

# **Lakes Timber Supply Area Timber Supply Analysis Discussion Paper**

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**Forest Analysis and Inventory Branch  
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Operations and Rural Development  
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## Introduction

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The British Columbia Ministry of Forests, Lands, Natural Resource Operations and Rural Development (the “Ministry”) regularly reviews the timber supply for all timber supply areas (TSA) and tree farm licences (TFL) in the province. This review, the fifth for the Lakes TSA, examines the impacts of current legal requirements and demonstrated forest management practices on the timber supply, economy, environment, and social conditions of the local area and province. Information gathered in this review will be used by the chief forester to determine a new allowable annual cut (AAC) for the Lakes TSA.

According to Section 8 of the *Forest Act* the chief forester must review and determine an AAC for each TSA and TFL in the Province of British Columbia (BC) at least once every 10 years.

The objectives of the timber supply review (TSR) are to:

- examine relevant forest management practices, environmental and social factors, and input from First Nations, forest licensees and the public;
- support the chief forester’s AAC determination; and,
- identify information to be improved for future timber supply reviews.

This discussion paper provides a summary of the results of the timber supply analysis for the timber supply review of the Lakes TSA. Details about the data and assumptions used in the analysis were provided in a June 2018 publicly released data package ([https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/stewardship/forest-analysis-inventory/tsr-annual-allowable-cut/lakes\\_tsa\\_data\\_package\\_2018.pdf](https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/stewardship/forest-analysis-inventory/tsr-annual-allowable-cut/lakes_tsa_data_package_2018.pdf)).

The updated data package is available at:

<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/lakes-tsa>

Further details regarding the description of the updated technical information (as described in the data package) are available on request from the Ministry’s Forest Analysis and Inventory Branch.

The timber supply analysis presented in this discussion paper should be viewed as a “work in progress”. Prior to the chief forester’s AAC determination for the TSA, the existing analysis will be reassessed as a result of input received on this discussion paper and if necessary further analysis will be completed.

For the purposes of the Lakes TSA timber supply review, forest management objectives are provided by the *Forest and Range Practices Act* (FRPA); the Lakes Land and Resource Management Plan (LRMP), the Lakes South Sustainable Resource Management Plan (SRMP); the Lakes North Sustainable Resource Management Plan and ministerial orders for specific objectives such as caribou. The chief forester does not have the legal authority to establish or modify land use objectives. Consequently, timber supply reviews undertaken in support of AAC

- ❖ *The timber supply for the Lakes timber supply area (TSA) is reviewed regularly. This review is used by the chief forester to determine a new allowable annual cut (AAC).*
- ❖ *Timber supply is the amount of timber available for harvesting over a specified period of time.*
- ❖ *Timber supply areas (TSAs) are integrated resource management units established in accordance with Section 7 of the Forest Act.*
- ❖ *Tree farm licences (TFLs) are tenures that grant exclusive rights to harvest timber and manage forests in a specific area; may include private land.*
- ❖ *Allowable annual cut (AAC) is the maximum volume of timber available for harvesting each year from a specified area of land, usually expressed as cubic metres of wood.*



determinations are based on current resource management objectives that have been formalized by government. However, the information compiled to support this timber supply review can be made available to support land use planning activities outside of the timber supply review process. In the event that resource management objectives and practices change, these changes will be reflected in future timber supply reviews.

## Timber supply review in the Lakes TSA

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On July 12, 2011, the chief forester set the AAC for the Lakes TSA at 2 000 000 cubic metres, of which no more than 350 000 cubic metres can be from non-pine species. Since then, new community forest agreements and First Nations woodland licences were established. In accordance with Section 8.1 of the *Forest Act*, the AAC was adjusted to 1 648 660 cubic metres, including a partition of 288 516 cubic metres attributable to non-pine species. This adjusted AAC is currently in effect.

In June 2018, a data package documenting the data and forest management assumptions to be used in this timber supply analysis was released for public review and for First Nations consultation. This discussion paper provides an overview of the timber supply review and highlights key findings of the timber supply analysis for the Lakes TSA. Before setting a new AAC, the chief forester will review all relevant information, including the results of the timber supply analysis and input from First Nations, government agencies, licensees, and the public. Following this review, the chief forester's determination will be outlined in a rationale statement that will be publicly available.

The actual AAC determined by the chief forester during this timber supply review may differ from the harvest projections, including the base case, presented in this discussion paper as the chief forester must consider a wide range of information, some of which cannot be quantified. Ultimately, the chief forester's AAC determination is an independent, professional judgment based on the legal requirements set out in Section 8(8) of the *Forest Act*.

Once the chief forester has determined a new AAC, the Minister of Forests, Lands, Natural Resource Operations and Rural Development will apportion the AAC to the various licence types and programs as per Section 10 of the *Forest Act*. Based on the minister's apportionment, the regional executive director will establish a disposition plan that identifies how the available timber volume is assigned to the existing forest licences, British Columbia Timber Sales (BCTS) and, where possible, to new opportunities.

## Public engagement in the Lakes TSA

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In the months leading to the data package release, several information meetings were held with local government officials and First Nations. As a result of these meetings, the data package includes detailed maps and data summaries. The data package for the Lakes TSA timber supply review was released for public review and First Nations consultation on June 12, 2018.

Following the release of the data package, information meetings were held with forest industry representatives, local government officials, and First Nations. In

❖ *The chief forester's AAC determination is an independent, professional judgement based on the legal requirements set out in the Forest Act. The AAC determined by the chief forester may differ from the harvest projections presented in this document.*

❖ *Extensive public engagement guaranteed timely information sharing and an open and transparent process.*

❖ *Public input resulting from this engagement led to in-depth analysis and a deeper understanding of the public's interest. All input received is considered by the chief forester.*

addition, the public was invited to attend public information meetings, one of which was very well attended.

The public review period was extended from 70 days to 101 days in response to a local state of emergency declared due to large wildfires burning in the TSA.

A total of 28 written submissions were received during the public review period.

These submissions expressed concerns about the impact a reduction in timber supply would have on jobs and communities, a desire to focus on timber supply mitigation as part of the timber supply analysis and subsequent AAC determination, and a desire to ensure that concerns are heard and considered by the chief forester. Numerous comments and suggestions were also made regarding the assumptions in the data package. A response was provided to everyone who took the time to write and the comments received are summarized in Appendix 1. In addition, all of the input received is provided to the chief forester for her consideration in determining an AAC.

Based on this input, written updates were provided regularly to forest industry representatives, local government officials and concerned stakeholders and engagement meetings were held. The Economic Services Branch of the Ministry completed a socio-economic analysis that included information provided by the Village of Burns Lake. In addition, a consultant was hired to assist with public consultation. The chief forester requested additional sensitivity analyses to gain insight into potential opportunities for increasing timber supply. In addition, the data package has been updated to fill gaps and correct errors.

Public engagement is continuing with this discussion paper. Feedback is welcomed on any aspect of this discussion paper or on any issue related to the timber supply review for the Lakes TSA.

## **First Nations engagement in the Lakes TSA**

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First Nations who reside in or have traditional territory within the Lakes TSA were invited in early 2017 to participate and engage early in the Lakes TSA timber supply review. This early engagement provided an additional opportunity to First Nations to identify their interests and to ensure all relevant information is presented to the chief forester for her consideration.

In addition to the early engagement in this timber supply review, formal consultation has been completed on the draft data package. This process was initiated early summer 2018 and was extended for one month due to the impact of the wildfires on many of the First Nation communities in the area. Many First Nation communities have engaged with the Province during this process. Concerns heard are, generally, in relation to wildlife and wildlife habitat, access and access management, biodiversity and cumulative effects.

Additional opportunities will be made available for First Nations engagement throughout the remainder of the timber supply review process, including formal consultation on this discussion paper. All input received will be considered by the chief forester.

❖ *First Nations engagement commenced in 2017 and is ongoing. Through this engagement, First Nations have expressed interests regarding wildlife, access management, biodiversity, cumulative effects. First Nations input is considered by the chief forester in determining an AAC.*

## Description of the Lakes TSA

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The Lakes TSA, located in north-central British Columbia, encompasses approximately 1.5 million hectares of land (see Figure 1). The TSA contains the headwaters of important tributaries of both the Skeena and Fraser watersheds as well as numerous lakes, which include some of the largest natural freshwater bodies in British Columbia.

The gently rolling terrain of the TSA is typical of the Nechako plateau portion of the central interior of British Columbia. The climate is characterized by seasonal extremes of temperature, including severe and snowy winters, and relatively short and warm summers. The ecosystems support forests dominated by lodgepole pine, hybrid spruce and subalpine fir (balsam).

The Village of Burns Lake, with a population of about 2,000, is the largest community within the Lakes TSA. The remainder of the TSA's population – about 6,000 residents is located in numerous smaller communities including Decker Lake, Grassy Plains, and Danskin.

There are six First Nation communities and a central economic development office (Burns Lake Native Development Corporation) that represents the economic interests of the six Nations within the Lakes TSA. An additional seven First Nations maintain communities outside the TSA; however, they assert rights and title that overlap lands relevant to this TSR.

The rights to harvest timber from public forests are granted by the provincial government through a wide variety of licences and tenure agreements. Within the geographic boundary of the Lakes TSA, there are 35 woodlots, two First Nations woodland licences, three community forest agreements, eight replaceable forest licences and a timber sale licence program. For the purpose of this timber supply review, the extent of the timber supply area is limited to that area where only holders of replaceable and non-replaceable forest licences or timber sale licences may harvest timber or construct roads (see Figure 1). This area excludes woodlots, First Nations woodland licences and community forests.

The diversity of licences and tenure agreements in the TSA reflects that the local economy is largely resource based and mostly dependent on the regional forest industry. There are three lumber mills and one pellet plant currently in operation within the Lakes TSA. These mills all rely on timber harvested from the Lakes TSA and from neighbouring TSAs. In addition, there is a lumber mill in Fraser Lake that receives a significant portion of its volume from the Lakes TSA. The TSA is administered from the Nadina Natural Resource District office of the Ministry of Forests, Land, Natural Resource Operations and Rural Development (FLNRORD) in Burns Lake.

- ❖ *For the purpose of an AAC determination under Section 8 of the Forest Act, the extent of the Lakes TSA is limited to areas where holders of replaceable and non-replaceable forest licenses or timber sale licences may harvest timber or construct roads.*
- ❖ *Although the analysis results are specific to this portion of the Lakes TSA, much of the contextual information presented in this paper relates to the total geographic boundary of the Lakes TSA.*



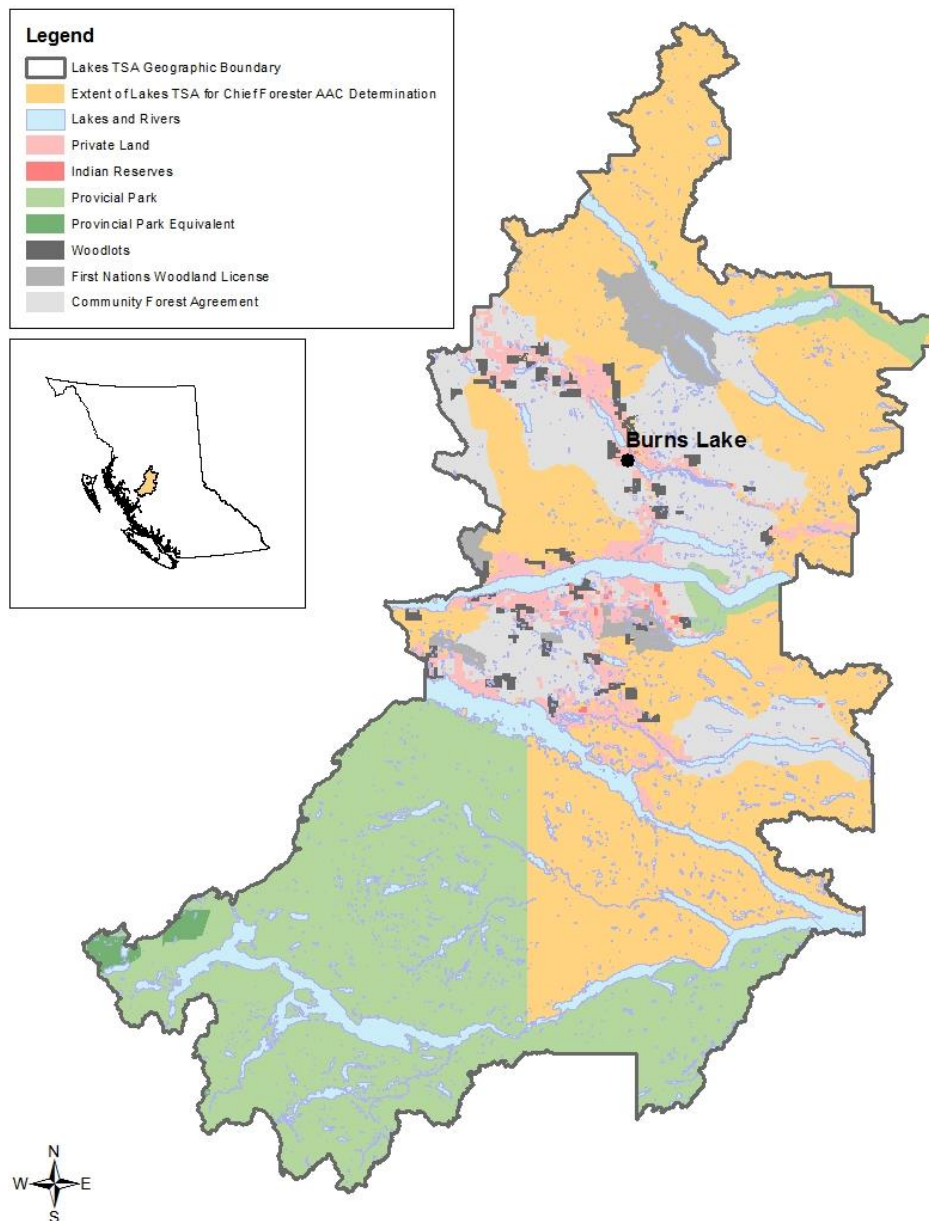


Figure 1. Overview map of the Lakes TSA.

## First Nations

First Nations within the total geographical boundary of the Lakes TSA are Carrier with Takla Lake First Nation identifying its members as descendants of Carrier and Sekani Aboriginal groups. Carrier subtribes are identified through their specific territories, with politically and economically autonomous communities and villages.

Thirteen First Nations assert traditional territory within the total geographical boundary of the Lakes TSA. Wet'suwet'en First Nation, Lake Babine Nation, Ts'il Kaz Koh First Nation, Skin Tyee Nation, Nee Tahi Buhn Indian Band and Cheslatta Carrier Nation have communities in the Lakes TSA. Takla Lake First Nation, Stellat'en First Nation, Nadleh Whut'en Band, Yekooche First Nation and Tl'azt'en First Nation have communities in the Prince George TSA. The Ulkatcho First Nation has a community in the Williams Lake TSA and the Office of the Wet'suwet'en is located in the Bulkley TSA.

Aboriginal Interests have been expressed by First Nations in this timber supply review process and in other consultation processes completed in the past. Interests include wildlife (moose, grizzly bear, caribou, marten) and wildlife habitat, access and access management, hunting, trapping (beaver, marten) and fishing. Concerns regarding cumulative effects, biodiversity, road density and a consideration of economic opportunity for First Nations have been expressed as well. Tl'azt'en First Nation and the Office of the Wet'suwet'en have provided the Province with stewardship principles relevant to their territories.

In addition, First Nations are deeply involved in the forest sector through partnerships with local mills, forest licence holders and community forests. First Nations are also tenure holders of community forests and First Nations woodland licences. The local forestry sector also provides employment for First Nations. Five of the First Nations listed above are signatory to the Carrier Sekani First Nations (CSFN) Collaboration Agreement with the Province. This agreement provides a framework for the Province and the seven signatory First Nations to increase and deepen collaboration on a range of issues and decisions. Due to the fragmented nature of the Lakes TSA in relation to CSFN traditional territories, the Lakes TSA timber supply review is drawing from learnings from the 2017 Prince George TSA timber supply review as well as applicable outcomes from the ongoing Omineca Environmental Stewardship Initiative (ESI) project.

