



The South Coast Region includes the following Natural Resource Districts:

- South Coast Region- DCK (Chilliwack), DSQ (Sea to Sky), and DSC (Sunshine Coast)

Prepared November 27, 2024- adapted from the Southern Interior Area Forest Health Program Pest Management Plan 2022-2027 by Lorraine Maclauchlan

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Coast Area

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Executive Summary and Background

Forest Health is an important component of Natural Resource Management within the British Columbia Ministry of Forests (FOR). In the past four decades, the Forest Health (FH) program has transitioned from being primarily focused on the suppression of epidemic insect outbreaks, into a multi-faceted program focused on mitigating damage to forest values and developing innovative and proactive strategies to address current and future FH issues. The existing FH program is a hybrid of proactive and reactive management. Proactive management creates forest conditions that mitigate the impacts of insects, diseases and abiotic factors. It creates an environment where an event can be contained and damage to the current and future forest is minimized. Reactive management addresses eruptive pest populations with thoughtful and measured control or management responses.

Over decades of practice in British Columbia (BC), we have developed a hybrid version of pest management that incorporates both reactive and proactive approaches. The use of integrated pest management (IPM) for insect defoliator management combines both reactive and proactive elements that accomplish efficient control and mitigation. The refinement of activities like the annual aerial overview survey (AOS), trapping of native and invasive insects, installation of long-term plots, and surveys is proactive, and part of a monitoring network designed to feed data into a pest management system that provides an early warning of unusual insect activity.

The Forest Health program is responsible for the detection, quantification and interpretation of forest health issues (insects, disease, abiotic). When there are imminent risks to trees, stands, ecosystems or human health (e.g. Douglas-fir tussock moth), control measures are conducted to minimize impacts, maintain forest values, and mitigate future risk. This involves developing and implementing the best management practices for each damaging agent. The FH program evaluates the impacts of forest health damaging agents on forest resource values (e.g. timber supply, habitat, old growth protection, cultural values). British Columbia has many tree species at high risk of pest damage, and large-scale outbreaks of various pests can cause extensive and severe consequences to BC's forests.

Forest pests include insects, pathogens, animals, and various abiotic events (e.g. wind, drought, flooding). The most common insects addressed in the FH program include bark beetles, defoliators, and weevils. Examples of pathogens are root rots, stem rusts, and needle blights. Even some animals such as squirrels, hares, porcupines, deer, and other mammals can have deleterious effects to forests. Forest pests may kill or damage a high volume of timber.

Goal four of the provincial forest health strategy (https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/forest-health/fh-strategies/fh_strategic_plan_2023_final.pdf) is to deliver effective and efficient management of forest pathogens and insects, and of climate change impacts,

The following **Pest Management Plan** is guided by the Forest Health Strategy for the Coast Area and the Integrated Pest Management Act (links below).

[Forest Health Strategy- Coast Area](#)

[Integrated Pest Management Act](#)

The Forest Health program within the two coastal natural resource regions of BC oversees operational and research projects that address critical and emerging entomology and pathology issues. The South Coast Region covers a large and diverse geographic area. Forest lands within this region span maritime and sub-maritime forest ecosystems in the Coastal Douglas-fir (CDF), Coastal Western Hemlock (CWH), and Mountain Hemlock (MH) bio-geoclimatic zones and interior transition forests in the Interior Douglas-fir (IDF), Montane Spruce (MS), and Engelmann Spruce Subalpine Fir (ESSF) zones. The geographic area includes the Sunshine Coast, Sea to Sky, and Chilliwack Forest Resource districts and extends roughly from Bute Inlet in the northwest to Manning Park in the southeast.

With this highly variable and diverse environment comes a wide range of damaging pests and pathogens. Forest pathogens may cause tree mortality, growth loss, and defects. Insect pests may include various species of bark beetles (e.g., Douglas-fir beetle, mountain pine beetle, spruce beetle, western balsam bark beetle), defoliators (e.g., Western spruce budworm, Western hemlock looper), and weevils. Some important forest pathogens in the Coast Area include Swiss Needle Cast and other foliar diseases, root diseases, stem decays, mistletoes, and stem rusts.

1 Introduction

Section 24(2)(g) of the Integrated Pest Management Regulation (IPMR) requires the preparation of a Pest Management Plan (PMP) for insecticide use for the management of native insect pests on more than 50 hectares a year of public land (e.g. provincial Crown land). This PMP is new for the Coast Area.

A PMP is a plan that describes:

- A program for managing pest populations or reducing damage caused by pests based on integrated pest management; and,
- The methods of handling, preparing, mixing, applying, and otherwise using pesticides within the program.

This PMP is consistent with all legislation such as the [Forest and Range Practices Act \(FRPA\)](#), and any associated operational plans or site-specific prescriptions written for areas where operational treatments will occur. Ministry of Forests (FOR) will adhere to the Forest and Range Practices Act, all Regulations of this Act, and all other Federal and Provincial Legislation, which may apply.

1.1 Purpose and Objectives of a PMP

Purpose

The primary purpose in developing this PMP is to implement a proactive program of Integrated Pest Management that involves the detection, identification, monitoring, mitigation, and control of specific defoliating insects. The goal is to protect and maintain biological diversity, wildlife habitat, range forage, and a healthy and productive forest that can be enjoyed and used by First Nations, the public, and forest industry. The Integrated Pest Management approach described in this PMP will ensure the effective management of **high priority defoliators** in the South Coast Region.

Objectives

The objectives of this PMP are to ensure:

- Legal accountability with the provisions of the [Integrated Pest Management Act \(IPMA\)](#) and [Integrated Pest Management Regulation \(IPMR\)](#), as well as applicable federal, provincial and local government laws and regulations;
- the responsible use of insecticides;
- the incorporation and use of the principles of integrated pest management;
- Public and First Nations awareness of, and input into, native defoliator management;
- the effective use of an integrated pest management program, considering environmentally sensitive areas and land use objectives;
- a long-term planning horizon and delivery of a timely, effective Forest Health Program; and,
- continued research into biological and alternative methods of defoliator management.

Under this PMP, populations of damaging defoliators, such as the western spruce budworm, may not be controlled, but rather kept from expanding or causing compounding damage to crown forest lands important for wildlife habitat, First Nations values, range, timber production, forest retention and other local values and objectives.

1.2 Identifying Information

Identification of plan holder

The PMP holder is the BC Ministry of Forests (FOR), located in the Coast Area Regional office at 2100 Labieux Rd, Nanaimo, BC, V9T 6E9.

Geographic boundaries and description of the PMP area

The plan area will be specific to provincial Crown land in the South Coast Region, with Regional Executive Director offices located in Surrey. A map showing the geographic boundaries of the area covered by this PMP is shown in Figure 1.

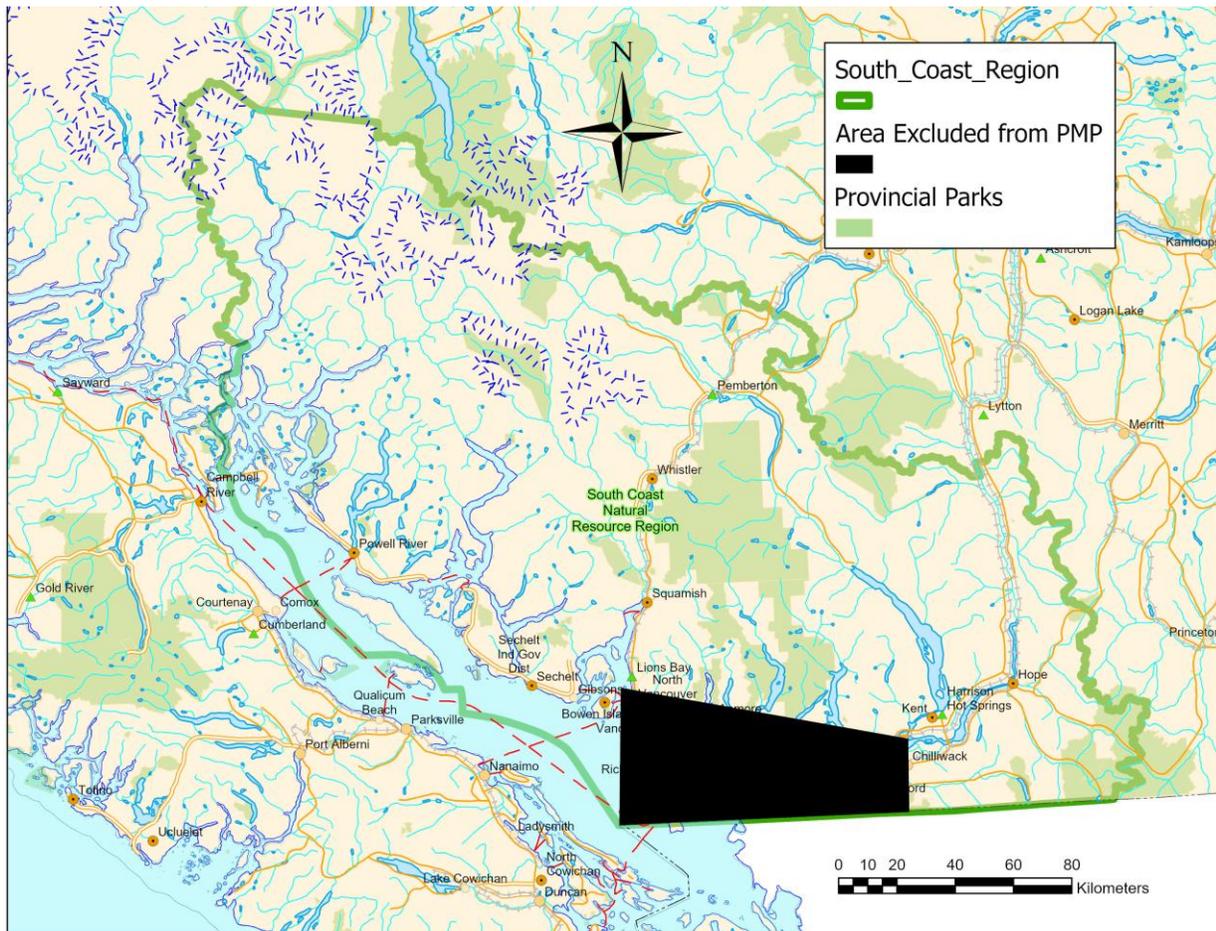


Figure 1. Map area covered by the South Coast Natural Resource Region PMP. The blacked-out area is excluded from the PMP.

