MINISTRY OF FORESTS

Selkirk Natural Resource District

Revelstoke & Cascadia (Revelstoke Portion) TSAs
Forest Health Strategy 2023-24

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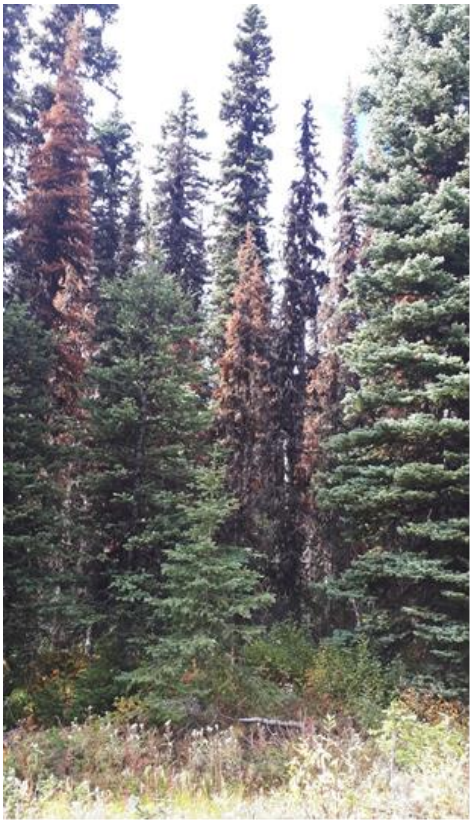
IBD Attack



Western balsam bark beetle attacked subalpine fir.

Spruce weevil damage showing multiple leaders.

Cover: Courtesy of Ash Warfe

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Extensive spruce beetle attack in Glacier National Park, east of Revelstoke.

1 GOAL

The goal of this Forest Health Strategy is to serve as a resource for directing forest health management and for communicating hazards or other relevant information on major pests in the Revelstoke Timber Supply Area (TSA) and Cascadia TSA and other area-based tenures -Woodlots. It provides some of the tools necessary to improve sustainability and resiliency of forested ecosystems by identifying strategies and tactics to minimize losses from damaging insects, diseases and abiotic disturbances. The Provincial Forest Health Strategy guides government's forest health program to achieve the goals of:

- maintaining and improving the productivity of British Columbia's forests
- extending the supply of the remaining timber resource
- protecting other forest resource values

2 OBJECTIVES

The overall objective is to minimize timber losses and the hazard and risk from forest health factors by:

- Maintaining a detection program for forest health agents over the land base;
- Assessing the potential risks and impact of the identified forest health agents on resource values and timber supply;
- Identifying prevention and suppression strategies and tactics for major pests;
- Implementing ecologically sound, economically feasible an socially acceptable mitigating strategies and tactics to address forest health agents while considering constraints and limitation placed on the land base;
- Encouraging and fostering knowledge sharing on forest health agents amongst the Revelstoke TSA forest stakeholders, primarily forest tenure Licensees;
- Evaluating management practices for the purposes of adaptive management; and
- Provide strategic direction for management activities.

2.1 Provincial Forest Health Mandate

The goal of the Provincial Forest Health Program is to manage pests to meet forest management objectives. The provincial government's three key strategic forest health objectives are to:

1. **Forest Health Factors are detected and assessed.**
   New and recurring disturbances caused by forest health factors are detected, and assessments of risk and impact to forest resource values are provided.
2. **Practices are adapted to accommodate known forest health risks.**
   Evidence-based information is used to develop recommendations and modify forest management practices to mitigate the impacts of forest health factors.
3. **Resources are protected.**
   Forest resource values are protected from forest health factor damage through appropriately applied direct management actions including treatment and monitoring. This includes the support and implementation of proactive management activities.

Additional information on the Provincial Forest Health Program can be found at:
https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/forest-health

3. REVELSTOKE TSA DESCRIPTION

The Revelstoke and Cascadia Timber Supply Areas are situated in the northwestern portion of the Kootenay Boundary Natural Resource Region and are administered by the Selkirk Resource District, Revelstoke office. The Revelstoke and Cascadia TSAs lie within the traditional lands of Okanagan,

Secwepemc and Ktunaxa Nations though there are no current First Nation communities within the TSAs boundaries.

The Revelstoke TSA covers 549,420 hectares of rugged and mountainous terrain. Approximately 222,822 hectares or 41 percent of the total TSA area is forest land managed by the Ministry of Forests. The area defined as the timber harvesting land base, 52,358 hectares, represents about 23 percent of the productive forest land base following area exclusions for factors such as poor operability, environmental sensitivity and unmerchantable forest types. The Cascadia TSA covers 77,548 hectares.

The species distribution within the Revelstoke TSA THLB is available in Table 1 with Hw, Sx, Fdi and Cw making up over 89% of the volume.

Table 1: Revelstoke TSA THLB Species volumes for > 60 year old stands (2022).

Species	Leading Species Volume m3	2nd Species Volume m3	3rd Species Volume m3	4th Species Volume m3	5th Species Volume m3	6th Species Volume m3	Total Species Volume m3	Species Volume %
Western Hemlock	1,819,261	653,536	353,101	124,661	36,814	10,362	2,997,735	36.68%
Western Red Cedar	734,744	574,390	244,056	54,302	9,220	3,020	1,619,732	19.82%
Douglas-fir	1,040,784	288,256	125,487	69,914	26,614	6,585	1,557,640	19.06%
Spruce	937,065	307,336	87,873	15,789	1,381	90	1,349,534	16.51%
Sub-alpine Fir	193,681	110,215	14,489	2,009	268	35	320,697	3.92%
Mountain Hemlock	167,687	78,853	33,446	5,735	502		286,223	3.50%
Paper Birch	10,216	4,238	2,171	1,015	435	243	18,318	0.22%
Western Larch	5,949	3,830	1,333	761	270		12,143	0.15%
Aspen	2,119	1,579	604	320	273	62	4,957	0.06%
Cottonwood	2,564	937	239	120	42		3,902	0.05%
Lodgepole Pine	1,443	284	82	116	16		1,941	0.02%
						Total	8,172,822	

A large portion of the timber harvesting land base (THLB) exists in younger age classes (0-50 years), and older age classes (141+), while relatively little area exists in stands between the ages of 41 and 140 years. Stands dominated by western red cedar, western hemlock, Engelmann spruce and Sub-alpine fir tend to make up a large component of the older age classes.

The forests of these areas provide a variety of habitat for wildlife, including large animals such as black bear, grizzly bear, moose, elk, mule deer, mountain goat, and mountain caribou. The TSAs provide important habitat for the Revelstoke/Shuswap caribou herd.

Recreational values and uses of forests in these areas are high due to proximity of national and provincial parks, exceptional natural scenery, and the presence of highway and rail transportation. Consequently, tourism is becoming an increasingly important economic sector in the area's economy.

Bark beetles have posed a threat to management objectives for many of these resources. Western hemlock looper is considered the highest priority forest health agent, with spruce beetle and Douglas-fir beetle to a lesser extent in each TSA. Catastrophic infestations result in millions of dollars in reduced revenue due to timber losses, degraded lumber values, reduced stumpage values, degradation of non-timber resources, increases in unsalvaged losses, and disruptions in forest planning and long-term impacts on resource sustainability. Large scale tree mortality within the two

TSAs could also have negative impacts on recreation, fire hazard, visual objectives, fish and wildlife resources, water management and other resource values.

