Integrated Silviculture Strategy

Fraser Timber Supply Area

Situational Analysis

V 1.4

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BRITISH COLUMBIA

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1 Introduction

The Resource Practices Branch (RPB) of the Ministry of Forests, Lands and Natural Resource Operations (FLNRO) is developing a new management unit planning framework; Integrated Silviculture Strategy (ISS). The ISS is a sustainable forest management planning framework with the objective to integrate all aspects of landscape-level and operational planning for each Timber Supply Area (TSA).

The ISS will integrate Type 4 Silviculture Strategies with timber supply review (TSR) to reduce duplication and redundancies where possible by sharing inventories, management zones, analysis units, Timber Harvesting Land Base (THLB) definitions and management assumptions. It is expected that the ISS process will improve the linkages to landscape level fire management, the Cumulative Effects Framework, the Forest and Range Evaluation Program's (FREP) multiple resource values assessments (MRVA) and other regional, management unit level or landscape level plans and strategies.

Provincial Timber Management Goals and Objectives (FLNR 2014) and the Chief Forester's Provincial Stewardship Optimization/Timber Harvesting Land Base (THLB) Stabilization Project (FLNR 2015) provide guidance to the ISS.

The ISS will consolidate all resource management related goals, objectives and strategies into one plan and then link these to a TSA wide tactical plan. The process includes a framework for monitoring and auditing, and continuous improvement.

The ISS aims to improve resource planning in British Columbia by addressing specific issues such as:

- Species at risk management and reserve allocation. Are the reserves placed where they provide the conditions most needed by species at risk?
- Ability to investigate options to co-locate reserves to provide required habitat benefits while preserving or increasing harvest opportunities;
- Current and predicted harvest levels – are the assumptions regarding the transition from old growth stands to second growth and managed stands accurate and, if not, what are the possible impacts on timber harvest and habitat values?
- What options are available to address habitat and timber supply using silviculture treatments?
- Effective use of public funds for new and existing funding initiatives;
- A feedback loop for adaptive management; ability to assess decision outcomes and modify behaviour based on new and better information; and,
- First Nations consultation; better understanding of the expected impacts of planned activities.

The project has the following objectives:

- Understanding and geospatial representation of existing and proposed legislation, regulations, and policy that conserve stewardship values;
- Seek information on ongoing monitoring and cumulative effect work, and collaborate to identify additional work needed;
- Collaborate with the intent to comprehend common landscape values;

- Develop decision support products for comprehensive and durable decisions based on scientific and traditional knowledge;
- Manage natural resources to continue providing the values that support traditional and modern day use;
- Work to identify the underlying issues and work towards solutions;
- Integration of the scenario based silviculture strategy process (Type 4) with the most recent Timber Supply Review (TSR);
- Prioritization of activities and treatments necessary to help with achievement of timber supply and habitat needs;
- Create a tactical plan documenting the strategies, targets, activities and treatments to improve or benefit other resource values; the targets would be agreed upon by those on the planning team; and,
- Incorporate climate change as a consideration into the resource management planning process including the identification of any associated risks (e.g. wildfire).

1.1 Context

This document is the first of four documents that make up an IRMP. The documents are:

1. **Situational Assessment – describes in general terms the current situation for the unit. The Situational Assessment forms the starting point for the initial planning group meeting to identify issues and opportunities.**
2. Data Package - describes the information that is material to the analysis including data inputs and assumptions.
3. Modeling and Analysis report –provides modeling outputs and rationale for choosing a preferred scenario.
4. Integrated Silviculture Strategy – represents the preferred management scenario which is the basis for the first iteration of the ISS. It includes an investment strategy and provides treatment options, associated targets, timeframes and expected benefits.

When the ISS is complete, a spatial operations schedule will provide direction for harvesting and a land base investment schedule will guide Forest for Tomorrow Annual Operating Plans.

2 Fraser TSA

The Fraser TSA is located in south-western BC and includes Metro Vancouver as well as the towns of Abbotsford, Chilliwack, Mission, and Hope. The TSA is bounded by Georgia Strait and Howe Sound on the west, the Soo and Lillooet TSAs to the north, the Merritt TSA to the east, and the Canada-USA border to the south (Figure 1). The TSA includes much the Fraser Canyon and the southern Coast Mountains, as well as the entire Fraser Valley floodplain and delta.

The Fraser TSA is part of the FLNRO Coast Region, and is administered by the FLNRO, Chilliwack Natural Resource District in Chilliwack.

The total area of the Fraser TSA is 1,423,038 hectares, of which 816,847 hectares are classified as Crown forested land base (CFLB). The timber harvesting land base (THLB) – areas available for timber harvesting - in the last timber supply review (2015) was 250,405 hectares.