## Natural resources

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Natural resources present within the total geographical boundary of the Lakes TSA include forests, water, fish, wildlife, and range lands. These resources provide many important services to residents. These include:

- Wood for lumber, pulp and fibre production;
- Non-timber forest products such as berries and mushrooms;
- The regulation of the timing and magnitude of peak flows, which have implications on flooding, channel stability and fish habitat;
- Clean water for human consumption, for fish, and for other aquatic organisms;
- Habitat for plants and animals, such as caribou, grizzly bear, mountain goat, moose, deer and sockeye salmon and many other fish species;
- Grazing land for cattle;
- Recreational opportunities such as hunting, fishing, snowmobiling, and hiking; and,
- Spiritual, aesthetic and educational opportunities.

- ❖ *Natural resources are regulated to ensure an effective range of vegetation species and stand ages is present across the land base.*
- ❖ *This range of species and stand age maintains and creates a diversity of habitats for all species, maintains peak flows and ensures a continuity of benefits to residents.*

Natural resources are regulated to ensure an effective range of vegetation types and forest ages is present across the land base. This range of vegetation and stand ages maintains and creates a diversity of habitats needed for all species, maintains peak flows and ensures a continuity of benefits to residents.

Protection and management of environmental values are addressed under provincial and federal legislation. The *Forest and Range Practices Act* (FRPA) is the primary provincial legislation regulating forestry practices. Under FRPA, the Forest Planning and Practices Regulation identifies objectives set by government for environmental values including fish, wildlife, biodiversity, soils, and water that are to be addressed within forest stewardship plans. Orders may be established under the Government Actions Regulation (GAR) or the Land Use Objectives Regulation for specific land uses such as ungulate winter ranges (UWR), wildlife habitat areas (WHA), critical habitat for fish, and old growth management areas. Approximately 17 percent of the Crown managed forest land base (CMFLB) of the Lakes TSA is provincially designated for the protection of its natural environment.

## The forest

The total area within the TSA geographic boundary covers 1 577 450 hectares. However, much of this land base is not considered to be available for timber supply purposes under the chief forester's AAC determination. This includes areas such as Tweedsmuir Provincial Park, community forests, First Nations Woodland Licences, and non-forest. The remaining forested area, commonly called the Crown managed forest land base, is 552 983 hectares. Further, about 68 percent of the CMFLB is identified as suitable for timber harvesting. This area of 363 194 hectares is referred to as the timber harvesting land base (THLB). Table 5 under *Timber Supply Forecasts* shows details of areas that are not included within the CMFLB or THLB.

The CMFLB of the Lakes TSA has relatively large areas of young forest, the result of past several decades of harvesting activities and large fires. Figure 2 shows the current age class distribution for forests in the CMFLB separated by THLB and non-THLB. The large amount of non-THLB in older age classes contributes to meeting the non-timber objectives.

The forests on the CMFLB of the Lakes TSA are primarily composed of lodgepole pine- and spruce-leading stands. The rest are composed of balsam-leading stands and deciduous stands (i.e., aspen and cottonwood). Figure 3 shows the current area and volume distribution of forests in the CMFLB. Given the loss of mature pine forests, much of the current volume available is located within spruce-leading stands. The total CMFLB live volume is 33 million cubic metres with 28 million cubic metres from coniferous-leading stands.

- ❖ **Crown managed forest land base (CMFLB)** is the forested area of the TSA that the provincial government manages for a variety of natural resource values.
- ❖ It excludes non-forested areas (e.g., water, rock and ice), non-productive forest (e.g., alpine areas, areas with very low productivity), and non-commercial forest.
- ❖ For the purpose of an AAC determination under Section 8 of the Forest Act, the CMFLB also excludes area-based tenures such as woodlots. Parks contribute to the accounting for biodiversity targets and are therefore included in the CMFLB.
- ❖ **Timber harvesting land base (THLB)** is an estimate of the land where timber harvesting is considered both acceptable and economically feasible, given the objectives for all relevant forest values, existing timber quality, market values and applicable technology.
- ❖ The THLB is derived from the data, forest management practices and assumptions described in the data package. It is a theoretical, strategic level estimate used for timber supply analysis and could include areas that may never be harvested or may exclude areas that will be harvested.

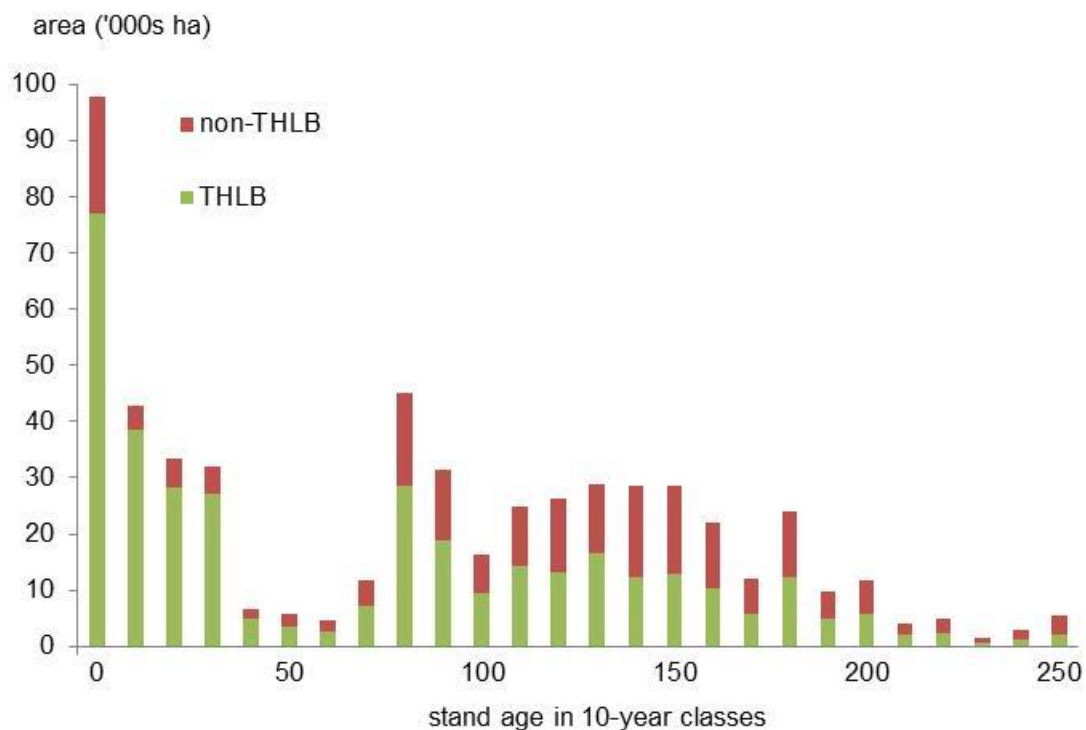


Figure 2. Age class distribution for the Crown managed forest land base in the Lakes TSA.

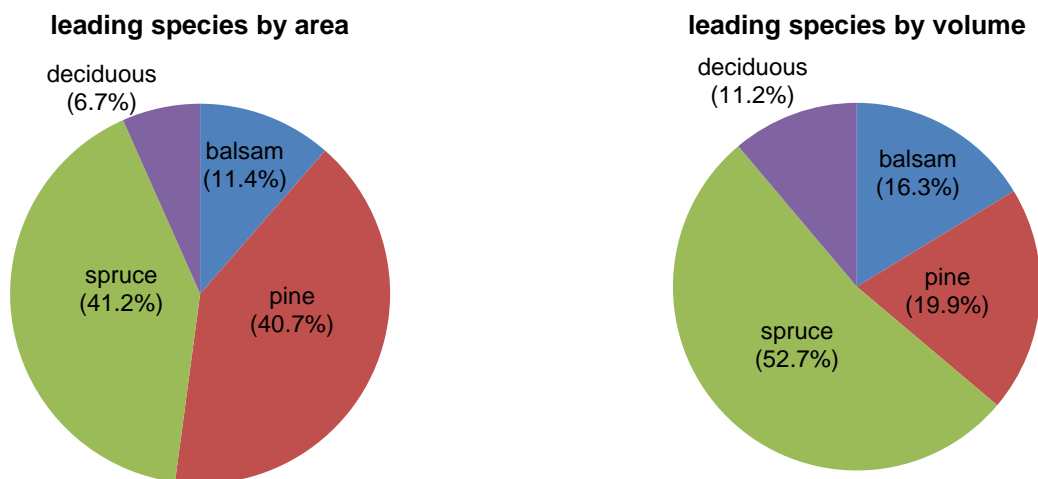


Figure 3. Area and the volume by leading species for the CMFLB in the Lakes TSA.

## Mountain pine beetle infestation

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Mountain pine beetle is native to British Columbia and usually occurs at endemic levels. Epidemic outbreaks have occurred periodically throughout the province and have played a vital role in the natural disturbance of pine forests, contributing to biodiversity and ecological variation across the landscape.

Between 1998 and the summer of 2014, it is estimated that the mountain pine beetle killed approximately 730 million cubic metres of pine, or about 55 percent of the commercially available pine volume in British Columbia. The magnitude of the outbreak has been attributed to two factors. First is the accumulation of mature lodgepole pine stands likely due to the success of fire-fighting efforts. The second factor is climate change. Historically, beetle populations have been limited by cold winters; however, the absence of sufficiently cold temperatures in the interior has allowed large populations of beetles to survive the winters under the bark of the pine trees.

Within the total geographic boundary of the Lakes TSA, the MPB outbreak began in the late 1990's and the peak in mortality occurred in 2005. It is currently estimated that about 76 percent of the mature pine volume – or 49 percent of the commercially available volume – was killed by the mountain pine beetle. This dead timber has been the focus of intensive salvage activities in order to recover its economic value before it decays. Past AAC decisions delayed the harvest of live timber for the future. As a result, about 75 percent of all the volume harvested in the past 20 years has been pine and most of that pine (about 76 percent) was killed by the mountain pine beetle.

While a significant amount of dead pine remains on the land base, there is uncertainty around the amount of the dead volume that can be salvaged. Over time, dead trees become less merchantable as they decay, break, and fall down. In addition, many factors, including markets and forest management objectives for other resource values, determine the suitability of a stand for salvage and the timing of the salvage. Given these factors, it is not certain how much of the remaining dead volume will be harvested.

As of 2018, dead pine continued to account for half of the total harvest in the Lakes TSA. To reflect this, no specific consideration for the change in merchantability over time (shelf life) was made in the base case; however the chief forester will need to consider the uncertainty around the continued merchantability of dead volume in her determination.

As shown in Figure 4, below, as a result of the outbreak and the associated salvage, the forests of the Lakes TSA have changed significantly. When the outbreak began, live mature (> 50 years) pine-leading stands dominated the forested land base. Young pine plantations now occupy the largest proportion of the forested land base and most of the mature stands are live spruce-leading stands. These changes are affecting biodiversity, wildlife habitat, hydrological and ecological processes as well as a recreation, hunting and trapping and timber harvesting.

### *Mountain pine beetle in the Lakes TSA:*

- ❖ *49 percent of the commercially available volume killed;*
- ❖ *Most of the volume killed between 2000 and 2005;*
- ❖ *Harvesting activities have been focused on salvaging dead pine;*
- ❖ *Uncertainty as to the length of time beetle-killed trees can be used;*
- ❖ *Remaining live mature stands must support harvesting and associated ecological functions until existing plantations are ready for harvest. Harvest forecasts are correlated with the amount of mature timber present.*

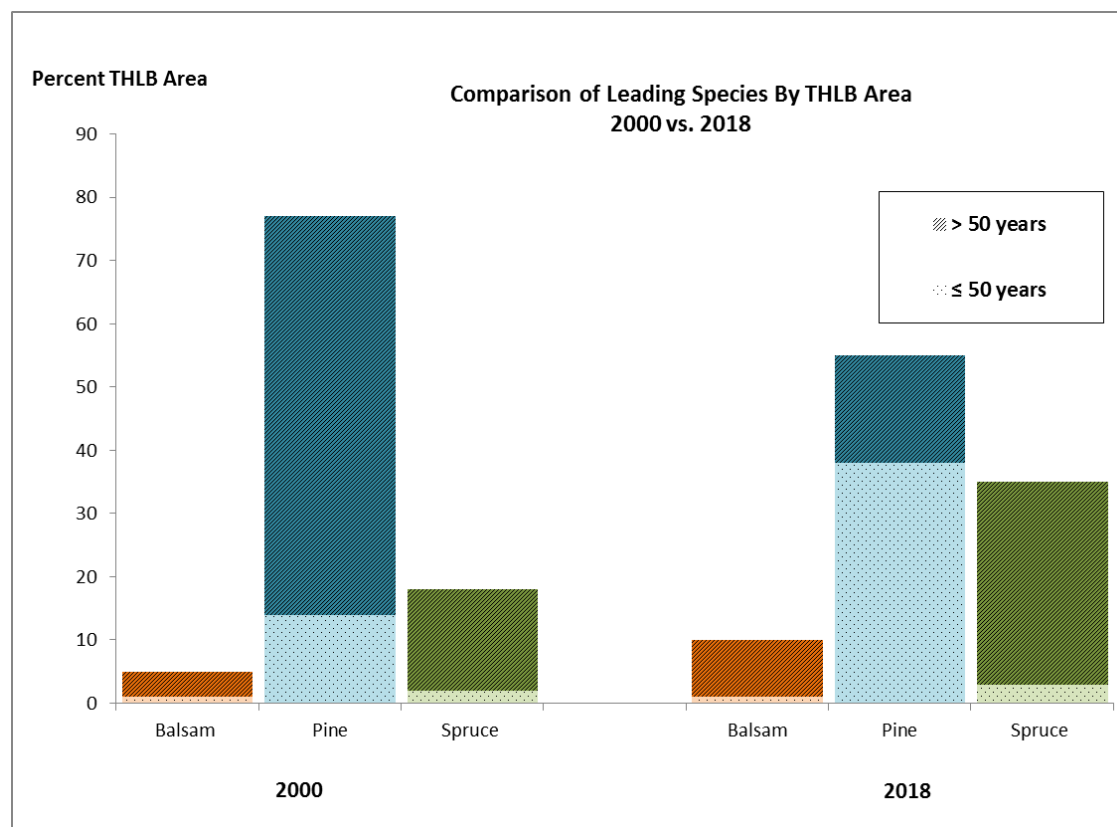


Figure 4. Comparison of Leading Species by THLB Area, 2000 vs. 2018.

## Forest fires

Forest fires are an integral part of the ecosystems of the Lakes TSA and stand replacing fires are frequent. Lodgepole pine is a fire-adapted species and is well suited to prompt re-establishment after fires. Fires provide nutrient cycling, complexity, resiliency, and biological legacies within the ecosystem.

A number of factors contribute to the occurrence and behaviour of wildfires. These include fuel characteristics (e.g., overall vegetation structure, dominant species, forest floor characteristics), fuel distribution, topography and climate. While fuel characteristics and distribution fluctuates over time as a result of natural disturbances and resource development, successful fire suppression efforts in the past century and climate change are affecting fire frequency and changing the dynamic of fire behaviour.

As shown on Figure 5, below, between 1933 and 2009, fires in the Lakes TSA burned an average of about 400 hectares per year and rarely did they exceed 1000 hectares in size. In the past decade, the average has increased tenfold to about 42 000 hectares per year. In 2010, about 28 000 hectares were burned by the Binta Lake fire; in 2014 the Chelaslie River and China Nose fires burned about 92 000 hectares and in 2018, a total of eight large wildfires impacted 209 000 hectares within the total geographic boundary of the Lakes TSA.

Wildfires are an integral part of the Lakes TSA ecosystems. Vegetation changes due to wildfires are captured in timber supply review in a variety of ways:

- ❖ The vegetation resource inventory (VRI) reflects the composition of the vegetation as of 2012;
- ❖ The VRI is updated annually to capture timber harvesting activities and changes due to wildfires;
- ❖ The Lakes TSA timber supply analysis is based on an updated VRI that captures the impact of the 2018 wildfires; and
- ❖ Modelling assumptions are made to reflect impacts and the growth of affected stands.

The timber supply review also includes assumptions regarding the amount of timber that remains unsalvaged following wildfire.



