

**2014-15
Forest Health Strategy
for the
Boundary Timber Supply
Area**

Updated by:

Dean Christianson, RPF
Stewardship Forester
Selkirk Natural Resource District
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Approved by:

Jim Guido, Acting District Manager
Selkirk Natural Resource District

Date

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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 Boundary Timber Supply Area (TSA). 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.

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 and socially acceptable mitigating strategies and tactics to address forest health agents while considering constraints and limitations placed on the land base;
- encouraging and fostering knowledge sharing on forest health agents amongst Boundary TSA forest stakeholders, primarily forest tenure Licensees; and
- evaluating management practices for the purposes of adaptive management.

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- Protect forest resources from pest damage by direct actions when operationally feasible and justified;
- 2- Implement stand management activities to minimize the expected impact of known forest pests; and
- 3- Assess pest impacts on forest values to improve estimates of timber yield from British Columbia's forests and prioritize management interventions.

More information on the Provincial Forest Health Program can be found at:

<http://www.for.gov.bc.ca/hfp/health/index.htm>

3. Boundary TSA description

The Boundary Timber Supply Area (TSA) lies in the southeastern part of the province, and is part of the Selkirk Resource District. The TSA covers 580,000 hectares (ha) with about 288,000 considered to be available for timber harvesting. Biogeoclimatic zones include Interior Cedar Hemlock (ICH), Engelmann Spruce-Subalpine Fir (ESSF), Montane Spruce (MS), Interior Douglas fir (IDF) and Ponderosa pine (PP). Forests are dominated by Lodgepole pine, Western larch, Spruce, Sub-alpine fir and Douglas-fir. While the external perimeter of the TSA includes Tree Farm Licences 8, Granby Provincial Park and Gladstone Provincial Park, these units are not included in the TSA area.

Important non timber values include domestic water, forest recreation, scenic, mule deer winter range and habitat for a threatened grizzly bear population. The last TSR determination concluded that non recovered losses due to forest health factors and growth losses due to *Armillaria* root disease are important factors driving allowable annual cut calculations.

The main communities in the TSA are Grand Forks, Christina Lake, Greenwood, Midway and Rock Creek.

Table 1: Total Volume (m³) by Species Boundary TSA, over 80 yrs old, February 2015

Species	Species1	Species2	Species3	Species4	Total Volume	Volume %
Pa	1,926	15,029	13,326	1,055	31,336	0.1%
Ep	38,931	25,960	37,366	17,697	119,954	0.2%
At	192,310	113,967	62,329	47,545	416,151	0.7%
Py	120,966	173,900	98,412	26,334	419,612	0.8%
Pw	76,888	109,787	185,655	87,159	459,489	0.8%
Ac	423,846	58,875	26,424	16,778	525,923	0.9%
Hw	467,703	114,467	49,862	26,796	658,828	1.2%
Cw	478,784	230,260	106,362	42,633	858,039	1.5%
Fdi	1,137,840	2,230,683	869,630	92,613	4,330,766	7.7%
Bl	3,967,693	1,673,367	369,600	95,762	6,106,422	10.9%
Sx	4,125,971	3,252,104	657,514	146,146	8,181,735	14.6%
Lw	7,068,651	5,236,754	991,600	145,204	13,442,209	24.0%
Pli	15,422,051	3,030,766	1,744,532	156,686	20,354,035	36.4%
Sum	33,523,560	16,265,919	5,212,612	902,408	55,904,499	

Areas within TFL8 are not covered by this Forest Health Strategy. The following BMUs contain area in both TFL 8 and in the Boundary TSA.

TFL8 BMUs
B01 – South Kettle (portion)
B07 – Boundary South (portion)
B08 – Beaverdell North (portion)

The following 14 BMUs are fully included in the Boundary TSA:

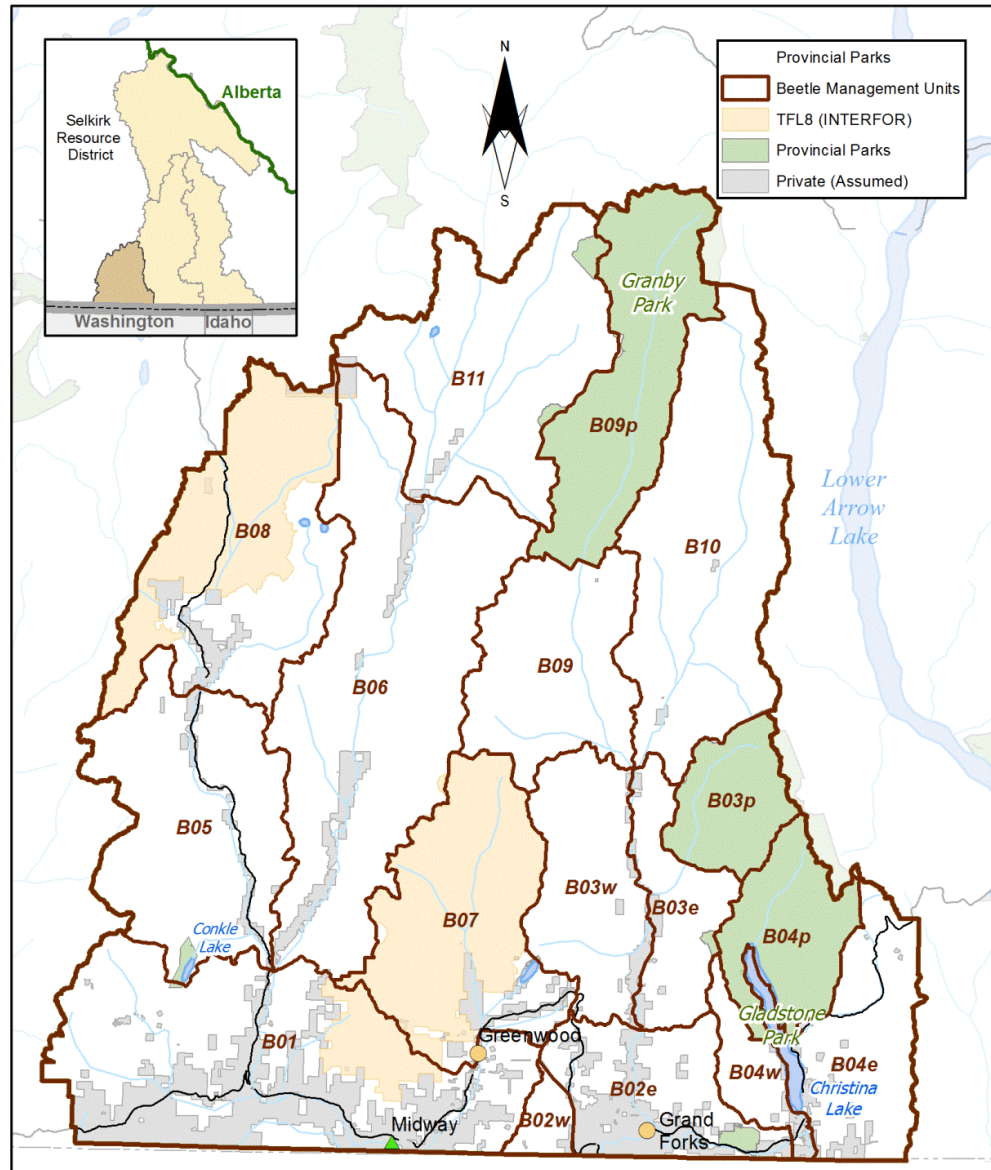
BMU #	BMU Name	BMU #	BMU Name
B01	South Kettle (portion)	B05	Beaverdell South
B02e	Grand Forks East	B06	Kettle River
B02w	Grand Forks West	B07	Boundary South (portion)
B03e	Mid Granby East	B08	Beaverdell North (portion)
B03w	Mid Granby West	B09	Upper Granby
B04e	Christina East	B10	Burrell Creek
B04w	Christina West	B11	Rendell Creek

Comprehensive descriptions of the Boundary TSA are included in the following documents:

- Boundary TSA Website <http://www.for.gov.bc.ca/hts/tsa/tsa02/>
 - Information Report
 - Analysis Report
 - Rational for Allowable Annual Cut Determination.

- Kootenay-Boundary Land Use Plan

<https://www.for.gov.bc.ca/tasb/slrp/pdf/LRMP/Kootenay%20Boundary%20Land%20Use%20Plan%20Implementation%20Strategy.pdf>



Map 1: Boundary TSA showing BMUs, TFL8, Parks and Private Land.

3.1. Previous Forest Health Strategies in the Boundary TSA

The last forest health strategy update was completed in 2014. Since 2005, there have been annual updates to Beetle Management Strategies (BMUs) based on annual aerial overview mapping, detailed mapping, ground surveys and other local information.

No ground surveys or single tree treatments of mountain pine beetle have been carried out in Boundary TSA for the last two years and areas treated in previous years were of a limited nature.

This forest health strategy addresses important insects and diseases beyond Mountain Pine Beetle.

4. TSA Priority Ranking of Forest Health Agents

The priority forest health agents have been ranked following the Provincial Forest Health Strategy (Table 2).