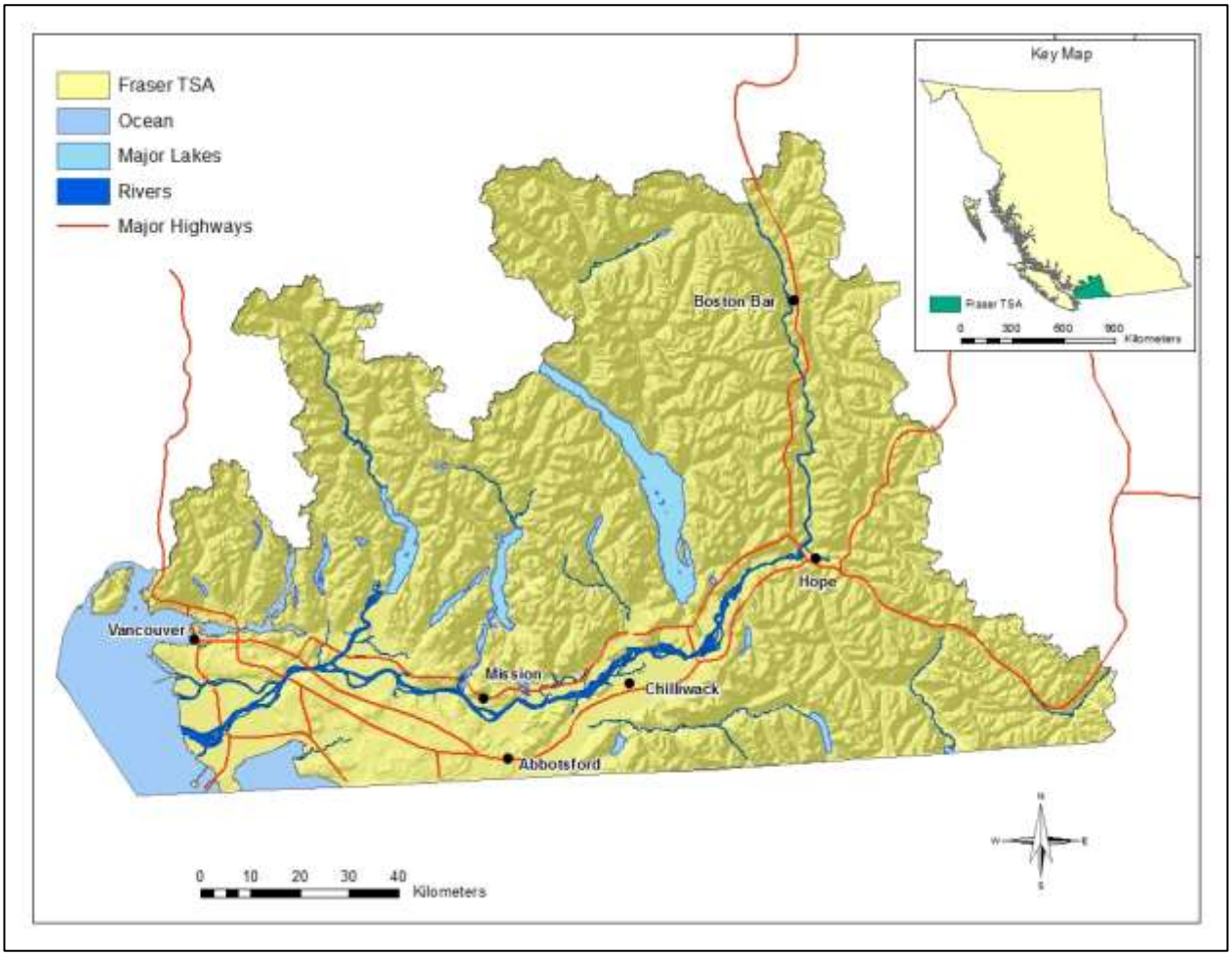

Figure 1: Fraser TSA location map

3 Summary of Current Plans and Strategies

3.1 Provincial Timber Management Goals and Objectives

Provincial timber management goals and objectives are currently under development; they include working targets for the provincial timber supply. These targets need to be set for each TSA as well, which can be accomplished through the ISS process.

The Draft Provincial Timber Management Goals and Objectives (FLNR 2014) set high-level provincial timber management goals, objectives and targets and provide direction for planning across all management units (https://www.for.gov.bc.ca/hfp/silstrat/other%20docs/Timber%20Goals%20and%20Objectives%20May%2026%202014.pdf).

The goals are set for timber volume flow over time, timber quality, tree species composition, stand productivity and growing stock and inherent site capacity.