Beetle Management Units (BMUs) follow the same boundary lines as Landscape Units and are listed and displayed in Table 2 and Figure 1.

Table 2: The following BMUs are included in this TSA Forest Health Strategy.

BMU#	BMU Name	BMU#	BMU Name
R01	Pingston	R10	Laforme
R02	Cranberry	R11	Big Eddy
R03	Akolkolex	R14	Liberty
R04	Mulvehill	R15	Horne
R06	Redrock	R16	Soards
R07	Jordan	R18	Bigmouth
R08	Frisby Ridge	R20	Illecillewaet

The following BMUs contain TFL55 & 56 area and are not covered by this strategy.

TFL BMU #	TFL BMU Name	TFL BMU #	TFL BMU Name
R05	French	R17	Mica
R12	Downie	R19	Goldstream

Comprehensive descriptions of the Revelstoke & Cascadia TSA are included in the following documents:

Revelstoke TSA Website:
https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/timber-supply-review-and-allowable-annual-cut/allowable-annual-cut-timber-supply-areas/revelstoke-tsa

Cascadia TSA website:
https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/timber-supply-review-and-allowable-annual-cut/allowable-annual-cut-timber-supply-areas/cascadia-tsa

- Data Package
- Analysis Report
- Rational for Allowable Annual Cut Determination

Kootenay-Boundary Land Use Plan

https://www2.gov.bc.ca/gov/content/industry/crown-land-water/land-use-planning/regions/kootenay-boundary/kootenay-boundary-rlup

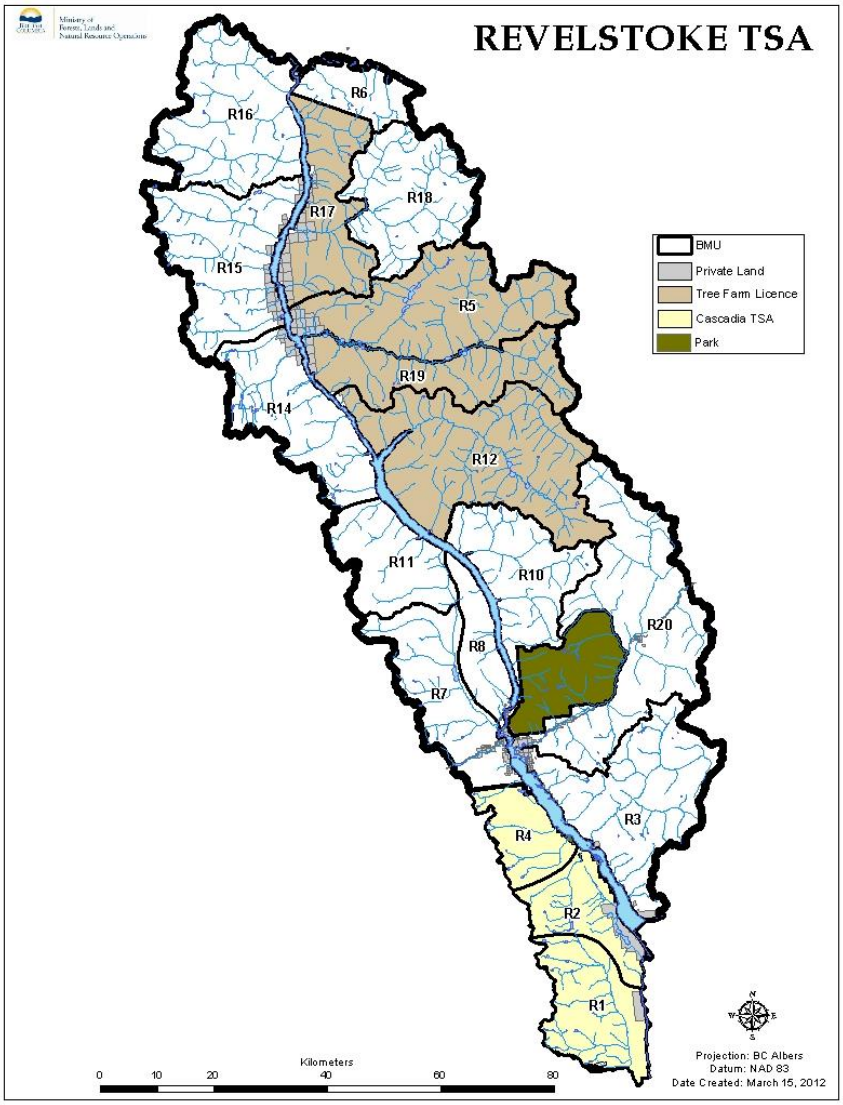

Figure 1: Map of Revelstoke and Cascadia (Revelstoke Area) TSAs, identifying Revelstoke National Park, private land and TFL area not included in this Forest Health strategy.

4 TSA Priority Ranking of Forest Health Agents

The priority forest health agents have been ranked following the Provincial Forest Health Strategy (Table 3).

Rankings were based on the following factors:

- The collective knowledge of the regional and district forest health specialists, forest managers, licencees and contractors.
- Historic recorded occurrence patterns.
- Known or suspected impacts to forest resource values, based on the knowledge of local forest professional and regional forest health specialists.
- Availability of operational detection and treatment methods.
- Costs and benefits of applying detailed detection and treatment activities.
- Overall level of knowledge about the hazard and risk zones.
- Distribution of pest and current incidence levels.

The rankings are somewhat subjective, so an additional approach is to consider what the impact of the forest health factor would be equivalent to in terms of area. This approach provides a useful perspective to the rankings and generally applies as follows:

Ranking	***Predicted potential damage loss per year (ha)***
Very High	>400
High	200-400
Moderate	100-200
Low	50-100
Very Low	<50

Note: some abiotic injuries (i.e. flooding) are not ranked, as the severity can change with each event. Also note that not all forest health factors are ranked, only the more significant pests within the two TSAs.

Table 3: Ranking of Forest Health agents by potential impact on forest management activities in the Revelstoke and Cascadia TSAs

	Very High	**High**	**Moderate**	**Low**
Defoliators	**Western hemlock looper, Spongy moth**			Black army cutworm, Birch leaf miner, Aspen serpentine leaf miner
Diseases	**Armillaria root disease**	White pine blister rust	Tomentosus root disease	Dothistroma, Lophodermella, Hard pine rusts (Western gall rust, Stalactiform blister rust, Comandra blister rust)
Insects	**Spruce beetle, Douglas-fir beetle, Western balsam bark beetle**		Spruce weevil	Mountain pine beetle
Mammals			Bear	Deer, Moose
Abiotic Factors	**Fire**	Windthrow	Drought	

An overview of the activity status of some of the priority forest health agents which were reported during the 2022 and 2023 provincial aerial overview surveys (AOS) are provided in Table 4. Note that spot tree counts have been incorporated into the severe category of damage based on a fraction of a hectare per spot. Priority ranking is based on risk of current and future non-recoverable losses. Fire Killed and IBD stands are Priority 1's that represents the largest current losses of higher value timber species and area and all the bark beetles have the potential to cause further losses if not managed/ harvested. Western Hemlock Looper will increase future non-recoverable losses if the population does not subside.