Rankings were based on the following factors:

- The collective knowledge of the regional and district forest health specialists, forest managers, licensees 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
- Resources required to obtain missing information necessary for management of the pests

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:

- Very High: a forest health factor that could result in damage equivalent to the loss of >400 ha per year
- High: loss of 200 – 400 ha per year
- Moderate: loss of 100 – 200 ha per year
- Low: loss of 50 – 100 ha per year
- Very Low: very little or no known damage (<50 ha per year)

Note: abiotic injuries (i.e. windthrow, 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 TSA. The following table covers the major forest health agents which can potentially impact the timber supply.

	Very High	High	Moderate	Low
Defoliators				Western Spruce Budworm Aspen Serpentine Leaf Miner
Diseases	Armillaria root disease		White pine blister rust Hard pine rusts (Western gall rust, Stalactiform blister rust & Comandra blister rust)	Dwarf mistletoe (pine and larch) Black Stain root disease
Insects	Mountain pine beetle Western balsam bark beetle			Douglas-fir bark beetle Western pine beetle Spruce bark beetle Spruce weevil
Mammals			Bear and other animals	
Abiotic Factors				Fire, Windthrow

5. Description of the Priority Forest Health agent status

The following table provides an overview of the activity status of some of the priority forest health agents which were reported during the 2012 provincial overview survey.

Table 3: Selected summary of 2013 & 2014 Boundary TSA significant Forest Health damaging agents

Forest health agents	2013 Affected Area (ha) & # of trees in spots	2014 Affected Area (ha) & # of trees in spots	Trend	Current Impact on Timber Supply	TSA Priority
Mountain pine bark beetle	21,253 ha/ 9,985	25,582 ha/ 5,483	Increasing	VERY HIGH	1
Douglas-fir bark beetle	13 ha/ 492	50 ha/ 320	Increasing	Low	2
Western balsam bark beetle	1033 ha/ 0	1246 ha/ 20	Increasing	Very High	2
Animal(Bear)	188 ha	67 ha	Decreasing	Low	3
Aspen Serpentine Leaf Miner	0 ha	234 ha	Increasing	Low	3
Spruce bark beetle	0 ha/ 0	0 ha/ 0	Endemic	Very Low	3
Western Spruce Budworm	1250 ha	0 ha	Decreasing	Very Low	3

5.1. Mountain Pine beetle –IBM (*Dendroctonus ponderosae*)

The mapped polygon area of current mountain pine beetle infestation has almost doubled from 13,932 ha in 2012 to 25,582 ha in 2014 with increases in each year (see Figure 1). Total number of trees killed from spot infestations has decreased in the last year from 9,985 in 2013 to 5,483 in 2014. The total number of Pli trees killed in Boundary for 2014 outside of the Provincial Parks is estimated at 320,925 trees. This may represent a volume loss in the range of 80,000 to 96,000 based on average Pli tree volume of 0.25-0.30 m³.

Mountain pine beetle has been active in the Boundary TSA since 2002 and does not appear to have peaked yet and has increased each of the last 4 years of overview survey data. The current infestation is considered to be both local population as well as the spreading population from the central interior which has infested large areas in Okanagan Shuswap District to the North-West. There are 117,752 ha, out of a total of 659,000 ha, of susceptible (>33 rating) forest types to Mountain pine beetle in the Boundary TSA based on a 2014 BMU analysis and Lodgepole Pine is the dominant tree species in this TSA.

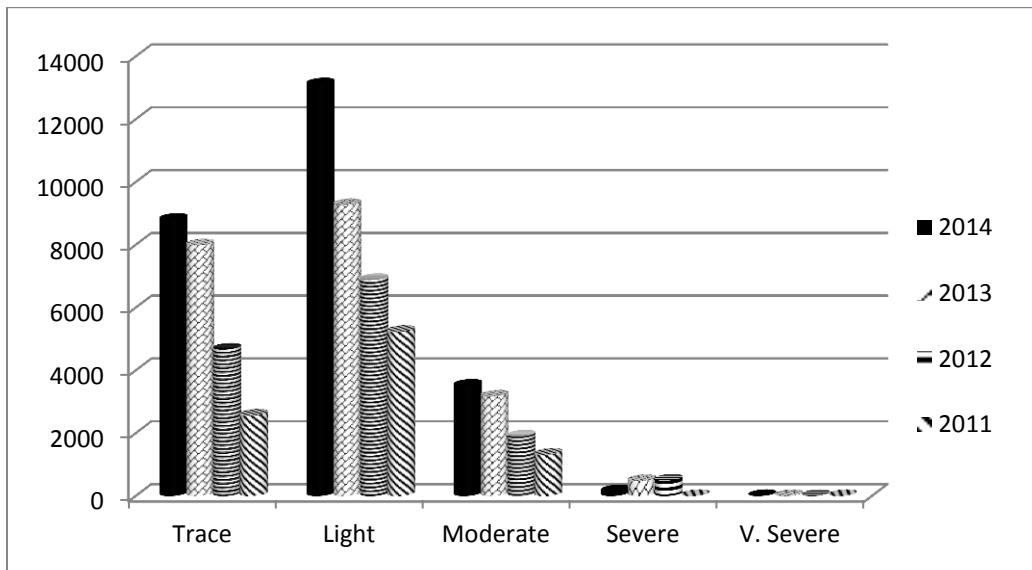


Figure 1 Boundary TSA: 2011 - 2014 MPB polygon area by severity class.