3.1.1 Timber volume flow over time

Goal: Promote resilient and diverse forest ecosystems that will provide a sustainable flow of economically valuable timber that generates public revenues, supports robust communities, healthy economies that provide an opportunity for a vigorous, efficient and world competitive timber processing industry

The objective is to ensure a reliable and consistent harvest of timber over time to support the economic and social objectives of the government. The management of timber volume flow will be integrated with the management of other key forest values, promoting resilient and diverse forest ecosystems. The ultimate goal is an internationally competitive timber processing industry, while the forests are managed in a sustainable manner based on the latest science and research.

The provincial targets for timber flow are currently expressed as the sum of all AACs from various management units. This will likely change as planning processes such as the Fraser ISS may set management units targets which will potentially become provincial targets when summed up.

3.1.2 Timber quality

Goal: Maintain a diversity of timber related economic opportunities through time

The objective is to maintain options for the future by growing a range of timber products. This can be accomplished by maintaining the share of high-value tree species in all management units at pre-harvest levels and limiting the proportion of lower value species. New forests must be regenerated with high quality stock capable of producing high quality forest products.

Targets:

- No reduction in the proportion of provincial forest land of high-value tree species, and
- The production of a minimum of 10 % premium grades from British Columbia's forests.

3.1.3 Tree Species Composition

Goal: To maintain or enhance timber and non-timber values, forest health, and resilience, through the management of tree species composition.

Timber and non-timber values, forest health, and resilience can be maintained or enhanced through the management of tree species composition. Where ecologically feasible, regenerated forests are expected to consist of a mix of species at both the stand and landscape level to reduce pest and disease risks and to maintain options in the long term. Furthermore, climate change and future risk must be considered in reforestation by promoting species compositions that reduce susceptibility to ecological and economic risks and by avoiding species that are already highly prevalent on the landscape.

The planting stock should be grown from known seed sources and the seeds are expected to be from genetically diverse trees, climatically suitable to various planting sites.

The strategy outlines the following targets:

- The proportion of monoculture stands at free growing in B.C. should not be greater than the proportion of monoculture stands prior to harvest.

- Within management units, the total number of tree species at free growing is expected to be no less than what was present prior to harvest.
- Within management units, the proportion of a specific tree species at free growing should be no more than 10 % greater than what was present prior to harvest, unless the increase in species proportion raises the proportion of higher value species or specific species diversity targets are approved for the management unit.
- By 2020, all tree seed used to establish a free growing stand should be registered and selected in accordance with new climate-based seed transfer standards.

3.1.4 Stand productivity and growing stock

Goal: Maintain or improve stand productivity.

Epidemics, such as the recent MPB infestation, require that strategies and options need to be developed for prompt management unit analysis and planning after significant and sudden changes to growing stock from natural disturbances and salvage harvesting. Reforestation and management should target full site occupancy of growing space with consideration for other values and risks. As with tree species selection, the proportion of high-risk species in management units should not be increased and, if the future risks are assessed high for such species, their share should be gradually reduced. Stand level management decisions should not be made only on the basis of return-on-investment, but should also consider risks and management unit objectives and targets. If seed for improved growth or pest tolerance is available, it should be used

Targets:

- Harvested areas will be reforested with tree species and stocking levels that meet or exceed growth and yield projections assumed in TSR.
- By 2020, 75 per cent of all trees planted will be grown from selected seed with an average genetic gain of 20 per cent.

3.1.5 Inherent site capacity

Goal: To maintain the inherent site capacity of B.C.'s forested ecosystems

It is expected that the permanent footprint of roads, trails, and landings will not exceed what is necessary for logical and efficient natural resource management, while road construction and maintenance should follow natural drainage patterns and flows without contributing to slope failures or chronic erosion over the long term.

Forest management activities must not result in significant soil compaction and/or erosion on areas that will be reforested, rather management activities should provide for maintenance or recovery of proper nutrient cycling and soil nutrition.

Targets:

- The province restricts soil disturbance to a maximum percentage of site disturbance within the net area to be reforested (Forest Planning and Practices Regulation (FPPR), s. 35).
- The province has incorporated explicit maximum percentage limits for site disturbance and construction of permanent access structures into the FPPR, s. 36. The target is to have the average site disturbance for the province at less than 5 %.
- The province directs the maintenance of natural drainage patterns for road construction and maintenance (FPPR, s. 37-39)

3.2 Spotted Owl Management Plan

This plan covers the Soo and Fraser TSAs and provides guidelines for the protection of spotted owl habitat. Some areas have been designated as Long-Term Owl Habitat (LTOH) while other areas are Managed Future Habitat Areas (MFHA). The LTOH areas are protected from harvesting, whereas harvesting is permitted in the MFHA with restrictions. Harvesting in the LTOH may be permitted providing that replacement LTOH are designated within the MFHA.

