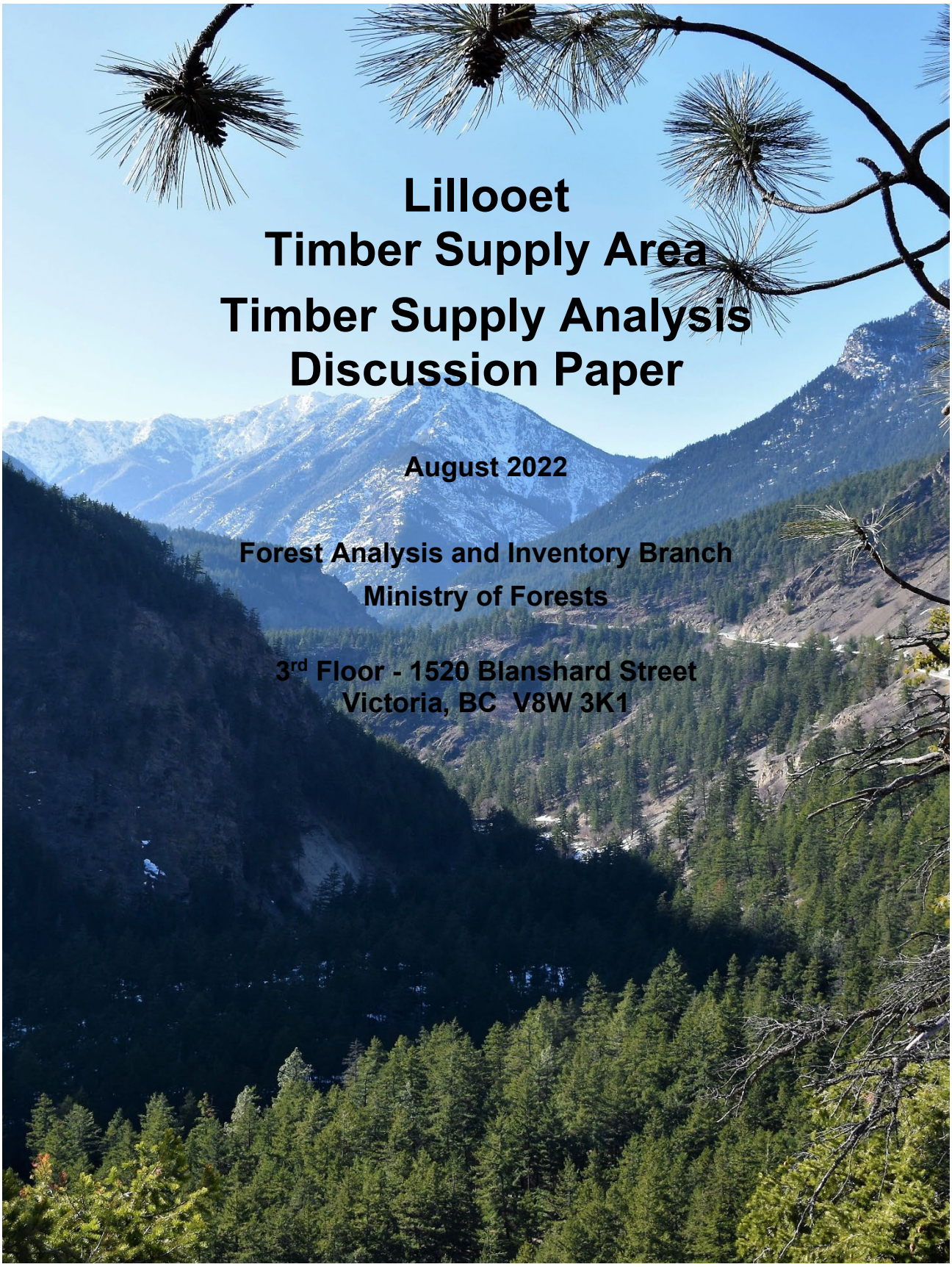

Lillooet Timber Supply Area

Timber Supply Analysis Discussion Paper

August 2022

Forest Analysis and Inventory Branch

Ministry of Forests

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Introduction

The British Columbia Ministry of Forests regularly reviews the timber supply[a] for all timber supply areas[b] (TSA) and tree farm licences[c] (TFL) in the province. This review 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. Based on this review, the chief forester will determine a new allowable annual cut[d] (AAC) for the Lillooet TSA.

According to Section 8 of the *Forest Act* the chief forester must regularly review and set new AACs for all 37 TSAs and 33 TFLs in the Province of British Columbia (BC).

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;
- set a new AAC; 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 Lillooet TSA. Details about the data and assumptions used in the analysis were provided in a data package (January 2021). Updates to the information used and technical details regarding the analysis are available on request from the Forest Analysis and Inventory Branch (FAIB). The timber supply analysis should be viewed as a "work in progress". Prior to the chief forester's AAC determination for the TSA, further analysis may need to be completed and existing analysis reassessed as a result of input received on this discussion paper.

Timber supply reviews undertaken in support of AAC determinations are based on the current resource management objectives established by the provincial government in legislation and by legal orders. For the purposes of the Lillooet TSA timber supply review, the current legal requirements and demonstrated management practices for the TSA and for the purpose of the TSR are defined by:

- current land base information for land ownership, topography, forest inventories, etc.;
- the current forest management regime which includes the productive forest land available for timber harvesting, the silviculture treatments, the harvesting systems, and the integrated resource management practices used in the area;
- land use plans approved by Cabinet; and
- legal objectives established under the *Forest and Range Practices Act* and the *Land Act* (e.g., visual quality objectives, wildlife habitat areas, and ungulate winter ranges).

The information compiled to support this timber supply review can be made available to support land use planning as required. However, land use planning and land use decisions are outside the scope of the chief forester's AAC determination. In the event that resource management objectives and practices change, these changes can be reflected in future timber supply reviews.

[a] **Timber supply**
Timber supply is the amount of timber available for harvesting over a specified period of time.

[b] **Timber supply areas (TSAs)**
Timber supply areas are integrated resource management units established in accordance with Section 7 of the Forest Act.

[c] **Tree farm licences (TFLs)**
Tree farm licences are tenures that grant exclusive rights to harvest timber and manage forests in a specific area; may include private land.

[d] **Allowable annual cut (AAC)**
Allowable annual cut is the maximum volume of timber available for harvesting each year from a specified area of land, usually expressed as cubic metres of wood.

Timber supply review in the Lillooet TSA

The current AAC for the Lillooet TSA, set on May 1, 2009, is 570 000 cubic metres, of which 400 000 cubic metres are specified as harvestable from species other than pine. This AAC was determined with the expectation that the harvesting in the TSA would be managed wherever possible to address the problem of the mountain pine beetle infestation. The AAC partition was specified with the intent of preventing the over-utilization of non-pine timber types that are necessary to support harvesting in the mid-term.

In January 2021, a data package documenting the data and forest management assumptions to be used in this timber supply analysis was released for public review and to support First Nations consultation. This discussion paper was released in order to provide an overview of the timber supply review and to highlight the key findings of the timber supply analysis for the Lillooet 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 provincial government agencies, First Nations, the public, and licensees. Following this review, the chief forester's determination will be outlined in a rationale statement that will be publicly available. The actual AAC that is determined by the chief forester during this timber supply review may differ from the harvest projections presented in this discussion paper as the chief forester must consider a wide range of information, some of which is not quantifiable. Ultimately, the chief forester's AAC determination is an independent and 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 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 and, where possible, to new opportunities.

Description of the Lillooet TSA

The Lillooet TSA covers approximately 1.125 million hectares in southwestern British Columbia, between the Coast Mountains and the Thompson Okanagan Plateau. The TSA is administered by the Ministry of Forests Cascades Natural Resource District (CNRD) in Merritt, BC, with a small field office in Lillooet.

The regional service center in the TSA is the town of Lillooet which accounts for roughly 40 per cent of the relatively small population of about 6500 within the TSA. The village of Lytton is the only other incorporated settlement in the TSA but there are several larger unincorporated communities including Bralorne, Gold Bridge, Spences Bridge, and the First Nations communities of Tsal'alh, Xwisten, Sekw'el'was, T'it'q'et, Xaxli'p, Ts'kw'aylaxw, Kanaka Bar, Skuppah, Nicomen, Lytton, Cook's Ferry, and Siska. It is estimated that half of the residents within the TSA are First Nations' members.