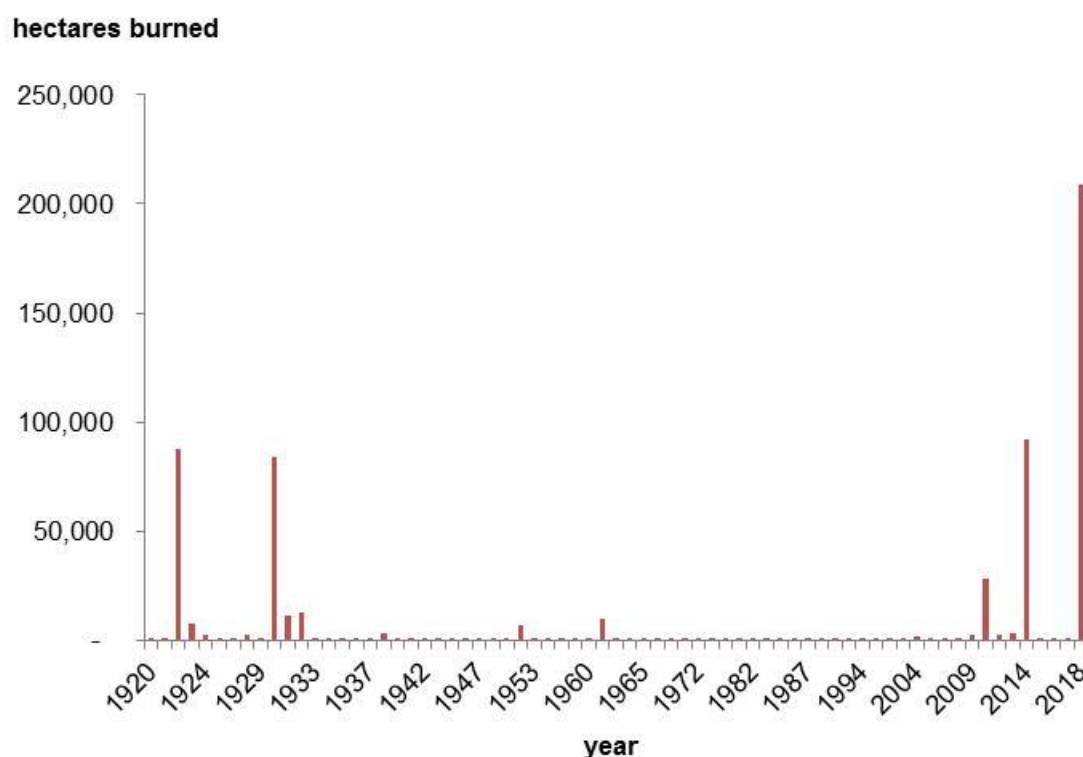


Figure 5. Fire history within the total geographic boundary of the Lakes TSA.

The vegetation resource inventory (VRI) that supports the timber supply analysis was updated for all fires that occurred prior to 2012. The inventory is also updated annually to reflect timber harvesting and all silviculture activities such as planting.

For fires that occurred since 2013, satellite imagery was used to classify the severity of the burn. The degree of severity influences the level of impact on stands and reflects the inconsistent burn pattern in various types of stands. Classifying the burn severity provides important information about fire impacts on volume. This classification is then used to adjust the basal area per hectare, stems per hectare and crown closure inventory attributes within the burned stands. This adjustment ultimately results in changes to the amount of volume available from the burnt stands.

The amount of timber that remains un-salvaged after fires is considered as non-recoverable losses. For the Lakes TSA, these losses are estimated at 59 741 cubic metres per year. This estimate was obtained by calculating the amount of unharvested volume within fire perimeters for the 1999 to 2017 period. The impact of climate change is anticipated to continue, which will result in lower snow packs and create dry summer conditions, therefore it is assumed that fire losses will continue to occur.

- ❖ In 2018, wildfires impacted over 200 000 hectares.
- ❖ About 45 000 hectares – or 22 percent of the burn area – is within the Lakes TSA THLB.
- ❖ Pine trees killed by the mountain pine beetle are assumed to have been incinerated.
- ❖ Tree mortality in the fire zones depends on the severity of the burn. The majority of trees killed are in a low burn severity class.
- ❖ It is estimated that fires burn about one million cubic metres of live trees within the Lakes TSA THLB.

Regarding the 2018 wildfires, since salvage is currently ongoing, no adjustments were made to un-salvaged loss estimates. Satellite imagery was acquired to classify the burn severity and the accuracy of the classification was confirmed through field sampling. The results of the classification were then used to update inventory attributes and the updated information was incorporated directly into this timber supply analysis.

In the timber supply analysis, a number of assumptions were made to account for the fires:

- MPB-killed trees are assumed to have been incinerated by the fires;
- In the high severity class, timber that was alive before fire is assumed to be too charred to be recoverable. The age of all forest stands within the high burn severity class was set back to zero. Stands that were at least 50 years at the time of the fire are assumed to regenerate naturally;
- Stands less than 50 years are assumed to be managed stands and are regenerated according to the future stands assumptions described in the 2018 data package;
- Fires were assumed to kill 50 percent of the live volume within the medium burn severity class, 20 percent of the live volume within the low burn severity class, and 10 percent of the unburned severity class. These stands continue to grow as projected by their pre-fire growth curves;
- Timber that was killed by the fires is assumed to be available for salvage for the next five years; and,
- Stands affected by the fires that meet the minimum harvest criteria contribute to the harvest forecast in the timber supply analysis.

Within the total geographic boundary of the Lakes TSA, wildfires affected about 209 000 hectares. A large portion of the area burned – about 102 000 hectares – is within Tweedsmuir Provincial Park. Outside of Tweedsmuir Provincial Park, a significant portion of the area burned is non-forested, within area-based tenures or private lands. Consequently, less than 30 percent – or 62 000 hectares – of the total area burned is within the Lakes TSA CMFLB. Of that portion, about 45 000 hectares is within the THLB. Tables 1 and 2 below show the total area and volume affected by wildfires within the Lakes TSA in 2018 and Figure 6 shows the location of these fires.

*Table 1. Summary of area burned in 2018 within the total geographic boundary of the Lakes TSA, including the CMFLB and the THLB*

Fire Name (Number)	Total area burned within the total geographic boundary of Lakes TSA	Lakes TSA CMFLB area burned	Lakes TSA THLB area burned
Chelaslie Arm (R12270)	9 000	8 500	6 000
Cheslatta Lake (R11683)	7 000	200	200
Island Lake (R11921)	2 700	2 600	2 000
Nadina Lake (R21721)	14 000	7 300	4 200
Pondosy Bay (R12068)	53 000	1 900	1 000
Shovel Lake (R11498)	21 000	18 000	13 500
Tesla Lake (R12315)	52 000	1 300	0
Verdun Mountain (R11796)	50 000	22 000	18 000
Other	300	200	100
Total	209 000	62 000	45 000

The fire intensity varies greatly within a burn area due to topography, hydrology, wind, and vegetation. Some portions can remain unburned while others burn at a high intensity. Based on the burn severity classification (Table 2), the severity of the burn was moderate over most of the impacted areas. Due to the distribution of forest stands within the burn areas, most of the impacted volume is located in areas where the burn severity is classified as low.

*Table 2. Summary of area and volume burned in 2018 within the total geographic boundary of the Lakes TSA, by burn severity classes*

Burn Severity	Area burned (ha)			Total (live and dead) volume impacted (m <sup>3</sup> )		
	Geographic	CMFLB	THLB	Geographic	CMFLB	THLB
High	71 000	11 000	7 600	11 956 929	1 381 738	835 561
Medium	82 000	27 000	19 000	3 179 167	1 223 792	837 440
Low	24 000	9 000	6 400	12 023 439	3 308 648	2 125 800
Unburned	29 000	12 000	10 000	2 577 325	879 846	634 288
Unknown	3 000	3 000	2 000	412 764	410 756	262 866
Total	209 000	62 000	45 000	30 149 623	7 204 780	4 695 954

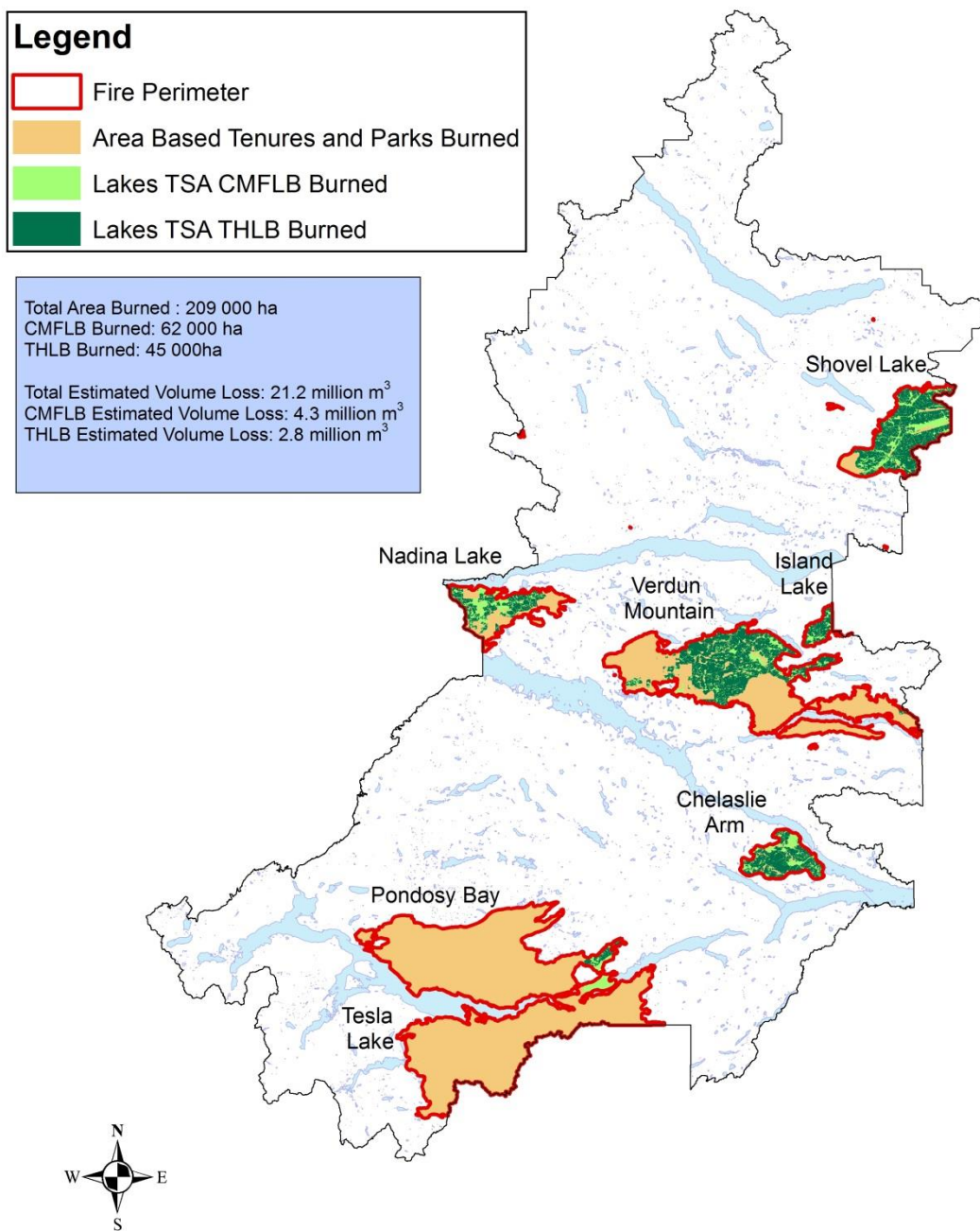


Figure 6. CMFLB and THLB within the 2018 fire perimeters within the total geographic boundary of the Lakes TSA.

As vegetation combustion and mortality varies according to the intensity of the burn, only a portion of the trees within burn areas is killed by a fire. Based on burn severity mapping done in the fall of 2018, it is estimated the wildfires incinerated about one million cubic metres of MPB-killed trees and killed about 1.5 million cubic metres of live volume (Table 3) within the THLB. Most of this volume is within the perimeter of the Verdun Mountain fire.

*Table 3. Summary of volume burned in the THLB of the Lakes TSA by fire*

Fire name (Number)	Volume loss (m <sup>3</sup> ) by fire		
	Live	Dead	Total volume loss
Chelaslie Arm (R12270)	155 552	193 948	349 500
Cheslatta Lake (R11683)	949	10 333	11 282
Island Lake (R11921)	56 618	79 792	136 410
Nadina Lake (R21721)	115 367	102 209	217 576
Pondosy Bay (R12068)	39 264	64 326	103 590
Shovel Lake (R11498)	391 034	400 213	791 247
Tesla Lake (R12315)	0	0	0
Verdun Mountain (R11796)	717 946	432 398	1 150 344
Other	4 968	1 808	6 776
<b>Total</b>	<b>1 481 698</b>	<b>1 285 028</b>	<b>2 766 726</b>

Fire guards built to control or suppress the 2018 wildfires are currently being assessed for rehabilitation. Rehabilitation work is regulated under the *Wildfire Act* and includes activities such as erosion and water flow control and preventing the introduction or spread of invasive plants. It is anticipated the rehabilitation work will begin during the summer of 2019 and be completed by the end of 2020.

Broader recovery of the land base affected by fire will occur through a combination of initiatives. Forest licensees are reviewing and initiating salvage operations while opportunities for reforestation under government funding programs (e.g., Forest Carbon Initiative) are being assessed. Plantations affected by the fire are being assessed to determine the appropriate silvicultural treatment (e.g., reforestation, site rehabilitation). In addition, wildlife habitat and fire resiliency at the landscape level are being factored as part of the rehabilitation and recovery initiatives. Overall, Government is seeking opportunities to collaborate with area First Nations as planning and operational elements move forward.

## Land use planning

The Lakes District Land and Resource Management Plan (LRMP) was developed by a dedicated group of public and government participants representing the full range of community interests. The LRMP was approved by the provincial government in 2000 and provides broad policy direction for various resources, including fish and wildlife, forestry, mining, agriculture, recreation, and tourism. The plan supported the creation of four protected areas – Entiako, Sutherland

River, Uncha Mountain/Red Hills and sites along Babine Lake. The plan also supported the creation of resource management zones and objectives for resource development, biodiversity, caribou and for mineral development.

In order to legally establish priority LRMP recommendations, to manage the mountain pine beetle infestation and to support the increase in allowable annual cut, the Lakes South Sustainable Resource Management Plan (SRMP) was approved by the provincial government in 2003. This plan provides legal objectives for seral stage distribution, old growth management areas, habitat connectivity corridors, patch size distribution, and wildlife tree retention.

In 2009, the Lakes North SRMP was approved by the provincial government. This plan is consistent with and also builds on the provisions of the Lakes LRMP and includes objectives for the management of biodiversity values in forested ecosystems. Specifically, the plan provides legal direction for seral stage distribution, old growth management, landscape connectivity, and wildlife tree retention.

In 2014, an extensive review of land use planning around Burns Lake determined that altering land use objectives in the area would provide little benefit to the region's timber supply and increase the risk to important environmental values. The review confirmed that the Lakes LRMP remained valid, both in terms of the legal objectives it supports and as policy guidance to land and resource management.

Together, the LRMP and the Lakes South and Lakes North SRMPs contribute to providing a range of habitat types that are intended to support a wide diversity of animals and plants, certainty around timber and biodiversity objectives, and guidance to forest professionals. The timber supply analysis assumes that forest management and timber harvesting will be consistent with the LRMP direction and SRMPs objectives.

## **Tenure changes**

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When the mountain pine beetle outbreak began, most of the timber harvesting rights within the total geographic boundary of the Lakes TSA were granted through replaceable forest licences, timber sale licences and woodlots. In response to needs and interests expressed by First Nations, communities and individuals, there is now a greater diversity of forest tenures in the Lakes TSA. These include some of the largest community forests and First Nations woodland licences in British Columbia.