3.3 Landscape Unit Plans

There are 24 landscape units within the Fraser TSA, 17 of these are covered by 12 landscape unit plans, all of which establish old growth management areas (OGMA); some also establish stand level retention targets (WTR). WTR is managed as per FRPA and the Landscape Unit Planning Guide (MFR, 1999). Where LU plans exist, WTR targets are specified (Table 1); for all other landscape units and BEC variants the WTR targets is 7%.

OGMAs have been approved in 21 of the 24 landscape units (LU). The approved OGMAs satisfy all old-seral biodiversity requirements as the LUs without OGMA designations are mostly parks, protected areas, or areas where timber harvesting is not allowed.

Table 1: Landscape Unit Plans in the Fraser TSA

Landscape Unit	LU Plan Name	Date	Objectives
Alouette	Lower Fraser SRMP Legal Order and Objectives	2013	OGMA
Big Silver	Big Silver LU – Legal Order and Objectives	2005	OGMA, WTR
Chehalis	Chehalis LU – Legal Order and Objectives	2006	OGMA, WTR
Chilliwack	Chilliwack LU – Legal Order and Objectives	2005	OGMA, WTR
Coquihalla	Coquihalla LU Order and Objectives	2004	OGMA, WTR
East Harrison	East Harrison LU – Legal Order and Objectives	2005	OGMA, WTR
Fraser Canyon	Fraser Canyon LUPs Legal Order and Objectives	2004	OGMA, WTR
Fraser Valley South	Lower Fraser SRMP Legal Order and Objectives	2013	OGMA
Hatzic	Lower Fraser SRMP Legal Order and Objectives	2013	OGMA
Manning	Manning LU Order and Objectives	2004	OGMA, WTR
Pitt	Lower Fraser SRMP Legal Order and Objectives	2013	OGMA
Silverhope	Silverhope LU Order and Objectives	2004	OGMA, WTR

Landscape Unit	LU Plan Name	Date	Objectives
Stave	Lower Fraser SRMP Legal Order and Objectives	2013	OGMA
Tretheway	Tretheway LU – Legal Order and Objectives	2005	OGMA, WTR
West Harrison	West Harrison LU – Legal Order and Objectives	2005	OGMA, WTR
Widgeon	Lower Fraser SRMP Legal Order and Objectives	2013	OGMA
Yale	Yale LU Order and Objectives	2004	OGMA, WTR

3.1 Sustainable Forest Management Plans

Independent organizations that measure forestry operations against standards for sustainable forest management complete forest management certification in Canada. The certification offers supplementary assurance that forest lands are managed legally, sustainably and in compliance with internationally acknowledged standards for sustainable forest management.

Certification is acquired for various reasons; consumers may consider certification in their purchasing decisions, while forestry companies can demonstrate responsible resource management through certification.

The operations of the Teal-Jones Group are certified by the CAN/CSA Z809-08 Sustainable Forest Management Standard, while the BCTS operations are certified by the Sustainable Forestry Initiative (SFI); both are internationally-recognized sustainable forest management certification program.

Information on the Teal-Jones Group certification and Sustainable Forest Management Plans (SFMP) can be found here:

http://tealjones.com/certifications/overview/

BCTS has published a provincial plan for certification:

https://www.for.gov.bc.ca/ftp/HBT/external/!publish/Web/EMS2/BCTS-Provincial-SFM-Plan.pds

3.2 S'ólh Téméxw Use Plan

S'ólh Téméxw, the traditional territory of the Stó:lō First Nation, covers approximately 90 percent of the productive forest in the Fraser TSA and overlaps many other First Nations territories The S'ólh Téméxw Use Plan (STUP) is a high-level strategic plan that expresses the land use interests of the Stó:lō, including economic development, cultural heritage, and environmental conservation and protection.

While the STUP has not been established through legislation, it is being observed in operational resource planning in the TSA, where cultural values recognized in the STUP are considered through various means such as co-location with existing reserve areas. It is expected that STUP spiritual practice areas may impact timber supply in the future.

In her determination, the Chief Forester encouraged licensees and district staff to ensure that the spatial information regarding cultural values associated with the STUP is considered in operational decisions. She further suggested that the locations of these values should be used as candidates when considering placement of reserves to protect other resource values.

3.3 Silviculture Strategies

Cortex Consultants Inc. completed a Type 2 Silviculture Strategy for the Fraser TSA in 2003 (Cortex Consultants Inc. 2002). The objective of the strategy was to provide strategic guidance to the district staff for designing and implementing a silviculture program.

The landbase and management assumptions reflected the TSR completed in 1998 (TSR 2, AAC determination in April 1999). TSR 2 predicted a mid-term fall down in timber supply, which was one of the factors addressed in the Type 2 Silviculture Strategy.