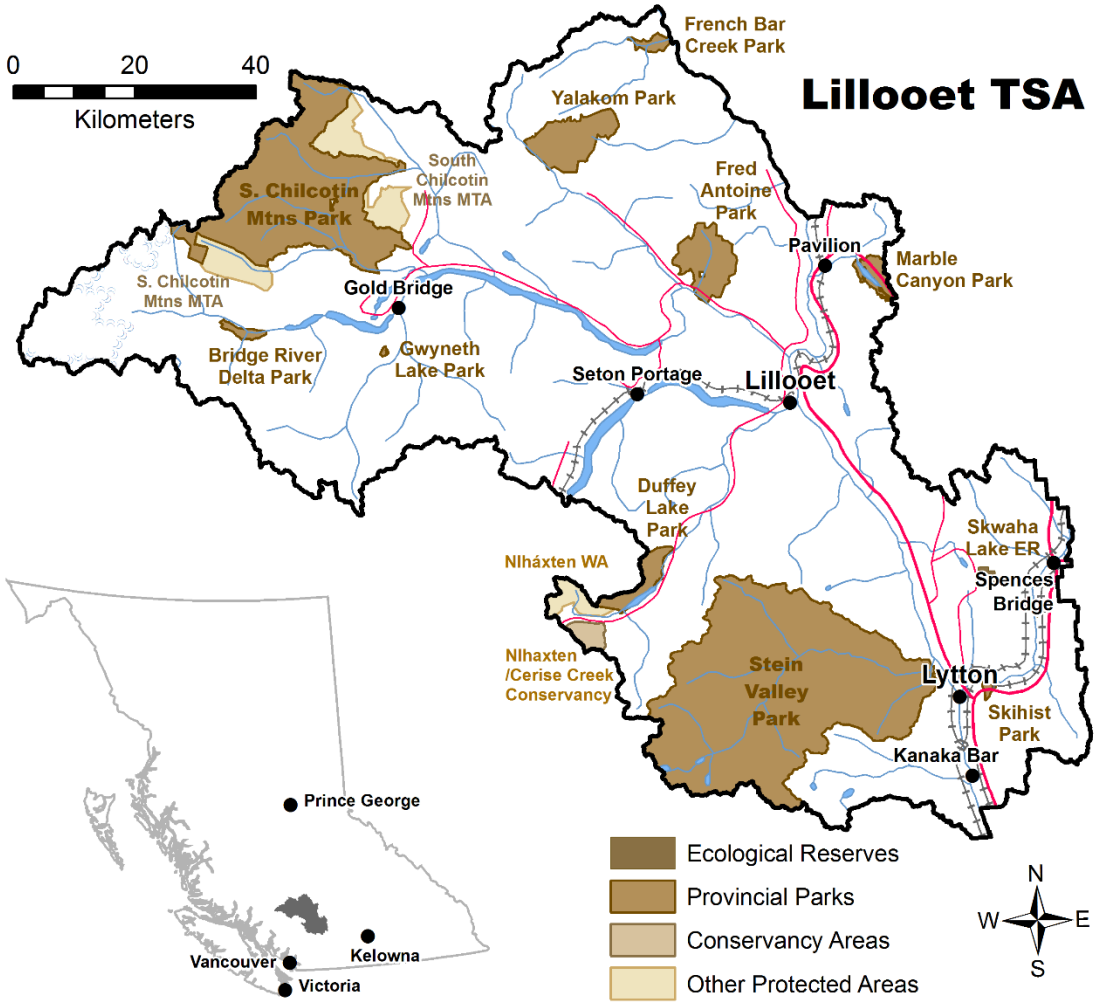

Figure 1. Map of the Lillooet TSA.

Natural resource values and old growth

The Biogeoclimatic Ecosystem Classification (BEC) is a system developed by V.J. Krajina to classify and manage sites based on their ecosystems. There are 14 BEC zones identified in British Columbia. Zones are used at the broadest scale and reflect large geographic areas with a similar type of macroclimate. Within the Lillooet TSA, the rugged topography and the dramatic climatic variations of mountainous terrain give rise to seven BEC zones with 30 variants. The varied landscapes include dry grasslands, coniferous forests, and alpine tundra, at lower, middle, and higher elevations respectively and contribute to high biodiversity values. In the western portion of the TSA, temperate rainforest conditions predominate, while eastern areas are dominated by the semi-arid and dry grassland landscapes of the province's interior dry belt. These wide-ranging landscapes support diverse forest types dominated by lodgepole pine, Douglas-fir, and spruce, with other species including ponderosa pine, white bark pine, subalpine fir (balsam), western redcedar, and hemlock.

There are several provincial parks and protected areas located in the TSA that support significant recreation activities, including mountain biking, hiking, climbing, fishing, camping, wildlife viewing, whitewater boating, heliskiing, snowmobiling, ski mountaineering, and cross country skiing.

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 and range practices. Under FRPA, the Forest Planning and Practices Regulation (FPPR) identifies objectives set by provincial government for environmental values including fish, wildlife, biodiversity, soils, and water that are to be addressed within forest stewardship plans. There are 10 red-listed species (endangered or threatened) and 30 blue-listed species (Species of Concern) that may be found in the TSA. Specific objectives for ungulate winter range management are in place under the FPPR Section 7 notices for mule deer, bighorn sheep, elk, mountain goats, and moose. Wildlife habitat areas have been established for several species at risk including spotted owl, coastal tailed frog, Western screech owl, Lewis's woodpecker, and most recently grizzly bear. 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, wildlife habitat areas, critical habitat for fish, and old growth management areas.

On April 30, 2020, an independent panel appointed by the BC Government submitted their report *A New Future for Old Forests: A Strategic Review of How British Columbia Manages for Old Forests Within its Ancient Ecosystems*. Currently, the BC Government is engaging with First Nations across the Province about how recommendations from the report will be implemented within the context of a Provincial strategy for the management of old forests. Recommendation 6 in the strategic review is to "defer development in old forests where ecosystems are at a very high risk of irreversible biodiversity loss". To help identify priority at-risk old growth ecosystems and prioritize areas for temporary deferral, the BC Government consulted an independent Old Growth Technical Advisory Panel (TAP).

FAIB staff have evaluated the resulting Priority Deferral Areas map created by the TAP and have determined that there are approximately 72 000 hectares of the TSR analysis forest land base (AFLB) that are considered by the TAP to be priority at-risk old forest. These estimates are subject to change contingent upon ongoing engagement with First Nations. Currently, the proposed old growth deferrals are comprised of areas either within the TAP, priority at-risk old forest, or are areas within First Nations proposed deferral areas. Any changes to the protected status of these areas, resulting from the work of the panel, will be accounted for in subsequent timber supply reviews for the Lillooet TSA, or the AAC may be adjusted in the interim by *Chief Forester's Order*.

Over time there has been increasing recognition of the complex management requirements of the dry forests characterized by ponderosa pine and Interior Douglas-fir. The interior dry forests provide a wide range of biodiversity values are often adjacent to communities and associated infrastructure, and support high levels of recreation. Increasingly climate change and its effects on wildlife, fire risk, and forest productivity is becoming more apparent in the lower, dryer regions of the province. The timber supply analysis has investigated alternative silviculture approaches to managing the interior dry forests in the TSA.

Cumulative effects are the changes in environmental, social, and economic values that result from the combined effect of past, present, and reasonably foreseeable future activities or events. The provincial government has developed, and is implementing, a cumulative effects framework (CEF). The CEF provides a strategic-level approach to assess and manage cumulative effects values. It facilitates periodic, landscape scale assessment of the current condition and trend for key values. Information regarding the current and potential future condition of cumulative effects values will be provided to support determination of the new AAC.

First Nations

Archaeological evidence and oral history indicate that First Nations have inhabited the Lillooet TSA since the last glaciation over 10,000 years ago. A large First Nations population is present in the TSA and is comprised of four Nations: St'at'imc, Nlaka'pamux, Secwepemc and Tsilhqot'in. The TSA overlaps the traditional territory of these nations.

The St'at'imc and Nlaka'pamux people are represented by many First Nations communities and tribal councils, of which 12 communities reside within the TSA. The remaining communities are located outside the Lillooet TSA but also use the area for sustenance, cultural, and spiritual activities.

The Nations conduct strategic planning, economic development, and coordination of information regarding their territories through their respective tribal councils or independently within their communities.

Since initiating the Lillooet TSR process in 2018, the Province has met with both the St'at'imc and Nlaka'pamux communities to discuss their perspectives on timber supply within their respective territories. The Province is committed to collaborative engagement with Indigenous communities on the Lillooet TSR until the AAC is determined.

The provincial government and the Nlaka'pamux Nation Tribal Council (which is comprised of Boothroyd Indian Band, Lytton First Nation, Oregon Jack Creek Indian Band, and Skuppah First Nation) have signed a land and resource decision making agreement that utilizes a shared decision-making board structure. Additionally, the recently signed comprehensive forestry agreement between the Nlaka'pamux Nation Tribal Council and the provincial government commits the parties to further developing their new and innovative model of forestry relations and includes forest licensees in tri-partite relations. Together the parties are working towards principles of a decision-making process that reflects the standard of free, prior, and informed consent and shared decision-making.

The provincial government will continue to work with other First Nations to understand their interests in the timber supply review and their territory.

Regional economy

The communities in the TSA have long based their economy on natural resources, with forestry continuing to be the largest industry. However, the only major timber processing facility in the TSA is Aspen Planer's veneer plant located in Lillooet. As there are no primary milling facilities, sawlogs must leave the TSA to be processed, typically in Merritt.

The area is well linked to the rest of BC by four highways and three rail lines. Other contributors to the regional economy include tourism, agriculture, and mining. Outdoor recreation opportunities in the TSA are exceptional. There are currently joint ventures between business, industry and First Nations being developed.

Land use planning

The Lillooet Land and Resource Management Plan (LRMP) process was initiated in 1995 and entailed a planning table consisting of varied interest groups tasked with developing the LRMP. In March 2001, after five years of discussion and negotiation, the planning table submitted two land use options. The provincial government at the time accepted one plan, however, with an election resulting in a change of government in 2001, the new government desired further social and economic assessment given the polarized nature of the planning table. On July 22, 2004, the Ministry of Sustainable Resource Management released an updated draft LRMP that reflects changes in land use planning policy.

The draft LRMP was never submitted to cabinet for review and approval. Since the release of the draft LRMP, components of the plan have been implemented under various legislation. These include parks and other protected areas, visually sensitive areas, and significant wildlife habitat areas for spotted owl.

In 2008, the Lil'wat Nation and the Province of British Columbia signed a land use planning agreement that attempts to harmonize the draft Sea-to-Sky LRMP and the draft Lillooet LRMP. While most of this agreement applies to the draft Sea-to-Sky LRMP area, it is also applicable to areas located at the most western tip and in the southwest portion of the TSA. Areas included are the Nlháxten / Duffey Lake Park addition, Nlháxten / Cayoosh Cultural Management Area, and Birkenhead River headwaters.