Harvest levels of Pli by Boundary TSA Forest Licensees have not been adequate to reduce Pli attack levels and likely not reducing non-recoverable losses significantly. Over the past several years Boundary TSA licensees/BCTS have targeted harvesting Lodgepole pine stands as a high percentage of their harvest. However, except for 2011, in the previous 5 year’s harvest levels have been significantly below the Annual Allowable Cut of 700,000 m³. Therefore, based on absolute values pine harvest has been significantly lower than needed to reduce attack and mitigate losses. Based on harvest billing data, harvest of Pli has increased over the last 2 years but that areas harvested have not necessarily been carried out in Overview survey red attack polygons. An analysis of the red attack polygons harvested from 2011 to 2014 by the two of the Licensees in Boundary TSA indicates the area harvested of these polygons is well below the minimum 50% target for holding strategy. The 2008 FH strategy, which was in place until 2013, had directed harvesting of susceptible Pli over attacked Pli as a prevention strategy.

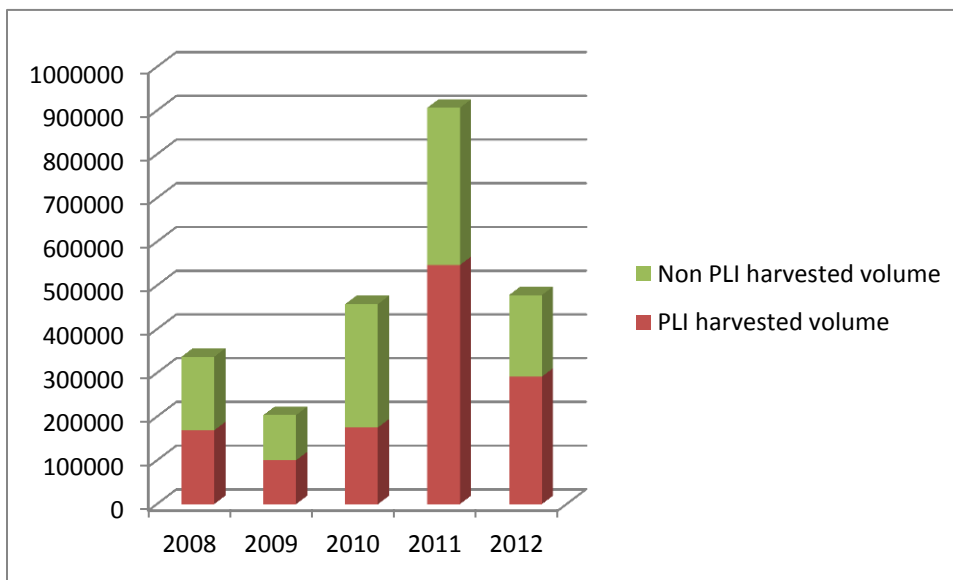


Figure 2: 2008-2012 billed volume (m³) for Boundary TSA.

Future Trends

The current mountain pine beetle populations in the Boundary TSA are a mix of local beetles and some that likely entered the Boundary TSA along the western and northern boundaries from the larger interior outbreak. The BC MPB projection of the Current Mountain Pine Beetle Outbreak estimates that less pine will be killed than originally thought but the impact on Boundary TSA is still significant. <http://www.for.gov.bc.ca/hre/bc/mpb/>