The strategy focussed on three objectives:

1. Maximizing total timber supply;
2. Maximizing the supply of larger dimension logs, and
3. Maximizing the supply of solid, clear wood.

Various strategies were investigated to meet the three objectives. Silviculture activities that were included in the analysis were:

- Select planting stock;
- Commercial thinning; and
- Spacing, pruning, and fertilization.

The analysis demonstrated that both the quantity and quality of timber supply can be increased significantly through incremental silviculture. However, the annual treatment areas and the required expenditures are expected to be consistent and high for the strategic objectives to be met.

The adopted, preferred management scenario emphasized quality and value over quantity with the expectation of longer rotations and larger logs. The preferred scenario supported a strategy that would include about 4,000 ha of incremental silviculture treatments annually at a cost of approximately $1.6 million per year.

3.3.1 Incremental Silviculture

Table 2 shows the treated areas by incremental silviculture treatment for the Fraser TSA between 2006 and 2015. Fertilization had been the treatment of choice with 14,808 ha treated over 10 years.

Table 2: Incremental silviculture in the Fraser TSA

Year	Fertilization	Juvenile Spacing
2006	280	
2007	2,782	
2008	3,566	
2009	1,408	
2010	1,017	
2011	1,407	
2012	1,485	196
2013		22
2014	1,439	
2015	1,426	6
Total	14,808	223

3.4 Provincial Stewardship Optimization/THLB Stabilization

MPB infestation impacts, other resource industries and the need to establish habitat for Species at Risk (SAR) are constraining the available land base for timber harvesting. In 2015 the Chief Forester initiated the Provincial Stewardship Optimization/THLB Stabilization project.

The intent of the project is to optimize stewardship while minimizing its impacts and stabilizing the Timber Harvesting Land-base (THLB). In practical terms, the project attempts to find more efficient ways throughout the province to meet all the SAR requirements, and objectives for the 11 FRPA values. This can be done by investigating different combinations of locating the many constraints on timber harvesting. The primary objective of the project is to stabilize or increase the size of the THLB by optimizing the placement of spatial constraints, without changes in land use plans or legislation.

The Fraser ISS can be used as a tool to investigate opportunities for THLB stabilization.

For more information on the Provincial Stewardship Optimization/THLB Stabilization:

https://www.THLB stabilization CF memo

3.5 Fire Management

Fires occur in the TSA, with approximately 30 fires last year with suppression costs of about $1,000,000. The ISS provides an opportunity to consider fire management in the overall context of managing the natural resources in the TSA.

There are no landscape fire management plans for the Fraser TSA; however other plans and initiatives exist. Union of BC Municipalities (UBCM) administers the Strategic Wildfire Prevention Initiative (SWPI) which is managed through the Strategic Wildfire Prevention Working Group. This initiative supports communities to mitigate wildfire risk in the wildland urban interface through a variety of activities such as fuel treatments and creation of fuel breaks.

Forest Enhancement Society funds wildfire mitigation activities for areas beyond the urban interface. In addition, all natural resource districts in BC have fire management plans that guide fire response (suppression) in case of wildfire.

The ISS planning team will set the priorities for reducing fire hazards and risk for the Fraser TSA. The focus is on reducing fire hazards and risk to protect life, properties and critical infrastructure, high environmental and cultural values, and resource values. This can be accomplished through planning of fire breaks, use of fire management stocking standards and providing recommendations for fuel management.

3.6 Forest Health Strategy

The Forest Health Overview provides background and strategic direction for the management of forest health in the West Coast and South Coast Regions (FLNRO, 2015). It identifies damaging agents that have the potential to harm the forest resource and suggests strategies to reduce short- and long-term forest health losses.

Several health agents exist in the Fraser TSA; however, few are significant.

3.6.1 Douglas-Fir Beetle

Douglas-fir beetle is an insect native to BC that attacks fallen trees, or trees weakened by drought, defoliation, or root diseases. Douglas-fir beetle attacked trees are common in the TSA. The mapped area of damage between 2012 and 2015 has varied between 500 and 1,000 ha. The latest TSR assumed that 8,800 m^3 of timber is lost annually to Douglas-fir beetle. 50% of this volume is assumed to be salvaged.

3.6.2 Mountain Pine Beetle

Recorded mountain pine beetle (MPB) infestations have occurred in the TSA from the 1940's on. During the recent province-wide infestation the attack peaked in 2007 with 31,921 ha of pine stands attacked. Most of the attacked areas have remained outside of the THLB (Manning Park) or showed only light to moderate impacts. The latest TSR assumed that 400 m^3 of timber is lost annually to the MPB. None of this volume is assumed to be salvaged.