The South Coast Natural Resource Region covers 46,553 square kilometres of some of the most productive forest land in the province. The annual AAC of the region as of August 2024 was 2,786,550 m³. This region is the most populated region in BC, accounting for over 60% of BC's human population.

There are 41 first nation bands in the South Coast Region. Forested land in the South coast is dominated by Douglas-fir in the drier subzones and western hemlock, amabilis fir, and western red cedar leading forests in wetter maritime areas. Natural hazards including floods, landslides wildfires and droughts have increased in recent years due to climate change. Increasing natural hazards can have an impact on forest pests such as insects and diseases.

Primary land use

Historically, mining and forestry have been the predominant industries but in recent years, liquefied natural gas development, residential development, tourism, agriculture, transportation, and recreational activities have become increasingly important. The vision of the provincial forest health strategy is to remain trusted leaders in proactive and targeted forest health management. Proactive forest health management includes annual monitoring and assessment of forest pests and promoting measures to reduce future pest impacts through species selection and diversity, stand density management, stand structure, and stand age to reduce the future impact of forest insect defoliators and other pests. Reactive measures for the treatment of insect defoliators includes the thoughtful and targeted use of insecticides to achieve these land use goals. Both proactive and reactive measures to reduce insect defoliators are covered by this PMP.

Public use

A network of primary and secondary roads service the developed area under this PMP. As areas are developed for harvest, public access increases. All main forest service roads are accessible for use by the public and will have signage notifying of pesticide use at all main entry points prior to treatment.

For many Indigenous people, forests are essential to cultural traditions, such as hunting and trapping, and serve as spiritual sanctuaries. Communication with and partnering with local First Nations is a key part in our Forest Health program and integral in the planning process of all defoliator control programs.

Outdoor recreation is a principal focus year-round in the South Coast with fishing, hunting, hiking, rock climbing, skiing, snow shoeing, and various motorized activities being carried out throughout the region. FOR has established many high value recreation sites and trails for public use throughout the PMP area. To maintain public safety and the integrity of these sites, the occasional use of pesticides in or near these sites may be warranted.

Forest Insect Pests

The defoliator species described in this PMP are those considered damaging to forest management objectives and include, but are not limited to:

- Western spruce budworm, *Choristoneura freeman* (Razowski)
- Western hemlock looper, *Lambdina fiscellaria lugubrosa* (Hulst)

This PMP outlines strategies that may be used to manage these forest insect defoliators to reduce their impacts and help preserve and protect important forest values at risk.

2 Background of pest management in the South Coast Region of BC

The Coast of BC has a long history of defoliator presence, but little native defoliator management. Much of the pioneering research for defoliator detection, monitoring, and control was conducted in southern BC where outbreaks of aggressive defoliators were more prevalent.

2.1 Defoliators

Western Spruce Budworm

Except for 2008 and 2009, when some small areas of the Chilliwack district were sprayed for western spruce budworm, management of defoliators in the South Coast Region has been mostly limited to monitoring. Monitoring occurs at the landscape level through the annual aerial overview survey. Ground monitoring can be done using three tree beatings, fall egg mass sampling, and spring bud mining surveys. Traps can also be used to capture male hemlock looper moths in the late summer and early fall. Historic detection of western spruce budworm defoliation is displayed below in Figure 2.

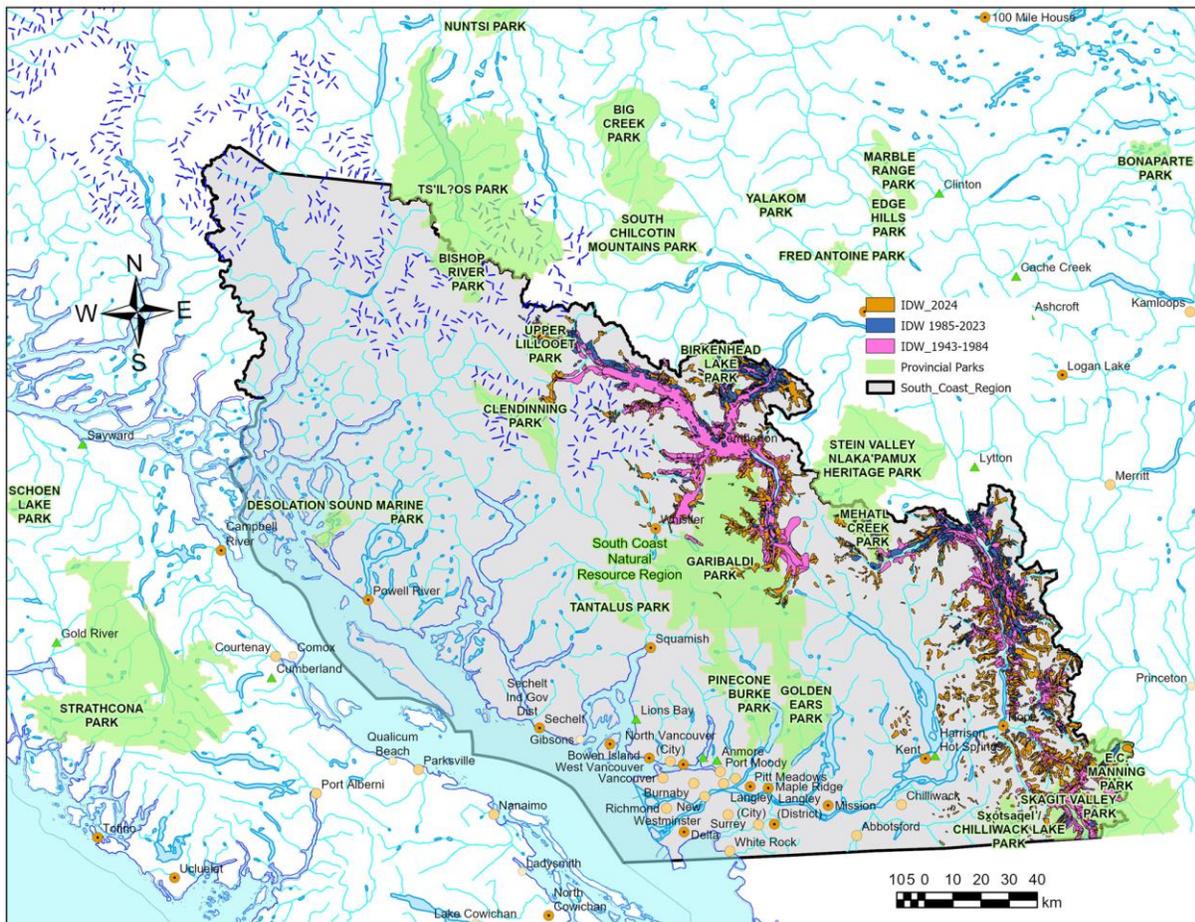


Figure 2. Extent of western spruce budworm (IDW) defoliation detected historically (pink = 1943-1984, blue = 1985-2023, orange = 2024) in the South Coast Region in British Columbia.

In 2008 and 2009, the biological insecticides, *Bacillus thuringiensis* var. *kurstaki* (*B.t.k.*) was applied in the Chilliwack Resource District. The formulation of *B.t.k.* used was Foray 48AB (Table 1). The

treatment was aimed at reducing top kill in trees 20-60 years old. *B.t.k* affects all species of Lepidoptera (moths and butterflies) actively feeding at the time of application. The Forest Health Program has supported some research into the effect of *B.t.k*. on non-target Lepidoptera (Boulton and Maclauchlan 2001).

Table 1. History of spray treatments against the western spruce budworm in the Chilliwack Natural Resource District (1987-2024), where Foray 48B is a product of the biological insecticide *B.t.k*.

Year	Hectares sprayed	Product Used
2008	833	Foray 48B
2009	1,474	Foray 48B
<i>Total</i>	<i>2,307</i>	

There have been six western spruce budworm outbreaks detected in the South Coast Region (Fig. 3). Western spruce budworm outbreaks historically occur around Pemberton and Lillooet Lake in Sea to Sky and in the Fraser Canyon in the Chilliwack Resource District. The most recent western spruce budworm outbreak started in 2022 in the Sea to Sky District and in 2023 in the Chilliwack District. The total area affected in 2023 was 15,893 ha in the Fraser timber supply area (TSA) in Chilliwack District and 18,294 ha in the Soo TSA in the Sea to Sky District. In 2024, the total area affected was 164,158 ha. This is the largest area recorded for a western spruce budworm outbreak on the coast area. The outbreak in the Chilliwack District has moved west of Harrison Lake and into the Chilliwack Valley in areas not historically impacted by western spruce budworm.