Since the previous TSR in 2009, there have been 15 areas that have been officially protected including eight Provincial Parks, three Mining and Tourism areas, two Culturally Significant Areas, and one Wildland Area, and Conservancy Area respectively.

History of the allowable annual cut and harvesting performance

Prior to 1982, the AAC for the Lillooet TSA was 650 000 cubic metres. In 1982, the AAC was temporarily increased to 800 000 cubic metres to allow for harvesting targeted to control the mountain pine beetle (MPB) infestation and the salvage of damaged timber. The temporary increase expired in 1985 and the AAC was returned to 650 000 cubic metres. In 1996, the AAC was reduced to 643 500 cubic metres to account for the designation of the Stein Valley Nlaka'pamux Heritage Park. The AAC was further reduced to 635 900 cubic metres in 2002 to account for the issuance of new woodlot licences. A timber supply review determination, effective May 1, 2009, set the AAC for the Lillooet TSA to be 570 000 cubic metres, of which 400 000 cubic metres are specified as harvestable from species other than pine. This AAC was predicated on the condition of the AAC to be managed to accommodate salvage of MPB damaged stands. This included land base exclusions to account for recently established woodlot licences and the Xaxli'p Community Forest Agreement.

Table 1. History of the AAC – Lillooet TSA

Year	AAC (m^3/year)	Notes
Pre-1982	650,000	
1982	800,000	Uplift for MPB control
1985	650,000	
1996	643,500	Designation of Stein Valley Issuance of new woodlot licences
2002	635,900	
2009	570,000	Issuance of new woodlot licences and the Xaxli'p Community Forest. Introduction of a 400 000 m^3 non-pine partition.

The following table (Table 2) summarizes the volume harvested between 2016 and 2020 based on data from the Harvest Billing System (HBS). The average harvest volume during the five-year period was 288 536 cubic metres per year, about 49 percent of the AAC. The average non-pine volume of 198 191 cubic metres per year was well below the limit of 400 000 cubic metres per year specified in the AAC determination. Dead volume accounts for 20 percent of the total harvest volume.

Table 2. Harvest performance for the period 2016 to 2020 – Lillooet TSA

Year	Total (m^3/year)	Non-pine (m^3/year)	Pine (m^3/year)	Live (m^3/year)	Dead (m^3/year)
2016	332,820	235,408	97,412	246,067	86,753
2017	261,078	210,536	50,542	208,960	52,118
2018	331,872	200,674	131,198	271,308	60,564
2019	213,779	149,915	63,864	178,833	34,946
2020	303,130	194,425	108,705	250,157	52,973
Average	**288,536**	**198,191**	**90,344**	**231,065**	**57,471**

Forest management

Major natural disturbances

Between 2005 and 2017, more than 4.5 million cubic metres of merchantable lodgepole pine was killed within the TSA by the MPB infestation. These losses and all salvage harvesting have been incorporated into the forest cover inventory data used in the timber supply analysis.

Since the previous TSR in 2009 to 2020, wildfires have affected 44 450 hectares. Of this area, most of the managed land base has been reforested through the Forests for Tomorrow Program. The 2021 fire season affected 25 959 hectares of the timber harvesting land base[e] (THLB) and its impact is not included in the base case but will be assessed and presented to the chief forester for the AAC determination.

Timber harvesting land base and significant changes since the last timber supply review

As part of the process used to define the modelled timber harvesting land base (THLB) in the timber supply analysis, a series of deductions were made from the TSA land base. Table 3 shows categories of land that were considered not to contribute to the THLB. The table presents the area of the categories within the gross TSA boundary and the area for each factor that was uniquely (i.e., no overlaps with other factors) considered excluded from timber harvesting. It is important to note that harvesting is not limited to the THLB, however it is the location in which harvesting is likely to occur.

The total area within the TSA boundary covers 1 125 019 hectares, of which 46 per cent, or 513 859 hectares, was within the analysis forest land base[f] (AFLB). Parks, unstable terrain, old growth management areas, wildlife habitat, ungulate winter range, and retention areas for riparian management and wildlife trees made up 185 508 hectares of the AFLB. Those areas were intended to protect wildlife habitat and water and to provide recreation opportunities. About 32 percent of the AFLB, or 14 percent of the total TSA area, was included in the current THLB of 163 040 hectares.

The THLB is 31 percent smaller than the THLB defined in the previous Lillooet TSR. The decrease in the THLB results from the exclusion of old growth management areas and culturally significant areas, establishment of wildlife habitat areas, enhanced riparian data, and a more refined low site stand definition. Detailed information on the development of the THLB can be found within the January 2021 *Data Package*.

[e]**Timber harvesting land base (THLB)**
The 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.

[f]**Analysis forest land base (AFLB)**
The forested area of the TSA that the provincial government manages for a variety of natural resource values. This 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 (e.g., brush areas). The analysis forest does include federally-protected areas because of their contribution to biodiversity.

Table 3. Land base classification – Lillooet TSA

Land classification	Gross area (ha)	Net area		
		Area (ha)	% of total	% of AFLB
Total	**1,125,019**			
Non-Crown land	78,793	78,793	7.00%	
Non-productive land	529,838	510,882	45.41%	
Existing roads	21,484	21,484	1.91%	
Analysis forest land base (AFLB)	**513,859**		**45.68%**	
Protected area	207,653	75,860		14.76%
Non-commercial brush	538	308		0.06%
Archaeological area	724	243		0.05%
Cultural significance area	1,464	1,229		0.24%
Old growth management area	74,854	49,568		9.65%
Wildlife habitat area	21,398	13,590		2.64%
Riparian	54,278	17,092		3.33%
Deciduous-leading stands	5,777	2,125		0.41%
Inoperable	566,909	68,553		13.34%
Low site	767,932	96,758		18.83%
Unstable terrain	68,210	13,150		2.56%
Wildlife tree patches	12,341	12,341		2.40%
Timber harvesting land base (THLB)	**163,040**			**31.73%**
Future roads	7,794			
Long-term THLB	**155,246**			**30.21%**

Figure 2 shows the current age class distribution for forests in the AFLB separated by THLB and non-THLB. There is a large amount of mature forest (i.e., 141 to 250 years) in the TSA, especially in the non-THLB portion.

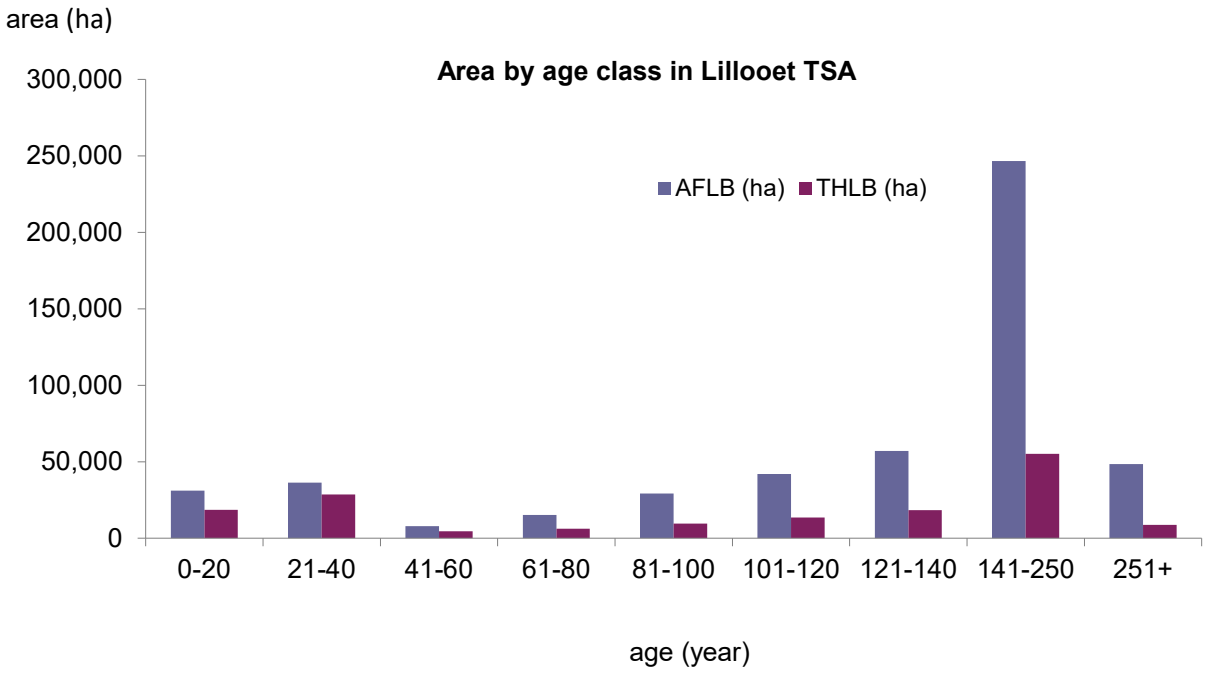

Figure 2. Age class distribution for the analysis forest land base Lillooet TSA.

Figure 3 summarizes the area and current volume by leading species on the THLB and shows that pine, Douglas-fir, spruce, and balsam-leading stands are the main stand types in the THLB. Cedar, larch, hemlock, and deciduous-leading stands are present but each accounts for less than one percent of the THLB.