Table 4: Selected summary of 2022 & 2023 forest health agents recorded during the aerial overview survey on forested lands in the Revelstoke and Cascadia TSAs and TFLs 55 & 56.

FH Agent	Common Name	2023 Affected Area (ha)	2022 Affected Area (ha)	Trend from previous year	Current Impact on Timber Supply	TSA Priority
NB/ NBP	**Fire/ Post Fire**	**3080**	**0**	**Significant Increase**	**Very High**	**1**
IBD	**Douglas-fir beetle**	**312**	**306**	Static	**High**	**1**
IBB	**Western balsam bark beetle**	**265**	**661**	**Significant Decrease**	**Moderate**	**2**
NDF	**Drought Foliar Loss/ Damage**	**12,131**	3967	Very Significant Increase	Very High	2
IDL	**Hemlock Looper**	**0**	**6509**	**Significant Decrease**	**Very Low**	**2**
IBS	Spruce beetle	0	0	Static	None	2
IBM	Mountain pine beetle	1	136	Significant Decrease	Very Low	3
ID6	Aspen serpentine leafminer	529	1314	Significant decrease	Very Low	n/a
ND	Drought	33	0	Slight Increase	Very Low	3
NW	Windthrow	16	10	Static	Very Low	3

5 FOREST HEALTH AGENTS - STRATEGIES AND TACTICS

5.1 DEFOLIATORS

Western hemlock looper IDL *(Lambdina fiscellaria lugubrosa)*

No IDL was detected in 2023 compared to 6,509 ha in 2022. Causes for the decline in attack could be a result of extreme dry conditions over last few years and the last Spray program in 2021. The preferred host of the looper is western hemlock followed by interior spruce, Douglas-fir and western red cedar and found primarily in mature and overmature hemlock and hemlock-cedar stands. Looper outbreaks tend to run on a 10-year cycle, the last outbreak began in 2012.

Aspen serpentine leaf miner ID6 *(Phyllocnistis populiella)*

Aspen serpentine leaf miner attacks trembling aspen and black cottonwood. Larval mining reduces tree photosynthesis and water vapour conductance. Heavy attacks can reduce tree growth, cause branch dieback and even cause tree mortality. Foliage discoloration and associated premature leaf fall may reduce the aesthetic value of trees on recreation sites. The area observed in 2023 is down to 529 ha in 2023 compared to 1,314 ha in 2022. This defoliator is not being managed though the presence of foliar diseases and climate change could impose constraints on future management. Aspen serpentine leafminer is widespread and there is no prescribed treatment or management for this defoliator.

Birch leaf miner IDN *(Fenusa pusilla)* (Birch Decline)

Birch leaf miner was not observed in the last 3 years. The trend has been sporadic over the last 6 plus years. This defoliator is not being managed though the presence of foliar diseases and climate change could impose constraints on future management. Birch leaf miner is widespread and there is no prescribed treatment or management for this defoliator.

Birch leaf miner "hammocks" present on the underside of affected leaves.

Black army cutworm IDA *(Actebia fennica)*

The black army cutworm hazard is highest when a site is burnt in the spring and no herbaceous food source is available. Most mortality occurs among those seedlings that are more than 60% defoliated. Hosts are spruce, lodgepole pine, western larch, Douglas-fir and trembling aspen with Douglas-fir and spruce being highly susceptible and lodgepole pine being relatively resistant to damage. The number of blocks broadcast burnt in recent years has been relatively low.
For blocks burned in the spring (May-June) of the previous year, one should try to delay planting until most cutworms have pupated. If cutworm damage is expected when seedlings are planted, the simplest and fastest approach is to plant on moist sites as early as possible in the spring; on sites where significant moisture stress is expected, delay planting for 1 year.

Black army cutworm trapping.

5.2 DISEASES

Armillaria root disease DRA *(Armillaria ostoyae)*

Management of Armillaria and other root diseases in the TSA is recommended to follow the "Managing Root Disease in BC" guide published by MoF (2018). Stocking Standards for Free Growing Stands are contained in each licensee's Forest Stewardship Plan and have been developed to address this disease. Harvested ICH may be considered for stump removal treatments post-harvest to reduce DRA levels. Because deciduous brush thinning can promote spread of Armillaria, such action should be applied cautiously.

Young plantations with Armillaria tend to suffer a distinct early wave of mortality due to young roots contacting infected stump systems. Mortality usually peaks between 9 and 16 years after planting. Thus, applying free-growing surveys after this time period would provide the most useful information on plantation success. A later FG survey than typical is recommended for areas with known Armillaria, such as ICH sites.

RESULTS data indicates that 0 hectares of stump removal was completed in 2023. Stump removal treatments have been minimal in the last 14 years. This number is low given the high % of ICH stands in Revelstoke TSA and potential susceptibility of these areas to DRA. It is recommended that all Licencees consider stump removal treatments and other silviculture options in high risk areas where feasible. Limiting factors are likely large stump size and steep slopes.

Tomentosus root disease DRT *(Inonotus tomentosus)*

Tomentosus root disease often causes small gaps in stand canopies that can coalesce into larger opening, within which lay randomly oriented, downed trees with decayed roots. Crown symptoms are not very common but include chlorotic thinning foliage, reduced shoot growth, and distress cones. Juvenile trees die quickly; older trees suffer extensive butt rot leading to increased susceptibility to windthrow and insect attack. Tomentosus spreads primarily through root contact and can survive in infected large stumps for decades.

White pine blister rust DSB *(Cronartium ribicola)*

White Pine blister rust is an introduced pathogen which has caused extensive mortality of western white pine, limber pine and whitebark pine. The availability of disease-resistant white pine makes it possible to ensure this valuable timber species is restored. Disease resistant white pine should be promoted as a reforestation species on appropriate sites. Based on successfully yielding approximately 65% survivorship of white pine, a similar rust-resistance effort should continue to be supported for whitebark pine, which is occasionally harvested, federally endangered, and especially valuable for wildlife. Forest Licencees are encouraged to consider planting rust resistant Pw seedlots.

Whitebark Pine Decline

Whitebark pine (*P. albicaulis*) often occurs within harvest units at elevations above 1600 meters. The causes are primarily white pine blister rust and mountain pine beetle. To a lesser extent, the exclusion of fire has favoured its less fire-hardy competitors. As a result, this tree species was placed on the federal endangered species list in 2012. Whitebark pine is valuable to grizzly bears and many other wildlife species for its very large seeds.

The cutting or damaging of whitebark pine should be strictly avoided. Whitebark pine stands, especially those with many cone-bearing trees and in good health, are good candidates for wildlife tree reserves, Old Growth Management Areas, and Wildlife Habitat Areas for grizzly bears. In harvest areas, the thinning of competing trees can promote whitebark pine survivorship by reducing competition and providing seed regeneration habitat.