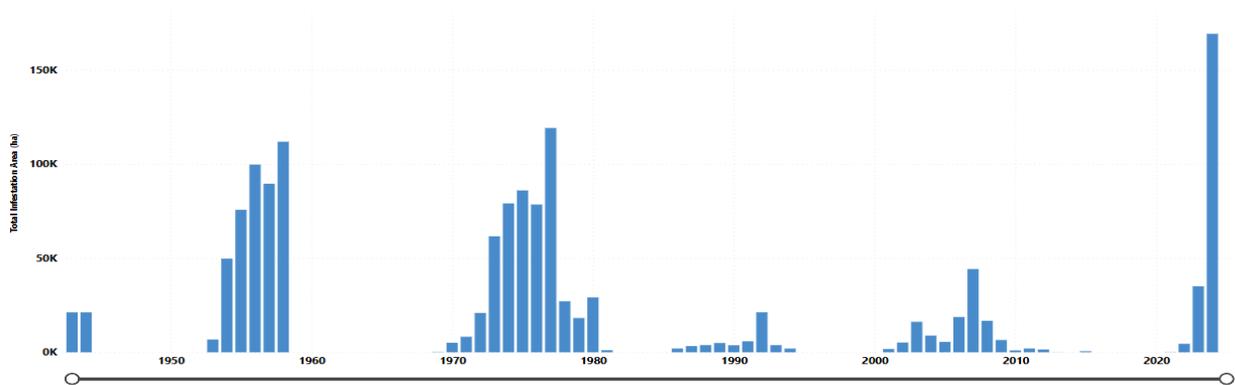


Figure 3. Area affected by western spruce budworm for the South Coast Region by year (up to and including 2024).

The current application rate of *B.t.k*. for western spruce budworm is 2.4 liters per hectare, applied neat (30 BIU/ha). Spray aircraft (rotary wing or fixed wing) are equipped with a spray system having a minimum of four nozzles capable of delivering droplets in the range of 100-120 median micron diameter at a constant rate and pressure over an even, unbroken swath (e.g. AU 4000 micronaires). The spray contractor must have a contingency plan and necessary equipment for containment and mop-up of spills that may occur over the project.

Western Hemlock Looper

The western hemlock looper is a native defoliator periodically destructive in coastal and interior B.C. It has been detected on the coast of BC since 1911 (Fig. 4). It reaches outbreak proportions approximately every 14 years on average in coastal ecosystems. Western hemlock looper outbreaks usually last about 3 years. Natural controls include parasites, predators, diseases, and heavy rains during the moth flight period. Occasionally intervention with *B.t.k.* may be needed to mitigate large areas of mortality and top kill. The western hemlock looper will readily feed on associated species in stands such as interior spruce, Douglas-fir, western red cedar and during outbreaks, even understory shrubs.

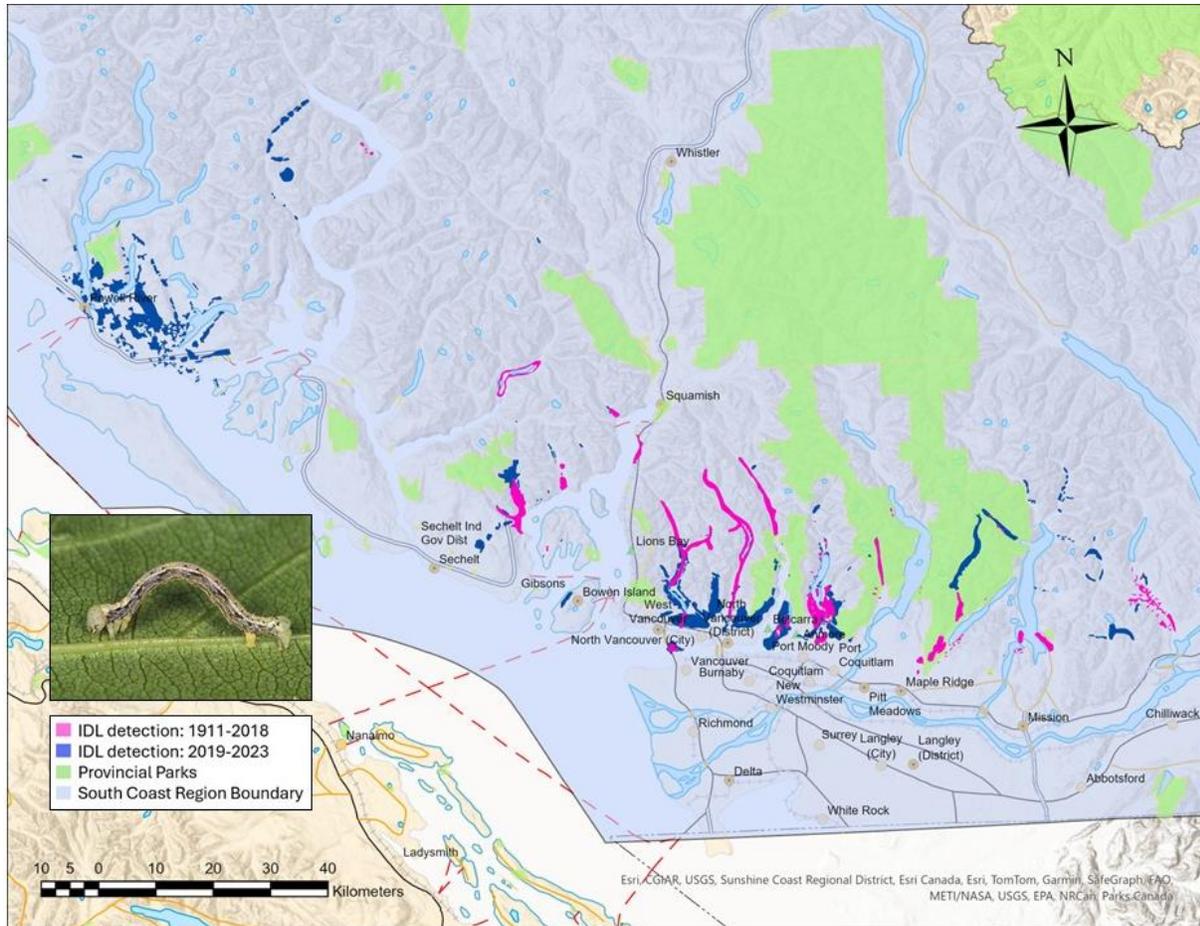


Figure 4. Extent of Western hemlock looper (IDL) defoliation detected historically (pink= 1911-2018, blue= 2019-2023) in the South Coast Region in British Columbia.

Western hemlock looper population trends are monitored annually by pheromone trapping male moths; three-tree beatings at permanent sample sites; and egg sampling (when outbreaks are imminent). Eighteen permanent sites have been established throughout the South Coast Region in the Sunshine Coast and Chilliwack districts. Three pheromone traps are deployed at each of these sites.

Aerial overview surveys have documented the outbreak cycles and extent of damage for this defoliator on the coast, shown below in Figure 5. The last outbreak was considerably larger than previous outbreaks and affected areas in and around Powell River. A large outbreak in Stanley Park from 2022-2023 has

resulted in widespread mortality and high tree removal costs to ensure public safety. There have been no spray programs implemented in the South Coast Region to manage for Western Hemlock Looper to date.



Aerial Overview Survey - BC Regions/Districts

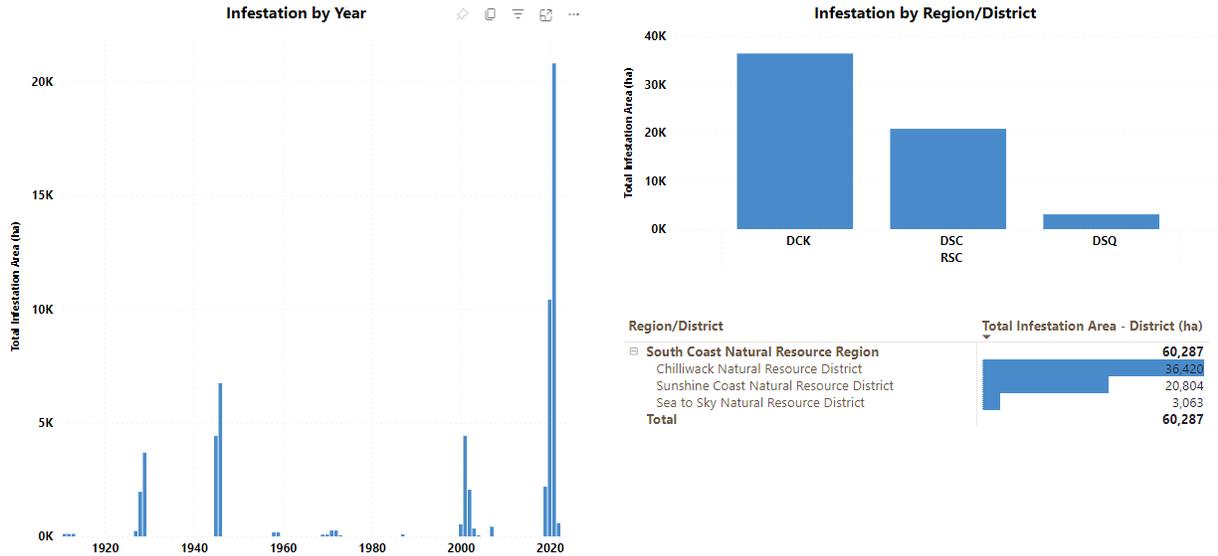


Figure 5. Area affected by western hemlock looper by year (up to and including 2022) and total hectares affected by resource district of the Chilliwack (DSK), Sunshine Coast (DSC), and Sea to Sky (DSQ) Natural Resource Regions.