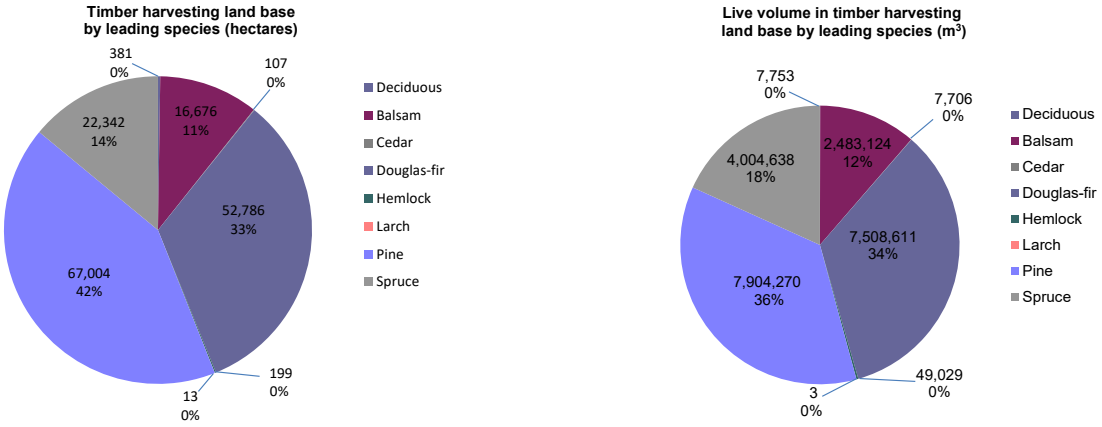

Figure 3. Leading species by area and by volume within the timber harvesting land base – Lillooet TSA.

Timber supply projection

For most AAC determinations, a timber supply analysis is 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 decrease or increase, 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 provides a baseline harvest flow from which the chief forester can understand the dynamics of timber supply. The base case was designed to reflect current management practices.

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 base case is not an AAC recommendation. Rather, it is one possible timber supply projection, whose validity, 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 additional projections are either 'alternative projections' or 'sensitivity analyses'. The base case, alternative projections, 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.

Woodstock spatial timber supply model (Remsoft Inc.) was used to generate the timber supply analysis presented in this discussion paper.

The base case projection

In this analysis, the base case was constructed as a maximum even-flow, as shown in Figure 4. The projection begins in 2019 with a sustained harvest level of 311 359 cubic meters per year constant through the modelled time horizon. The base case projection is 45 percent lower than the current AAC and 25 percent lower than the TSR3 projection (413 900 cubic metres per year). The lower base case projection reflects the 31 percent reduction in the THLB (since the previous TSR), volume lost due to the mountain pine infestation, and a lower level of harvest performance within the term of the current AAC.

An alternative harvest forecast conducted for this review demonstrated that it is not possible to elevate the short-term timber supply above the base case even-flow without disruption to the mid-term timber supply.

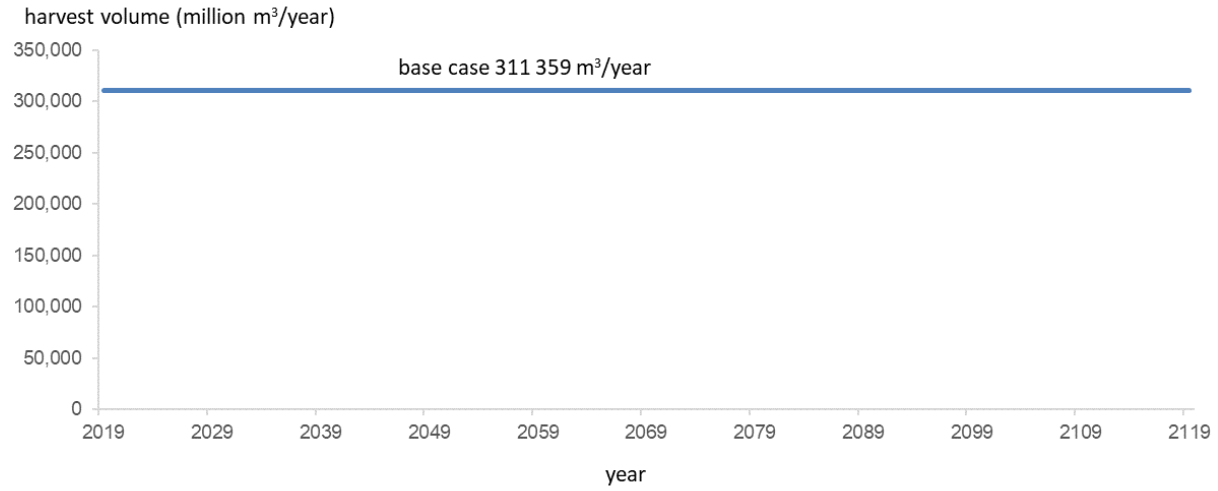

Figure 4. Base case harvest flow – Lillooet TSA.

Figure 5 presents the projected transition from the harvest of natural stands to managed stands over time. For the first 55 years, natural stands support almost the entire harvest but after 65 years, managed stands account for more than half of the harvest volume. The transition is also responsible for the projected decline in harvest age over time (Figure 5) as harvesting shifts to younger managed stands. During the first 55 years when natural stands are harvested, the average harvest stand age declines from 230 years to 165 years, and after 65 years when managed stands become the main source of harvest, the average harvest age drops to the range of 92 to 99 years (Figure 6).

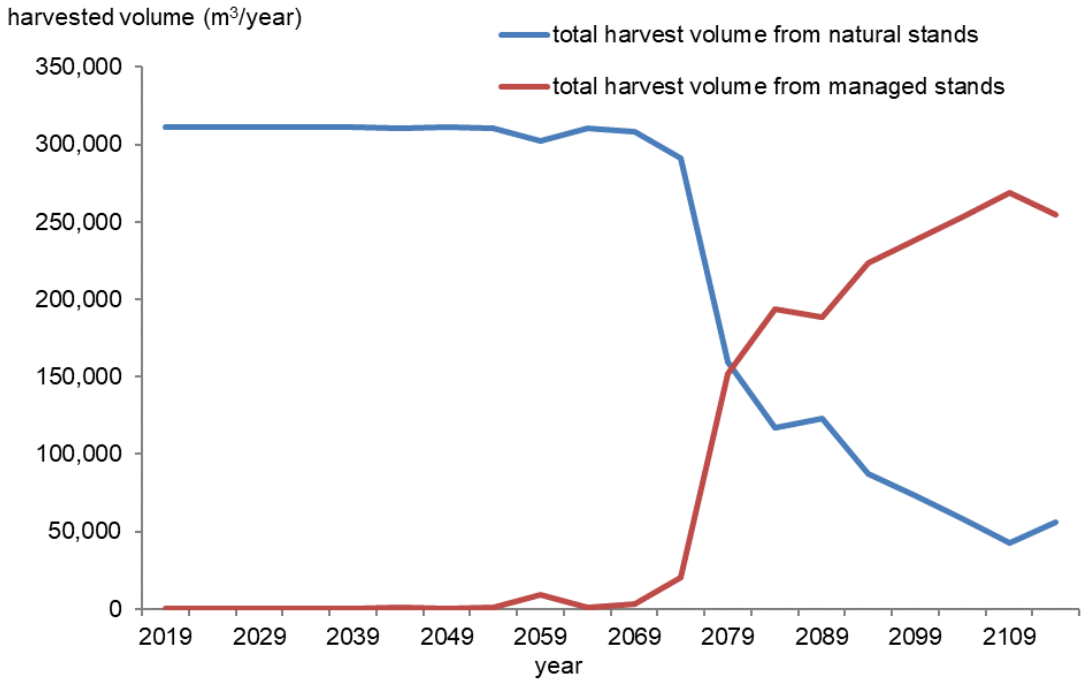

Figure 5. Volume by natural and managed stand types for base case – Lillooet TSA.

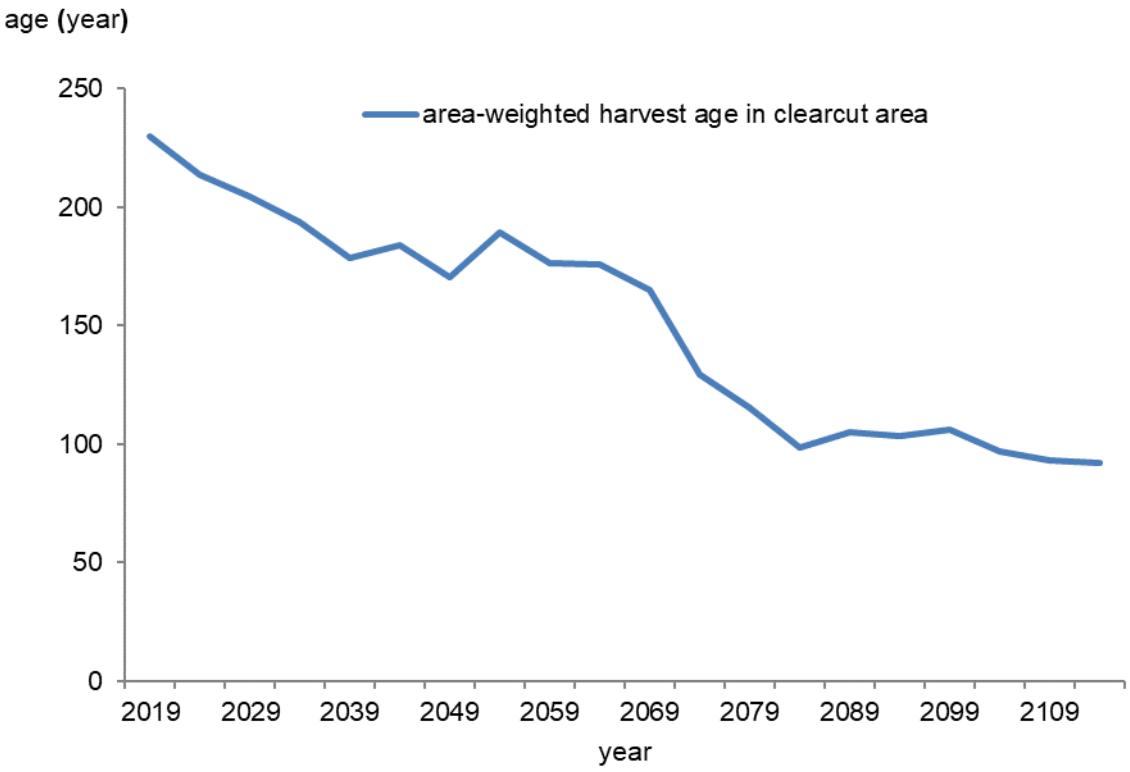

Figure 6. Harvest age of the base case – Lillooet TSA.