3.6.3 Spruce Beetle

There is little spruce beetle activity in the Fraser TSA. The latest TSR assumed that only 200 m3 of timber is lost annually to the MPB. None of this volume is assumed to be salvaged

3.6.4 Western Balsam Bark Beetle

Western balsam bark beetle does not occur in large contiguous areas. It tends to be scattered, at higher elevations within the ESSF mw. The latest TSR assumed that only 3,100 m3 of timber is lost annually to the western balsam bark beetle. None of this volume is assumed to be salvaged

3.6.5 Forest Health of Young Plantations

There have been incidents of damage in young plantations in the TSA by agents such as Swiss needle cast.

3.6.6 Root Diseases

There are areas in the TSA with significant incidence of root diseases, primarily laminated root disease of Douglas-fir and Armillaria root disease on many conifer hosts. Root disease losses were not accounted for in the latest (2016) TSR.

3.7 Species Monitoring

In 2009, the chief forester provided direction on the need to understand current trends in species selection, developing species selection criteria for sustainable future ecosystems and setting up a monitoring framework for updated data. The percent share of harvest volume by species for each BEC subzone in the Fraser TSA is illustrated in Table 3 and compared with the share of previous inventory species, the share of planted species area after harvest and the share of all regenerated species area at free growing.

The time frames in the table for different categories are different due to availability of data:

- Long term for billed volume is 2005 – 2015;
- Short term for billed volume is 2014 – 2015;
- Long term for previous inventory species is 2004 – 2014;
- Short term for previous inventory species is 2013 – 2014;
- Long term for planted area is 2002 – 2012;
- Short term for planted area is 2011 – 2012;
- Long term for regenerated area is 1997 – 2007;
- Short term for regenerated area is 2006 – 2007.

Table 3: Harvest % by species, previous leading species, planted and regenerated species (source FLNRO, 2016)

ZONE	SUB ZONE	SP	Billed		Previous %		Planted		Regenerated	
			Long-Term	Short-Term	Long-Term	Short-Term	Long-Term	Short-Term	Long-Term	Short-Term
CWH	dm	Act	0	0					1	3
CWH	dm	Bg	3	6						
CWH	dm	Cw	13	14	3	4	29	27	20	15
CWH	dm	Dr	1	1	1	0	3	2	4	13
CWH	dm	Ep	1	1					5	6
CWH	dm	F			6					
CWH	dm	Fd	55	48	72	70	67	70	50	51
CWH	dm	Hw	25	30	17	23	0		19	10

ZONE	SUB ZONE	SP	Billed		Previous %		Planted		Regenerated	
			Long-Term	Short-Term	Long-Term	Short-Term	Long-Term	Short-Term	Long-Term	Short-Term
CWH	dm	Mb	1	1	1	3			2	2
CWH	ds	Ba	4	8	1	7	0		2	5
CWH	ds	Cw	18	17	12	10	20	26	18	15
CWH	ds	Dr	1	1	1		1		1	2
CWH	ds	Ep	1	0					8	2
CWH	ds	Fd	50	42	59	54	78	74	50	68
CWH	ds	Hw	26	31	27	29			14	
CWH	ds	Mb	0	0					1	
CWH	ds	Pl					0		2	
CWH	ms	Act			1					
CWH	ms	Ba	17	22	13	14	6	10	26	16
CWH	ms	Cw	14	17	3	5	24	22	13	14
CWH	ms	Ep	0	0					1	1
CWH	ms	Fd	33	25	41	37	51	43	26	43
CWH	ms	Hw	33	30	40	44			19	17
CWH	ms	Pl							1	
CWH	ms	PLI							0	0
CWH	ms	Sx	2	5			18	18	11	7
CWH	ms	Yc	1	1			2	7	1	0
CWH	vm	Ba	13	18	10	19	4	1	20	14
CWH	vm	Cw	20	19	12	6	46	42	19	24
CWH	vm	Dr	1	1	1		3	5	2	2
CWH	vm	Ep	0	0					2	4
CWH	vm	Fd	22	22	18	30	44	49	17	20
CWH	vm	Hw	42	39	54	44	1	2	35	33
CWH	vm	Hm			1				1	0
CWH	vm	Yc	1	1	0	0	2		3	2
ESSF	mw	ACT	0	1						
ESSF	mw	B	37	38	3					
ESSF	mw	BA			61	81	2		37	14
ESSF	mw	BG							0	1
ESSF	mw	BL							14	11
ESSF	mw	CW	5	5			0		2	2
ESSF	mw	D	0	0						
ESSF	mw	E	0	0						