2.2 Pesticides

Pesticides to be used for defoliator management under this PMP are shown below in Table 2.

Table 2. Biological insecticide used to treat western spruce budworm and hemlock looper.

Active ingredient	Trade Name(s)	PCP No.	Application Rate
<i>Bacillus thuringiensis</i> var. <i>kurstaki</i>	Foray 48B, or other registered <i>B.t.k.</i> product	24977	30 BIU/ha @ 2.4 litres/ha

3 The Coast Area Forest Health Integrated Pest Management Program

Integrated Pest Management (IPM) is a pest control strategy that uses an array of complementary methods: natural predators and parasites, pest-resistant varieties, cultural practices, biological controls, various physical techniques, and the strategic use of pesticides. IPM is an ecological approach that can significantly reduce or eliminate the use of pesticides.

Techniques such as stand susceptibility rating, incorporation of population outbreak models, pheromone monitoring, stand and host species manipulation and application of biological insecticides are all part of an IPM system. The Coast Forest Health Program fully embraces the concept of IPM. Insecticides are part of a broader, biologically based management strategy for defoliators and are used only after monitoring indicates that a critical threshold of damage or population density will be reached or surpassed. Insecticides are applied according to established best management practices guidelines and decision matrices, and treatments are made with the goal of removing or reducing only the target organism. Pest control methods are selected and applied in an effective and economical manner that minimizes risks to human health, beneficial and non-target organisms, and the environment. IPM has become even more important with the ever-increasing impacts of climate change that are now apparent in the changing dynamics of some of our native forest defoliators.

IPM is defined in the legislation ([Integrated Pest Management Act](#)) to mean, “a decision-making process that uses a combination of techniques to suppress pests and must include but is not limited to the following elements:

- a) planning and managing ecosystems to prevent organisms from becoming pests;*
- b) identifying potential pest problems;*
- c) monitoring populations of pests and beneficial organisms, pest damage, and environmental conditions;*
- d) using injury thresholds making treatment decisions;*
- e) reducing pest populations to acceptable levels using strategies that include a combination of biological, physical, cultural, mechanical, behavioral, and chemical controls; and,*
- f) evaluating the effectiveness of treatments.*

3.1 Prevention

Prevention or proactive strategies are the keystone of the Forest Health Program. Prevention strategies include long and short-term tactics directed at the host, landscape (ecosystem), and insect. Prevention strategies and tactics will not eliminate the occurrence of defoliator outbreaks but will lessen the extent, duration, severity, spread, and damage incurred when defoliator populations reach outbreak proportions.



Long-term strategies for defoliators include, but are not limited to:

- long-term plans for managing susceptible species
- stand susceptibility rating for all susceptible landscapes
- host species density, age and stand structure manipulation
- promoting age and species mosaics across susceptible landscapes
- silviculture treatments to lessen susceptibility of trees and stands

Short-term tactics for defoliators include, but are not limited to:

- annual detection (air and ground)
- population monitoring and prediction (trapping & life stage sampling)
- permanent sample sites for population monitoring and impact assessment
- monitoring weather patterns to determine stress level of forests and potential impacts on defoliator species
- treatment with biological insecticide when threshold levels of damage or insects are reached

3.2 Pest identification and monitoring

A pest is defined as “any organism or damaging agent designated as detrimental to effective resource management” (Doliner and Borden 1984). For the purposes of this Pest Management Plan, the term pest refers to major native defoliator species (Table 3).

Table 3. List of major insect defoliators referred to in the Coastal Pest Management Plan (PMP).

Pest common name	Latin name
Western spruce budworm	<i>Choristoneura freemani</i> (Razowski)
Western hemlock looper	<i>Lambdina fiscellaria lugubrosa</i> (Hulst)

Annual aerial overview surveys (AOS) are conducted via fixed-wing aircraft over the entire forested landbase in BC, including the forest region covered by this PMP. This annual survey supplies critical information supporting all Forest Health activities. This survey maps current damage and identifies the causal agent, location, extent and severity. Data from this survey goes back to about 1910, so historic trends and changes in range can be analysed. The survey is conducted each year from mid-July through August. Aerial overview surveys are done to the Provincial standard and identify areas that may require a more detailed air or ground survey in order to develop appropriate management strategies.

[Aerial Overview Surveys - Province of British Columbia \(gov.bc.ca\)](http://gov.bc.ca)

Detailed aerial surveys are conducted (rotary-wing surveys) to further delineate defoliator activity and to determine where spray programs may be necessary.

Defoliator populations are monitored through the use of permanent monitoring sites. These sites can be one or a combination of the following:

- 3-trap clusters baited with pheromone
- single trap stations (pheromone baited)
- egg mass sampling sites, and occasionally,
- three tree beating sites

3.3 Treatment thresholds, options and selection

The goal of this IPM program is to set clear, distinct and tangible thresholds that will assist in determining the level at which defoliators become “pests” and require treatments to control or reduce damage. See Defoliator Management Guidebooks and the provincial and Forest Health website.

[Forest health - Province of British Columbia \(gov.bc.ca\)](http://gov.bc.ca)

3.4 Western spruce budworm

The following criteria must be met when planning a control program for western spruce budworm. These general concepts can be applied to other insect defoliators with some species-specific differences.

Damage Criteria:

- stand has suffered a minimum of 1-year defoliation (understory and/or overstory) and defoliation predictions are light to severe for the coming year; or
- high priority stand with little or no current defoliation and defoliation prediction indicates moderate to severe defoliation for the coming year; or
- consecutive years of light defoliation and defoliation predictions indicate continuing damage at this level.

Note: This criterion does not apply to eruptive defoliators such as loopers and tussock moths.

Insect Criteria: populations are building and expanding in range.

Recent and predicted defoliation: light to moderate defoliation occurred for at least one year before treatment. Exceptions include stands, often adjacent to or close to active populations, where egg mass sampling predicts high levels of defoliation (moderate or greater) in the coming year. Defoliation in the coming season is predicted to be moderate to severe and trees in the understory layers will incur high levels of damage (mortality and top kill) if there is no intervention.

Historic defoliation: Stands that have incurred damage in past defoliation events (e.g. top kill) and cannot withstand another defoliation event. Historic records show the periodicity of outbreaks in given geographic outbreak areas so if historically outbreaks are very short-lived and eruptive in nature, then perhaps spraying in these areas can be deferred.

Areas considered for treatment are evaluated using the following criteria:

- should be in the Timber Harvest Land Base (THLB)
- moderate understory density (L3 and L4 layers)

- Douglas-fir dominated ecosystems on the Coast, such as the CWHds1, CWHms1, and IDFww
- past or planned silviculture investment, such as spacing, pruning, thinning or fertilization
- recent or planned partial cutting
- planned for harvest in the next 5-10 years
- high in-stand mortality of other tree species
- stand is within, or in close proximity to, an historic area of budworm activity
- evidence of Douglas-fir beetle activity (building or adjacent populations)

The tables in this section outline the major treatments and factors governing treatments conducted by FOR in its defoliator management activities under this PMP. Table 4 lists the various treatment options for select defoliator species in the PMP. Table 5 lists by treatment option the various application methods and information pertaining to use and safety.

Table 4. List of management considerations for western spruce budworm.

Western spruce budworm
Hazard and risk rate stands to evaluate management options
Partial cutting or thinning stands
Promote species mixtures
Manage for resilient stand structures e.g. lower densities
Biological insecticide treatment (<i>B.t.k.</i>)
Monitor/no action

Table 5. Treatment options using *B.t.k.* for management of Western spruce budworm- describing host insect and tree species, application methods and timing, equipment, cost efficacy and safety.

<u><i>Aerial application of B.t.k.</i></u>
<p><u>Target Douglas-fir:</u></p> <p><u>Western spruce budworm</u></p> <ul style="list-style-type: none"> • stands with high and/or increasing (building) populations • next season defoliation is predicted to be light, moderate or severe (Note: predictive egg mass sampling often underestimates defoliation) • stands are at risk due to past stress or damage from budworm defoliation • stands receiving silviculture treatments such as spacing, thinning • high risk stands (e.g. multi-structured) with history of budworm • high priority areas (mid-term timber supply; recreation; First Nations) <p><u>Equipment Used and Application Method:</u></p> <ul style="list-style-type: none"> • aerial application using fixed or rotary wing aircraft (e.g. AT-802F Air Tractors, Ag Cats, Hiller 12E, Lama) • equipped with spray booms having a minimum of 4 Beecomist or 4 A.U. 4000 micronair atomizers (or equivalent) <p><u>Cost of Treatment and Factors Influencing Costs:</u></p> <ul style="list-style-type: none"> • \$35-\$45 per hectare all-found (<i>B.t.k.</i> application at 2.4 litres per ha – cost will increase at higher dosage rates)

- treatment size (total hectares) and spatial distribution of blocks
- individual block size and proximity to staging area
- number of treatment blocks
- geographic location – ease of access to stage spray operations if using helicopters or proximity to airstrips when using fixed-wing aircraft
- differential bud-flush and insect development due to aspect and elevation
- terrain and topography
- number and configuration of spray aircraft
- annual weather patterns
- local economics

Treatment Efficacy

- dependent on insect density, insect stage at treatment, stand structure, tree phenology and condition
- weather conditions during spray operations

Worker and Public Safety Considerations:

Workers:

- overall, generally accepted method of defoliator management

Mitigation:

- special worker training in aerial spray technology

Effect of Treatment on Soil Properties:

- none

Effect of Treatment on Fisheries Resources:

- no effect on streams or any water body
- can overspray small streams and waterbodies

Effect of Treatment on Wildlife and Habitat:

- none

Benefits of Treatment (Social and Environmental):

- biological treatment
- treatment is very target specific (only Lepidoptera feeding at time of treatment are potentially affected and at early instar development stage)

Limitations:

- must have qualified and experienced ground crew
- must have suitable weather conditions (no rain; low wind; no extreme heat events)

Population reduction *versus* foliage protection

Direct control strategies include population reduction and foliage protection. Foliage protection is the strategy most used for budworm outbreaks in B.C. The aim is to reduce feeding damage early in the feeding cycle to minimize damage, decrease insect density, maintain tree vigour and promote tree resilience.