The average harvest stand volume fluctuates between 190 to 259 cubic metres per hectare (Figure 7).

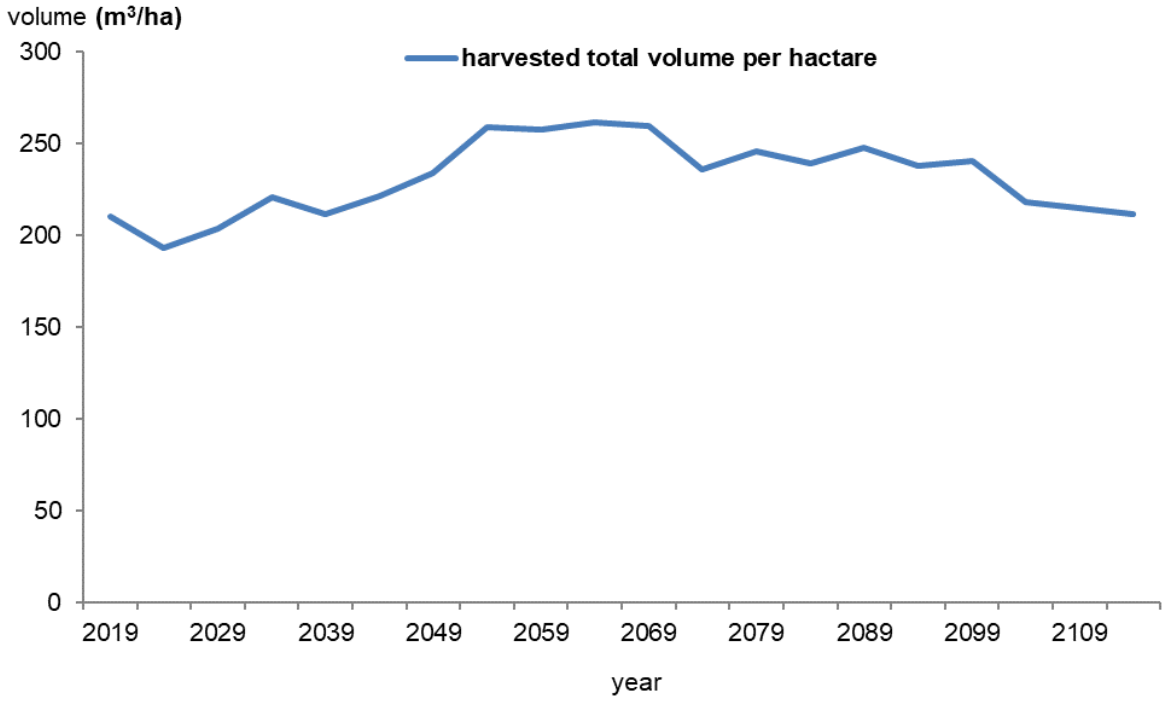

Figure 7. Mean volume per hectare for base case – Lillooet TSA.

Sensitivity analyses

The base case used 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. Although the base case was designed to reflect current management in the Lillooet TSA, there is uncertainty about some management information and the modelling framework. Therefore, sensitivity analyses are used to provide further understanding by examining the effect on timber supply of uncertainty in data and assumptions.

Timber harvesting land base sensitivities

Two sensitivity analyses explored the effect on timber supply of decreasing the size of the THLB by five per cent and 10 percent respectively. These sensitivities were conducted to evaluate the impact of potential additional constraints on the land base for First Nations values and Interests such as mushrooms and increased riparian buffers on streams.

Decreasing the size of the THLB by five percent lowered the harvest level by 4.9 percent to 296 194 cubic metres (Figure 8) and decreasing the size of the THLB by 10 percent lowered the harvest level by 9.6 percent. These sensitivity analyses demonstrate that the size of THLB is proportionately related to the volume available for harvest.

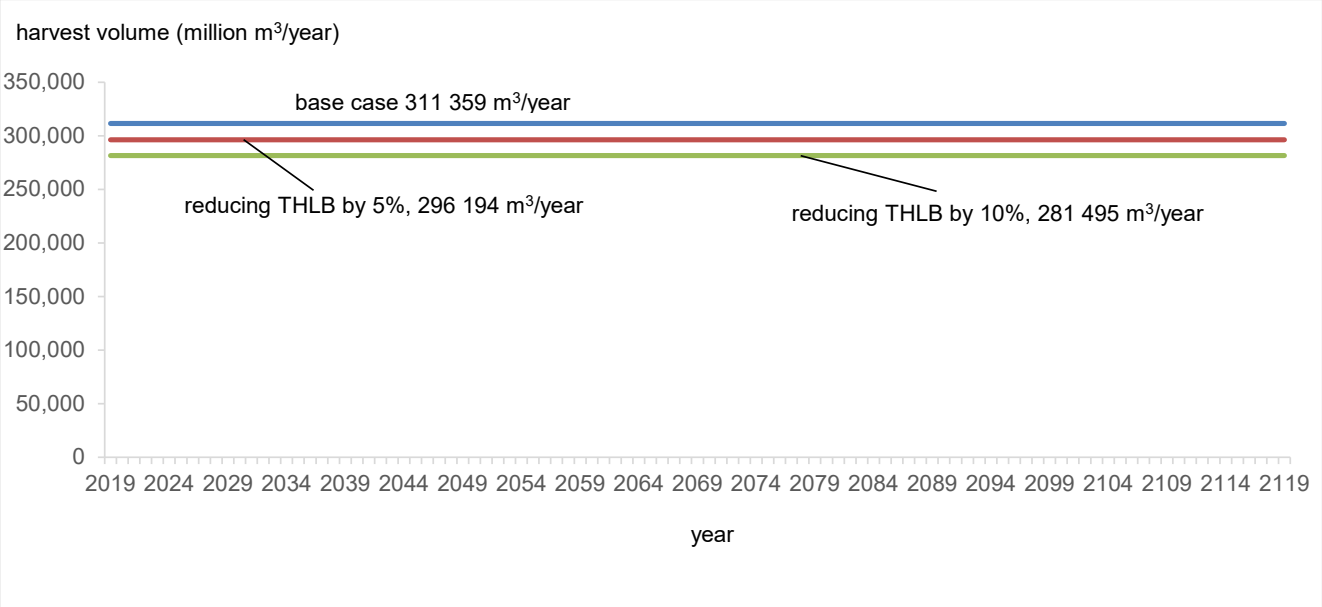

Figure 8. THLB sensitivity analyses - Lillooet TSA.

Harvesting profile sensitivity analyses

Harvest limitations due to the economic operability of stands is a key concern in the Lillooet TSA. Factors contributing to the economic feasibility of harvesting include road access and haul distance (i.e., cycle times), stand types (i.e., pine *versus* non-pine), minimum volume per hectare, and slope. Results from the base case indicated that the timber supply is heavily reliant on lower volume stands, stands on steep slopes, and stands with long haul distances in the first 50 years. To evaluate if the base case represents the current harvest profile across the land base, all stands harvested between 2016 to 2020 were summarized using data from the Electronic Commerce Appraisal System (ECAS) and compared to the profile of the base case harvest flow. When significant discrepancies were identified, the current profile was modelled in a sensitivity analysis to assess the impact on the harvest level.

Cycle time

Cycle time data from ECAS was used to develop the zones (in hours) that are summarized in Figure 9, which represent the total time allocated to hauling from the cutblock to a mill and back to the cutblock. When comparing the cycle time recorded from recent harvest activity to the cycle time projected by the model to support the initial harvest level, it was found that the distance profile of the ECAS data was generally consistent with that modelled in the base case (Figure 9). Therefore, no sensitivity analysis was conducted for the cycle time profile as the base case was consistent with the current harvest profile.