- ❖ *In 2014, an extensive review of land use planning around Burns Lake determined that altering land use objectives in the area would provide little benefit to the region's timber supply and increase the risk to important environmental values.*
- ❖ *The review confirmed that the Lakes LRMP remained valid, both in terms of the legal objectives it supports and as policy guidance to land and resource management.*



Community forest agreements, First Nations woodland licences and woodlots tenures are area-based tenures that give the exclusive rights to harvest timber and construct roads within the area associated with the tenure to the tenure holder. In contrast, holders of forest licences and British Columbia Timber Sales (BCTS) may exercise the rights associated with their forest tenure over a shared land base. These types of tenures are volume-based tenures and the shared land base is a timber supply area. The extent of this timber supply area is subject to an AAC determination by the chief forester under Section 8 of the *Forest Act*. Other areas – such as woodlots, community forests or First Nations woodland licences – have distinct and unrelated processes and decision makers for determining their AAC.

As area-based tenures were created or expanded within the geographic boundary of the Lakes TSA, the areas associated with forest licences and BCTS – the CMFLB and THLB – were also reduced. As a result, the Lakes CMFLB is approximately 33 percent (265 000 hectares) smaller than it was in 2000 (Figure 7).

The tenure changes have also shifted the proportion of the total harvest that comes from areas managed under volume-based tenures by a similar proportion. As shown in Figure 7, below, almost all of the harvested volume in 2000 was associated with volume-based tenures. By 2018, about two-thirds of the total volume harvested within the geographic boundary of the Lakes TSA was from volume-based tenures.

- ❖ *As area-based tenures were created or expanded within the total geographic boundary of the Lakes TSA, the area associated with volume-based forest licences and BCTS (the timber supply area subject to an AAC determination by the chief forester) was reduced.*
- ❖ *These tenure changes have also shifted the proportion of the total harvest that previously came from volume-based tenures to area-based tenures.*

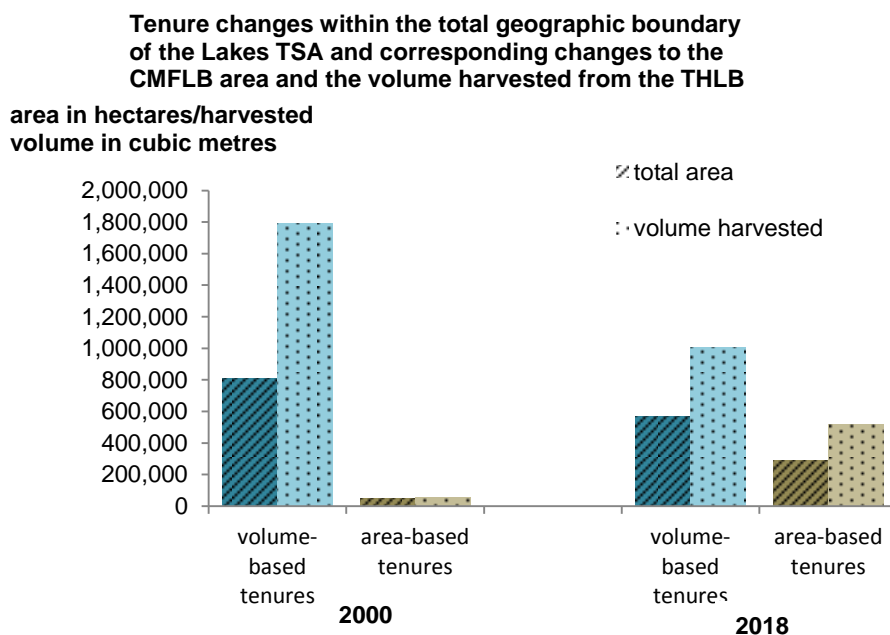


Figure 7. Tenure changes within the total geographic boundary of the Lakes TSA and corresponding changes to CMFLB area and harvested volume from the THLB.

The Lakes THLB is also about 30 percent (160 000 hectares) smaller than the last timber supply review due to the expansion of the Burns Lake Community Forest, the creation of the Chinook Community Forest, and the Lake Babine Nation and Nee Tahi Buhn First Nations woodland licences.

Figure 8 shows the current CMFLB and THLB in the Lakes TSA.

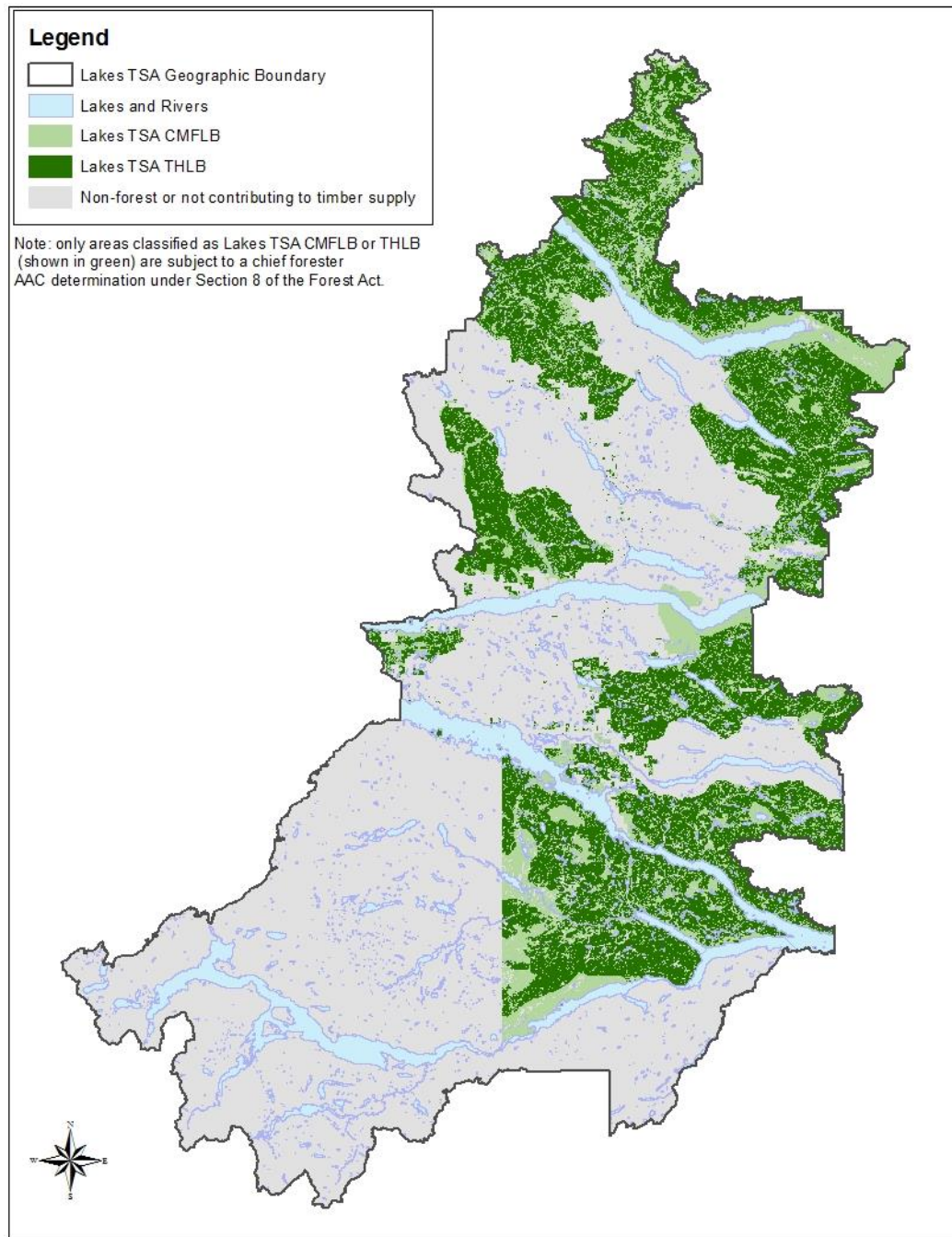


Figure 8. CMFLB and THLB in the Lakes TSA.

## Recent history of the allowable annual cut and harvest performance

From 1982 to 1996, the Lakes TSA AAC was set at 1.5 million cubic metres. In 2001, to facilitate the salvage of stands damaged by the mountain pine beetle, the AAC was increased to 2 962 000 cubic metres. In 2004, the AAC was raised to 3 162 000 cubic metres.

In the last AAC determination, in 2011, the AAC was set at 2.0 million cubic metres. This AAC included a partition of 350 000 cubic metres attributable to non-pine species. Due to the expansion of the Burns Lake Community Forest and the creation of the Chinook Community Forest, Lake Babine Nation woodland license and Nee Tahi Buhn woodland licence, the AAC was adjusted to 1 648 660 cubic metres in September 2016. The adjusted AAC includes a partition of 288 516 cubic metres attributable to non-pine species.

Volume-based tenure agreements under the *Forest Act* provide rights to harvest a specific allowable annual cut of Crown timber. This AAC represents the amount of Crown timber committed under a tenure agreement. Currently, replaceable forest licences (i.e., Nechako Lumber, Babine Forest Products, Babine Timber Cheslatta Carrier Nation, and West Fraser Mills) and BCTS hold the vast majority of AAC commitments in the Lakes TSA. A small portion is committed to pending First Nations woodland licences and to the Forest Service reserve (Figure 9). The sum of these AAC commitments is less than the current AAC of 1 648 660 cubic metres as previously issued non-replaceable forest licences have expired.

- ❖ The current AAC for the Lakes TSA is 1 648 000 cubic metres.
- ❖ It includes a partition of 288 516 cubic metres attributable to non-pine species.

**Lakes TSA AAC commitments (total cubic metres)**

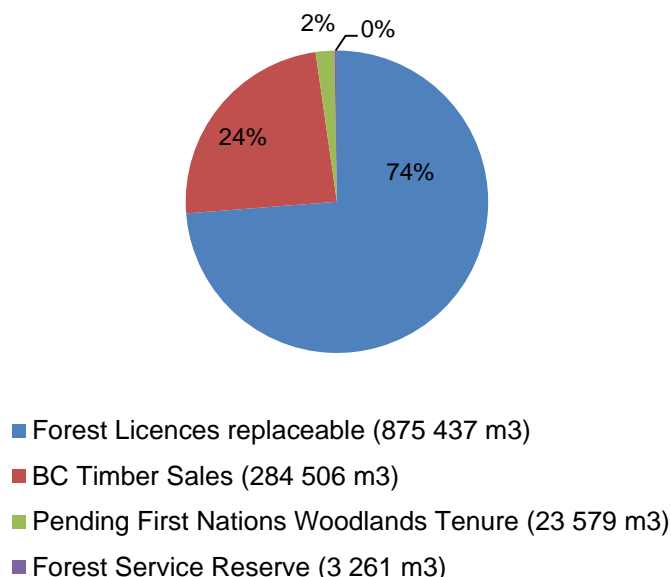


Figure 9. Current AAC commitments in the Lakes TSA.

As shown on Figure 10, annual harvest levels in the Lakes TSA have been generally lower than the AAC for the past 20 years. Harvest levels exceeded the AAC in 2000 in response to the mountain pine beetle outbreak and also in 2016 as the AAC adjustment to reflect new or expanded area-based tenures became effective late in the year. Since the last determination in 2011, annual harvest levels have fluctuated between one million cubic metres and 1.8 million cubic metres, which represent an average of about 66 percent of the AAC.

- ❖ *Harvest levels in the Lakes TSA are lower than the AAC.*

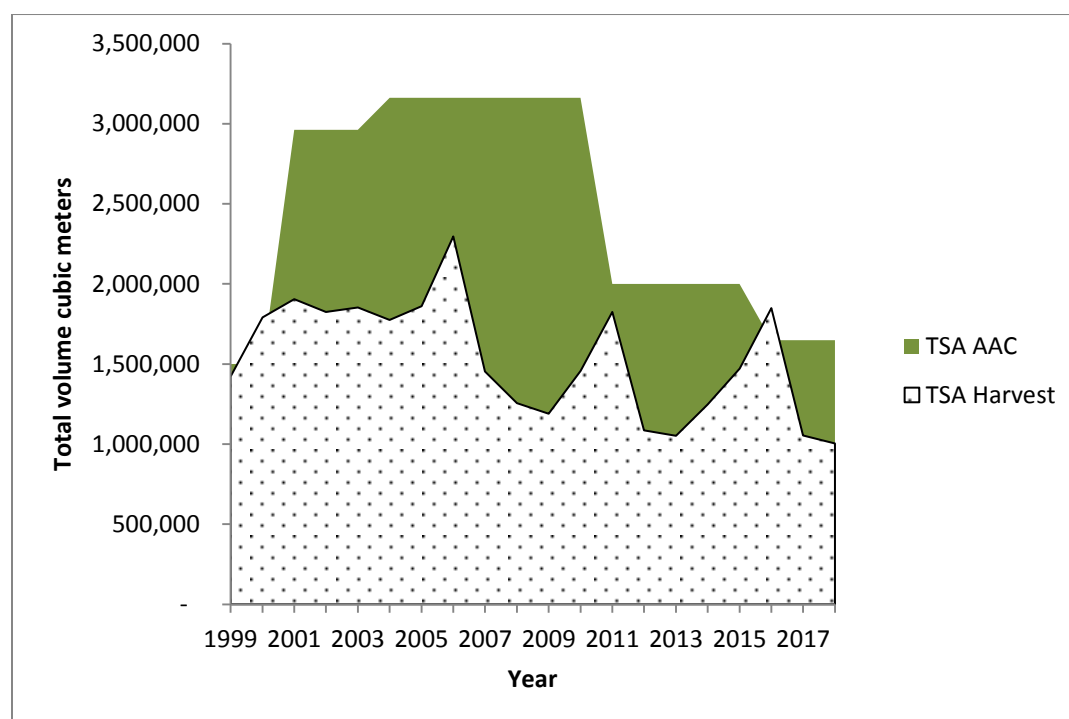


Figure 10. Harvest volumes and AAC since 1999.

About 75 percent of this harvest has been pine, which reflects the successful efforts made by the forest industry to focus on pine. Due to these efforts, most of the harvested pine – about 76 percent – was killed by the mountain pine beetle. Since 2012, the percentage of pine relative to the total harvest has fluctuated from 67 percent to 78 percent and the percentage of dead volume relative to the total volume has fluctuated from 52 percent to 61 percent.

The 2011 AAC determination included a partition of 350 000 cubic metres attributable to non-pine species. On average, 360 093 cubic metres of non-pine species were harvested annually, which is about three percent above the AAC partition. Table 4 shows harvest performance relative to the AAC non-pine species partition and details of the harvest performance in the Lakes TSA over the past five years.

- ❖ *Due to successful salvage efforts by the forest industry, 52 percent to 61 percent of the total volume harvested since 2012 was dead.*
- ❖ *On average, about 360 000 cubic metres of non-pine species are harvested annually.*

Table 4. Harvest performance in the Lakes TSA since 2011

Year	Total harvest (m <sup>3</sup> )	Live pine harvest (m <sup>3</sup> )	Dead pine harvest (m <sup>3</sup> )	Non-pine harvest (m <sup>3</sup> )
2012	1 130 609	221 575	661 003	248 031
2013	1 083 949	194 946	615 278	273 725
2014	1 248 588	161 613	732 257	354 719
2015	1 472 343	144 894	876 203	451 247
2016*	1 850 120	173 113	1 137 669	539 338
2017	1 055 264	122 718	606 107	326 439
2018	1 004 826	156 049	521 625	327 152

\*AAC adjustment occurred September 8, 2016.

In addition to the timber supply area subject to an AAC determination by the chief forester under Section 8 of the *Forest Act*, there are several area-based tenures within the geographic boundary of the Lakes TSA. All of these tenures – volume and area-based – contribute to the forest economy of the area.

Figure 11, below, shows the proportion of harvested volume by tenures type within the geographic boundary of the Lakes TSA. About 23 percent of all the volume harvested within the geographic boundary of the Lakes TSA in the past five years came from area-based tenures.