Population reduction can be applied to areas where little or no defoliation can be tolerated and when you want to “crash” the outbreak cycle. This strategy is applied in the early stages of an outbreak, to reduce extremely high populations, thereby minimizing significant resource impacts. This strategy is most often applied to western hemlock looper.

Variation in the timing of direct control can achieve either foliage protection or population reduction and sometimes both. Higher insect mortality is achieved when later instars are targeted (5th or 6th instar for western spruce budworm); however more *B.t.k.* must be consumed per insect to achieve desired results, and thus more damage is incurred prior to treatment. Late instars are more open feeding, consume greater quantities of foliage, and are thus likely to encounter and consume a lethal dose of *B.t.k.*

Higher potency *B.t.k.* formulations, increased dosage rates, or double application of lower potency formulations, may be considered in the following situations:

- high larval densities early in the outbreak phase;
- building phase of outbreak when the management objective is population reduction (e.g. Douglas-fir tussock moth or western hemlock looper);
- high value stands; and,
- multi-layered, high density stands (high foliar biomass).

Defoliation history of trees and stands, combined with the predicted level of defoliation, influence which tactic will be implemented. Stands that have already sustained significant damage over 2 or more years (moderate to severe whole tree defoliation) should be managed under the foliage protection strategy. This will minimize further damage. If the population reduction strategy is applied in this situation, considerable damage could occur prior to the treatment being applied.

For western spruce budworm, peak 4th instar is targeted to minimize defoliation. Timing to achieve good foliage protection is difficult due to differences in host phenology and insect phenology. Larvae remain feeding in buds until the 4th instar and are thus well protected from predators and the effects of a spray program. Larvae begin open feeding on the flushed shoots at the 4th instar. Buds on overstory trees should be >80% flushed prior to treatment and understory trees should be close to 100% flushed.

3.5 Western hemlock looper

Short-term, direct control measures are taken only when western hemlock looper populations reach proportions that threaten stewardship goals such as Mountain Caribou critical habitat. Long-term management strategies, however, can reduce the risk of defoliator damage and improve the health and productivity of forested ecosystems. There are five components to integrating the evaluation of stand, site and insect populations to create plans and prescriptions. The steps are:

1. landscape level hazard and risk assessment;
2. aerial and ground surveys to map and evaluate looper activity and determine stand susceptibility and risk;
3. annual monitoring using pheromone traps and three-tree beatings;
4. predictive sampling to develop treatment prescriptions (collection of lichen to assess number of eggs will give a prediction of insect levels and subsequent damage in the coming season); and,
5. long- and short-term treatments (*B.t.k.* spray).

Stand susceptibility assessments should be done to address the current and potential impact of the western hemlock looper in terms of stand and site ecology. The long-term impacts of allowing a western

hemlock looper outbreak to run its course would be the loss of integral mule deer winter range, increases in unsalvaged losses, and areas that are of lower value to numerous resources.

Stand susceptibility provides some guidance as to expected impacts on various sites and can be used to establish priorities for undertaking surveys, treatments, and for developing silviculture prescriptions.

Factors that are considered, and that influence stand susceptibility, are:

- historic occurrence of western hemlock looper;
- expected frequency and periodicity of outbreaks (approximately every 14 years on the coast);
- biogeoclimatic zones and subzones;
- species composition and age (predominantly old hemlock);
- stand density;
- stand structure (e.g. single vs. multiple canopy structure);
- elevation and aspect;
- tree vigor; and
- site characteristics.

Foliage protection and population reduction are both **short-term strategies**. Direct control should be considered when moderate to severe defoliation is predicted in a stand the following year and building populations are present. *B.t.k.* is registered for use against the western hemlock looper. Operational trials were conducted in 2003 within the Columbia Forest District to determine optimum spray timing and dosage rates to achieve desired objectives. Using these parameters, a successful spray program was conducted in 2012 targeting 2nd to 3rd instar using 2.4 litres per hectares, single application. The spray program in 2021 used 2.4 litres per hectare on all blocks and achieved very high insect mortality and foliage protection.

The use of biological insecticides has proven to be very successful as a management option for other defoliators and will greatly assist in the options available for managing western hemlock looper. Environmental impact due to the application of biological insecticides is minimal, and efficacy is high provided the insecticide is applied in a correct and timely fashion.

Table 6 should be considered when planning a control program for western hemlock looper. Special management or stewardship considerations will have to be considered when deciding to treat or not. For example, public safety might be a consideration for high use recreation areas. Table 7 describes the activities involved in a management program for western hemlock looper, or similar defoliator species.

Table 6. Parameters affecting stand susceptibility to western hemlock looper*.

Factor	Level	Hazard Rating
Biogeoclimatic zone	MHmm	Low
	CWHxm	Moderate
	CWHvm, CWHdm	High
Species Composition**	Hw Cw <= 25 %	Low

	Hw Cw ≤ 50 %	Moderate
	Hw Cw ≥ 50 %	High
Stand Density	Open grown	Low
	Spaced with gaps	Moderate
	Dense, overstocked	High
Stand Structure	Even canopy	Low
	Single layer dominants	Moderate
	Multi-story	High
Age Class	≤ 80	Low
	≤ 120	Moderate
	>120	High
<p>* Adapted from Defoliator Guidebook (1995) hazard rating for western hemlock looper. ** Observations from the 2021 Powell River outbreak suggest that understory western hemlock associated with Douglas-fir leading stands are particularly susceptible to defoliation and subsequent mortality.</p>		

Table 7. Description of activities involved in a management program for western hemlock looper.

Activity Description for Western hemlock looper	
1.	Aerial overview survey to map visible pest damage. Maps are distributed to all districts, First Nations, licensees and other interested parties (e.g. Parks Canada).
2.	Annually establish pheromone baited monitoring traps at permanent sample sites (located in areas of historic defoliation) throughout high hazard stands.
3.	Conduct 3-tree beating samples as needed throughout high hazard stands.
4.	About 2 years prior to anticipated outbreak, begin population sampling by conducting egg surveys (lichen collection and/or egg extraction) and more detailed aerial surveys.
5.	When low level, small areas of defoliation is detected in annual aerial overview survey, or egg sampling indicates moderate to high levels of defoliation, additional egg surveys should be conducted at a landscape level in high hazard stands and/or in a more concentrated fashion if a direct control program is being considered.
6.	Implement control program as per western spruce budworm for <i>Btk</i> .

Post-treatment evaluations should be conducted in one of the following ways, dependent upon target insect and treatment. Table 8 details the evaluation techniques for treatment options.

Table 8. Listing of post-treatment evaluations conducted for each available insecticide treatment, by target insect species.

Target insect	Treatment	Post-treatment evaluation
Western spruce budworm <i>and</i> Western hemlock looper	Aerial spray of <i>B.t.k.</i>	<ul style="list-style-type: none"> • Assess spray deposit using kromecote spray cards (inside & outside block boundary) • Spray deposit may also be assessed (when available) using the ADAM-ELISA kit technology. This provides estimates of spray deposit. • Pre- and post-spray larval sampling is conducted to estimate insect mortality (inside & outside blocks, before and after spray application). Last post-spray is conducted when >75% insects are pupae. This can be done by branch sampling or 3-tree beating. • Fettes defoliation estimate is conducted pre- and post-spray at the time of larval sampling. • Post-spray sampling <u>and</u> level of defoliation mapped in the following year indicates program effectiveness.

Post-treatment evaluation is conducted in-part to refine and improve future management prescriptions and strategies and will determine the need for any immediate follow-up treatment.

4 Operational practices and PMP content requirements

4.1 Qualification of personnel

Regional Forest Health specialists in the Coast Area of FOR are trained in Integrated Pest Management, entomology, spray technology, and pesticide use. These specialists are licensed Professionals (Forest Professionals of British Columbia <https://www.fpbc.ca/> , Biologists <https://cab-bc.org/>), have their M.Sc. or Ph.D. in Entomology and/or Pest Management, and are responsible for the development and implementation of all programs carried out under the Pest Management Plan.

The treatment of forest insect pests (defoliators and bark beetles) within the plan area is coordinated by FOR staff and/or qualified contract personnel possessing valid licenses to conduct forest insect control treatments. All pesticide use shall be carried out by, or under, the direct supervision of an individual with a valid British Columbia pesticide applicator certificate in the forestry category.