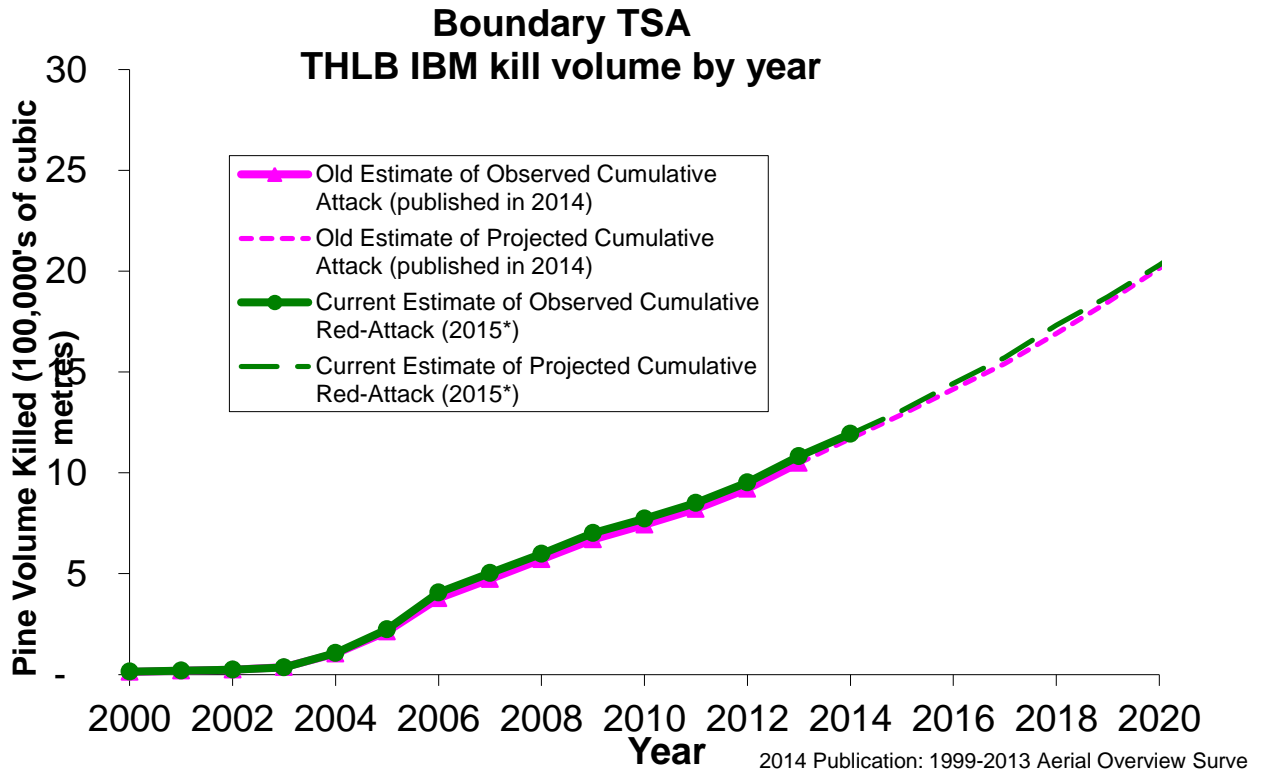


Figure 3: BCMPB V12 IBM pine kill volume projection, increased kill projection over previous year.

The BCMPB model estimates that less pine will be killed than originally thought but the impact on Boundary TSA is still significant and projects that IBM attack will continue to increase for Boundary TSA. **The current model projects that the volume of Pli killed will continue to rise over the next 10 years to almost double the amount in 2014. From 1999 to 2024 the projection is that 19% of the total Pli volume will have been killed by IBM.**

5.2. Douglas-fir beetle –IBD (*Dendroctonus pseudotsugae*)

The Douglas-fir beetle population appears to be endemic in Boundary TSA. The infested area has increased to 50 ha in 2014 from 13 ha in 2013. For 2014 28 spots were noted from the overview flight with 320 killed trees. There have been some anecdotal reports of additional IBD from some of the Woodlot Licensees as well. Attack levels are still low but increasing over previous years.

Douglas-fir is a common species in this TSA and is of an age and diameter to be susceptible to the beetle. There are 60,270 ha of susceptible (>20 rating) forest types to Douglas-fir beetle in the Boundary TSA based on a 2014 BMU analysis and Douglas-fir is one of the dominant and valuable tree species in this TSA. Proactive management of Douglas-fir beetle and Douglas-fir leading stands remains a priority for the Boundary TSA given this species' higher wood value. 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 would be considered good practice to minimize future losses. The Bark Beetle Guidebook is an additional source to guide treatments. In recent years some IBD attacked trees and blowdown have been salvaged through the District Small Scale Salvage Program, reducing potential non recoverable losses.

5.3. Spruce bark beetle -IBS(*Dendroctonus rufipennis*)

No spruce bark beetle was identified in the aerial overview mapping. Spruce blowdown when identified is a high priority for harvest and treatment. There are 51,496 ha of susceptible (>20 rating) forest types to Spruce beetle in the Boundary TSA based on a 2014 BMU analysis. The Bark Beetle Guidebook will guide treatments. Link is as follows:

<http://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/beetle/betletoc.htm>

5.4. Windthrow

No windthrow was observed by the overview survey in 2014 and it has remained low the last 4 years but it is a concern especially when located in Douglas-fir and spruce types. Historically, spruce bark beetle and Douglas-fir beetle outbreaks have been closely associated to windthrow events. Prompt removal of spruce and Douglas-fir windthrow trees are imperative to avoid the buildup of these two bark beetles. The direct impact of windthrow on the TSA is usually minimal however, the indirect impact in the form of bark beetle outbreak, can be serious.