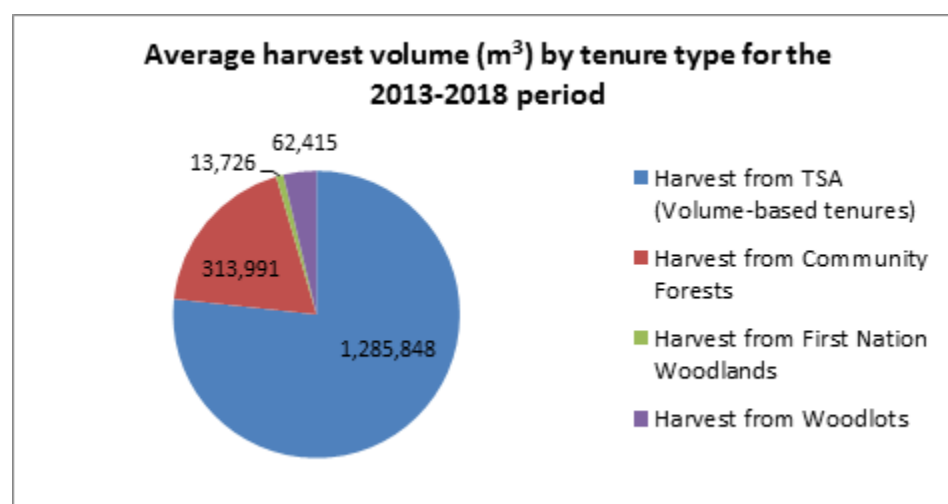


Figure 11. Harvest volumes from all tenures in the geographic boundary of the Lakes TSA between 2013 and 2018.

Most of the volume harvested within the geographic boundary of the Lakes TSA (all tenures) is transformed into forest products such as lumber or pellets in one of the processing facilities located in Burns Lake or Fraser Lake. The Burns Lake processing facilities include three lumber mills (Babine Forest Products, Pacific Timber, Decker Lake Forest Products) and one pellet plant (Pinnacle Renewable

- ❖ All tenures (volume and area-based) contribute to the forest economy of the Burns Lake area.
- ❖ About 32 percent of all the volume harvested within the total geographic boundary of the Lakes TSA in the past five years came from area-based tenures.

- ❖ Burns Lake mills transform timber harvested from multiple timber supply areas.

Energy). Based on scale billing reports, about 68 percent of the volume processed by these facilities over the past five years came from the geographic boundary of the Lakes TSA. The rest was purchased from tenure holders operating in neighbouring TSAs (i.e., Kalum, Kispiox, Bulkley, Morice and Prince George) or obtained under tenures held by Lakes TSA licensees in these other TSAs.

## Significant changes since the last timber supply review

The timber supply analysis presented in this discussion paper differs from the analysis used in the 2011 AAC determination. Significant changes include the following:

- expansion of the Burns Lake Community Forest;
- creation of the Chinook Community Forest;
- creation of Lake Babine Nation and Nee Tahi Buhn Woodland Licences;
- large wildfires;
- new vegetation resource inventory;
- establishment of Government Action Regulation (GAR) Orders for the provision of ungulate winter range (UWR) for mountain goat.

In addition, a new modern sawmill was constructed (Babine Forest Products) and the Pinnacle pellet plant opened.

## Timber Supply Forecasts

### Timber harvesting land base

The *Lakes TSA Data Package*, published as part of this TSR, provides background information about the land base within the TSA and about forest management.

As part of the process to develop the base case, the timber harvesting land base (THLB), where harvesting activities are projected to occur, and the non-THLB which may contribute to forest management objectives other than timber harvest are derived.

Table 5, commonly called a netdown table, shows the derivation of the CMFLB and the THLB. In this table, the categories of land that are considered not to contribute to the CMFLB and THLB are shown as reductions (i.e., netdowns). The table presents first the total area of the TSA, then sequentially identifies categories of reductions that are not in the CMFLB, and then identifies categories of reductions that are not in the THLB. In Table 5, the categories not in the THLB are further divided into those areas in which legislation prohibits logging and those areas where logging, at least in part, may be allowed.

Table 5 shows the gross area of the various categories, the amount that is found with the CMFLB, and the sequential net area removed. The sequential net areas for each category are the area in a category less any area overlapping from the netdowns above it in the table. Given the presentation of sequential net areas, the derivation of the CMFLB and THLB areas is simply the total TSA area less the sum of the net sequential areas excluded from that land base.

- ❖ *Timber supply forecasts are produced to reflect different harvest levels, rates of increase or decrease and potential trade-offs between short- and long-term harvest levels.*
- ❖ *The base case is a forecast that attempts to avoid excessive changes from decade to decade and significant timber shortages in the future.*
- ❖ *The base case provides a baseline from which the chief forester can understand the dynamics of timber supply.*
- ❖ *The base case is not an AAC recommendation.*
- ❖ *The timber harvesting land base (THLB) is an estimate of the area where timber harvesting is legally and economically feasible.*
- ❖ *Operationally, there may be areas that were not included in the THLB where harvesting does occur. Likewise, there may be areas within the THLB that never actually are harvested.*



As shown in Table 5, the total area within the geographic boundaries of the Lakes TSA is 1 577 450 hectares. After accounting for water bodies, Tweedsmuir and Entiako Provincial Parks, land administered under separate area-based tenures, private land and non-forested land, the CMFLB is 552 983 hectares (35 percent of the total geographic boundary of the TSA). After further reductions for areas not suitable or available for harvesting because of ecological, economic, or social considerations, the THLB area is 363 194 hectares (68 percent of the CMFLB or 24 percent of the total TSA). These land reductions include parks, lands designated for the protection of wildlife, riparian reserves, old growth values, roads, inoperable conditions and uneconomic stands or areas otherwise unsuitable for timber harvesting.

Comments received during the review of the data package expressed concerns that reductions to the CMFLB were disproportionate compared to other timber supply areas. Figure 12 shows how the THLB compares to the CMFLB in nearby TSAs. In addition, a several sensitivity analysis was conducted to examine the impact on timber supply of increasing the THLB. The results are discussed in the sections following.

Table 5. Lakes TSA land base classification summary

Land classification	Total area (ha)	Total forested area (ha)	Net area removed (ha)	% of total area	% of CMFLB
Total area	1 577 450			100	
Land not administered by FLNRORD for the purpose of an AAC determination under Section 8 of the <i>Forest Act</i>	889 915		889 915	56.7	
Non-forested and non-productive	299 285		123 854	7.5	
Roads	10 698		10 698	0.7	
Total Crown managed forest land base	552 983			35.1	100
Parks and protected areas	23 955	22 488	23 312	1.4	4.1
OGMA	86 864	57 385	55 357	3.6	10.3
Wildlife – ungulate winter range	5 166	3 722	3 039	0.2	0.5
Lakes North LCM – rare and hydro-riparian ecosystems	21 677	11 604	8 658	0.6	1.6
Total gross harvesting land base	462 617			29.3	83
Inoperable areas	76 886	13 471	7 193	0.5	1.3
Low productivity sites	6 427	4 630	4 359	0.3	0.8
Problem forest types	229 172	73 125	40 372	2.6	7.3
Riparian areas	87 319	31 821	19 619	1.2	3.5
Wildlife tree retention areas	25 157	16 551	10 166	0.6	1.8
Future wildlife tree retention areas			17 714	1.1	3.2
Total current reductions to the CMFLB			189 789	12.0	34.3
Timber harvesting land base	363 194			23.0	65.7
Future reductions					
Future roads			4 673	0.3	0.8
Future timber harvesting land base	358 521			22.7	64.8

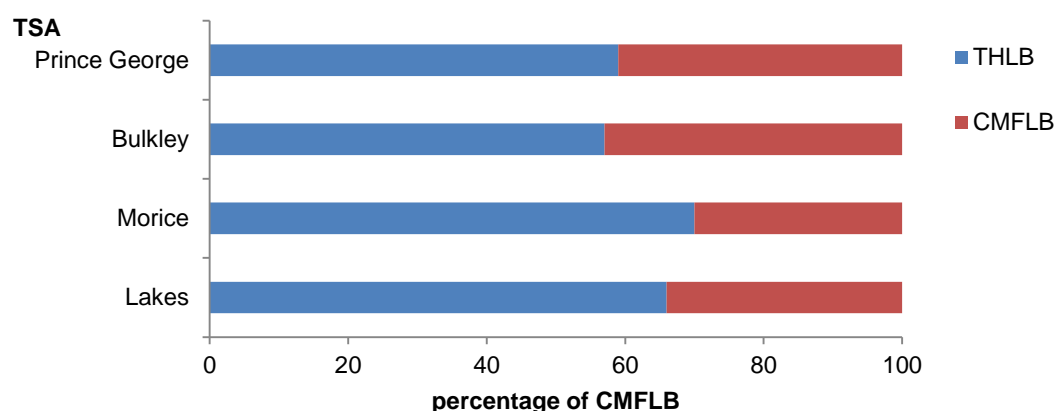


Figure 12. THLB as a percentage of the CMFLB among neighbouring TSAs, based on most recent timber supply review.

The THLB is a strategic-level estimate of the area available for timber harvesting for the purposes of modelling timber supply. However, inclusion or exclusion of an area in the THLB does not imply a change in operational management. Operationally, there may be areas that were not included in the THLB where harvesting does occur. Likewise, there may be areas within the THLB that never actually are harvested.

### **Forest management objectives**

Current forest management must be consistent with the requirements of the FRPA and associated regulations that are designated to maintain a range of economic, biodiversity and wildlife values. All forested lands, whether they contribute to timber supply or not, help to maintain critical habitat for many species. Therefore, the timber supply analysis includes constraints or forest cover requirements for biodiversity, visual quality, wildlife habitat, recreation features, riparian management and protection of environmentally sensitive areas. These requirements are applied to the CMFLB as shown in Figure 13 below.

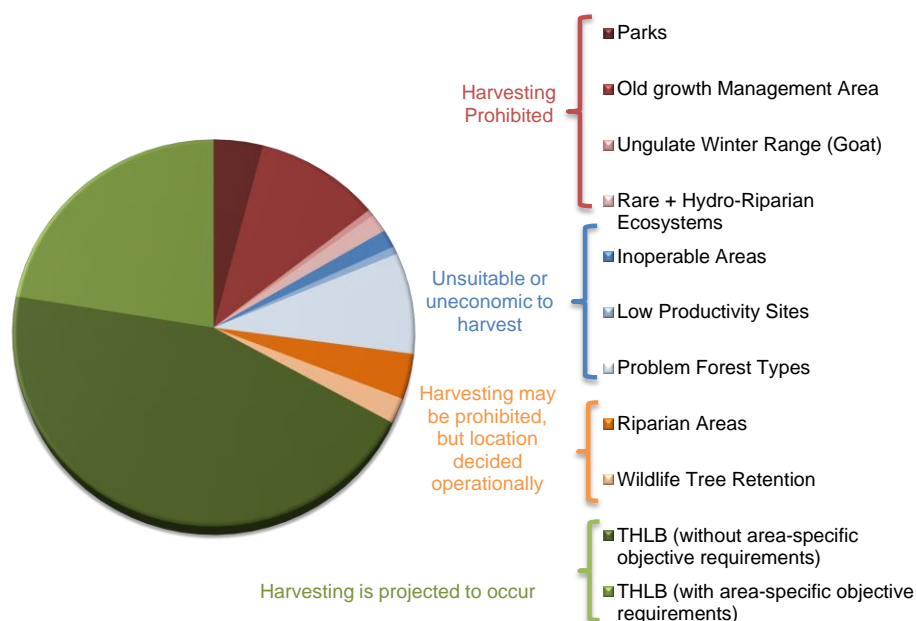


Figure 13. Crown managed forest land base (CMFLB) classification.

## Timber Supply Forecast Base Case

As part of the TSR, a timber supply analysis is typically carried out using three categories of information: land base inventory, timber growth and yield, and management practices. Using this information and a computer model, a series of timber supply projections are produced to reflect different starting harvest levels, rates of increase or decrease, and potential trade-offs between short- and long-term harvest levels.

From a range of possible projections, one is chosen which attempts to avoid both excessive changes from decade to decade and significant timber shortages in the future, while ensuring the long-term productivity of forest lands. This is known as the 'base case' projection and it provides a baseline harvest flow from which the chief forester can understand the dynamics of timber supply in the Lakes TSA. The base case is designed to reflect current management practices and assumptions.

The base case is not an AAC recommendation because it represents only one of a number of possible projections, and incorporates information and modelling assumptions about which there may be some uncertainty. The validity of the base case - as with all the other projections provided - depends on the validity of the data and assumptions incorporated into the computer model used to generate it. Due to the existence of uncertainty in the timber supply analysis, additional projections are usually prepared to test the effect of changing some of the assumptions or data used in the base case. These harvest projections are referred to as 'sensitivity analyses'. Both the base case and sensitivity analyses are prepared using a computer model that projects the future availability of timber for harvesting based on the growth of the forest and the level of harvesting, while

staying within the legal land use objectives established by the provincial government. For the current analysis, the forest estate model Remsoft Spatial Woodstock™ was used.

## ***The base case***

In a timber supply analysis, the forest composition data, growth and yield projections, and forest management objectives determine the availability of timber supply and the possibilities for harvest flow (i.e., the amount of harvest available over time). Many different harvest flows are possible given harvesting assumptions and harvest flow objectives.

In this analysis the base case was selected after exploring various harvest flow options around live and dead volumes. A primary consideration for the harvest flow was to maintain a sustainable live volume harvest flow and secondarily to enable the capture of dead volumes. As a result of these considerations, the base case harvest flow was modelled based on obtaining a sustainable live volume harvest but with an initial harvest priority on stands with the highest percentage of dead volume.

In this analysis the base case was constructed as two even-flows: one from 2019 to 2079 and another one for the long-term (from year 2080 to year 2220). The short-term (next 60 years) even-flow forecast allows for a sustainable harvest from existing, mature live stands while transitioning to a harvest based on managed plantations. The transition to the long term occurs when 90 percent of the harvest comes from existing and future managed stands. The long-term harvest level was capped at a level that ensured a stable long-term growing stock. Scenarios showing other possible transitions between the current- and long-term are provided as alternate harvest flows.

In the base case (Figure 14), an initial harvest level of 400 000 cubic metres of live volume was possible for the first 60 years. While harvesting this live volume, an additional 400 000 cubic metres per year of dead volume could also be salvaged for the next 10 years. This dead volume is from stands severely affected by the mountain pine beetle. The managed stands are projected to provide almost the entire harvest after 60 years from now and are able to support a stable long-term harvest level of 900 000 cubic metres per year.

In the first decade of the base case, lower productivity stands included in the THLB contribute about 292 000 cubic metres of live volume and 268 000 cubic metres of dead volume. The live volume component of these low productivity stands is 125 cubic metres per hectare for balsam-leading stands; 80 cubic metres per hectare for pine-leading stands and 82 cubic metres per hectare for spruce-leading stands.

The base case attempts to capture current management practices and use the best available information. However, there are uncertainties around some of the data, management, and modelling assumptions used.

In the base case, all currently dead volume identified in the forest inventory is considered available until it is harvested. This provides an upper bound on the possibly available dead wood volume rather than modelling some estimate of the loss of this dead volume over time. Synthesis of the “shelf life” of dead trees following death due to the mountain pine beetle infestation suggest that up to 50 percent of dead trees will have fallen after one decade since the time of death. However, operationally in 2018, 13 years after the peak in mortality, 52 percent of the harvest in the Lakes TSA was dead pine demonstrating continued availability. While the demonstrated harvest suggests that continued harvest is likely in the near future, there is recognition that there will be declines in the proportion of the currently dead volume that will be available.