The Contractor shall provide the required number of certified Pesticide Applicators (forestry category) so as to comply with the worker/supervisor ratio required by the Integrated Pest Management Program, Ministry of Environment. Copies of the certificates of all certified personnel will be provided to the Ministry Representative upon request.

“The Contractor’s project supervisor must be certified as a Pesticide Applicator, and must be familiar with the constraints and requirements of the Pesticide Use Permit(s) or approved Pest Management Plan.”

“The Contractor must possess a valid British Columbia Pest Control Service Licence, and shall make a copy available for inspection upon request by the Ministry Representative or the Integrated Pest management Program, Ministry of Environment.”

4.2 Pesticide handling practices

4.2.1 Transportation

The Transport of Dangerous Goods Act regulates the handling and transportation of poisonous substances that may include chemical insecticides. The *Pesticide Control Act* also specifies certain transport procedures. The following procedures are followed with respect to the transport of insecticides as part of the Southern Interior Region Forest Health Program:

- Pesticide to be transported in original, labelled container(s);
- Insecticide to be carried separately from food, safety gear and people;
- Spill equipment to be carried on vehicle near insecticide; and
- Appropriate documents and placards to be carried in or on vehicle during transport.

“The Contractor shall deliver to the project area(s) sufficient quantities of pesticide(s) (in factory sealed containers), additives and carrier (except water), as supplied or arranged by the Province, to treat the unit(s) specified in the contract.”

4.2.2 Storage

Insecticides will be stored in accordance with the *Pesticide Control Act Regulations*; this includes storage at District and Region compounds, or licensed companies that have specialized cold temperature storage units and provide secure, lockable areas that are vented to the outside and accessible only to those with authority to do so. The storage is equipped with necessary spill equipment and first aid in the event of spill.

“The Contractor shall provide a means of securing equipment and supplies to prevent unauthorized access to the pesticide(s).”

4.2.3 Mixing and loading

All pesticides used under this PMP shall be mixed (if needed) at designated mixing and filling stations or will be applied “neat”. Most *B.t.k.* products used are delivered to staging sites in 1,000 litre factory labelled containers and are pumped directly into application aircraft – no mixing required. Requirements and procedures to be followed during the mixing and loading of pesticides:

- Wherever possible, the mixing/loading station should be located in the treatment area and a minimum of 100 metres away from any water body. The mixing site shall be selected so that it is on level ground, and situated so that if a spill does occur, run-off into water bodies will not occur.
- The minimum crew size for mixing and loading will be one 1 dedicated person, and other than that, crew size will depend upon the size of the project (Ha to be sprayed).
- All pesticide use will be recorded by the Project Supervisor at the end of each day.

Table 9. Minimum safety equipment required by personnel performing various functions regarding insecticide operations under this PMP.

Method	Function	Safety Equipment (Minimum)
<i>B.t.k.</i>	Any	Clean coveralls, goggles, and standard safety gear

- Each *B.t.k.* load shall be recorded once loaded into the spray aircraft. The record shall include:
 - a) PMP number
 - b) Contractor name, service licence and certification number
 - c) Date and time
 - d) Insecticide name, PCP Number and concentration
 - e) Volume of insecticide in litres
- The rotary-wing or fixedwing spray aircraft shall include the following specific parts and features:
 - a) Loading equipment with an accurate metering device, or the aircraft tank/hopper with a calibration as to provide a positive measure of the insecticide. Filler connections should be compatible with loading equipment.
 - b) Leak proof system with positive shut off device. Loading gate and discharge tube gate shall be tight closing.
 - c) Functional quick dump.

4.2.4 Container and residual pesticide disposal

The responsibility of container disposal associated with any pesticide application program lies with the contractor. It is the contractors' responsibility to rinse empty insecticide containers (according to product recommendations) and dispose of at appropriate sites if necessary or return to vendor. Any unused pesticide will be stored at an appropriate facility (e.g. refrigerated, secure) in the original container for future use. The responsibility of container disposal associated with the defoliator program lies with the FOR Project Supervisor.

4.2.5 Spill response plan

A pesticide spill kit will be carried in the FOR Project supervisor vehicle during defoliator spray programs and shall contain as a minimum the following articles:

Instructions for spills

- Emergency telephone numbers
- Kitty litter (2-20 kg bags)
- Large plastic garbage bags (4)
- Shovels (2)
- Plastic tarp (10'X10' minimum)
- Dustpan and shop brush
- Flagging and rope
- First aid kit

- Personal protective safety gear (rubber gloves, safety glasses)

Project supervisor will approve spill plan prior to commencement of pesticide treatment.

4.3 Aerial spray programs

For aerial application of insecticides, rotary wing surveys will be conducted prior to final delineation of spray block boundaries. Spray blocks will be mapped on appropriate scale maps. Spray blocks are then made into spatial GIS files that are downloaded into spray aircraft navigation systems. All spray aircraft now utilize GPS spray guidance systems, showing block boundaries, priority edges, road access to the block and any other critical landscape features. Block boundaries are created in Arc GIS and all spray aircraft use these spatial files to load GPS co-ordinates of spray block boundaries. Spray areas generally encompass all high priority areas ensuring that the highest insect density areas are covered thus reducing re-invasion by insects.

Spray block boundaries are generally delineated by using distinctive features such as:

- timber types (species)
- open range
- height of land
- rock outcrops
- lakes, rivers, creeks and other water bodies or critical habitat
- fence lines and roads
- private land

4.3.1 Equipment maintenance and calibration

Spray equipment will be supplied by the contractor and be in good working condition. An inspection and calibration of spray apparatus will occur prior to commencement of aerial spray projects each year. A spray log and digital spray swath files will be submitted to the FOR Project Supervisor at the conclusion of each spray project.

As an example, for *B.t.k.* application:

- Conventional boom lengths not exceeding 75% of the rotor diameter or total wingspan.
- Equipped with at least four (4) micronair nozzles, of appropriate type (AU4000), or equivalent, for a *B.t.k.* (or NPV) spray. The pumping system shall provide a constant pressure capable of distributing the insecticide in an even and unbroken swath at the specified rate(s). This equipment shall be capable of providing 80-120 micron volume median diameter droplet sizes.
- A pressure gauge mounted in such a location that it can be read from outside the aircraft during calibration operations.
- A spray boom should be mounted according to helicopter/fixed-wing aircraft or boom manufacturer's specifications, unless the Contractor can demonstrate that a different position of spray boom will give an equal or better spray pattern.
- Nozzles mounted on the spray boom should be oriented to give the best droplet spectrum for the desired job. The angle of the nozzles shall be uniform across the boom.
- When installed, a spray boom shall be of continuous construction. The nozzles will be distributed evenly along the spray boom attached to a helicopter. For a fixed wing aircraft the inboard section of the right hand boom may require additional nozzles to compensate for propeller effect.

4.3.2 Pesticide treatment signs

The South Coast Region's Forest Health Program, FOR, commits to the following minimum standards for information on treatment signs:

Signs containing site-specific information about treatment of each site shall be posted at main and secondary access points to the treatment area. Signs will be posted prior to, and during, the treatment process. Pesticide Treatment Signs should be (Fig. 6):

- large enough to be easily read by passing traffic;
- in highly visible locations;
- water resistant;
- posted a few days in advance of the spray date;
- include the title "INSECTICIDE USE NOTICE" or "PESTICIDE USE NOTICE" in large capital letters; and
- contain the following:
 1. Date of Application
 2. Pesticide Trade Name
 3. Pesticide Common Name
 4. PMP Number
 5. Purpose of Treatment
 6. Method of application
 7. Ministry Office, Address, Contact Name and Phone Number



Figure 6. Example of a Notice of Pesticide Treatment sign for western spruce budworm in the Thompson Okanagan Region.

4.4 Pesticide application procedures- *Btk*

Weather and timing of *B.t.k.* application must be carefully considered before spraying. Applications are done when the following parameters are met:

- relative humidity is 50–100%
- foliage is dry or damp but not wet
- heavy rain is not forecast in the next 12 hours
- temperatures are between 5–20°C
- winds are 0–8 km/h, with gusts not exceeding 15 km/h.

The best time to apply *B.t.k.* is when larvae are actively feeding. Larvae tend to feed more during warm weather; therefore, it is advisable to spray at these times. There should be no threat of heavy, continuous rain for at least 24 hours after spraying. Heavy rains could wash off spray deposit, and similarly, if foliage is wet at the time of application, spray droplets may not adhere to the foliage. Light rain, for a short duration will not seriously impact the efficacy of treatment. As long as foliage is not wet to the point of run-off, some moisture in the stand is desirable, to maintain a higher humidity.

The Kestrel 3000® (a portable weather device) is used to monitor and record wind speed (average, gusts), relative humidity and temperature. All weather parameters are monitored closely on spray sites before and during spray operations to ensure weather conditions are suitable for insecticide application.

Both aerial and ground application techniques are available for applying *B.t.k.* However, aerial application gives the best coverage, and is generally the most economical method for large, continuous areas of mature forests. Either fixed or rotary wing aircraft may be used in the application of *B.t.k.* Aircraft should be equipped with spray systems capable of delivering droplets in the range of 80–120 median micron diameters at a constant pressure over an even, unbroken swath.

Sample lines inside and outside of treatment areas can be established to assess the efficacy of *B.t.k.* treatments. Treated and untreated areas should have the same budworm population, cover the same elevational range, and have similar stand structure and composition.