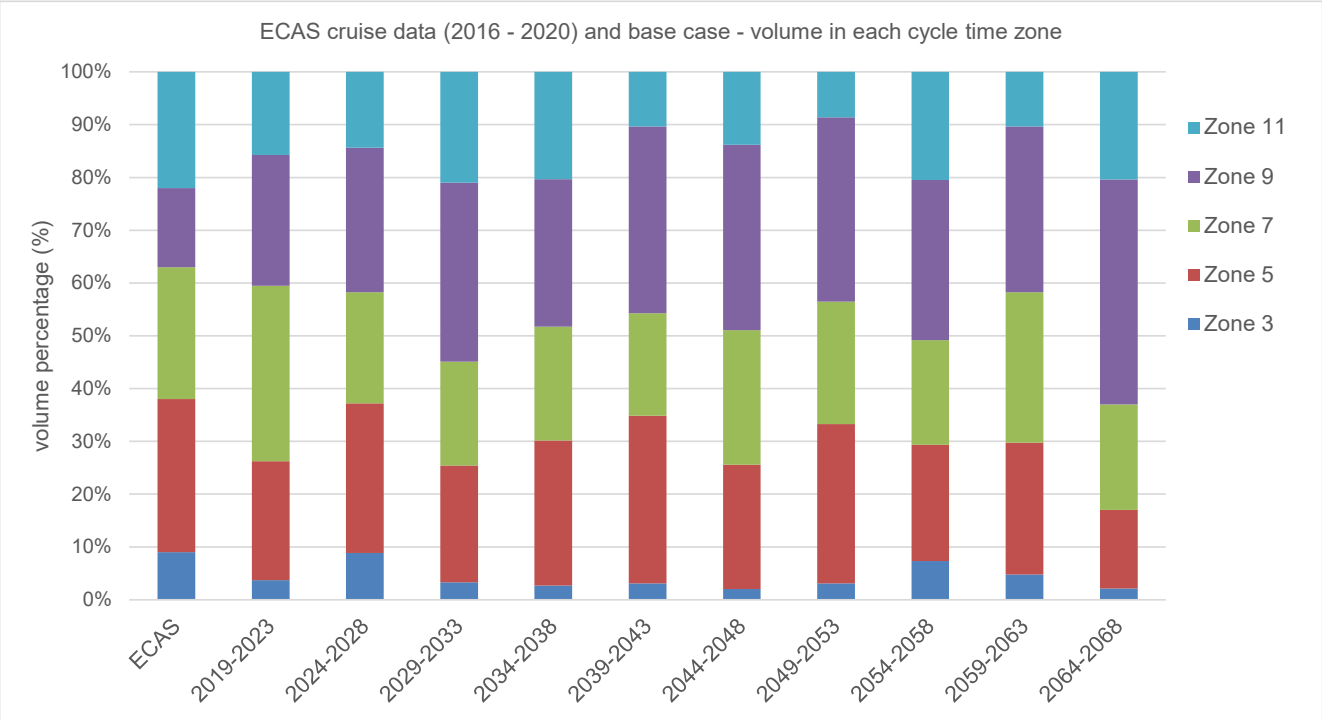

Figure 9. ECAS cruise data vs base case output – volume by cycle time - Lillooet TSA.

Stand type

The species profile projected to be harvested within the base case was compared to the volume and species mix that was recorded in the Harvest Billing System (HBS) between 2016 and 2020. It indicated that the harvest profile of pine *versus* non-pine projected in the base case was consistent with same profile in the data from the HBS (Figure 10), therefore, no sensitivity analysis was conducted for the stand type harvest profile.

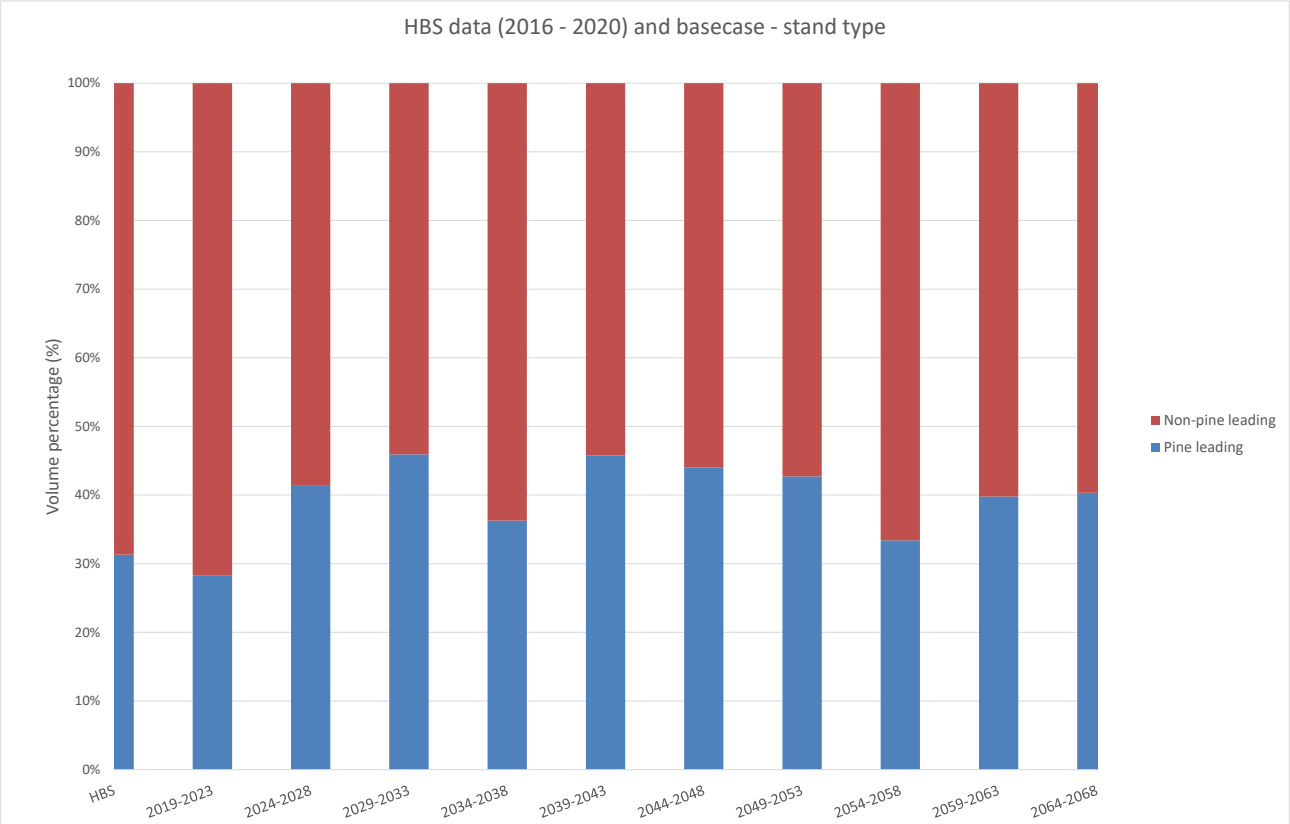

Figure 10. HBS data versus base case output – stand type - Lillooet TSA.

Low volume stands

The base case harvest projection relies heavily on the contribution from low volume stands for the first 30 years. As shown in Table 4, stands with 220 cubic metres per hectare or less provide 49 percent to 85 percent of the harvest profile, whereas the ECAS data indicate that low volume stands only account for 25 percent of the recent harvest profile (Figure 11). It should be noted that the average volume of 220 cubic metres per hectare in the base case is equivalent to 264 cubic metres per hectare in the ECAS data since the base case only accounts for live volume while recent harvest records indicate approximately 20 per cent dead volume (see Table 2).

Harvest performance in low volume stands was examined by a sensitivity analysis that limited the volume contribution from stands with 220 cubic metres per hectare or less to no more than 25 percent of the harvest. The harvest level was reduced by 14 percent to 267 633 cubic metres per year (Figure 12).

Table 4. Base case harvest flow by volume/hectare - Lillooet TSA

	Period	2019-2023	2024-2028	2029-2033	2034-2038	2039-2043	2044-2048	2049-2053	2054-2058	2059-2063	2064-2068
Clearcut volume/ha (m3/ha)											
150-220		60%	85%	69%	53%	57%	49%	34%	29%	29%	28%
220+		40%	15%	31%	47%	43%	51%	66%	71%	71%	72%
Total		**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