Specific guidelines for retaining whitebark pine are provided by the Ministry of Forests with the link below:
Natural Resource Best Management Practices - Province of British Columbia (gov.bc.ca)

Hard pine rusts- Commandra blister rust *DSC (Cronartium comandrae*), Stalactiform blister rust *DSS (Cronartium coleosporioides*), Western gall rust DSG *(Endocronartium harknessii)*

Hard pine rusts are a very minor concern in the Revelstoke area as Lodgepole pine is not normally planted in harvested blocks in either TSA. Based on RESULTS records no Pli has been planted in the last 15 years, except for approximately 9,000 seedlings in Cascadia in 2022.

Lophodermella (Pine) Needle Cast -DFL (*Lophodermella concolor*) and Dothistroma Needle Blight – DFS (*Dothistroma septosporum*)

Dothistroma and Lophodermella were not detected in 2021-2023, 213 ha was observed in 2020. They both typically affect young pine stands and can cause serious defoliation typically during moist summer years. Growth reductions and mortality may result after repeated epidemics. Both are often associated with over planting of Lodgepole pine in ICH sites or planting offsite seedlots. Where possible, a mix of species is highly recommended to be planted or regenerated naturally. The impact on the TSA can be significant in local areas, especially on regenerating plantations although planting of Pli has not been significant in Revelstoke for some time and this is I assume a legacy on some older plantations. Careful consideration should be given to species selection in higher risk areas such as the ICH BEC zone. Licencees may want to give consideration to timing of Free Growing surveys for high percentage Pli plantations in high-risk areas to ensure these diseases are detected. One strategy could be to at least do a sample of surveys earlier in the season.

5.3 INSECTS

Western balsam bark beetle IBB *(Dryocoetes confusus)*

There are significant areas of subalpine fir leading forest stands in the TSAs that are susceptible to western balsam bark beetle. Western balsam bark beetle has been chronically causing mortality over the years. 2023 attack levels decreased significantly to 265 ha from 661 ha in 2022. Attack was mostly in Trace severity class and about 10% in Light. Harvesting areas of more severe attack is recommended, if possible, to reduce Non-Recoverable Losses. Direct control action on that insect is very difficult due to its attack dynamics and the scattered distribution of the stands.

Douglas-fir beetle IBD *(Dendroctonus pseudotsugae)*

The aerial overview survey observed a decrease in incidence of Douglas-fir beetle from 515 in 2021 to 306 ha in 2022. Attack was mostly in Moderate severity class followed by Light. Attack is primarily centered around the Revelstoke city area, no other significant concentrations noted. Large outbreaks of Douglas-fir beetle have not been recorded likely due to the widespread occurrence of mixed species stands. Local mills bringing in Douglas-fir should consider deploying Pheromone baited funnel traps within their mill sites.

There are 15,344 ha of susceptible (>20 rating) forest types to Douglas-fir beetle in the Revelstoke TSA based on a 2014 BMU analysis. Most of the susceptible area is in the 2 lower classes of 20-40 and 40 -60. Douglas-fir beetle has the potential to significantly impact the Revelstoke TSA timber supply as much of the concentration of Fdi susceptible stands are in areas of high constraint for other values such as Visuals, Ungulate range and Recreation. Therefore, the management of Douglas-fir beetle and Douglas-fir leading stands remain a high priority. **Trap tree and/ or funnel trap programs and monitoring post-harvest slash and monitoring blowdown in recently harvested blocks and removing or burning any slash are recommended beneficial practices to minimize future losses.** Additional good practice includes harvesting fired damaged trees and

adjacent stressed trees to reduce IBD population increases. In 2023, DSE funnel frap contractor observed 50 cm or so tall stumps near some sites on fresh logging and this could be an exacerbating factor for IBD population increases. Stumps should be <= 30 cm ideally.

Licencee response in suppression BMUs should be targeting harvest of at least 70% of the previous year's attack within 1 to 2 years.

Information on managing IBD post fire can be found here:

DFB_Post-fire information_Nov 28_2017.pdf (gov.bc.ca)

Spruce beetle IBS *(Dendroctonus rufipennis)*

Spruce beetle was not observed in 2023 or 2022, only 1 ha in 2021 (a few spots, no polygons). IBS was observed adjacent to Revelstoke TSA within Glacier National Park in 2022 and previous years and is worth monitoring for any Licencees with operating areas close to the boundary.

There are 98,221 ha of susceptible (>20 rating) forest types to Spruce beetle in the Revelstoke TSA based on a 2014 BMU analysis. 13 BMUs have greater than 4,000 ha of susceptible Sx area. The TSA is very susceptible to IBS with the high amount of spruce covered area in moderate or higher susceptibility. Most of the susceptible areas is within the 20-40 and 40-60 susceptibility classes.

Spruce blowdown when identified is a high priority for treatment / harvest. The Bark Beetle Guidebook will guide treatments. Link is as follows:

Rapid harvest response to any IBS outbreaks on operable THLB area is critical to reduce losses and IBS populations. **Given the current low amount of attack in operable areas, harvesting, and keeping IBS populations low should be targeted through immediate harvesting, in less than 1 to 2 years.**

Mountain pine beetle IBM *(Dendroctonus ponderosae)*

Mountain pine beetle has been noted on white pine as spot infestations on the aerial overview surveys over the last number of years. Only 0.5 ha of IBM attacke was observed in from spot attacks in 2023 compared to 136 ha 2022. . Due to the minor lodgepole pine component, most of the area is considered low hazard to mountain pine beetle, with most of the hazard found in the southern part of the TSA. Any larger polygons of moderate or worse severity should be targeted for harvest if feasible. There are only 868 hectares of susceptible area within Revelstoke TSA with over half in 1 BMU - Akolkolex and therefore is not considered a significant threat to timber supply.

Spruce weevil *(Pissodes strobi)*

Spruce weevil is an insect that will repeatedly attack and damage the leader of spruce trees, causing poor form and reduced growth. It is not typically noted by the AOS. Spruce weevil is currently a medium to low priority issue overall, but in plantations that contain a large proportion of spruce seedlings; it is a medium to high priority. The best method of dealing with this insect is to ensure that there is a good species mix on the site, consider Sx seedlot selection carefully and maintain a relatively high planting density.

5.4 MAMMALS

Bear AB

Bear damage was 0 ha observed for the last 5 years. Mortality often appears to be on younger (saplings and poles) single trees rather than widespread areas. Bear damage is not easily identified by the overview survey as only red attack trees are identified; ground checks are required to positively identify the cause of death. Bear damage has been identified at the free growing survey stage and in a number of blocks where Stand Development Monitoring (SDM) plots had been established in the Revelstoke TSA. To be detected on the AOS it would be significant damage within an opening or strata. Potential solutions to manage animal damage and in particular bear damage might include species diversity at time of planting and perhaps higher planting density as well. Rapidly growing, vigorous trees in moderately to lightly stocked stands are preferred. Stands that have been juvenile spaced and or pruned appear to have a greater incidence of bear damage than stands that have not been spaced and or pruned.

