



Ministry of
Forests

Forest Health Bulletin

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Twists and Turns of Another Western Spruce Budworm Outbreak.

The western spruce budworm, a native defoliator, is currently at outbreak levels throughout Douglas-fir dominated forests in the southern interior and coastal B.C. Douglas-fir is the primary host; however spruce, subalpine fir, other true firs, and larch are commonly defoliated. The current outbreak is impacting low to high elevation mixed species stands of all ages. Voracious feeding has also been observed on young lodgepole pine, which is not considered a host for this insect. Until this outbreak, defoliation has rarely been seen on individual pines, and never on large areas such as those recorded in 2024 and 2025.



Western spruce budworm defoliation on lodgepole pine shoots.



Western spruce budworm 2025 defoliation on a mid-rotation Douglas-fir and lodgepole pine stand.

Defoliation causes stem defects, top-kill, and after consecutive years of defoliation, tree mortality. Due to budworm's preferential feeding on the current year's buds and foliage, height and incremental growth can be severely reduced or eliminated, particularly on young or understory trees. It takes far fewer budworm larvae to strip small trees than larger, mature trees. New buds and foliage are very important for continued growth and resilience. Severe outbreaks increase tree susceptibility to other insect pests and diseases, impede forest management and indigenous cultural values, as well as a forest's ability to sequester carbon. Budworm population

levels may be evaluated by calculating larval density on branch tips (number of larvae/m² foliage). In 2024, larval density was extremely high, averaging 184 larvae/m² (maximum=729). High larval densities continued into 2025, averaging 116 larvae/m² (maximum=648). This lower, yet still extreme “budworm loading” on branches simply reflects that after two or more years of defoliation, trees produce fewer buds, thereby limiting the number of budworms per branch. When moths emerge and encounter denuded trees, they will disperse out of these stands to seek better hosts.



First year of defoliation on Douglas-fir.



Multiple years of defoliation on Douglas-fir.

There have been numerous western spruce budworm outbreaks in B.C. since record keeping began in the early 1900's. In the previous two outbreak cycles, the number of hectares defoliated in a single year peaked at 836,854 ha (1987) and 847,138 ha (2007) (Figure 1). In 2024, over one million hectares were defoliated in B.C. These landscape-level defoliation events may be severe and long-lasting, sometimes persisting for over 10 years. However, at a smaller geographic scale, budworm may display short, very intense, eruptive cycles.

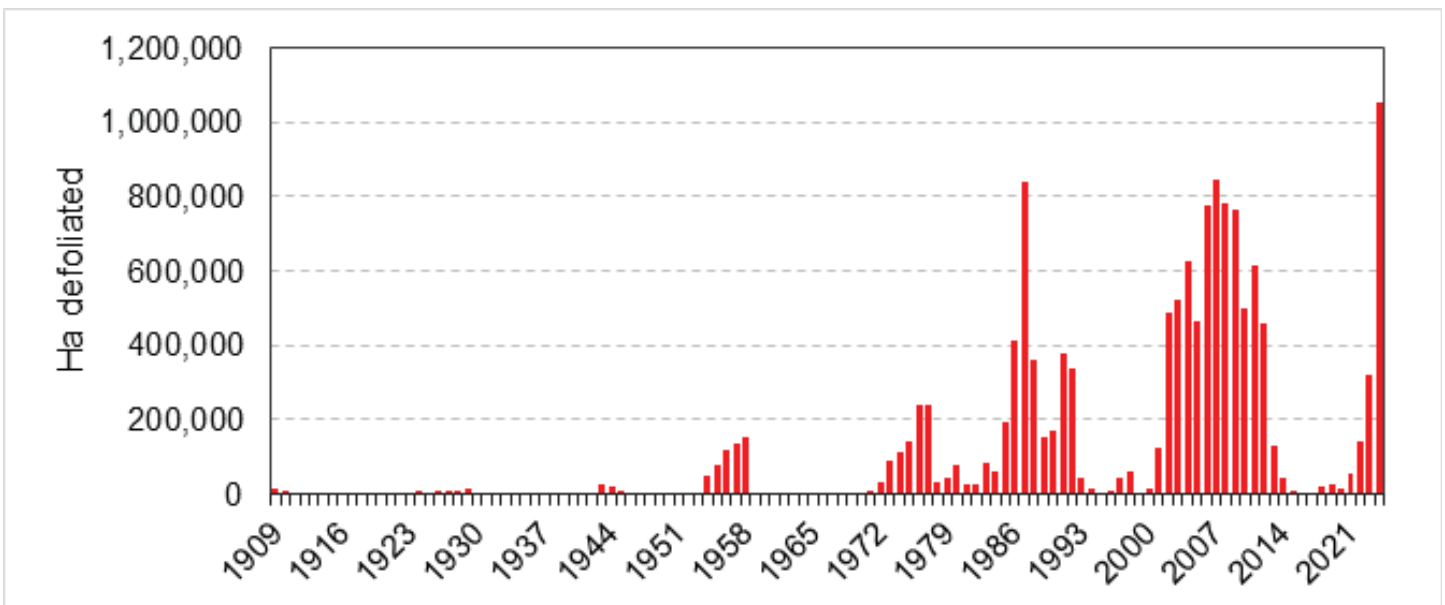


Figure 1. Hectares defoliated by western spruce budworm in B.C. (1909-2024).