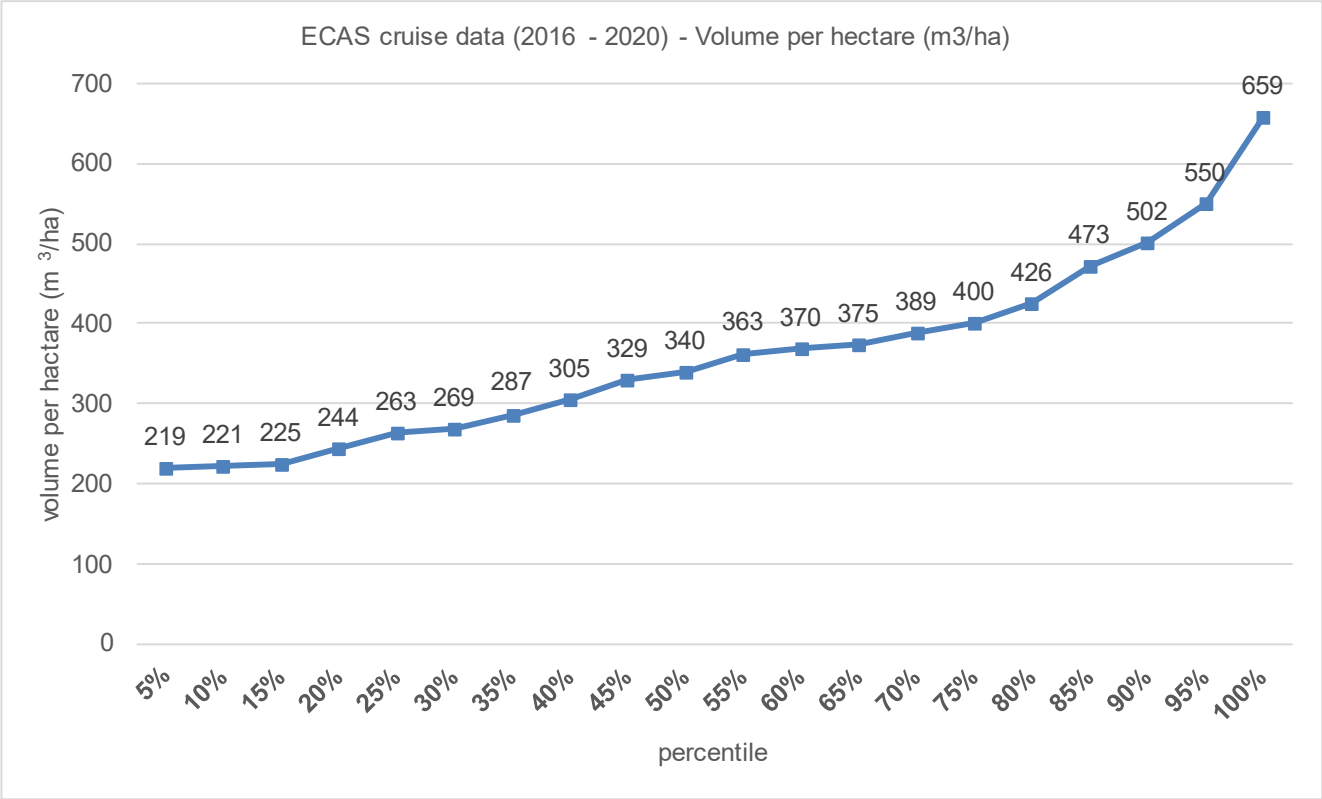

Figure 11. ECAS cruise data – volume per hectare - Lillooet TSA.

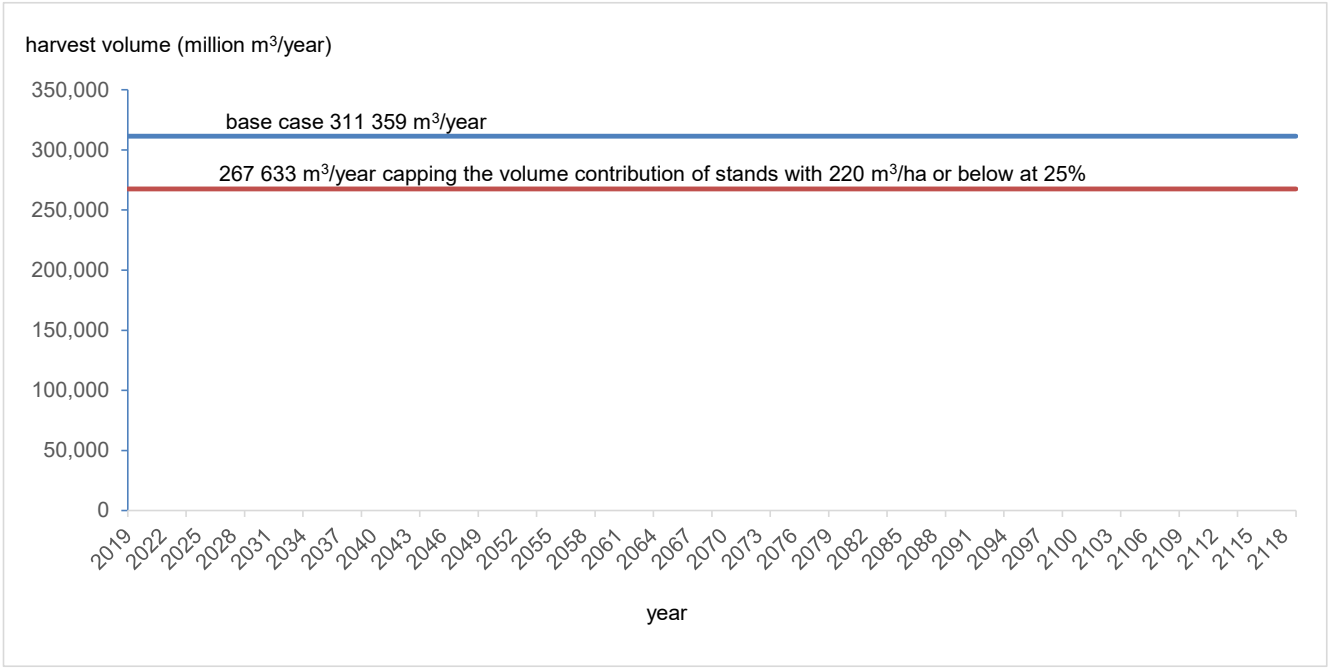

Figure 12. Capping the contribution of stands with low volume/hectare - Lillooet TSA.

Slope

The base case harvest projection relied heavily on the contribution of stands from steep slopes (e.g., greater than 40 percent slope). The harvest volume from stands on steep slopes accounted for 39 percent to 46 percent of the harvest profile (Table 5). The ECAS data indicate that only 20 percent of recent harvest volume was sourced from stands on steep slopes (Figure 13). A sensitivity analysis was completed that limited the contribution of steep slope stands to a maximum of 20 percent to represent current performance. This limitation decreased the harvest level by 16 percent to 260 923 cubic metres per year (Figure 14).

Table 5. Base case harvest flow by slope categories – Lillooet TSA

	Period	2019-2023	2024-2028	2029-2033	2034-2038	2039-2043	2044-2048	2049-2053	2054-2058	2059-2063	2064-2068
Slope Class											
0-40		54%	56%	60%	59%	57%	59%	62%	61%	59%	56%
40.1-70		42%	41%	38%	39%	39%	37%	35%	37%	39%	40%
>70		4%	3%	2%	3%	3%	4%	3%	2%	2%	4%
Total		**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

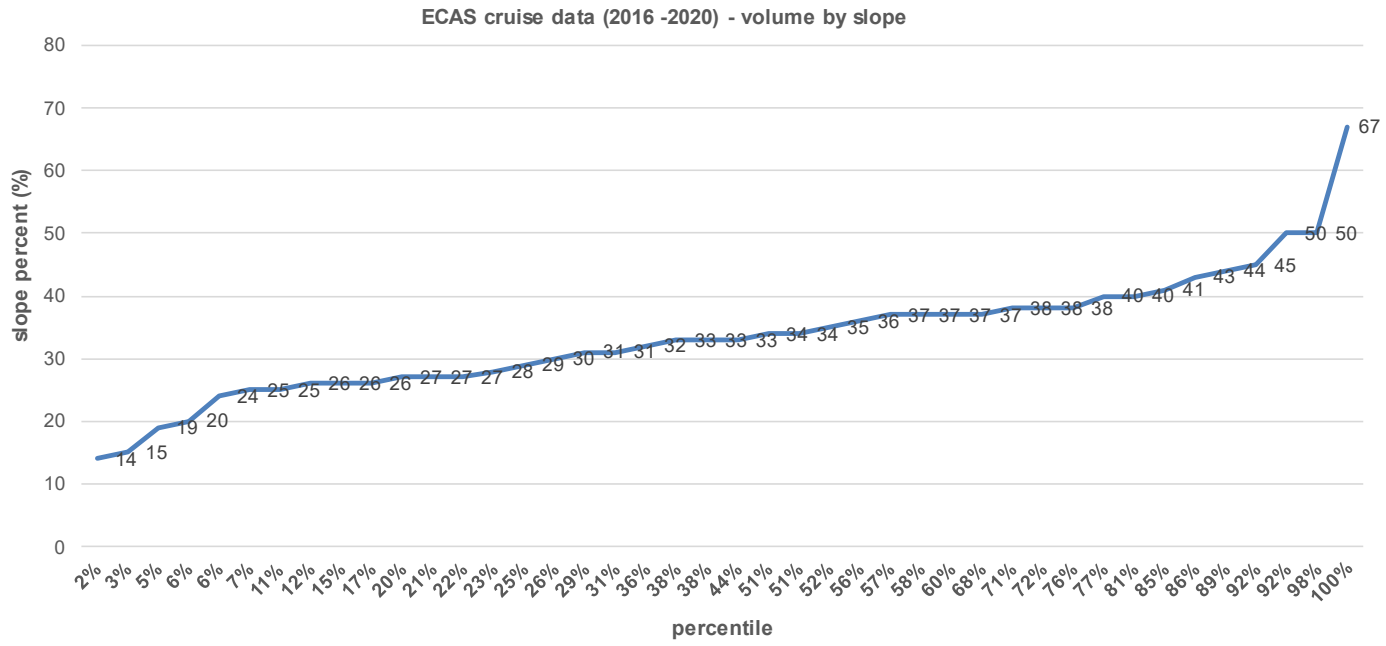

Figure 13. ECAS cruise data - volume by slope - Lillooet TSA.