5.5 ABIOTIC FOREST HEALTH FACTORS

Windthrow NW

Overall, damage as a result of wind, can cause significant forest losses. 16 ha of windthrow was observed for 2023. Windthrow at smaller scales is not typically noted in the AOS, only larger patches. The geography of the area consists of many narrow valleys that drain cold air from higher elevations and flow into the Columbia River drainage: this concentrates air flows and creates turbulence pockets both of which can result in increased wind speeds. Strategies for managing windthrow risk include considering dominant wind patterns when establishing the boundaries for harvest areas, and, in rare cases where there are high values at risk and forested areas that are not overly decadent, feathering the edges of harvest blocks by selectively removing trees and retaining the more wind-firm stems. Since management strategies cannot account for unpredictable storm winds, aerial overview survey data will identify new patches of windthrow and can be evaluated for salvage potential. Licensees have been monitoring areas of known wind events e.g. Boulder Mountain has had several wind events over the last many years resulting in patches of Douglas-fir being blown down.

Fire NB & Post Fire Mortality NBP

In recent history, fire has not been a major concern in Revelstoke TSA. No area was affected in 2022 while 2021 saw a large area of 1928 ha were burned or post fire mortality from the previous year. The largest fire damaged areas for 2021 were in Bigmouth Ck in Revelstoke TSA and the Goldstream River area of TFL55. Fire damaged area is detected based on previous year's fire season and post fire damage is additional noted mortality in subsequent years. Fire damaged stands should be considered for immediate salvage to reduce future damaging agents such as Douglas-fir bark beetle and to reduce non-recoverable losses. Harvest within a year of damage is recommended for wood quality and reduction of other pests.

Hot Droughts ND

The frequency and intensity of drought combined with higher summer temperatures appears to be increasing in the southern interior of BC. As a result, trees become stressed, especially young regeneration and overstocked (high density) mature stands. No drought areas were mapped in either 2022 or 2021 compared to 56 ha in 2020. Drought mortality may not become evident until the year

following as well. Impacted trees often don't die until a year or two post hot drought. The hot droughts of 2003 and 2007 are implicated in the timing of deaths of Armillaria infected regeneration on the Knappen Creek Stump Removal Trial. In a report to the Chief Forester, Axelson and Ebata (2015) predict the following impacts:

- Bark beetles of various species populations will increase.
- Plantation pests such as spruce weevil or lodgepole pine terminal weevil will increase.
- Defoliator activity could increase. Decline syndromes already being experienced in aspen and birch, they will continue or will become accelerated.
- Root diseases impacts will accelerate.

Drought ND, Drought Foliar Loss/ Damage NDF and Cedar Flagging NE

A very significant amount of area was observed as NDF in 2023 – 12,131 ha and 33 ha of Moderate attack ND. NDF was mostly Moderate severity followed by Light then Severe attack. Cedar Flagging in 2022 was 3,967 ha. NDF attack was widespread across the TSA north of Hwy 1. Cedar flagging is typically a result of hot, dry weather and drought conditions from current and previous years. The increase and severity of the observation is likely a result of multiple years of drought conditions.

Flooding NF & Slides NS

No slides or flooding were mapped for 2022 or 2023. Slide damaged areas can be a source are for IBD and IBS population build up and should be managed by harvest, adjacent trap trees and/ or IBD funnel trapping if feasible.

6 Management Objectives for Priority Forest Health Agents

6.1 Integrated Forest Health Management objectives

The following principle for management objective commonly known as "Integrated Forest Health Management" will be followed for all the priority forest health agents in the Revelstoke TSA:

1. Know the land base and resource management objectives;
2. Manage from an ecological perspective;
3. Don't make the situation worse;
4. Practice adaptive management.

The Integrated Forest Health Management is a system that, in the context of specific resource management objectives and knowledge of the associated environment and the biology of the forest health agent and host species, applies all suitable techniques and methods to maintain forest health agent populations at levels below those causing unacceptable damage or mitigates such damage.

6.2 Management objectives for bark beetles (IBD, IBS and IBM)

The following are the management objectives to be implemented for the three main bark beetles in the Revelstoke and Cascadia TSAs: spruce bark beetle, Douglas-fir beetle and mountain pine beetle. Any reference to "bark beetles" in the following management objective refers to the three bark beetles listed above.

1. **Sanitation and salvage harvesting of beetle killed areas where economically feasible, especially moderate or higher severity IBD, IBS and IBM attacked polygons and larger Light attack polygons identified by the Aerial Overview Survey or other surveys. Limit the amount of unsalvageable losses due to bark beetles. Target**

harvesting a minimum of 80% of the area to maintain BMU Targeted strategy within 24 months of the AOS flight.

2. Prioritize the forest management to higher hazard forest stands by harvesting or reducing the susceptibility of stands to bark beetles.
3. Limit the amount of non-recoverable losses due to bark beetles;

Definitions:
Sanitation harvesting: harvesting operations specifically designed to maximize the extraction of currently infested or infected stands in order to reduce the damage caused by forest pests and to prevent their spread, e.g. bark beetles.

Salvage Harvesting: harvesting operations primarily designed to recover timber damaged or degraded by fire, an old insect attack, wind, or disease before the potential wood products become un-merchantable. Control of forest health factors such as bark beetles is incidental and is not the primary objective of salvage logging.

6.3 Harvesting Treatments

Harvesting is to be considered the preferred treatment for all infestations where it is operationally feasible. Treatment may include a single harvest regime or combination of harvest regimes ranging from large cut blocks, to single tree selection or small patch where appropriate.

The treatment goal is to remove as much, if not all of the current attack prior to the next beetle flight period. Within the Suppression Zone action plans must contemplate harvest before the next flight period. If this is not achievable, or the likelihood of pre-flight harvest is low, then these areas should be tabled as opportunities for other Licencees by at least April 1st of the following year.

Direct single tree treatments are not to be considered an alternative for harvest where the recovery of otherwise lost timber values and sanitation of beetles, i.e. removal of trees with brood can be attained. Where resources are insufficient to address the removal of all infestations prior to the next beetle flight, consideration must be given to minimizing block sizes and/or harvesting only those portions of the block that are infested this should be considered a short-term strategy until resources permit the removal of logical openings.

It is imperative the operational planning requirements are scheduled accordingly and where necessary to meet tight time frames. If necessary, expedited approvals should be requested and are appropriate where infestations are identified post-flight and where harvest is planned to take place prior to the next beetle flight.

Licencees should consider a small-scale sanitation program as required to meet overall objectives. Sanitation is defined as the removal of infested material prior to beetle flight. Sanitation is to be used, where necessary, to balance resource allocations to optimize the effectiveness of harvesting and single tree treatment strategies and maximize the recovery of otherwise lost timber values.

Sanitation should also be considered where landscape level disturbances and impacts dictate a light footprint approach and where a minimum of one truck load (40 m^3) of operable timber can be recovered, within reasonable skid distance (400 metres) of established logging truck access; the objective is to remove all infested trees prior to the next beetle flight. Only under exceptional circumstances where the methods cannot be applied should these sites be baited and held over flight.

If it is determined that harvesting prior to the next beetle flight is impossible, then consideration should be given to expanding the harvest area to include the area baited, as well as sufficient susceptible host.