ZONE	SUB ZONE	SP	Billed		Previous %		Planted		Regenerated	
			Long-Term	Short-Term	Long-Term	Short-Term	Long-Term	Short-Term	Long-Term	Short-Term
ESSF	mw	F			2					
ESSF	mw	FD	26	28					1	5
ESSF	mw	FDC			16	5	5		1	3
ESSF	mw	H	10	11						
ESSF	mw	HM			2	5			0	
ESSF	mw	W			5				1	1
ESSF	mw	M	0	0						
ESSF	mw	PA	0							
ESSF	mw	PL	4	3	1				0	1
ESSF	mw	PLC			3				0	
ESSF	mw	PLI							0	0
ESSF	mw	PW	0	0						
ESSF	mw	PY	0	0						
ESSF	mw	S	17	14						
ESF	mw	SE			4	8			13	6
ESSF	mw	SX			1		92	100	30	55
ESSF	mw	YC	0	0			0		1	
ESSF	mw	Z	0	0						
IDF	ww	Bg	16	19					3	1
IDF	ww	Cw	9	6	11	1	12		13	3
IDF	ww	Ep	0	0					4	7
IDF	ww	F			8					
IDF	ww	FD	49	56	72	96	86		68	85
IDF	ww	Hw	5	3	1	3			2	
IDF	ww	Pl	7	2	15		2		8	3
IDF	ww	Py	0	0			1		0	2
MH	mm	Ba	48	64	68	84	56	96	63	71
MH	mm	Cw	2	0			10	1	2	2
MH	mm	FD	11	2						
MH	mm	FDC					0		0	
MH	mm	Hw	32	19	4	16			8	11
MH	mm	Hm			4				8	7
MH	mm	Pl	1	2						
MH	mm	Sx	1	3			23	2	12	
MH	mm	Yc	5	9	1		11		7	10

4 Timber Supply

4.1 Forest Inventory

The forest inventory for the Fraser TSA is a vegetation resource inventory (VRI). It was completed using 1996 aerial photography. Since then the inventory information has been updated for disturbance and forest cover attributes have been projected to 2014 in the most current inventory file.

VRI Phase 2 sampling was completed in the Chilliwack Natural Resource District (excluding private lands, parks and protected areas, TFLs, and woodlots). The data was compiled in 2014 for the TSR.

The overall volume adjustment ratio (net decay waste and breakage) was 0.98 indicating that the Phase 1 inventory slightly overestimates the overall per ha volume. Due to discrepancies in the sample data the latest TSR utilized unadjusted inventory volumes and natural stand yield tables.

4.2 Historical and Current Annual Allowable Cut (AAC)

The current AAC in the Fraser TSA is 1,235,700 m^3 per year. This AAC was set in 2016 and will remain in effect until a new AAC is determined, which must occur in 2026 or before. Table 4 shows the historical and the current AAC.

Table 4: Historical and current AAC (m^3 per year)

AAC (m^3)		1999	2004	2011	Current (2016)
		1,270,000	1,270,000	1,239,100	1,235,700
Partition	Conifer	1,237,500			
	Deciduous	32,500			

4.3 Apportionment of the AAC and TSA Licensees

Table 5 shows the current apportionment of the AAC to various license types within the Fraser TSA. Approximately 74% of the AAC has been committed to the licensees operating within the TSA (Table 6). Note that the apportionment does not match the current AAC. This is because the current AAC has not yet been apportioned.

Table 5: Apportionment, Fraser TSA

Tenure	Total (m^3)
Forest Licenses Replaceable	650,119
Forest Licenses Non-Replaceable	290,116
Community Forest Agreement	44,300
BCTS Timber Sale License	246,745
TSL <=10,000 m^3 Replaceable	6,005
Woodlot License	12,600
Forest Service Reserve	20,115
Total	**1,270,000**

Table 6: Licence AAC commitments in the Fraser TSA

Forest Licences Replaceable	Licence	Licensee	Total m^3
	A19201	Teal Cedar Products Ltd.	314,380
	A19202	606546 B.C. Ltd.	129,566
	A19207	Lakeside Pacific Forest Products	125,484
	A20542	Western Canadian Timber Products	56,264
	A74688	606546 B.C. Ltd.	13,597
	A75657	Probyn Log Ltd.	4,578
	A77464	606546 B.C. Ltd.; Allison Pass	6,250
Total			**650,119**
Forest Licences Non-Replaceable	A87588	Northwest Hardwoods Canada Inc.	10,000
	A90539	Shannon Lumber Ltd.	3,000
	A94074	NFP Timber Solutions Ltd.	40,000
Total			**53,000**
Non-Replaceable Forest Licence	A75807	Ts'elxweyeqw Forestry Limited Partnership	40,270
	A79504	Leq' a: Mel Forestry Limited Partnership	9,112
	A79506	Northwest Hardwoods Canada, Inc.	2,165
	A81096	Seabird Island Forestry Limited	21,500
	A81822	Cheam First Nation	12,800
	A82638	Union Bar First Nation	2,767
	A84106	Matsqui First Nation Development	6,316
	A90236	Kwaw-Kwaw-Apilt	1,353
	A90380	Skwah	13,323
	A90591	Chawathil First Nation	13,890
	A91108	Seabird Island Forestry Limited	17,944
	A91109	Ts'elxweyeqw Forestry Limited Partnership	33,558
	A91110	Sts'ailes	23,107
	A91368	Shxw'owhamel Ventures Gp Ltd.	4,240
	A93093	Peters	3,549
	A94351	Douglas First Nation	6,406
Total			**237,802**
Grand Total			**940,921**