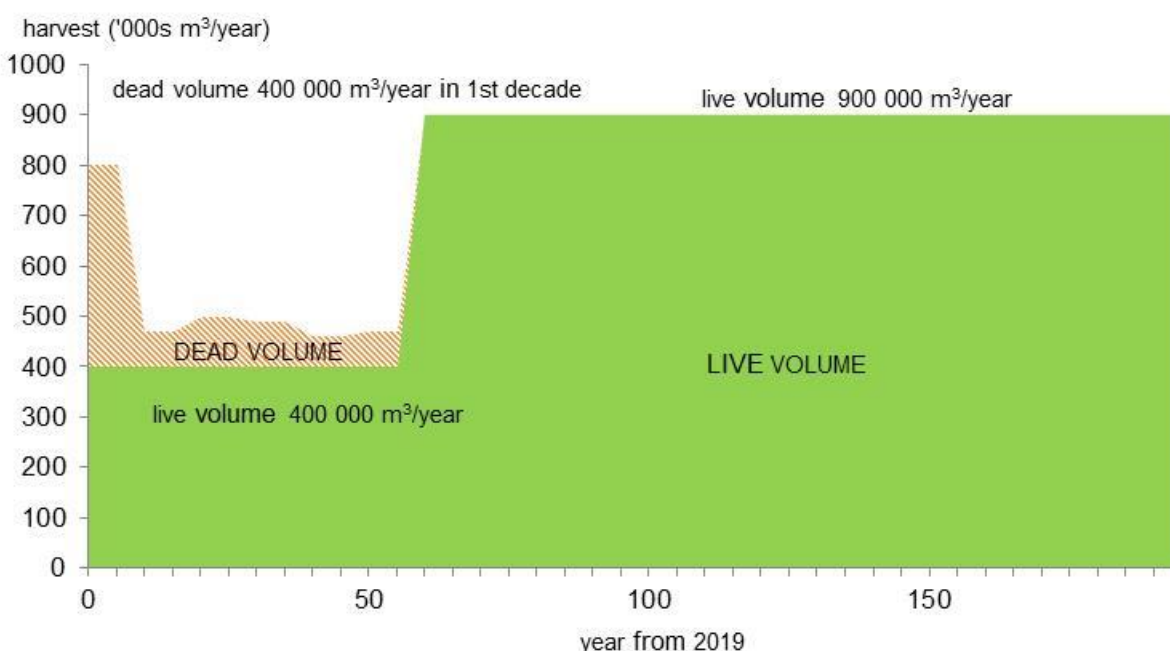


Figure 14. Base case showing live and dead volume components – Lakes TSA, 2019.

## Alternative harvest flows

The base case is one of many harvest flows possible. Figure 15 presents two alternatives that demonstrate how changing the initial harvest level or changing the assumptions can affect the projected harvest levels in the following decades.

The first alternative seeks to maximize the live volume harvest in the first decade (*versus* maximizing an even-flow harvest for the first six decades). In this alternative, an initial live volume harvest level of 500 000 cubic metres per year is possible but it requires a slightly lower mid-term (380 000 cubic metres per year).



Attempts to raise the harvest of live volume higher in the first decade, result in further lowering of the mid-term. Alternatives that attempted to increase the initial harvest level to the current harvest level (one million cubic metres per year) or AAC (1.6 million cubic metres per year) could not be achieved.

The second alternative answers the question what is the harvest level that can be maintained throughout the planning horizon. In this case, an even-flow harvest of 400 000 cubic metres per year can be obtained.

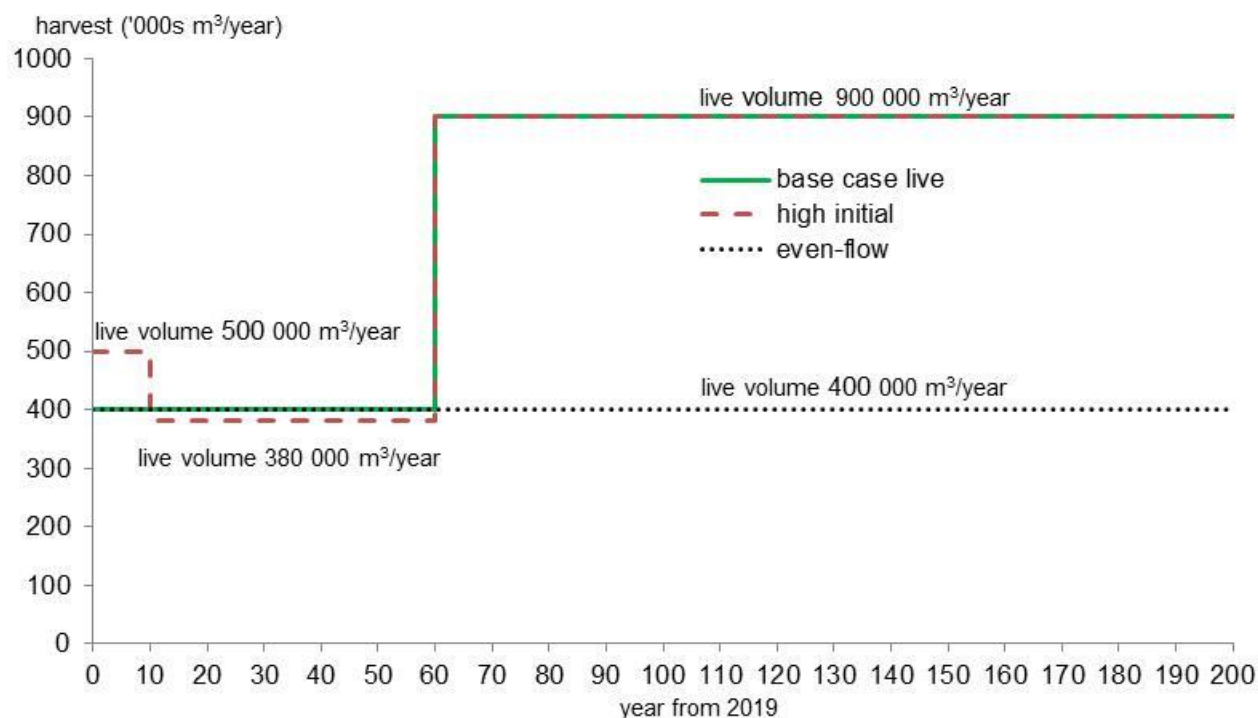


Figure 15. Alternative harvest flows for the live volume portion– Lakes TSA 2019.

**Attributes of the base case**

Figure 16 shows that in the base case, managed stands start to contribute to harvest 30 years from now and by the sixth decade, about 94 percent of the harvest comes from managed stands.

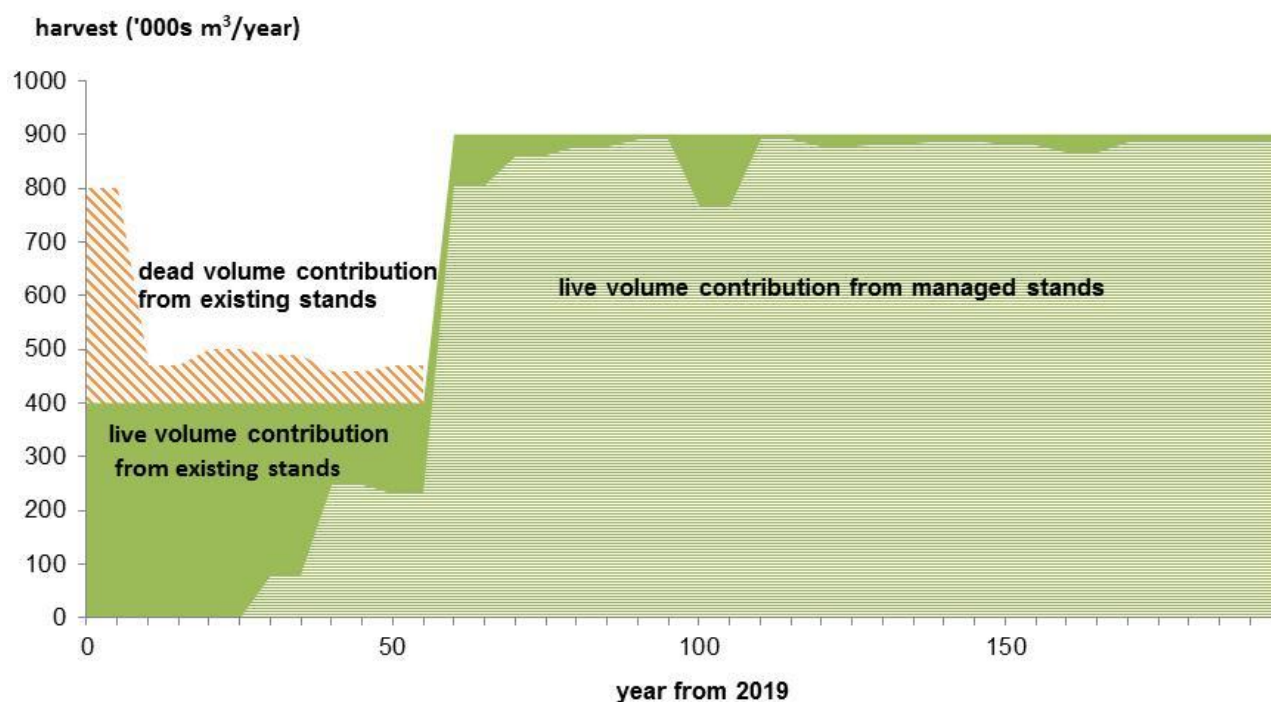


Figure 16. Contribution of managed stands in the base case – Lakes TSA, 2019.

Figure 17 shows that the total volume of growing stock today is about 23 million cubic metres. The growing stock declines in the first four decades before quickly rebounding to a long-term stable level of 65 million cubic metres. Figure 17 also shows the projection of the merchantable growing stock (stands meeting the minimum merchantability criteria).

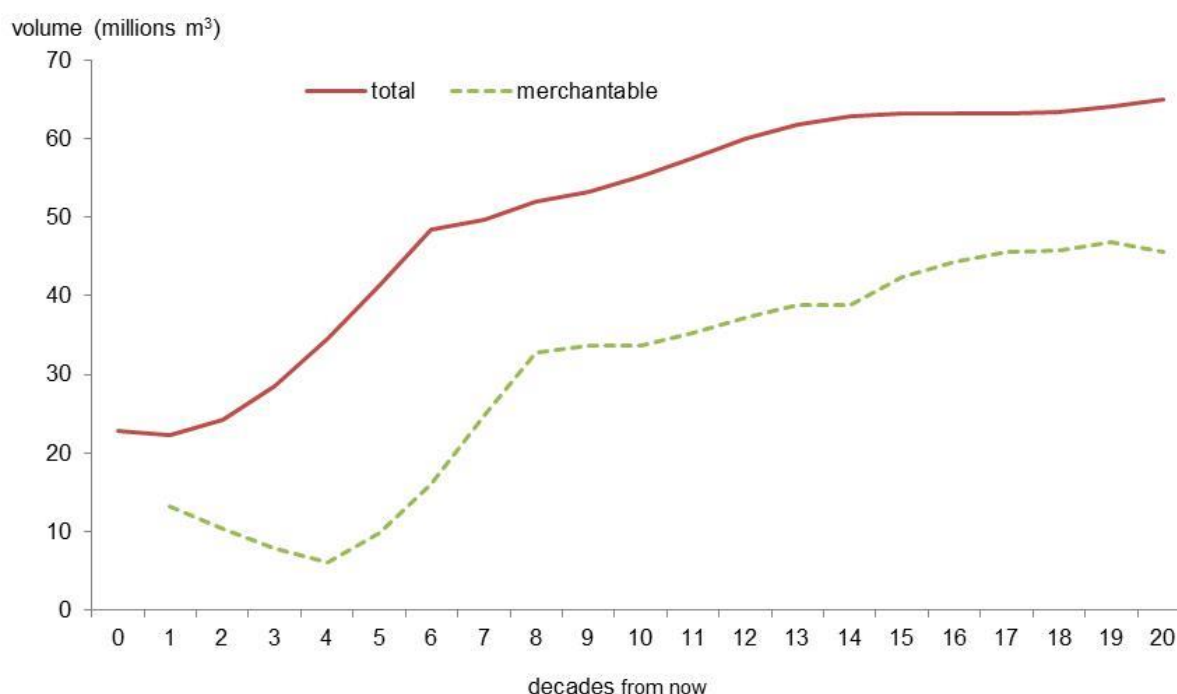


Figure 17. Growing stock of the base case — Lakes TSA, 2019.

Figure 18 shows the average volume and average age of the live volume harvested. The average harvest age in the timber supply model is approximately 125 years for the first 40 years of the forecast and approximately 100 years thereafter.

The average harvest volume per hectare increases from about 130 cubic metres in the short-term to 380 cubic metres in the long-term. In order to direct the model to continue harvesting pine beetle-impacted stands for the next 10 years, the minimum harvest volume for all areas with relatively low productivity was set lower than the minimum merchantability requirement of 140 cubic metres. The long-term average volume harvested per hectare is much higher than the current average volume harvested per hectare. This reflects the site index estimates for future stands, genetic gains and the fact that all volumes are live and merchantable.

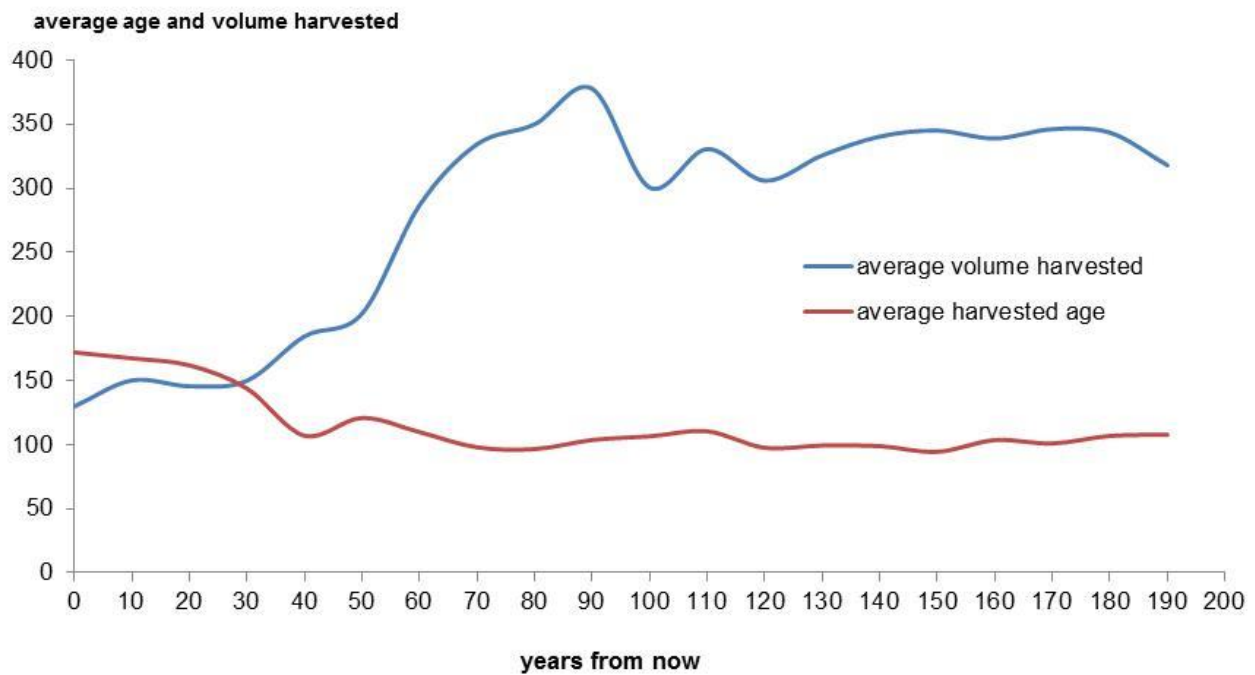


Figure 18. Average age and average volume of the live volume harvested in the Lakes TSA.

Figure 19 shows that the area harvested is high in the short-term reflecting the harvest of lower volume stands.