6.4 Hauling and Milling Guidelines

The following guidelines should be considered when areas surrounding the mill site are in or near urban areas, or in areas not yet affected by bark beetles.

In recognition of the potential for bark beetles to fly from milling facilities into adjacent areas the following guidelines apply typically from April 1 to August 15 for IBD, May 1 to June 30 for IBS and July 1 to August 31 for IBM.

- Manage -spring break up inventories of infested timber for priority processing prior to the above-noted period;
- Keep mill inventories and deliveries of bark beetle infested wood at a minimal operational level to meet business needs;
- Mill profile requirements permitting, prioritize processing beetle- infested sources over uninfested sources.
- Establish funnel traps (especially for IBD) in and around log yards, log decks and log booms to assist in monitoring bark beetle flight and to serve as a control measure. Traps should be monitored at least weekly and contents destroyed.

In recognition of the potential for bark beetles to fly from infested cut blocks (standing trees or decks) to adjacent timber, the following guidelines apply:

- In Salvage BMU's, no special considerations
- In Proactive, Targeted and Reactive BMU's:
  - For infested cut blocks that are not harvested/hauled prior to beetle flight, consider baiting in an attempt to minimize spread. Licensees should, where practical, plan operations that avoid leaving decks of infested timber on site.
  - Communication of business needs/expectation for awareness between licensee and DSE prior to spring break-up/next beetle flight is required.

In recognition of the potential for bark beetles to fly from trucks during transport the following guidelines apply:

- Inform truck drivers when they are hauling green attack loads and that the beetle flight period typically extends from April 1 to August 15 for IBD, May 1 to June 30 for IBS and July 1 to August 31 for IBM.
- Inform truck drivers that extended delays along the way can result in bark beetles flying from the load into the adjacent forest land base.
- When practical, hauling of beetle infested logs should be as direct as possible from the cutting area to the mill.

6.5 Pheromone Placement

Pheromone placement is to occur in **infested stands only**, where beetle control activities cannot be implemented until after the next flight and in mop up operations around harvested and treated infestations. In the case of larger blocks with isolated concentrations of attack, only the infested portions of the block should be baited.

The use of pheromone baits must always be followed by actions to remove or eradicate the concentrated beetle populations. All pheromone placement plans should be shared at operational beetle planning meetings, including scheduling follow-up treatments and responsibilities.

Pheromone placement can be implemented throughout the spectrum of treatment strategies including fall and burn. Pheromones should not be placed in operable areas where population levels are extremely high and increasing, or in inoperable areas where population levels are endemic and declining.

The responsibility to carry out follow-up treatments to remove or eradicate concentrated beetle populations resulting from baiting lies solely with the placement agency (Section 41 of the Forest Planning and Practices Regulation (FPPR)). Follow-up actions must be carried out prior to the subsequent beetle flight unless specifically exempted by the District Manager (Section 91 of the FPPR).

Licensees, excluding TSL holders not operating under a cutting permit authority, should consider pheromone bait placement in unharvested portions of beetle infested blocks prior to biological beetle flight times where due to unforeseen circumstance the Licensee will not be able to complete harvest prior to the beetle flight.

All pheromone placement activities must be carried out in a manner which allows for future identification and location of baited trees. Baited trees must be marked conspicuously in the field using flagging, and the placement agency must be identified at each bait site. Maps identifying all baited areas should be provided to the District by September 15th each year. Detailed guidance and protocols on the use of pheromones is provided in "Strategies and Tactics for Managing the Mountain Pine Beetle", developed for the B.C. Forest Service by Lorraine Maclauchlan and J. E. Brooks (*http://www.for.gov.bc.ca/ftp/HFP/external/!publish/MPB_booklet/*).

7 ROLES AND RESPONSIBILITIES

Detailed bark beetle surveys are carried out to determine the nature and extent of bark beetle infestations within the area of the plan. Specific areas requiring surveys are identified from aerial overview maps and previously known infestations.

If significant risks to forest resources are identified from surveys, actions to reduce risks are identified and reported within bark beetle survey reports and shared with the appropriate licencee. The responsibility to carry out these actions or measures is the responsibility of the licencee.

1. Responsibilities are assigned in this matrix according to funding source. Although there are allowances for some activities under the appraisal system, the responsibilities assigned include the implementation and funding of these activities.
2. In the event that a Forest Licencee must carry out activities within the operating area of another Forest Licencee, the responsibility for bark beetle management activities post-harvest are to be negotiated in advance.
3. Where special management areas have been identified such as areas of interest for the Protected Areas Strategy, the responsibilities identified in this matrix may be amended to address specific management guidelines for these areas.

DSE Forest Health Responsibility Matrix

DISTRICT RESPONSIBILITIES	REGIONAL RESPONSIBILITIES
Prepare an annual TSA Forest Health Strategy	Conduct annual aerial overview surveys and provide digital data to Districts to produce overview maps and to distribute to DSE clients.
Info sharing at TSA Steering Committee meetings and directly to Forest Licencees and other clients	Produce and distribute the Provincial annual forest health overview surveys
Conduct detailed aerial and ground surveys within the TSA where deemed appropriate	Conduct defoliator monitoring & aerial treatments for defoliators (ex. spruce budworm Bt spraying)
Produce maps from the aerial surveys and provide ground survey information and maps to Licensees and clients	Provide overwinter mortality estimates of bark beetles

Within Selkirk Resource District (DSE), Forest Licensees have a responsibility to track, monitor and treat forest health factors. The following table covers the responsibilities for Licensees and the Ministry of Forests.

ACTIVITY	***MoF***	***LICENCEES***
Monitor and evaluate forest health activities (Utilize the best current information to detect and manage forest health factors)	***X***	
Conduct treatment of defoliator outbreaks (MoF regional responsibility)	***X***	
Develop annual reports of bark beetle activities for the Province	***X***	
Conduct bark beetle treatments when required by the Forest Health Strategy	***X***	***X***
Maintain and share records of collected survey information	***X***	
Conduct ground surveys when required to verify incidence and severity of forest health pests	***X***	***X***
Conduct aerial overview forest health surveys and report on results (MoF region)	***X***	
Conduct detailed aerial surveys focusing on suppression beetle management units	***X***	
Submission of survey and treatment data to MoF		***X***

8 BMU STRATEGY FOR IBS, IBD and IBM

Most of the BMUs are listed as Targeted in Table 5 for all 3 bark beetles with BMUs listed as No Action where susceptibility is extremely low. No changes have been made to the BMU strategies for the 3 bark beetles for many years. The updated Strategy options and descriptions are as follows:

1. Proactive	The use of proactive management tactics and is applied where beetle populations are in the endemic population phase. The key goal of the Proactive strategy is to prevent beetle populations from expanding to unmanageable levels.
2. Targeted	The use of aggressive pest reduction tactics on beetle populations that are in the incipient population phase and is applied where pest populations are building but can still be effectively reduced before more widespread infestation occurs.