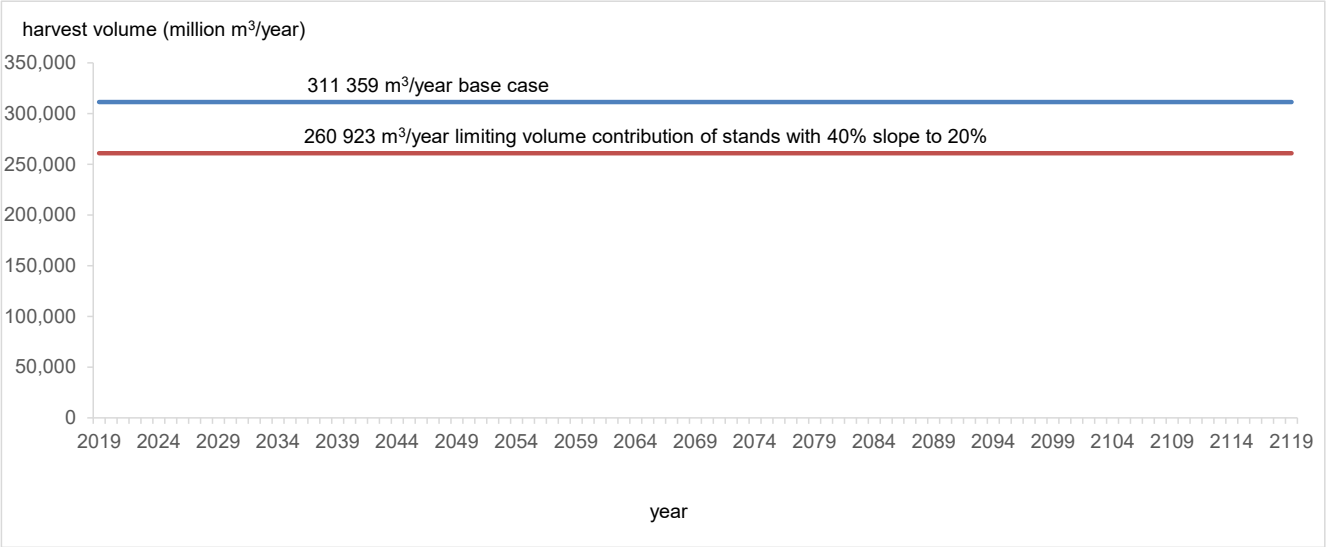

Figure 14. Limiting contribution of steep slope stands to 20 percent - Lillooet TSA.

Volume per hectare and steep slope

The previous two sensitivity analyses demonstrated that restricting harvesting to match the recent harvest profiles in steep slopes and low volume stands both resulted in substantial decreases in timber supply compared to the base case. Therefore, a sensitivity analysis was completed to determine the combined effect of the two sensitivity analyses (i.e., limiting volume contribution from low volume stands to 25 percent and contribution from steep slope stands limited to 20 percent)

The results of the sensitivity analysis indicate that applying these two limits combined lowers the harvest level by 32 percent to 211 928 cubic metres per year (Figure 15).

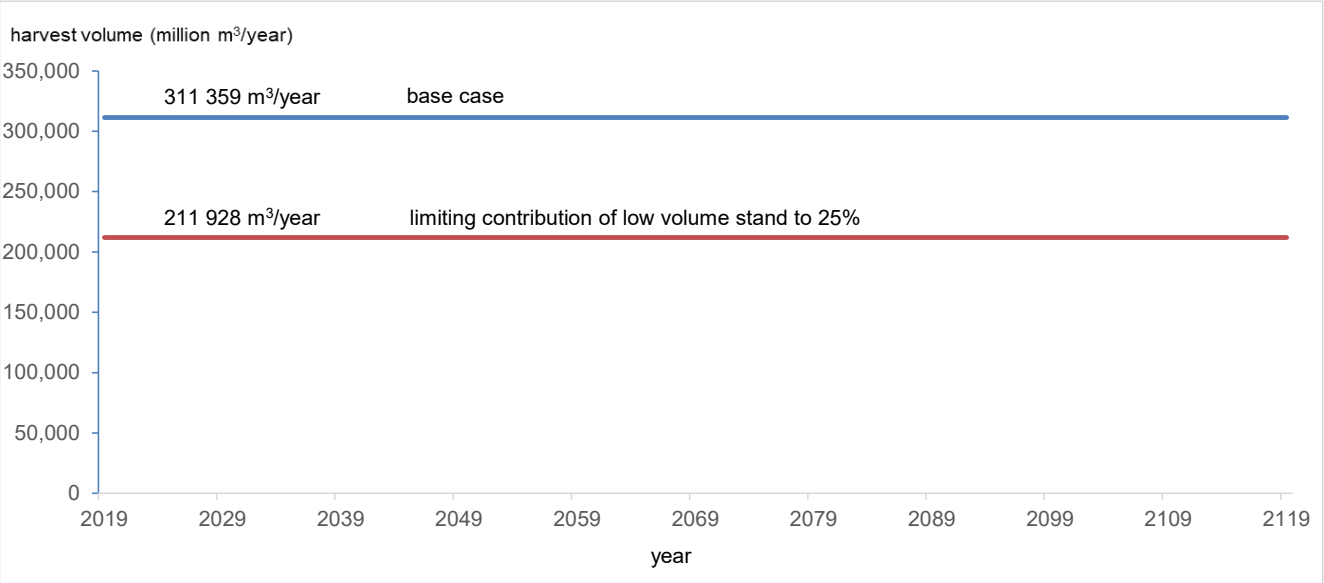

Figure 15. Limiting contributions from low volume stands and steep slope stands - Lillooet TSA.

Other sensitivity analyses

In addition to current harvesting practices, sensitivity analyses have been conducted to explore the effect on timber supply of the following scenarios:

- Decrease the visual absorption capability (VAC) of visual quality objectives (VQO) by one level;
- Exclude harvesting in the wildland urban interface (WUI) area defined in 2017; and,
- Model all non-designated watersheds as designated community watersheds by applying an equivalent clearcut area (ECA) limit.

The results from the sensitivity analyses indicate that decreasing the VAC by one level reduced the harvest level by 2.5 percent; excluding the WUI area from harvesting reduced the harvest level by 6.5 percent; and applying the ECA limit to the non-designated watersheds had a negligible effect on the harvest level.

The results of the sensitivity analyses completed are summarized in Table 6 below.

Table 6. Results of sensitivity analyses – Lillooet TSA

Key Issue	Change	Initial harvest (m^3/year)	Percent Impact (%)
Timber harvesting land base	-5%	296,100	-4.9%
	-10%	281,500	-9.6%
Limiting contribution of low volume stands (< 220 m^3/ha)	Maximum 25%	267,630	-14%
Limiting contributions of steep slope stands (> 40%)	Maximum 20%	260,920	-16%
Limiting contributions from both low volume stands, and steep slope stands		211,930	-32%
Decreasing visual absorption capability (VAC) of visual quality objective (VQO) polygons	One level	303,580	-2.5%
Wildland urban interface (WUI)	Exclude from harvesting	291,225	-6.5%
Applying ECA of 30% to non-designated watersheds	Same as designated community watersheds	311,300	negligible

Additional analyses

The Lillooet TSA experienced significant losses during the 2021 wildfire season with 25 959 hectares, or 15.9 percent, of the THLB being impacted. The inventory team of the FAIB is compiling a new inventory for the Lillooet TSA with the 2021 wildfire impact incorporated and the effect of the new inventory and the 2021 wildfire will be assessed and presented to the chief forester if the new inventory is ready before the determination, otherwise the impact of the 2021 fire will be analyzed with the current inventory and presented to the chief forester.

In November 2021, the provincial government released draft proposed two year deferral areas to protect old growth and big trees areas throughout the province. The process to identify and legally reserve these areas from harvesting is in preliminary stages so the proposed deferral area will not be considered in this TSR. When deferral areas are legally established the AAC set in the TSR may be subsequently adjusted through a chief forester's order.

The TSR team is still working on a few other non-timber forest values in the TSA and the assessment will be presented to the chief forester to be considered in the AAC determination. The following resource values are proposed to be assessed using a cumulative effects approach: watershed/aquatic ecosystem health, old growth, visually sensitive areas, grizzly bears, mule deer, moose, and forest biodiversity including pine mushrooms.

Conclusion

The base case identified a sustainable harvest flow of 311 359 cubic metres per year at an even-flow harvest level. The base case harvest level is considerably lower than the current AAC and the projection presented by the previous TSR analysis. The lower harvest level results primarily from the reduction in the size of THLB and growing stock volume diminished by the recent mountain pine beetle infestation. The base case projection now better aligns with recent harvest level performance in the Lillooet TSA which has been an average of 277 458 cubic metres per year. However, if the licensees operating in the TSA maintain the current harvest profile in terms of stand volume per hectare and slope, the base case harvest level cannot be maintained. A continued focus on high volume stands located in moderate slopes will have a negative long-term effect on volume availability across the Lillooet TSA.

Although the above timber supply analysis is a significant source of information provided to the chief forester for consideration, the chief forester's AAC is not a calculation solely based on this strategic-level analysis. The AAC determination of the chief forester 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* in addition to the timber supply analysis. In addition, the chief forester may employ methods such as partitions[g] to bridge the gap between timber supply model outputs and current performance.

[g]**Partition**
Under Section 8(5) of the Forest Act *the chief forester in determining an AAC can specify a portion of the AAC that is attributable to certain types of timber, terrain, or areas of the TSA.*

Your input is needed

Public input is a vital part of establishing the allowable annual cut. Feedback is welcomed on any aspect of this *Discussion Paper*, the *Data Package* or any other issue related to the timber supply review and the allowable annual cut determination for the Lillooet TSA.

Ministry staff would be pleased to answer questions to help you prepare your response. Please send your comments to the address below.

Your comments will be accepted until October 18, 2022.

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.

Please send your comments to:

Ministry of Forests
Cascades Natural Resource District
PO Box 4400 Stn. Main
Merritt, BC V1K 1B8

In addition, a copy of the Public Discussion Paper will be made available at:
Ministry of Forests
Cascades Natural Resource District
3840 Airport Road,
Merritt, BC V1K 1M5

Email: forests.cascadesdistrictoffice@gov.bc.ca

Telephone: 250-378-8400

If you have any comments or questions, contact:

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Further information regarding the technical details of the timber supply analysis is available on request by contacting Forests.AnalysisBranchOffice@gov.bc.ca

Visit the Forest Analysis and Inventory Branch web site
https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/timber-supply-review-and-allowable-annual-cut