Establishing sample lines for pre- and post-spray sampling:

1. Sample lines should be at right angles to the predicted spray swath and cover the range of elevations within the treatment area.
2. Sample trees on sample lines should be a minimum of 50 m inside treatment boundaries and spaced about 50 m apart.
3. The number of sample trees depends upon the ultimate objective of the sampling (e.g. research project) and size of the project.

** The FOR Project Supervisor in the South Coast Region where spray programs are implemented will retain operational pesticide treatment records.

5 Environmental protection

5.1 Community watersheds and water intakes

Community watersheds

There are numerous Community Watersheds throughout the South Coast Region. Any activities within or adjacent to Community watersheds during the term of this PMP will be described in the Notice of Intent for all interested parties.

Surface water

A Pesticide Free Zone (PFZ) of 10 meters will be maintained from all bodies of surface water when applying **chemical pesticides** as per label instructions. Adequate buffer zones will be associated with PFZ's to ensure integrity of surface water and riparian areas.

When applying **biological insecticides** such as *B.t.k.*, no Pesticide Free Zones are required.

Wells and intakes

A minimum 30 m buffer will be maintained from all domestic water intakes and wells. This information is made available to applicators prior to treatment.

During the development of the Notice of Intent to treat each year, all domestic water intakes that are within one (1) kilometre of the proposed treatment area will be identified and mapped. Consultation with

the holder of the domestic water source will take place, and efforts will be made to alleviate concerns, if any arise.

5.2 Fish and wildlife resources and riparian areas

The area encompassed within this PMP includes many significant fisheries values. To prevent contamination of water in fish bearing streams, **chemical pesticides** will not be applied to ditches that flow directly or indirectly into fish bearing systems. When spraying *B.t.k.* major streams will be mapped and avoided where possible. *B.t.k.* can be sprayed over small streams (which may or may not contain water) and ephemeral water bodies (an ephemeral stream has flowing water only during, and for a short duration after, precipitation events in a typical year) ([Integrated Pest Management Regulation](#)).

The Coast of B.C. has many important and diverse habitats for mammals, birds, amphibians and fish species. Wildlife shall be managed according to current and evolving biodiversity guidelines.

All wildlife values and critical habitats identified in any of the numerous forest stewardship planning processes, or through the consultation/referral process, shall be protected when carrying out treatments under this PMP.

Species requiring protection

Where “at risk” animal or plant species have been identified in higher level planning, they will be managed accordingly within the Forest Health Program. Specialists within the Region, Districts and other Ministries will be consulted to help identify some of these species as well as locations where they are to be managed in these areas.

5.3 Preventing pesticide contamination of food intended for human consumption

The following is a description of the environmental protection strategies and procedures that will be followed under the plan to prevent pesticide contamination of food intended for human consumption.

Foods may include commercial agricultural crops of vegetables, berries or fruit and may also include domestic vegetable gardens and fruit trees, bee keeping areas, forage crops, beef and milk production and areas where wild berries or medicinal plants may be collected. Pre-treatment inspections of all proposed treatment areas and consultation with Indigenous groups and the general public will enable identification of those areas.

Food growing/gathering areas will be identified through consultation and/or during pre-treatment inspections of proposed treatment areas. Berry picking, bee keeping areas, vegetable gardens, organic farms, and areas containing agricultural crops or livestock may also be found at some locations within the plan area. Considerations of strategies to prevent contamination of food intended for human consumption that should be addressed during PMP development, include the following:

- Maps in and around proposed treatment areas will be prepared in ARC GIS using appropriate spatial layers that identify agriculture use, private land and other critical information. Low level aerial reconnaissance is conducted over every proposed treatment area (often numerous times and in different seasons) to identify areas of food growing and gathering. As needed, detailed ground reconnaissance will be conducted with interested parties (e.g. First Nations, ecologists, private landowners) to identify areas of food gathering.

- Helicopter aerial reconnaissance will be conducted over proposed treatment areas (often numerous times and in different seasons) coupled with ground reconnaissance to identify areas of food growing and gathering.
- A one (1) kilometre buffer will be mapped around any no-treatment zones. Strict monitoring and adherence to spray weather parameters (e.g. wind direction, speed) during pesticide application operations near food growing/gathering sites will be ensured. Where appropriate, spray droplet card will be placed to monitor any drift.
- Pesticide Treatment Notices will be placed at all access points to the treatment blocks in advance of treatment and will be left in-place for 2-5 days following treatment to notify anyone that may be picking in the area. B.t.k. and/or NPV is not harmful to humans or to food products so there is no specific time period where picking should not be done. It will be recommended that all food (berries) picked in treatment blocks be washed prior to eating.
- Notifications of the proposed treatments are advertised in local print and online newspapers. The Ministry of Forests Forest Health web page posts maps of the proposed treatment areas; the pesticide to be used (B.t.k.); information about B.t.k; and any precautions that may be necessary. Very detailed letters are sent to all First Nations that are near or may have an interest in the proposed treatment areas. In this letter, we provide maps and detailed information about the pesticide.
- Signs describing the treatment (pesticide, proposed treatment dates, maps) and area to be treated are posted along all roads leading into the proposed sites and at main intersection where visibility is highest. Signs and information brochures are also posted on local noticeboards and at Postal Box pick-up sites.
- There is no harmful effects to milk and beef production from cattle foraging on or adjacent to treatment sites with the application of B.t.k.

First Nations will be provided with information on where treatment is planned each spring and if requested, we will call or email First Nations Band offices the day prior to treatment.

There are ongoing communications around areas proposed for treatment through attendance at community meetings, TSA Meetings and other venues.

Organic growers' certification bodies will be contacted to determine the location of certified organic farms to enable communication with known organic operators and discussion of treatment methods and timing.

The PMP holder will consider alternative treatment methods adjacent to organic agriculture farms at their request.

All proposed pesticides (*B.t.k.*) have no bee toxicity.

6 Implementation, notification, consultation, and reporting

6.1 Treatment area maps

Maps showing treatment areas will have clear legends and will be of sufficient quality, detail and scale to allow environmental risks to be assessed and to show the location of treatment sites.

Two maps will be submitted.

- 1) A small scale, *overview* map showing the location of all sites, individually labelled, in relation to the entire PMP area.
- 2) A larger scale *treatment* map of the treatment areas showing:
 - Unit or block number
 - All major water bodies
 - Location of local roads, communities or recreation areas
 - Location of proposed treatments
 - Scale $\pm 1:50,000$

6.2 Notices of intent to treat

As per section 42 of the IPMR, for the purpose of an annual Notice of Intent to Treat, the plan holder will ensure a copy of the “**Notification of Intent to Treat**” is posted each year at the appropriate FLNRORD office to allow inspection by the public. A copy of the “**Notification of Intent to Treat**” is also submitted to local newspapers in the nearest communities to the proposed treatment to give the public additional notification (Fig. 7).

The Plan holder shall submit the “**Notification of Intent to Treat**” to the Deputy Administrator at least 45 days before the start of pesticide applications on site each year. The Notification will include:

- * A notice, listing each site to be treated, and pesticide
- * a treatment location map

A copy of the “**Notification of Intent to Treat**” shall be supplied to the Band Office of each affected First Nation when treatment is proposed within their traditional territory or area of interest by March 31st of each year or 45 days before the start of pesticide applications on site.



Figure 7. Example of a “Notice of Intent to Treat” submitted to local newspapers to inform local residents of the BC Ministry of Forest’s planned activity under the south area PMP.

6.3 Advertising treatment sites

If required by the Deputy Administrator, additional advertising and notification requirements for particular treatments identified in “Notices of Intent to Treat” will be included in the PMP Approval document.

6.4 Public consultation plan

Prior to submitting a Pesticide Use Notice to Ministry of Environment for the PMP confirmation, the plan holder will carry out a consultation process with the public.

The objectives of conducting consultations when this PMP is at the draft stage are:

- To increase public awareness of the PMP process and of the principles of Integrated Pest Management which are embodied in the PMP;

- To ensure that the public have an opportunity to identify concerns, and for the plan holder(s) to address those concerns before the PMP is finalized and a Pesticide Use Notice submitted for confirmation;
- To ensure a transparent and accountable review process for the PMP;
- To educate the public on the need to manage forest insects to protect forest resources; and,
- To explain how the planning process that is described in the PMP recognizes the need to protect human health and the environment.

The public will be notified of the PMP development and invited to consult via notices in local community newspapers within the geographic boundaries of the plan.

As per Section 61(1) of the IPMR, at least 45 days before submitting a Pesticide Use Notice, the first of 2 notices, at least 40 cm² in size, will be published within a 2-week period in newspapers circulated in the various communities (or nearest communities).

During the public consultation process, the draft PMP will be accessible to the public in various locations, as stated in the public notifications and on the FOR Forest Health website to allow the public to view and download the PMP text and maps.

6.5 Public consultation report

The plan holder will submit to the Administrator of the *IPMA*, a Public Consultation Report that contains:

- A summary of public consultations, including the names of those who provided input the nature of their concerns and/or recommendations, and the plan holder response to the input from the public.
- A list of newspapers in which notification of the pending PMP submission appeared, along with the publication dates and a photocopy or tear sheet of a representative advertisement.

6.6 First Nations consultation plan

In addition to the objectives for public consultation outlined in Section 6.5, the plan holder will consult with First Nations to avoid infringement on aboriginal rights, treaty rights, or cultural values by the PMP. The plan holder not only has an obligation to consult with First Nations, but it must also attempt to address their concerns and accommodate their cultural interests. Consultation processes must take into account the BC Treaty negotiation process and the current litigation actions by First Nations respecting aboriginal land use or sovereignty. In light of the above sensitivities and special concerns, the plan holder is committed to establishing and maintaining positive relationships with First Nations through meaningful and respectful consultation.