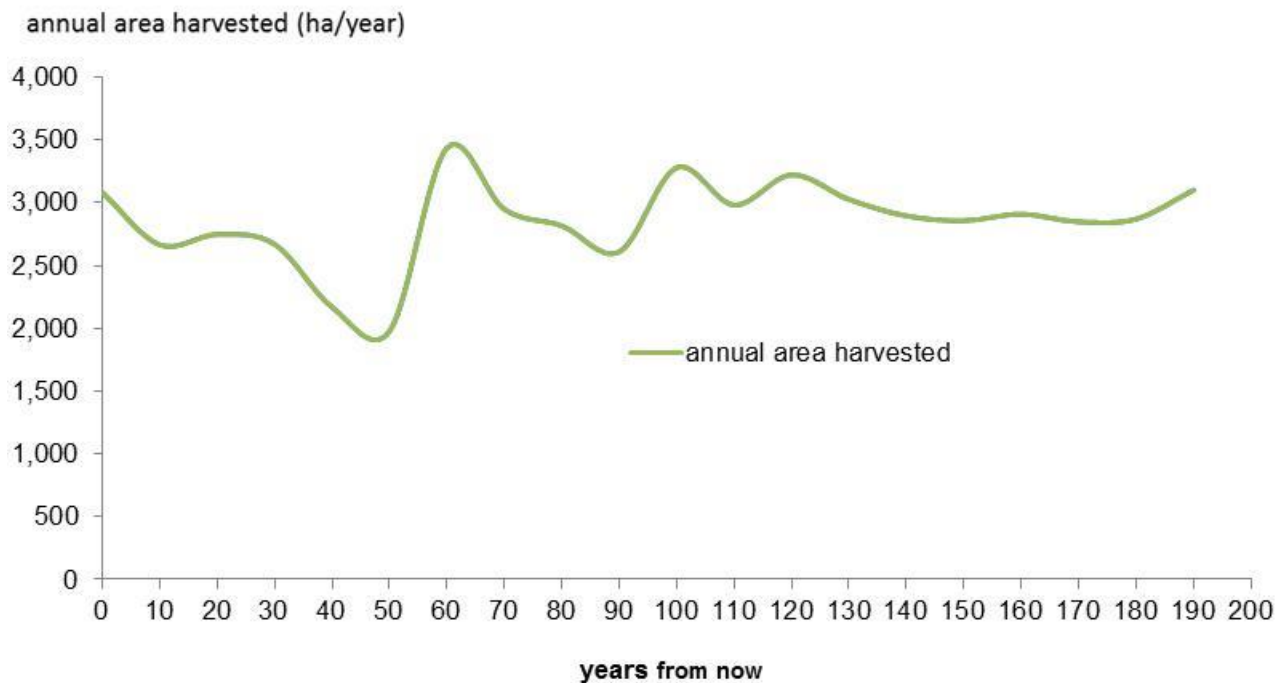


Figure 19. Average harvest area of the base case — Lakes TSA, 2019.

## ***Sensitivity analyses***

The base case uses a specific set of data and assumptions that are intended to reflect forest composition and growth, legally established land-use objectives and current forest management practices. However, while the base case is designed to reflect current management in the Lakes TSA, there is uncertainty about some data and management practices. Therefore, sensitivity analyses are used to examine the potential impacts of uncertainties about, or changes to, resource information and management practices. Key issues for the Lakes TSA are described in the sensitivity analyses described below. Results are summarized in Table 6.

## ***Utilization of deciduous species***

The utilization of deciduous species is highly variable across British Columbia. Although considered uneconomical in many TSAs, deciduous fibre has been used for the past two and a half years in the production of pellets in the Lakes TSA. The demand for pellets is still growing in Europe and appears to be increasing in Asia. In response to a comment from industry, suggesting the consideration of including unconstrained deciduous-leading stands in the THLB and a partition to encourage their use, two sensitivity analyses were conducted:

- 1) including the deciduous component of coniferous-leading stands resulted in a 10 percent increase in short-term timber supply and one percent increase in long-term timber supply; and,
- 2) including deciduous-leading stands resulted in a five percent increase in short-term timber supply and four percent increase in long-term timber supply.

The results of these sensitivity analyses suggest deciduous utilization may represent an opportunity to mitigate potential impacts that the forecast reductions in AAC may have on primary forest sector operations.

## ***Marginally economic stands***

The report, *Growing Fibre, Growing Value* (2012) from the Special Committee on Timber Supply, identified opportunities for utilizing marginally economic stands to mitigate mid-term timber supply. In response to public and First Nations concerns regarding the impact on timber supply of including low-volume pine stands with significant mortality, two sensitivity analyses were conducted:

1. including low volume ( $< 140 \text{ m}^3/\text{ha}$ ) pine stands ( $\geq 70\%$  pine) with significant mortality ( $\geq 50\%$  mortality); and,
2. including low volume ( $< 140 \text{ m}^3/\text{ha}$ ) pine stands ( $\geq 70\%$  pine) with severe mortality ( $\geq 90\%$  mortality).

Including these marginally economic stands resulted in a 0.1 to 0.2 percent short-term increase in base case timber supply. These results incorporate the assumption that the shelf life could be up to 30 years (since the beginning of the MPB outbreak in 1995) as shown by the dead volume component in the base case graph.

## ***Low productivity sites and problem forest types***

Sites may have low productivity either because of inherent site factors such as poor nutrient availability, high exposure or excessive moisture. These stands are unlikely to grow a merchantable crop of trees in a reasonable amount of time. Stands may also have been excluded due to the general unmerchantability of the stand type (i.e., a problem forest type).

In response to a licensee comment that it is inappropriate to exclude low productivity sites as they are sometimes harvested and improved, a sensitivity analysis was conducted. Including low productivity sites and coniferous problem forest types resulted in a six percent increase in short-term and five percent increase in long-term timber supply relative to the base case timber supply.

## ***Minimum harvestable age***

In the timber supply model, a minimum harvestable age is applied to prevent the model from selecting stands for harvest with an age younger than the specified minimums. In response to comments from public engagement sessions reporting that stands younger than 80 years are being harvested, a sensitivity analysis was conducted that removed the criteria that stands must reach a minimum harvestable age of 80 years. This resulted in a 10 percent increase in short-term and 5.6 percent decrease in the long-term timber supply relative to the base case.

## ***Minimum harvestable volume***

In the timber supply model, a minimum harvestable volume is applied to prevent the model from selecting stands for harvesting with less volume than the specified minimum. In the base case, a minimum harvestable volume of 140 cubic metres per hectare were assumed to be available for harvest in the Lakes TSA from stands growing on medium- or good-productivity sites. For stands growing on low productivity sites, the base case assumed a lower minimum harvestable volume for the live component (125 cubic metres per hectare for balsam stands; 80 cubic metres per hectare for pine; and 82 cubic metres per hectare for spruce stands). Past harvesting history indicates less than seven percent of the stands currently harvested have volumes less than 200 cubic metres per hectare.

The lowest average minimum volume observed in the last eight years is 170 cubic metres per hectare. In a sensitivity analysis, increasing the minimum harvestable volume to 170 cubic metres per hectare (except for low productivity sites) resulted in harvest levels 22 percent lower than projected in the base case in the short-term, and nine percent lower in the long-term.

Comments received during the data package review period indicated that the focus on lower volume stands will be increasingly more common. Although there is uncertainty in this timber supply review as to the extent to which licensees will be able to shift harvest operations into low volume stands as existing natural stands (with higher volume) are depleted, a sensitivity analysis was conducted that decreased the minimum harvestable volume to 100 cubic metres per hectare. It resulted in harvest levels nine percent higher than projected in the base case in the short-term, with no impact to the long-term.

## ***Natural and managed stand volume projections***

While there was no evidence that volume estimates for natural or managed stands in the Lakes TSA may be different than modelled, increasing natural stand yield volumes by 10 percent resulted in a 10 percent increase in short-term timber supply with no impact to the long-term. Decreasing natural stand yield volumes by 10 percent resulted in a decrease of 22 percent in short-term timber supply and decrease of two percent in long-term timber supply relative to the base case.

Increasing managed stand yields by 10 percent resulted in no impact to short-term timber supply and an increase of 10 percent in long-term timber supply. Conversely, decreasing managed stand yields by 10 percent resulted in no impact to short-term timber supply and a decrease of 10 percent in long-term timber supply.

## ***Steep slopes***

In response to licensee concerns that the steep slope data may not accurately represent that amount of harvesting occurring in these areas, a sensitivity analysis was conducted that included all slope classes in the THLB. Including steep slopes in the base case resulted in a one percent increase in short-term timber supply and one percent increase in the long-term.

## ***Timber harvesting land base (THLB)***

Licensees have expressed concerns regarding the stability of the THLB. The THLB could change due to changes in management practices, First Nations' reconciliation agreements, social expectations or environmental risks. A sensitivity analysis was conducted to examine the effect of increasing or decreasing the THLB.

Increasing the THLB by five percent resulted in a five percent increase in the short- and long-term timber supply. Conversely, decreasing the THLB by five percent resulted in a seven percent decrease in short-term timber supply and five percent decrease in long-term timber supply.

## ***Visual quality objectives (VQOs)***

Visual quality objectives have been legally established to manage the scenic value of designated areas (e.g., Babine Lake, Tchesinkut Lake). For the base case, visually effective green-up (VEG) heights and plan-to-perspective (P2P) ratios were used to derive visual quality objectives (VQOs). These heights and ratios are applied by VQO polygons and weighed by slope classes. Within a VQO there are a range of maximum percent alterations that are dependent on the visual absorption capability of the scenic area. As such, the maximum degree of alteration can also vary. In the base case, the maximum alteration used was the mid-point of the possible range of alteration. Sensitivity analyses were conducted to examine the impact of modifying the minimum and the maximum percent alteration rather than the mid-point of the range. In other words, the amount of area that could be harvested at any given time was modified within VQO polygons.

Applying the maximum permissible disturbance resulted in no increase in short-term timber supply and a 0.2 percent increase in long-term timber supply. Conversely, applying the minimum permissible disturbance resulted in a



0.3 percent decrease in short-term timber supply and two percent decrease in long-term timber supply.

## ***Riparian assumptions***

Under the Morice and Lakes Innovative Forest Practices Agreement (IFPA), a project was undertaken to classify mapped streams according to fish presence and the average channel width. The resulting dataset was used to estimate the area managed as riparian reserves and riparian management zones in the timber supply analysis. A licensee expressed concerns that the IFPA classification work overestimated the presence of fish and channel width and provided an alternate stream class distribution. In response, a sensitivity analysis was conducted that assumed the following percentage retention by stream class:

- S2 = 2%
- S3 = 16%
- S4 = 13%
- S5 = 3%
- S6 = 38%
- NCD (not classified drainage) = 28%

These riparian management reductions resulted in a short- and long-term increase in timber supply by one percent.

## ***Natural disturbance***

In order to model natural disturbances, and ensure stands do not age to infinity, stands located outside of the THLB in the SBS biogeoclimatic zone had their ages reset to 21 years once they reached 250 years of age. Stands outside of the THLB in the ESSF biogeoclimatic zone had their ages set to 21 years once they reached 350 years of age. Resetting the age to 21 years, recognizes that these naturally disturbed stands will be considered to still contribute to non-timber values after disturbance. Results of the sensitivity analysis showed no impact on short- or long-term timber supply.

## ***Future managed stand regeneration***

Based on current management practices, 95 percent of managed stands younger than 10 years of age and all future managed stands were assumed to be planted with improved stock. The remaining five percent is assumed to regenerate naturally. Increasing the proportion of future managed stands regenerated naturally from five percent to 10 percent, resulted in no impact to short-term timber supply and decrease of one percent in long-term timber supply.

Table 6. Sensitivity analyses results – Lakes TSA

Key Issue	Change	Initial harvest (m <sup>3</sup> /year)	Percent (%) impact	
			Short-term	Long-term
Economic operability of mixed-species stands with a deciduous component	Include the deciduous component from coniferous-leading stands	440,000	10	1
Economic operability of deciduous-leading stands	Include deciduous-leading stands	420,000	5	4
Marginally economic stands	Include stands with < 140 m <sup>3</sup> /ha, ≥ 70% pine content and ≥ 50% mortality	400,800	0.2	0
Low productivity sites	Include stands with < 140 m <sup>3</sup> /ha, ≥ 70% pine and ≥ 90% mortality	400,400	0.1	0
	Minimum SI lowered to ≥ 5 m for balsam, pine and spruce low productivity sites	424,000	6	5
Minimum harvestable age (MHA)	Removal of regenerating stand requirement of at least 80 years of age	440,000	10	-5.6
Minimum harvestable volume (MHV)	Decrease MHV from 140m <sup>3</sup> /ha to 100 m <sup>3</sup> /ha	434,000	8.5	0
Natural stand volumes	Increase MHV from 140 m <sup>3</sup> /ha to 170 m <sup>3</sup> /ha (excluding low productivity areas)	312,000	-22	-9.2
	Increase natural stand yields by 10%	440,000	10	0
	Decrease natural stand yields by 10%	320,000	-20	-2.3
Managed stand volumes	Increase managed stand yields by 10%	400,000	0	9.8
	Decrease managed stand yields by 10%	400,000	0	-9.7
Economic operability of steep slopes	Slopes =< 50%	405,000	1.3	0.8
Timber harvesting land base	Increase the THLB by 5%	420,000	5	5
	Decrease the THLB by 5%	374,000	-6.5	-4.5
Visual quality objectives (VQOs)	Apply the maximum point of permissible disturbance (%) of alteration in perspective view	400,000	0	0.2
	Apply the minimum point of the permissible disturbance (%) of alteration in perspective view	399,000	-0.3	-1.8
Riparian assumptions	Decrease riparian management area reductions	405,000	1.3	0.9
Natural disturbance	Set non-THLB to age 21 when it reaches 250 years in SBS and 350 years in ESSF	400,000	0	0
Future managed stands	Increase future managed stand natural regeneration by 5%	400,000	0	-1.4

\*Note: Short-term = Decades 1 to 6; Long-term = Decade 6 and after.

## Regional Economy and Socio-Economic Analysis

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Since 1995, there have been many changes within the Lakes TSA such as: the MPB outbreak, the large recent wildfires, and the issuance of large area-base tenures. The mountain pine beetle epidemic is having the effect of significantly reducing the mid-term AAC in the Lakes TSA. It is recognized that the regional timber supply for the Lakes TSA includes the Lakes, Morice and Bulkley TSAs, all regional community forests, woodlots and First Nations woodland licenses, and private land harvest contributions to the region. AAC reductions may, depending on industry business decisions, lead to sawmill curtailment of lumber production, as well as reduced availability of sawmill residual fibre for the downstream residual fibre users such as pulp mills, pellet plants and board producers.

The implication of changes in the timber supply for local communities is an important consideration in the timber supply review. It is recognized that the forestry sector support additional employment through business purchasing good and services (indirect impact) and through employees spending their income on local good and services (induced impact).

Information on the regional economy was provided by the Village of Burns Lake. Results presented in the 2018 report, *Chart the Course – The Lakes District Economic Diversification Strategy – Economic Profile*, indicate that agriculture, forestry, fishing, hunting and manufacturing (likely mills) account for approximately 28 percent of the total basic employment for the Lakes District – one of the largest sectors. Using this information, a socio-economic analysis was completed by Economic Services Branch of the Ministry. This analysis considered harvest volume, stumpage value, and direct impacts to gross revenue, gross domestic product (GDP), household income, employment and government revenue.

Based on the average harvest level for the past 4 years, and aligned with the results presented in the base case forecast, two different scenarios were generated to examine the impact of a decline in timber supply on employment:

- Scenario 1 (live and dead): in this scenario, the AAC was assumed to decline to 800 000 cubic metres per year, of which 400 000 cubic metres is live volume and 400 000 cubic metres is dead volume;
- Scenario 2 (live only): in this scenario, the AAC was assumed to decline to 400 000 cubic metres per year of live volume only.

The British Columbia Input-Output Model (BCIOM) was used to generate the estimates. Economic multipliers were applied to potential harvest declines to estimate the impact to employment and GDP. Table 7 summarizes the results of an input/output analysis that assessed the economic impacts of the two scenarios. These should be considered longer-term impacts after adjustment – in the short-term, impacts could be higher or lower depending on business decisions of the forest industry.

Scenario 1 shows that if harvest levels decrease to 800 000 cubic metres per year, direct forest sector employment is estimated to decrease by 88 jobs and indirect and induced employment will decrease by an additional 65 jobs.

Scenario 2 shows that if harvest levels decrease to 400 000 cubic metres per year, direct forest sector employment is estimated to decrease by 264 jobs and indirect and induced employment will decrease by an additional 195 jobs.