5.5. Armillaria Root Disease –DRA (*Armillaria ostoyae*)

Armillaria root disease has been identified as an issue in the Boundary TSA. Management of Armillaria in the TSA follows the “Armillaria root disease management guideline for the Nelson Forest Region” Technical report TR-014, March 1998. 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 stands of a suitable nature should be considered for stump removal treatments post harvest to reduce DRA levels. Because deciduous brush thinning also promotes spread of Armillaria, such action should be applied carefully.

5.6. Western Balsam bark beetle IBB (*Dryocoetes confuses*)

There are large areas of subalpine fir leading forest stands in the Boundary TSA that are susceptible to western balsam bark beetle. Western balsam bark beetle has been chronically causing mortality over many years. Attack levels increased slightly to 1246 ha in 2014 compared to 1033 ha of in the 2013 overview survey. Direct control action on that insect is very difficult due to its attack dynamics and the scattered distribution of the stands.

5.7. Western pine beetle (*Dendroctonus brevicomis*)

Western pine beetle has been identified in the Boundary TSA in the past and appears to be present in low levels in the extensive Py stands along the main valleys especially on private land. Normal

overview monitoring should identify future problems, however, none was detected by this survey in 2014 or for previous many years. There were several reports of red attack Ponderosa pine likely killed by Western pine beetle. Ground confirmations of this beetle were found in the Grand Forks and Christina Lake areas. Management of Py blowdown is an important component of WPB control.

5.8. Larch Dwarf mistletoe (*Arceuthobium laricis*) & Lodgepole Pine Dwarf mistletoe (*Arceuthobium americanum*)

The larch and lodgepole pine Dwarf mistletoes may be causing losses in volume in some parts of the TSA. No recent field data to verify level of impact or occurrence. The impact on the TSA is negligible. Refer to the Dwarf Mistletoe Guidebook for management strategy and tactics <http://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/dwarf/dwarftoc.htm>

5.9. Larch needle cast (*Meria laricis*) and blight (*Hypodermella laricis*)

In 2014, no area was mapped. This was the second year in a row of significant decreases. The disease is associated with cool damp spring and early summer conditions and this last year saw drier conditions earlier in the summer season. These diseases infect Western larch of all ages. Defoliation by these diseases may cause minor growth reduction in large trees and young trees may be killed. No impact on the TSA is expected at this point and no management is proposed except continuous monitoring of the occurrence.

5.10. Black Stain Root Disease (*Leptographium wageneri*)

Black Stain root disease has caused some mortality and was noted in past monitoring and can be associated with Ips beetle. The impact on TSA is not considered significant and no management actions are planned.

5.11. Hard pine rust: Western gall rust (*Endocronartium harknessii*), Stalactiform blister rust (*Cronartium coleosporioides*), Comandra blister rust (*Cronartium comandra*)

The hard pine rusts are a minor concern in the Boundary TSA at this time and often found in pine plantations. The impact on the TSA can be significant in local areas, especially on regenerating plantations. Low levels of Western Gall Rust were noted on post Free Growing Stand Development Monitoring plots completed from 2008-2011. Stocking Standards should be modified to ensure stands are not declared free growing without the stand being old enough or tall enough to more fully express the potential problem with these diseases, especially in ICH sites where Pli is planted or regenerated. Where possible, a mix of species should be planted.

5.12 Western Spruce Budworm -IDW

Detection, prediction and treatment of defoliators remain the responsibility of the Kootenay Boundary Regional staff. More specific information on the defoliator program can be obtained from them and in the Defoliator Management Guidebook (1995) <http://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/defoliat/defoltoc.htm> .

The population of IDW decreased to 0 ha noted in the overview survey down from 1250 ha detected in 2013. The 2012 spray program seems to have reduced attack levels significantly and lowered populations of budworm. Forest tenure holders should give thought to appropriate silviculture systems to manage for this pest where other management constraints allow. This would include limiting the amount of single tree selection harvesting or heavy retention systems where

trying to regenerate a younger layer under an established canopy. Multi-layered multi-aged stands are especially vulnerable to damage by IDW.

5.13 Deciduous Pests

The only pest in this category was Aspen serpentine leaf miner with 234 ha of area noted. The impact of this pest on the TSA is not significant. No management is planned. As per Chief Forester direction, deciduous species should not be included in stocking standards. Chronic damage impacting deciduous species in the Boundary and other adjacent TSAs over the last many years, possibly related to climate change or weather patterns, supports this recommendation.