In conducting these First Nations consultations, the plan holder will follow all of the procedures outlined in the September 2023 publication entitled “[Indigenous Engagement: a Guide for Integrated Pest Management Act Proponents](#)”, published by the BC Ministry of Environment and Climate Change Strategy.

Notification of First Nations in the time and manner as agreed during the First Nations consultation process will be completed prior to treatments. The plan holder will maintain a record of all First Nations notifications for each treatment area.

6.7 Annual reporting

The Forest Health Program will submit annual summaries to the Deputy Administrator by December 31st in each year of the plan. For each site treated with pesticides within the PMP area during that calendar year, the report will list:

- PMP number
- site name, block number or description
- pesticide used, including PCP number
- method
- total area treated (ha)
- quantity of each active ingredient used (kg, litres)
- the total area treated with each pesticide (ha)
- for the entire PMP, the total quantity of each pesticide active ingredient used (litres; kg)
- treatment location and/or map identifying areas of treatment.

Appendix 1- MSDS & labels for pesticides

2017-3694
2017-09-26

Group 11 Insecticide

Foray[®] 48B
Biological Insecticide Aqueous Suspension

For Use in Forests, Woodlands, and Other Treed Areas

RESTRICTED
READ THE LABEL BEFORE USING

GUARANTEE:

Bacillus thuringiensis subsp. kurstaki strain ABTS-351..... Potency: 10,600 Cabbage
Looper Units (CLU)/mg of product (equivalent to 10 billion CLU/kg).

The potency measurements are not internationally standardized.

REGISTRATION NO. 24977 PEST CONTROL PRODUCTS ACT

POTENTIAL SENSITIZER
CAUTION EYE IRRITANT
READ THE LABEL BEFORE USING

Net contents: L (Litres)

Date of manufacture: _____

Lot No.:

Best Before:

Registrant:
Valent BioSciences LLC
870 Technology Way
Libertyville, IL 60048
USA

Canadian Agent:
Valent Canada, Inc.
3-728 Victoria Road South
Guelph, Ontario N1L 1C6

<https://forestry.valentbiosciences.com/valent-biosciences-corporation-forest-home/products/foray>



SAFETY DATA SHEET

1 of 10

Foray 48B Biological Insecticide Aqueous Suspension

SDS# VBC-0244 Revision 0 ISSUED 04/05/17
(Classification according to OSHA: 29 CFR § 1910.1200, (3/12/2012))

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY

1.1 Product Identifier

MATERIAL NAME: Foray 48B Biological Insecticide Aqueous Suspension

Synonyms: None

PCP No.: 24977

Code Number: 12280

List Number: 60179

Chemical Family: Microbial, Btk strain ABTS-351

Substance Registration Number(s)[REACH]: N/A

1.2 Relevant Identified Uses and Uses Advised Against

Identified Uses: Agricultural Insecticide

Uses Advised Against: This pest control product is to be used only in accordance with the directions on the label. It is an offence under the Pest Control Products Act to use this product in a way that is inconsistent with the directions on the label.

1.3 Details of the supplier of the Safety Data Sheet

Supplied By: Valent BioSciences
870 Technology Way
Libertyville, Illinois 60048

1.4 EMERGENCY TELEPHONE NUMBERS

Emergency Health or Spill:
Outside the United States: 651-632-6184
Within the United States: 877-315-9819

2. HAZARDS IDENTIFICATION

2.1 Classification of the Substance or Mixture

Eye Irritation – Category 2B

2.2 Labeling Elements

Symbol(s)
Not required

Signal Word
WARNING

Hazard Statement(s)
Causes eye irritation



OMRI Listed®

The following product may be used in certified organic production or food processing and handling in accordance with the Canadian Organic Standards.

Product
Foray 48B Biological Insecticide Aqueous Suspension

Company
Valent BioSciences® LLC
Maria Pilar Herrero
1910 Innovation Way, Suite 100
Libertyville IL 60048 United States

Status Allowed with Restrictions	Category COR: Biological Organisms	Issue date 8-Aug-2018
Product number abb-10913	Class Crop Pest, Weed, and Disease Control	Expiration date 1-Mar-2022

Restrictions

May only be used if the requirements of CAN/CGSB-32.310 subclause 5.6.2 are met, which require the use of organic management practices and mechanical techniques.

Caution: This product was produced using GE substrate or growth media. If commercially available, a non-GE alternative shall be used in accordance with CAN/CGSB 32.311 subclause 4.1.3.b.


Peggy Miers
Executive Director/CEO

Product review is conducted according to the policies in the current OMRI Policy Manual® and based on the standards in the applicable OMRI Standards Manual®. To verify the current status of this or any OMRI Listed product, view the most current version of the OMRI Canada Product List® at OMRI.org. OMRI listing is not equivalent to organic certification and is not a product endorsement. It cannot be construed as such. Final decisions on the acceptability of a product for use in a certified organic system are the responsibility of a CFIA accredited Certification Body. It is the operator's responsibility to properly use the product, including following any restrictions.



Organic Materials Review Institute
P.O. Box 11558, Eugene, OR 97440-3758, USA
541.343.7600 · info@omri.org · OMRI.org

APPENDIX 2- Description and biology of major forest insect pests covered by the PMP



Western spruce budworm (WSB)



Budworm egg mass



Budworm moth



Budworm defoliation

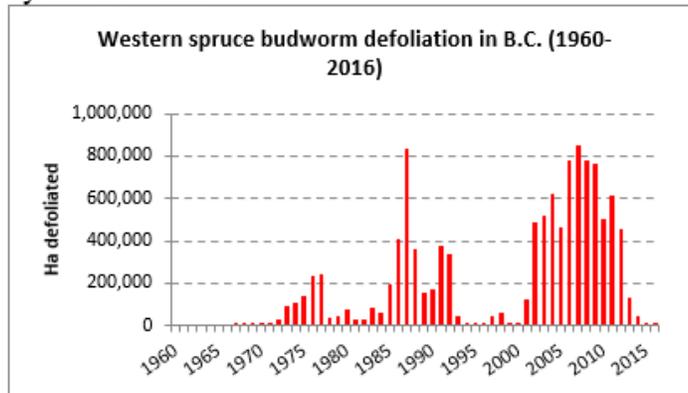
Western spruce budworm, *Choristoneura freemani*

The western spruce budworm is an important native defoliator of interior Douglas-fir. Outbreaks have been recorded in B.C. since the early 1900's in interior B.C. forests. Periodically, population levels reach outbreak proportions. In 1987 and 2007, over 800,000 ha were under attack by the budworm, mostly in the southern interior of the province. Budworm outbreaks may be sustained for up to 25 years.

Host trees: Primarily Douglas-fir, with other tree species such as the true firs, larch and to a lesser degree, spruce, also impacted by the budworm.

Description and life cycle: Budworm moths mate and lay eggs in late July-August. The female deposits overlapping, shingle-like egg masses on the underside of Douglas-fir foliage. Larvae hatch but do not feed that summer and overwinter as 2nd instars. When buds begin to swell and burst the following summer, the insect emerges from their overwintering site and begins to mine buds. As they develop through six instars, the larvae become larger and feed more openly.

Repeated budworm defoliation causes tree mortality over large areas, reduction of growth rates and reduced lumber quality. Sustained attack results in complete defoliation in 4 to 5 years. Once an infestation has subsided, defoliated trees take several years to regain a full foliage complement, and therefore radial growth rates require several years to attain normal growth following defoliation by the budworm.





Western hemlock looper



Looper pupae



Western hemlock looper moth



Western hemlock looper defoliation

Western hemlock looper, *Lambdina fiscellaria lugubrosa*

The western hemlock looper is a native defoliator that is periodically destructive in coastal and interior forests of British Columbia. It reaches outbreak proportions every 11 in the interior and about every 20-plus years in coastal ecosystems. Western hemlock looper outbreaks usually last about 3 years and are generally brought under control by parasites, predators, and diseases (heavy rains during the moth flight period can reduce egg-laying & hasten the decline of an outbreak).

Host Trees: primarily where mature western hemlock predominates but will readily feed on associated species in stands such as spruce, Douglas-fir and understory shrubs.

Description and Life Cycle: Moths fly, mate and lay eggs in late September-October. The eggs are about the size of a pinhead, blue to gray green or brown with a characteristic impression. They are attached to moss and lichen on tree boles and limbs and on moss in understory shrubs. Larvae hatch from eggs in the spring. Feeding by early instars during May, June and early July is light, and not too noticeable. Larvae are wasteful feeders, chewing off needles at their bases; thus causing the stand to appear yellowish-red then brown. Larger larvae feed voraciously on both old and new foliage and in heavy infestations trees may be stripped in a single season. In late summer, larvae are very mobile and feed voraciously. In August-September, caterpillars drop to the ground or lower branches to secret themselves in protected places where they pupate.

Damage symptoms: Defoliation in the interior occurs at 0-1400 m elevation and is found in valley bottoms having a high proportion of western hemlock. Defoliation often occurs in distinctive elevational bands with stands appearing yellowish-red, then brown, as if scorched by fire. Early defoliation occurs in upper crowns of trees; and progresses downward. The ground becomes littered with chewed needles and in severe outbreaks, the stand is covered in large amounts of silk-like webbing and loopers are seen hanging from branches. Trees can be killed after one year of severe defoliation (>50% foliage removed).

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