*Table 7. Economic impact of the forest industry in the Lakes TSA.*

*All \$ values in millions.		Direct Impacts						Indirect Impacts				
	Harvest level (m <sup>3</sup> )	Stumpage value	Output (gross revenue)	GDP	Household income	Employment	Gv't tax revenue	Output (gross revenue)	GDP	Household income	Employment	Gv't tax revenue
Scenario 1 (Live and dead)	800,000	\$2.6	\$ 39	\$ 12	\$ 8	88	\$ 1	\$ 13	\$ 7	\$ 5	65	\$ 1
Scenario 2 (Live only)	400,000	\$7.9	\$ 118	\$ 37	\$ 25	264	\$ 3	\$ 40	\$ 22	\$ 14	195	\$ 2
TOTAL Impacts												
	Output (gross revenue)	GDP	Household income	Employment	Gv't tax revenue							
Scenario 1 (Live and dead)	\$ 53	\$ 20	\$ 13	153	\$ 1							
Scenario 2 (Live only)	\$ 158	\$ 59	\$ 39	460	\$ 4							

The chief forester will consider the results of this analysis in her AAC determination. It should be noted that it is inappropriate for the chief forester to speculate on business decisions of the forest industry. The utilization of the AAC, including employment levels and types of forestry products, depends on business and operational plans.

These impacts do not account for timber supply from other sources such as Community Forests, First Nations Woodland Licences, and Woodlot Licences.

## Summary

In 1995 the AAC for the Lakes TSA was set by the chief forester at 1.5 million cubic metres. The 1995 base case showed a stable timber supply of 1.5 million for seven decades, a 3 percent drop in the mid-term, followed by a long-term level of 1.4 million. Since 1995, there have been many changes within the Lakes TSA such as: the MPB outbreak, the large recent fires, and the issuance of large area-based tenures.

The most significant change was the mountain pine beetle infestation which started around 1999 and peaked in 2005 in the Lakes TSA. This infestation is estimated to have killed about 76 percent of the mature pine volume, or about 49 percent of the commercially available volume. To facilitate the salvage of stands damaged by the mountain pine beetle, the AAC was increased to 2 962 000 cubic metres in 2001 and in 2004, the AAC was adjusted to 3 162 000 cubic metres. In the last AAC determination, in 2011, the AAC was set at 2.0 million cubic metres. In order to keep the mid-term timber supply as high as possible, this AAC included a partition which limited the harvest of non-pine species to 350 000 cubic metres. Timber supply analyses conducted in 2012 showed that after the pine salvage the timber supply would drop to about 500 000 cubic metres per year. The results of the 2012 analyses were presented in the report, *Mid-Term Timber Supply Project Report for the Minister and Deputy Minister* (February 29, 2012).

The amount of area burned by wildfires has also increased in the TSA. Between 1933 and 2009 the average area burned in the TSA was about 400 hectares per year. In the past decade the average increased to about 42 000 hectares per year. In 2018, eight large fires affected 209 000 hectares in the TSA. It should be noted that most of the area burned is outside of the Lakes TSA timber harvesting land

base. It should also be noted that not all of the area in the fire perimeter was burned and that beetle-killed stands comprised a significant amount of the burned timber.

The current timber supply analysis incorporates changes to the land base such as the creation of community forests and First Nations woodland licences. While the creation of these tenures reduces the timber supply (and the resulting AAC) of the remaining TSA, that volume is still likely available for harvest and for processing by local mills.

In the current analysis, low productivity stands containing less than the minimum volume criterion (140 cubic metres per hectare of live volume) were included and scheduled for harvest in the first 10 years. The live volume component of these low productivity stands is 125 cubic metres per hectare for balsam-leading stands; 80 cubic metres per hectare for pine-leading stands and 82 cubic metres for spruce-leading stands. An analysis of these stands indicated that there was enough standing dead volume to enable these stands to meet the minimum merchantability criterion.

Of all of the sensitivity analyses conducted to increase timber supply beyond the base case level, the harvest of the deciduous component of coniferous-leading stands had the largest potential impact in this TSA. It must be understood that the base case timber supply is based on the management practices and assumptions outlined in the revised data package and in this discussion paper. If harvesting activity varies from these assumptions then the timber supply showed in the base case will not be realized.

The provincial chief forester's AAC determination is an independent judgment based on professional experience and consideration of the broad range of social, economic and environmental factors required under Section 8 of the *Forest Act*. This includes information obtained through the consultation process with First Nations. An AAC is neither the result of a calculation nor limited to the results of timber supply analysis; therefore, the new AAC may not be the same as any of the initial harvest levels depicted in any of the scenarios included in this document.

## Next Steps

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Comments on the discussion paper are requested by Friday, July 5, 2019 which provides for a review period that is beyond the standard 60-day time frame.

During the review period, ministry staff will be actively engaging with First Nations, licensees, stakeholder groups and the public. This includes a licensee-led field tour with the chief forester and district staff, which is planned for early July. This will allow for the chief forester to observe first-hand, the current state of the forest conditions in the Lakes TSA. This level of active engagement exceeds the established norms for the timber supply review process for TSAs in the province.

After the review period ends, the chief forester will then conduct a two-day determination meeting where she will consider not only information provided through the data package and timber supply analysis but also information,

objectives, and uncertainties that were unavailable or could not be quantified. This includes all of the input from the public review and First Nations consultation.

Approximately three months following the determination meeting, the chief forester will announce the new AAC in a rationale document. The chief forester's rationale statement provides a description of the new AAC, explains how the factors required under Section 8 of the *Forest Act* and, where appropriate, the input received from the public and First Nations were considered, and identifies where new information is required.

Following the chief forester's AAC decision, the Minister of FLNRORD apportions the volume to licence types based on a disposition plan prepared by the Regional Executive Director.

## **Your input is needed**

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Public input is an important part of establishing the allowable annual cut. The information and comments received from this review will be provided to the chief forester prior to determination of the new allowable annual cut. Feedback is welcomed on any aspect of this discussion paper or any other issue related to the timber supply review for the Lakes TSA. Ministry staff would be pleased to answer questions to help you prepare your response. Please send your comments to the resource district manager at the address below.

Your comments will be accepted until Friday, July 5, 2019.

You may identify yourself on the response if you wish. If you do, you are reminded that responses will be subject to the *Freedom of Information and Protection of Privacy Act* and may be made public. If the responses are made public, personal identifiers will be removed before the responses are released.

For more information or to submit comments, contact:

Resource District Manager  
BC Ministry of Forests, Lands, Natural Resource Operations and Rural  
Development  
Nadina Natural Resource District

183 Yellowhead Highway  
Box 999  
Burns Lake, BC V0J 1E0

Phone: (250) 692-2200

Or contact:

Agathe Bernard, Stewardship Officer  
Nadina Natural Resource District  
[Agathe.Bernard@gov.bc.ca](mailto:Agathe.Bernard@gov.bc.ca)

# Lakes TSA Discussion Paper

**April 2019**

Further information regarding the technical details of the timber supply analysis is available on request by contacting:

[Forests.ForestAnalysisBranchOffice@gov.bc.ca](mailto:Forests.ForestAnalysisBranchOffice@gov.bc.ca)

Visit the timber supply review web site:

<https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/timber-supply-review-and-allowable-annual-cut>



## Appendix 1: Acknowledgement of First Nations and Public Review and Comment

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### Acknowledgements

The Office of the Chief Forester and the Nadina Natural Resource District would like to acknowledge the substantial public engagement and participation by a large number of people at the open house following the release of the *Lakes Timber Supply Area Timber Supply Review Data Package* (June 2018). Written comments were provided by and/or meetings held with the following individuals, First Nations, companies and groups:

Amanda Carley	Babine Forest Products
Brian Mailloux	Richard Vossen
Dennis Firomski	Daniella Oake
Darel Panrucker	
Eric Hannula	BCTS
Earl Hughes	
Ian Gray	Cheslatta Forest Products
Fabian Michell	
Bill Miller	Decker Lake Forest Products
Gordon McFee	Ian Gray
Jan Makowski	
Jeff Gillanders	Fraser Lake Sawmills
Katie Lambert	Tan Calhoun
Patrick Pelletier	Jaret van der Giessen
Tanner Mielken	
Trieu Nguyen	Nechako Lumber
Jean and Richard Vossen	
	Pinnacle Pellet
Cheslatta Carrier Nation	Bernard Tobin
Ben Wilson	
	Tahtsa Timber
Lake Babine Nation	
	Bulkley Nechako Regional
Stellat'en First Nation	District
Tl'azt'en First Nation	Lakes Stakeholder Group
	Cindy Shelford
Ts'il Kaz Koh First Nation	
	Village of Burns Lake
Wet'suwet'en First Nation	
Yinka Dene Economic	
Development Limited	
Partnership	
Reg Ogen	

Key features of the timber supply review process are public documents and two 60-day review periods that allow First Nations, the public, licensees and other stakeholders to share information and provide input to the process. In keeping with the ‘*Guiding principles for AAC determinations*’ as described in the chief forester’s rationale statement, relevant input is used to confirm or adjust a conclusion, when addressing factors associated with AAC determinations. For the purposes of this discussion paper, input in the form of letters, data package review, or public engagement meeting comments have been concisely summarized in order of consideration that is consistent with the factors as required by Section 8 of the *Forest Act*.

## **8(8)(a)(i) The composition of the forest and its expected rate of growth on the area**

Land base contributing to timber harvesting

- *general comments:*

- Request for datasets and source data used in the development of the THLB be made available to download.

- *area based tenures:*

- *roads, trails and landings:*

- Comment that road widths applied in the data package were too large and therefore overestimated the non-productive area. Operational roads are most often reforested and sufficiently re-stocked.
- Future road development is expected to be minimal. Sensitivity analysis is required in consultation with licensees to look at current and future road construction practices.

- *inoperable areas:*

- Inoperable areas should not be excluded from this TSR (THLB) as approximately 5.6% of ‘inoperable areas have logging history using all or most of non-conventional harvest systems. Harvesting has been focused on gentler slopes to address the MPB outbreak.
- Steep slope data layer used in the TSR does not accurately reflect where harvesting has or is expected to occur. Steep slope operating procedures are developed on a case by case basis and can include ground based conventional or modified conventional (tethered) harvesting systems (licensee has access to).
- Request for a review of the TSR assumptions regarding steep slope cut-offs be done.

- *low productivity and non-economic stands:*

- Concern that low productivity stands including problem forest types (PFTs) and some deciduous-leading stands should not be removed from the THLB but managed in the analysis through: (a) minimum age and volume thresholds, (b) reductions to stand yield curves, and (c) consideration of the coniferous component of some deciduous-leading stands (e.g., some deciduous-leading VRI polygons have a 60% coniferous component). Request for additional sensitivity analysis.

- *current inventory*

- Concerns regarding discrepancies between Vegetation Resources Inventory (VRI) data layers available from the BCGW *versus* VRI used in the TSR data package (e.g. updates to the block history).
- Request for clarification regarding the calculation of dead volume by species, and if dead pine stands are being converted to deciduous-leading and thereafter removed from the THLB.

- Request for further assessment of stands post-MPB be done to determine if age classes in the VRI could shift to reflect the loss of pine.

## *-volume estimates for managed stands*

- Concerns that stands in the Lakes TSA are generally healthy and OAF application is not justified for rusts.

## *-deciduous utilization*

- Concern that deciduous utilization is happening with bioenergy facilities; therefore a 100% reduction for the deciduous component of conifer-leading stands is not appropriate.

## *-minimum harvest age/volume*

- Concern regarding the minimum harvest volume used of 170 m<sup>3</sup>/ha AND 80 years. Licensees in the TSA are harvesting stands with less than this. Rates of growth may increase with warming climate allowing for 170 m<sup>3</sup>/ha to be reached before 80 years. Request for additional sensitivity analysis.
- Request for review of TSR assumptions regarding minimum harvest age/volume.

## *-operable adjustment factors:*

- Concern that the application of OAF 1 and 2 in combination with the loss factors is over-accounting for losses in plantations.

## **8(8)(a)(ii) The expected time it will take the forest to become re-established on the area following denudation**

*- regeneration delay*

*- not satisfactorily restocked areas*

## **8(8)(a)(iii) Silviculture treatments applied to the area**

### *-silvicultural systems*

- Concern that the list of harvesting systems is not complete as per actual operations on the TSA: e.g., does not include tethered ground systems.

### *-genetic gain*

- Concern that Class A seed was deployed more extensively than reflected in the analysis; e.g., for spruce exclusively since 1997. Therefore, 'genetic gain is not applied to any species' in the data package is incorrect.

## **8(8)(a)(iv) The standard of timber utilization and allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area**

### *-utilization*

- Concerns that a 15 cm stump height be used in the base case to reflect IFPA findings.

### *-grade 4 credit*

- Support for grade 4 credit incentives to harvest low grade logs.

### *-residual waste*

- Concerns regarding the amount of wood waste still being left in debris piles on harvested blocks.

## **8(8)(a)(v) The constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production**

### *-integrated resource management objectives*

- Concerns regarding accurate reflection (in the analysis) of criteria specified in Lakes North and South Sustainable Resource Management Plan (SRMP)

### *-visual quality objectives*

- A temporal approach to visual landscape management should be considered in the analysis.
- Concerns regarding how VQOs were modelled, e.g., calculation of area-weighted averages, slope classes, summary of ages etc.

### *-riparian management areas*

- Recommendation that the legally approved forest stewardship (FSP) stream width buffers; not FREP data (limited amounts available) be applied to analysis.

### *-wildlife tree retention (WTR)*

- Recommendation that the approach used in the 2010 TSR data package where future WTRs are applied as a reduction and not removed from the THLB.

### *-climate change*

- Concerns regarding climate change being reflected in growth patterns.

## **8(8)(a)(vi) Any other information that, in the chief forester's opinion, relates to the capability of the area to produce timber**

### *-harvest performance:*

- Concern that AAC decision considers licensee ability and likelihood to perform rather than base analysis on past performance; particularly with respect to mountain pine beetle stands.
- Concerns that the data package assumptions do not align with current licensee forest management practices and performance which are in transition.

### *-partitions:*

- Request for live/dead and deciduous partitions.

## **8(8)(b) The short and long term implications to British Columbia of alternative rates of timber harvesting from the area**

### *-alternate harvest flows*

- Concern that even-flow modelling for this TSR is not appropriate and adds risk to the management of the over mature forests of the Lakes TSA.

## **8(8)(d) The economic and social objectives of the government, as expressed by the minister, for the area, for the general region and for British Columbia**

- Concerns regarding mitigation efforts to minimize the negative impacts to the local mills and the Burns Lake community.
- Request for the provincial government to do more to support processing facilities in the Lakes TSA.

- Requests for the chief forester particularly consider socio-economic conditions in the Lakes TSA. It is recommended that the provincial government work to diversify the economy in the Lakes TSA; particularly in the Burns Lake community. Also it is important to protect it from catastrophic wildfires that may be linked to the mature forests that have been retained for social and environmental reasons.
- Request for the government do everything it can to keep the mill running and to provide much needed jobs.

## **8(8)(e) Abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area**

### *-Mountain pine beetle:*

- Request for continued incentives to harvest in MPB/fire damaged stands.
- Comment that pine as a percent of total harvest has remained relatively stable (average of 58% between 2010 and 2016); not declining as assumed in the analysis.

### *-Wildfire:*

- Request for analysis that considers the impact to timber supply of fire/burned areas.

### *-other concerns and comments:*

- Request for the government commitments from the 2012 Lakes TSA mid-term timber supply review be met.
  - Request for additional sensitivity analysis to examine volume losses from wildfire on woodlots and other area based tenures.
  - Concern that silvicultural systems should be designed to mitigate the impact of wildfires.
  - Request for a review of 'dated' higher-level plans and GAR orders be done to update and support this TSR.
  - Request for more flexible approaches be applied to visual resources, to allow for continued MPB salvage efforts. These relaxed standards were used with the Merritt TSA. The high level of disturbance in the Lakes TSA from MPB and wildfire requires this consideration.
  - Logging methods should acknowledge the use of other systems like cable, hoe-chucking, tethered etc.
  - Concerns regarding the extent and purpose of old-growth management areas (OGMAs).
  - Section 18 transfers.
  - TSA amalgamation.
  - Concerns regarding alleged bioenergy sector advantage vs. cycle times for hauling.
  - Request for locally-owned and managed forests.
  - Perceptions regarding logs leaving the local community (to be processed elsewhere).
  - Concerns regarding re-charting exercise and timing of apportionment.
  - Concerns regarding community wildfire protection plan (CWPP) and development of implementation action plan.
  - Concerns regarding employment opportunities for First Nations.
  - Request for 3-phase power to be brought to the south side to potentially stimulate economic development.
  - Request for a fibre-based AAC.