3. Reactive	The use of tactics in response to pest populations that are in the epidemic population phase. The goal of the Reactive strategy is to reduce and mitigate widespread bark beetle-caused host tree morality.
4. Salvage	Focus on the harvesting of mostly dead or dying trees and stands to minimize timber value losses in widespread infestations and is applied where management efforts would be ineffective in reducing beetle populations and subsequent levels of damage. The Salvage strategy is most suited for beetle populations that are nearing the end of the epidemic phase or in the post-epidemic phase. The goal is to recover timber value, to regenerate impacted areas and to reduce fire risk to promote future more resilient forests.
5. No Action	The No Action strategy is applied to designated areas where: • Natural disturbances are left unmanaged • Management efforts would be ineffective in substantially reducing beetle populations and impacts • There is no short-term possibility of salvaging dead timber • Access cannot be put in place before substantial merchantable degradation of the dead material (economically constrained areas) • Non-timber values or other management constraints such as wilderness areas, Parks or ecological reserves, culturally significant areas, supersedes that of timber or wood products Areas designated as no action should be large enough to allow for the full range of ecosystem processes through time.

Table 5: BMU Strategy by beetle: IBM, IBS, IBD for 2020-21 for the Revelstoke TSA (unchanged)

BMU	**BMU Name**	**Beetle**		
		IBM	**IBS**	**IBD**
R01	Pingston	No Action	Targeted	Targeted
R02	Cranberry	No Action	Targeted	Targeted
R03	Akolkolex	Targeted	Targeted	Targeted
R04	Mulvehill	No Action	Targeted	Targeted
R06	Redrock	No Action	Targeted	Targeted
R07	Jordan	No Action	Targeted	Targeted
R08	Frisby Ridge	No Action	Targeted	Targeted
R10	LaForme	Targeted	Targeted	Targeted
R11	Big Eddy	No Action	Targeted	Targeted
R14	Liberty	No Action	Targeted	Targeted
R15	Horne	No Action	Targeted	No Action
R16	Soards	No Action	Targeted	Targeted
R18	Bigmouth	Targeted	Targeted	Targeted
R20	Illecillewaet	Targeted	Targeted	Targeted

9 Recommended activities to manage IBS, IBD and IBM

9.1 Douglas-fir beetle

The overall strategy for Douglas-fir beetle (IBD) management is that of suppression/monitor through the use of one or a combination of the following:

1. Sanitation harvesting;
2. Clean harvesting practises;

3. Trap trees;
4. Anti-aggregation pheromones (MCH);
5. Funnel trapping.

9.1.1 Harvesting

Timber harvesting in infested (1st priority) and red/grey attack (2nd priority) and un-infested stands (3rd priority) with high hazard and stress factors such as nearby windthrow, fire damage for example and/ or infestation is critical to meeting suppression strategy objectives and reducing non-recoverable losses. A combination of sanitation and salvage harvesting for Douglas-fir beetle suppression should be carried out in areas of current-attack in order to reduce the existing population and inhibit the infestation expansion. Failure to address these losses continues to impact future timber supply determinations negatively.

Trap trees are highly recommended as an effective tool to reduce overall beetle population levels in any IBD areas or Douglas-fir stands and complete a post-harvest mop-up where necessary. Baited funnel traps and MCH anti-aggregant may be used where conditions are appropriate.

9.1.2 Pheromone Use

Pheromone use is planned for use with IBD funnel trapping projects only at this time under Land Based Investment Funding works through Selkirk Resource District and is covered by the Southern Interior Region Pest Management Plan. In 2023 the District captured 648,733 IBD, 1 major Licencee, 1 woodlot capture a total of 240,800, saving an estimated 523 trees. . Funnel trapping is planned by DSE and some Forest Licencees for 2024.
http://www.for.gov.bc.ca/rsi/ForestHealth/PDF/PMP_2013-2017_FH_Southern_Interior_Feb_19_2013.pdf.

9.1.3 Single tree treatment and other treatments

No planned single tree treatments at this time.

9.1.4 Detailed Flight and Ground Surveys

There is no planned detailed survey flight for IBD 2024 due to budget restraints and no ground treatments planned.

9.2 Spruce beetle

The overall strategy for Spruce beetle (IBS) management is that of suppression/monitor through the use of one or a combination of the following:

1. Clean harvesting practices;
2. Trap trees.

9.2.1 Harvesting

Timber harvesting in infested (1st priority) and red/grey attack (2nd priority) and un-infested stands (3rd priority) with high hazard and/ or infestation is critical to meeting suppression strategy objectives and reducing non-recoverable losses. A combination of sanitation and salvage harvesting for Spruce beetle suppression should be carried out in areas of current attack in order to reduce the existing population and inhibit the infestation expansion. Failure to address these losses continues to impact future timber supply determinations negatively.

Trap trees are highly recommended as an effective tool to reduce overall beetle population levels in any IBS areas or Spruce stands and complete a post-harvest mop-up where necessary.

Trap trees are highly recommended as an effective tool to reduce overall beetle population levels in any IBS areas or Spruce stands and complete a post-harvest mop-up where necessary.

9.2.2 Pheromone Use

No planned use of pheromones is planned at this time for IBS management.

9.2.3 Single tree treatment and other treatments

No planned single tree treatments at this time.

9.2.4 Detailed Flight and Ground Surveys

The current plan for 2024 is no heli detail survey due to lower incidence and budget constraints. No ground surveys currently planned either.

9.3 Mountain pine beetle

9.3.1 Harvesting

Harvesting is the most efficient short-term method of managing IBM populations with the intent to prevent timber loss. Timber harvesting in infested (1st priority) and red/grey attack (2nd priority) and un-infested stands (3rd priority) with high hazard and/ or infestation is critical to reducing non-recoverable losses. Failure to address these losses will impact future timber supply determinations negatively. To reduce mid-term timber supply impacts harvesting should be targeted at infested stands with significant hazard where feasible.

9.3.2 Pheromone Use

None planned at this time.

9.3.3 Single tree treatment and other treatments

No planned single tree treatments at this time.

9.3.4 Detailed Flight and Ground Surveys

None planned at this time as susceptible area too small to manage at this time.

10 Priority Activities in BMUs

The following projects are planned:

- Ongoing discussions with Licencees regarding active IBS, IBD and IBM populations and infestations in their operating areas and targeting these areas and any fire damaged or windthrow areas for immediate harvest.
- Funnel Trapping for IBD in selected areas and encouraging Forest Licencees to consider their own funnel trap and trap tree programs.

11 2024-25 Fiscal Year Tactical Plan

The tactical plan will be to continue to monitor forest health agents through the overview survey. Selkirk District is currently implementing a small funnel trap program for IBD near the city of Revelstoke and south to the ferry. Additional opportunities for funnel trapping will be considered on an annual basis based on current attack levels, funding, and site feasibility.

Forest Licencees have been encouraged to consider their own funnel trapping programs and trap tree programs for IBD. The focus will continue on TSA Licencees meetings to address primarily IBD & IBS impacted areas through harvesting to reduce non-recoverable losses and attempt to limit the spread of the various bark beetles. No single tree treatments are planned at this time.

12 Stocking Standards

Forest health concerns can be a factor in species selection and other aspects of stocking standards. There is some concern of drought risk for some species currently listed in DCO stocking standards such as Sub-alpine fir at lower elevations where it was not previously listed by Chief Forester Standards.