5.14 Bear and other Animal Damage

Bear damage was mapped at 67 ha for 2014, showing a slight increase in area from 18 ha in 2013. During FREP SDM sampling bear damage and possibly other animals were found to be killing and damaging young Pli trees by stripping their bark and the damage levels are likely significantly higher than can be mapped by the overview survey. Potential solutions to managing animal damage and in particular bear damage might include species diversity at time of planting, less Pli, and perhaps higher establishment density as well. Consideration should be given to avoiding or careful consideration of spacing, pruning and fertilizing.

5.15 Birch Decline

Paper Birch (*Betula papyrifera*) decline has been widespread throughout the Southern Interior region of the province. Characterized by crown die-back, most mature birch appear susceptible. The spatial distribution patterns and actual causation remain poorly understood. A variety of agents have been observed including bronze birch borer (*Agrilus anxius*), non-native birch leaf miners (*Fenusa pussila* and *Profenusa thomsoni*), *Fomes fomentarius*, *Cryptosporella tomentella*, *Armillaria ostoyae* and *Cerrena unicolor*. These are possible pathogens that could be contributing to birch decline. Climatic perturbations may be a pre-disposing factor – and are currently under investigation using dendrochronology methods. The decline of birch can accelerate the impacts of *Armillaria* within mixed conifer-broadleaf stands. A particularly important aspect of forest health relates to birch's resistance and tolerance of *Armillaria* root disease. In fact, the roots of deciduous trees often provide a barrier to disease spread, thus protecting neighbouring conifers such as Douglas-fir and lodgepole pine from infection. When birch are harvested, or killed by other causes, the *Armillaria* fungus is able to quickly spread along dead birch roots and transfer to conifers. Overall, the incidence accelerates. Thus, careful consideration should be given in regards to thinning birch and other deciduous brush.

5.17 Whitebark Pine Decline

Whitebark pine (*P. albicaulis*) often occurs within harvest units at elevations above 1600 meters. About half of all whitebark pine in the Boundary region is dead or dying. 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 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.

6. Management objectives for priority forest health agents

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

The following are the management objectives, **in order of priority**, to be implemented for the three main bark beetles in the Boundary TSA: mountain pine beetles, Douglas-fir beetle and spruce bark beetle. Any reference to “bark beetles” in the following management objective refers to the three bark beetles listed above.

1. **Salvage beetle killed areas where economically feasible, especially larger moderate or higher IBM attacked polygons identified by the Aerial Overview Survey or other surveys. Limit the amount of unsalvageable losses due to bark beetles. Target a minimum of 50% of these areas to maintain current holding action strategy IBM within BMUs.**
2. **Reduce bark beetle populations to acceptable levels through prioritizing harvest of current infestations.**
3. Prioritize the forest management to higher hazard forest stands by harvesting or reducing the susceptibility of stands to bark beetles.
4. Maintain the annual IBM affected volumes to no greater than the one year of the current AAC, 700,000 m³.

7. Provincial Ranking and BMU Strategy for IBM and IBD

Ranking for the two bark beetles with the highest potential impact on the TSA will be covered in this section: Mountain pine beetle and Douglas-fir beetle. The two ranking tables below follow the methodology outline in the Provincial Bark Beetle Strategy and also include the strategy for each BMU.

7.1. Mountain pine beetle ranking table

BMU#	BMU Name	Susceptibility	Provincial Ranking	BMU-Strategy
B01	South Kettle	High	4	Hold
B02e	Grand Forks E	Low	7	Hold
B02w	Grand Forks W	High	4	Hold
B03e	Mid Granby E	High	4	Hold
B03w	Mid Granby W	High	1	Hold
B04e	Christina E	High	4	Hold
B04w	Christina W	Low	6	Hold
B05	Beaverdell S	High	4	Hold
B06	Main Kettle River	High	1	Hold
B07	Boundary S	Low	8	Hold
B08	Beaverdell N	High	1	Hold
B09	Upper Granby	High	4	Hold
B10	Burrell	High	3	Hold
B11	Rendell	High	4	Hold

If the MPB infestation declines sufficiently at some point, it may be appropriate to re-designate some BMUs as suppression. However, at this time it is likely more appropriate to change all the units to salvage strategy as it does not appear that 50-70% of the infestations are being harvested. No ground

based data is available to accurately assess green attack numbers but ground sampling 2 years ago high green attack rates in the area surveyed and given ongoing expansion rate of IBM it is assumed to be high

7.2 Douglas-fir beetle ranking table

BMU#	BMU Name	Susceptibility	Provincial Ranking	BMU Strategy
B01	South Kettle	High	3	Suppression
B02e	Grand Forks E	High	3	Suppression
B02w	Grand Forks W	High	3	Suppression
B03e	Mid Granby E	High	3	Suppression
B03w	Mid Granby W	High	3	Suppression
B04e	Christina E	High	3	Suppression
B04w	Christina W	High	3	Suppression
B05	Beaverdell S	High	3	Suppression
B06	Main Kettle River	High	3	Suppression
B07	Boundary S	Moderate	3	Suppression
B08	Beaverdell N	Low	8	Suppression
B09	Upper Granby	Low	8	Suppression
B10	Burrell	Low	8	Suppression
B11	Rendell	Low	8	Suppression

Note: No ground based data is available to accurately rate the #green as attack levels have been very low and no monitoring on the ground was deemed warranted.

