current Conditions

There is a landscape scale budworm epidemic across the Douglas-fir forests of the southern Bighorn Mountains. In 2017, at first visit, there was noticeable light defoliation occurring throughout the area, with a large number of larvae still actively feeding. The area and surrounding areas showed light to moderate levels of defoliation that year. Since then, budworm has intensified in level of damage and spread in the amount of area effected in the southern Bighorns. Whereas 2 years ago, defoliation was

relatively heavy on understory trees and light on mature trees, it has now reached a point where many of the larger trees are also being heavily defoliated and entirely stripped of all needles.

With defoliation levels being high on all tree sizes and an expected continuation of high budworm populations in the area, even mature trees are going to get to the point of not having any needles for a second or third straight year. The mature overstory trees will not be able to survive much longer in this condition. Most or all of the smaller understory trees have already sustained enough damage they likely will not survive.

**Conclusions and Recommendations**

The current western spruce budworm epidemic occurring in the southern Bighorns has reached a point where there is potential for widespread tree mortality across the landscape. Douglas-fir forests of all size classes and ages are being heavily impacted. Trees sustaining 3 or 4 years of heavy defoliation will have a difficult time recovering. At this point there has been 1 year of heavy defoliation and the epidemic is intensifying and spreading to new areas on the landscape. Any Douglas-fir stands in the area are at risk to being impacted. It is still early enough in the epidemic that there is not much outright tree mortality, particularly in the overstory, yet, however if conditions do not change, mortality would be expected in the next few years.

There are a number of treatments that can reduce the risk and damage caused by budworm. Many silvicultural treatments provide excellent opportunities to alter stand conditions creating a forest that is more resistant to insect epidemics. Stands most susceptible to insect damage, such as high density stands, can be harvested and replaced with less dense stands and in stands scheduled for overstory removal, shelterwood, or uneven-aged management, individual suppressed or dying trees can be removed, increasing the overall growth and vigor of remaining trees. Any treatments that create more open stand conditions, such as thinning activities, will decrease stand susceptibility to budworm. Open stands produce more vigorous trees and also provide less continuity in foliage, which will reduce budworm survival. Treatments that reduce the amount of dense, mature overstory should also reduce susceptibility to budworm as the number of larger older trees are removed. Any treatments that increase non-host species, such as pine and aspen, will reduce the damage and mortality caused by budworm. The negative aspect of reducing stand density through treatment is it may lead to more multi-storied stands which will increase susceptibility to budworm as regeneration occurs. Treatments are best directed at those stands that have been defoliated the heaviest for the longest amount of time as these are most likely to have increased tree mortality.

Any treatments that help break up the continuous, even aged structure of mature dense host will help reduce long term insect problems even in stands that are not treated. Leaving areas of high insect susceptibility on the landscape is acceptable if they are adjacent to areas that have reduced susceptibility. This will create areas that are unfavorable for insects intermixed with those that are more favorable.

Precommercial treatments, such as thinning from below or removing the understory will reduce the susceptibility of these stands to budworm.

As this is relatively early in this budworm epidemic, any treatments should occur as quickly as possible to reduce damage to the Douglas-fir forests in this area. Reducing susceptibility across at least parts of the landscape should slow the progression of budworm caused damage and leave behind a forest that is more resilient to insect damage in the near future. The currently proposed treatments on BLM lands in the area in conjunction with efforts being carried out on adjacent state and private lands should help to provide a more resilient forest in this area.

## LITERATURE CITED

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