Western spruce budworm feeding on and damaging lodgepole pine is a new phenomenon, likely a consequence of the changing climate and forest conditions encountered by budworm in the current outbreak cycle. Budworm is greatly influenced by both climate and stand and host parameters (e.g. species, age, density). The majority of lodgepole pine affected in 2024 and 2025 occurred in young (± 40 year), second growth plantations, surrounded by Douglas-fir dominated stands. Questions needing further investigation include:

- ✓ How many larvae can pine shoots sustain?
- ✓ What larval density is needed to kill pine shoots?
- ✓ Do larvae mine pine buds similar to that seen on Douglas-fir?
- ✓ How many consecutive years of defoliation (and what severity) can pine endure before top-kill or mortality occurs?
- ✓ Do budworm moths lay eggs on pine?
- ✓ Are budworm as fecund when reared on pine?
- ✓ Foliage retention - old vs. new foliage functionality?
- ✓ Will defoliated pine be more susceptible to secondary insect attack?



Multiple western spruce budworm larvae feeding on lodgepole pine shoot.

Regional Forest Health specialists are responsible for the detection, assessment, quantification, and targeted mitigation of native forest insect defoliators, including western spruce budworm, and for the development of long-term, landscape-level management recommendations. Not all defoliation is detrimental and budworm can function as a natural thinning agent, thereby contributing to nutrient cycling in the form of dead insects, and insect frass and foliage falling to the ground due to insect feeding. Tree mortality due to defoliation can contribute to forest succession. However, when there is imminent risk to trees, stands, cultural values, or ecosystems, the application of a biological insecticide, *B.t.k.* (*Bacillus thuringiensis* var. *kurstaki*), may be considered, in consultation with First Nations and the public, to reduce damage, maintain forest values, and protect future forest resources. Management of western spruce budworm is multi-faceted and continually changes to adapt to, and address, the pressures of changing climate, forest conditions, and insect dynamics.



Western spruce budworm damage and frass on lodgepole pine shoot.



Aerial application of B.t.k. to mitigate western spruce budworm caused damage.

Out of the Classroom and Into the Field: Forest Health Training in the North

The Omineca and Northeast Regional Pathologist, Kelly Hrywkiw, and Regional Entomologist, Philip Batista annually lead forest health training for BC Timber Sales (BCTS) Forest Technologist Entry Level Program (FTELP), which is based in Mackenzie, BC. The FTELP program is a two-year, on-the-job training program for forest technology diploma or degree graduates, followed by full-time regular employment with BCTS.

The objective of the training is to support the Ministry's goals to improve forest health, improve early detection of pests and diseases, and support informed decision-making in forest management. This training incorporates two parts with the first section consisting of a classroom presentation covering the basics of insect and pathogen biology and identification. This is followed by field training at several teaching sites to reinforce the classroom teachings through hands-on experience and to build competence in identifying different forest health factors that can affect young stands.

Some key entomology factors included identifying the symptoms of trees impacted by root collar weevil, white pine weevil, and sequoia pitch moth, whose impacts can lead to wood quality and potentially tree death. Pathology training focuses on identifying hard pine stem rusts and understanding their biology, relating growth form to impact, and management strategies. A major focus is distinguishing among the three primary rusts in the region: Comandra blister rust, Stalactiform blister rust, and Western gall rust. Considerable time is dedicated

to showing students multiple examples in the field to build their confidence in identification. Other key forest pathogens, including Lodgepole pine dwarf mistletoe, Elytroderma needle cast, Dothistroma needle blight, and Lophodermella needle cast, are also introduced.

The Omineca/Northeast forest health specialists have supported forest health training for the FTELP program over the past several years. To learn more about FTELP visit: <https://www2.gov.bc.ca/gov/content/careers-myhr/job-seekers/featured-careers/ftelp>

Philip Batista, PhD, has been the Regional Entomologist for the Omineca/Northeast Regions since 2021. He joined the ministry in 2019 as a spruce beetle researcher and has a PhD in Biology from the University of Alberta.

Kelly Hrywkiw has been the Regional Pathologist for the Omineca/Northeast Region since 2023. Kelly will be leaving the Ministry to pursue a different career. Her contribution to the forest health program has been very valuable and she will be missed by the team.