8. Proposed activities to manage IBM and IBD

8.1. Mountain pine beetle

8.1.1. Harvesting

Timber harvesting in infested and red/grey attack (1st priority) and un-infested stands (2nd priority) with high hazard and/ or infestation is critical to meeting holding strategy objectives and reducing non-recoverable losses. Failure to address these losses will impact future timber supply determinations negatively. Due to insufficient funds to single tree treat the entire area and a lack of coordinated harvesting of Beetle infested stands in BMUs previously designated with a Suppression strategy all Suppression BMUs were downgraded to holding as of winter 2013-14.

8.1.2. Pheromone Use

No planned pheromone use at this time but it is covered by the Southern Interior Region Pest Management Plan http://www.for.gov.bc.ca/rsi/ForestHealth/PDF/PMP_2013-2017_FH_Southern_Interior_Feb_19_2013.pdf.

8.1.3. Single tree treatment

Given change of previously designated Suppression BMUs to holding strategy, no further single tree treatments are planned at this time. Insufficient funding has not allowed for treatment for the last several years and only small areas of previous suppression units. In the last year of treatment, 2012-13, treatments were focused in the Grand Forks West BMU and the southeast portion of Main Kettle River BMU.

8.1.4. Detailed Flight and Ground Surveys

Given change of previously designated Suppression BMUs to holding strategy no further detailed mapping or ground surveys of IBM is planned at this time for the purpose of single tree treatments..

8.2. Douglas-fir beetle

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.

Trap trees should be used to reduce overall beetle population levels and complete a post logging mop-up where necessary. Baited funnel traps and MCH anti-aggregant may be used where conditions are appropriate.

Insufficient funding was available to complete any detailed IBD flights for Boundary TSA. Current planning is for detailed mapping of IBD in suppression units in 2014, subject to funding.

9. Priority Activities in non suppression BMUs

With the Timber Supply Review completed, the following projects were part of the last FH strategy:

- Non recovered (unsalvaged) loss estimate - completed 2011
- Growth losses in post Free Growing stands – 29 SDM samples completed 2009 - 2011

Other potential projects:

- Monitor young Pli plantations to determine if they are being attacked and therefore susceptible to Mountain Pine Beetle attack.
- IBD funnel trapping where deemed necessary for control

10. 2015-16 Fiscal Year Tactical Plan

The tactical plan will be to continue to monitor forest health agents through the overview survey and IBD detailed survey.

11. Stocking Standards

While there are some recommendations within current stocking standards for forest health agents, the risk to Lodgepole pine (Pli) on ICH sites may be inadequately dealt with to date. Consideration should be given to increasing the minimum free growing height for Pli by up to 50% and perhaps increasing the target and minimum density for stands regenerated to a high percentage of Pli in the ICH. Significant concerns relating to rusts, bear damage and other damaging agents exist for this species especially when stands are declared at such a young age due to the fast growing nature of this species. Evidence for this includes FREP SDM surveys within Boundary TSA as well as other SDM surveys in adjacent TSAs and continued research by Alex Woods and David Coates.

Licenses 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.

An additional consideration to professionals completing Free growing declarations is the age at which plantations are allowed to undergo Free Growing 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.

12. Information Links

Report: 2014 Overview of Forest Health in the Southern Interior Region

<http://www2.gov.bc.ca/gov/content/environment/research-monitoring-reporting/monitoring/aerial-overview-surveys/summary-reports>

The above report is based on spatial data found at the location below for 2012 Annual Overview Survey.

Provincial Forest Health Strategy 2013-2016

<http://www.for.gov.bc.ca/hfp/health/Strategy/Forest%20Health%20Strategy.pdf>

Provincial Bark Beetle Management Technical Implementation Guidelines (formerly Bark Beetle strategy)

<https://www.for.gov.bc.ca/hfp/health/fhdata/bbstrategy.htm>

Spatial Data:

Bark Beetle Hazard Ratings

https://www.for.gov.bc.ca/rsi/foresthealth/hazard_rating.htm

2014 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/

2014 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