Licencees and prescribing foresters need to be cognizant of climate change and how this can impact future timber supply through stocking recommendations and forest health issues that may have greater, lesser or different impacts in the future as a result of climate change. With the effects of climate change and the unforeseen impacts that this will have on forest health, it will be important to recognize changing environmental conditions and predict the effect that this will have on the management of forest ecosystems. Forest managers will need to assess the suitability of other non-native species as well as how current species will respond to changing climatic conditions.

An additional consideration to professionals completing Free Growing (FG) declarations is the age at which plantations are allowed to undergo FG evaluation. The average FG declaration age is 9 years in the South Area. However, Armillaria root disease, the primary agent of mortality in a substantial number of plantations, does not typically spread until 12-16 years. Thus, FG evaluations prior to 16 years of age risk underestimating stand mortality.

13 Non-Recoverable Losses

Non-recoverable losses (NRLs), or unsalvaged losses, are the amount of volume lost annually to damaging agents that is not harvested. This represents losses above and beyond those already accounted for in existing growth and yield models, often as a result of unpredictable events. These losses can be both incremental losses (e.g. defoliation, defect) and mortality. NRLs are generally subtracted from yield projections.

Table 6: 1999-2019 THLB volume killed, and not harvested and total killed volume harvested by selected Forest Health factors.

Annual Volume Killed (m3) on the THLB and Not Harvested as of 2019 – Revelstoke TSA									**Volume Killed and Harvested**	
Year	**Fire**	**IBM**	**IBD**	**Flood**	**NW**	**IBS**	**IBB**	**Grand Total***	**M³**	**% of Total Killed**
1999-2009	20,017	6,146	1,764	0	335	694	778	29,399	11,104	22%
2010	1,969	1,412	340	-	4,780	-	-	3,721	2,181	37%
2011	-	3,162	183	970	-	-	-	4,315	150	3%
2012	-	249	-	-	-	-	5	254	736	74%
2013	-	239	866	1,458	-	-	-	2,563	1,395	35%
2014	873	805	140	-	-	-	-	1,818	18	1%
2015	-	6	69	702	-	-	-	777	-	0%
2016	-	16	600	2,992	-	583	-	4,191	264	6%
2017	-	83	6,431	576	399	295	57	9,610	456	5%
2018	9,480	-	790	-	54	14	32	10,316	-	0%
2019	-	11	1,615	-	-	-	-	1,626	-	0%
Grand Total	**32,339**	**12,129**	**12,798**	**6,698**	**5,568**	**1,649**	**872**	**68,590**	**16,304**	19%

*Includes Drought

The estimated annual forest volume killed by selected Forest Health Factor and not harvested in the Timber Harvesting Land Base (TSA only), as well as the amount of that killed volume that has been harvested for 1999 to 2019 is presented in Table 6. There are no 2020 to 2022 updates to this table as it was not supplied at the time of this report preparation. **The losses are relatively low when compared to other TSAs within Selkirk District.**

Over the 21 years reported in this table the volume lost by the significant FH factors represents about **0.3%** of the AAC for that time period. The 21-year average annual of Volume Killed and harvested is 19%, 2013 was the last year that the TSA met or exceeded this value. Ideally Licencees should target more of the beetle attacked AOS polygons in the operable landbase for harvest and within a faster timeframe to reduce losses and beetle population growth which contribute to more future losses. While there is often a lag between losses and harvesting and some damaged timber is easier to harvest than others the last 3 years show a low harvest response to date and given rise of IBD and IBS especially Forest Licencees are encouraged to target the damaged stands for immediate harvest (maximum completion in 2 years).

The historical Revelstoke TSA AAC (excludes Area based tenures – CFAs and WLs and Cascadia (TFL23 Area) from 1999 to present is listed in the table below.

Revelstoke TSA Historical AAC	
	Volume m3
1999-2010	230,000
2011- Present	225,000
23 Year Total	5,235,000

14 Conclusion/ Final Comments

This Forest Health Strategy provides strategic direction for the licensees, and MoF in the Selkirk Natural Resource District – Revelstoke and Cascadia TSAs. 2021 & 2022 significant concerns are Western Hemlock Looper, Cedar Flagging/ Drought damage, Douglas-fir Beetle, Fire damage, and Balsam Bark Beetle and areas affected by these FH agents should be considered for targeted harvesting. Prompt action can mitigate any future losses. IBD attack has been observed to be heavier around recent harvesting which could be due to either slash or taller stumps. Managing to a lower stump height at harvest and prompt disposal or removal of potential green Fdi slash could help reduce IBD population increases. Another solution could be to have funnel trapping and MCH use post harvest on any blocks with Fdi in the stand and adjacent. To date NRLs in Revelstoke remain minimal and much of the attack and corresponding losses have been in the National Parks over the years. Specific practices conducted by each licensee should fall within the strategic direction provided within this document. Woodborers have become a primary mortality agent in Boundary, Arrow and Kootenay Lake TSAs within Selkirk District and it is worth watching for within the Revelstoke Management units.

Periodic review of the Forest Health Strategy will allow adaptive management principles to be used. The plan is to review it on an annual basis will ensure forest managers regularly turn their minds to other potential sources of damage or risk to the forest.

The active co-operation of licensees and MoF staff working together to promote and manage healthy forests through diversity, early detection of forest health issues, and direct action as required, will ensure a sound and sustainable industry.

15 Information Links and Reference Material

Report: BC Southern Interior FH Conditions for 2023

2023_southern_interior_fh_report_feb_15_2024_final.pdf (gov.bc.ca)

Provincial Forest Health Strategy 2023-2026

fh_strategic_plan_2023_final.pdf (gov.bc.ca)

Provincial Bark Beetle Management Technical Implementation Guidelines (formerly Bark Beetle strategy
https://www.for.gov.bc.ca/hfp/health/fhdata/bbstrategy.htm

Natural Resource Climate Change Applied Science

Applied Science - Province of British Columbia (gov.bc.ca)

Spatial Data:
Bark Beetle Hazard Ratings
https://www.for.gov.bc.ca/rsi/foresthealth/hazard_rating.htm

2023 and earlier Annual Overview Surveys. (fixed wing based aerial mapping of all visible forest pests).

http://www.for.gov.bc.ca/ftp/HFP/external/!publish/Aerial_Overview/

2023 and earlier Detailed Mapping (Helicopter based aerial mapping of Beetle Management Units with a Douglas-fir beetle strategy of suppression). Available upon request from District Forest Health Staff or at following FTP location:
https://www.for.gov.bc.ca/ftp/DAB/external/!publish/Forest%20Health/Detailed%20and%20Aerial%20Overview%20flight%20data/

2019-21 Maps of IBD, IBS and IBM for the area are available on the FTP site at

https://www.for.gov.bc.ca/ftp/DAB/external/!publish/Forest%20Health/Detailed%20and%20Aerial%20Overview%20flight%20data/2018%20data/AerialOverviewSurvey%202016-2018%20IBM%20IBD%20NW%20NF%20GEOrefPDF%20maps/

Additional maps and data are available on the Branch FTP site at
https://www.for.gov.bc.ca/ftp/HFP/external/!publish/Aerial_Overview/