4.4 Species Profile and Age Class Distribution

The THLB Fraser TSA is dominated by hemlock-balsam stands and Douglas-fir stands. Hemlock or Balsam is the leading species on approximately 53% of the THLB area. The share of Douglas-fir is 35% while Western redcedar or cypress is the dominant species on 5% of the land base (Figure 2).

The same species ratio is reflected in the THLB inventory volume. Hemlock and Balsam stands constitute 56% of the standing timber inventory. The shares of Douglas-fir and Western redcedar are 28% and 8% correspondingly (Figure 3).

The TSA has a significant volume of second growth timber due to the long logging history extending back to the early 20th century. Approximately 60% of the THLB is in age classes 0-60 years, while about 20% of the THLB is older than 140 (Figure 4). Age classes 5, 6 and 7 are not well represented in the THLB. Approximately 75% of the old growth stands in the THLB are hemlock-balsam leading (Figure 5).

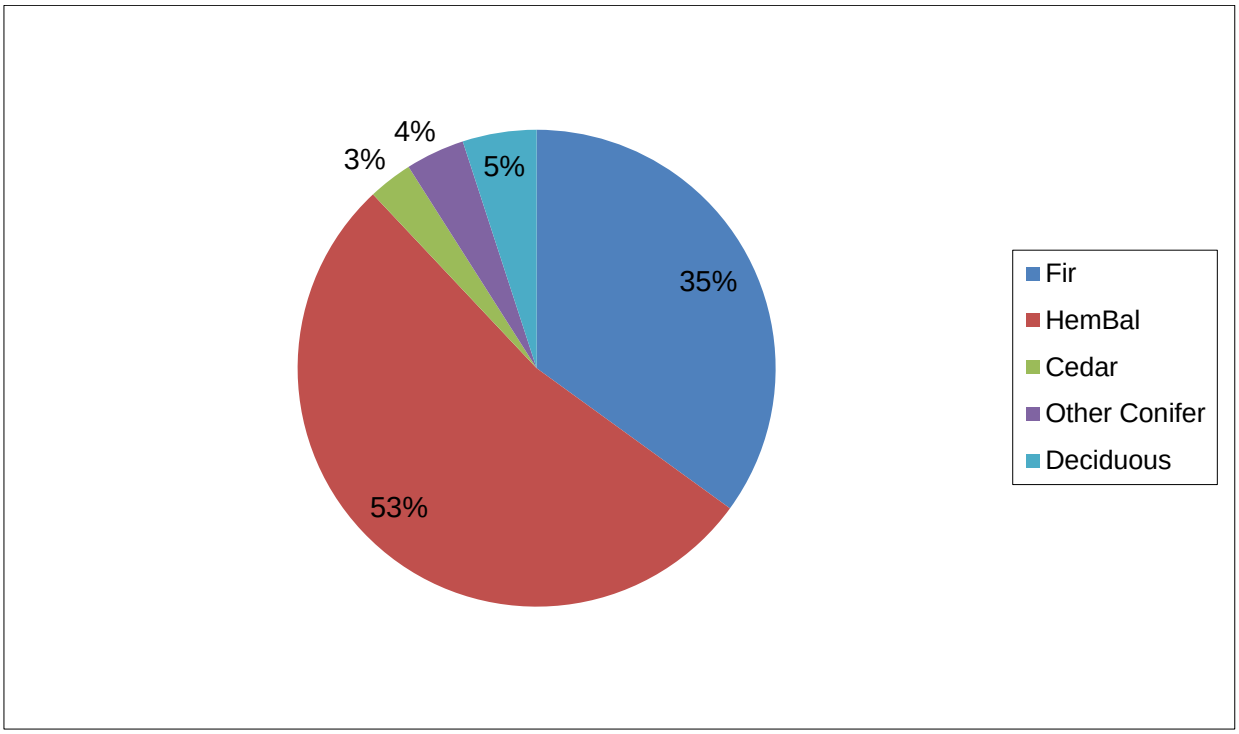

Figure 2: Leading species on the THLB, Fraser TSA

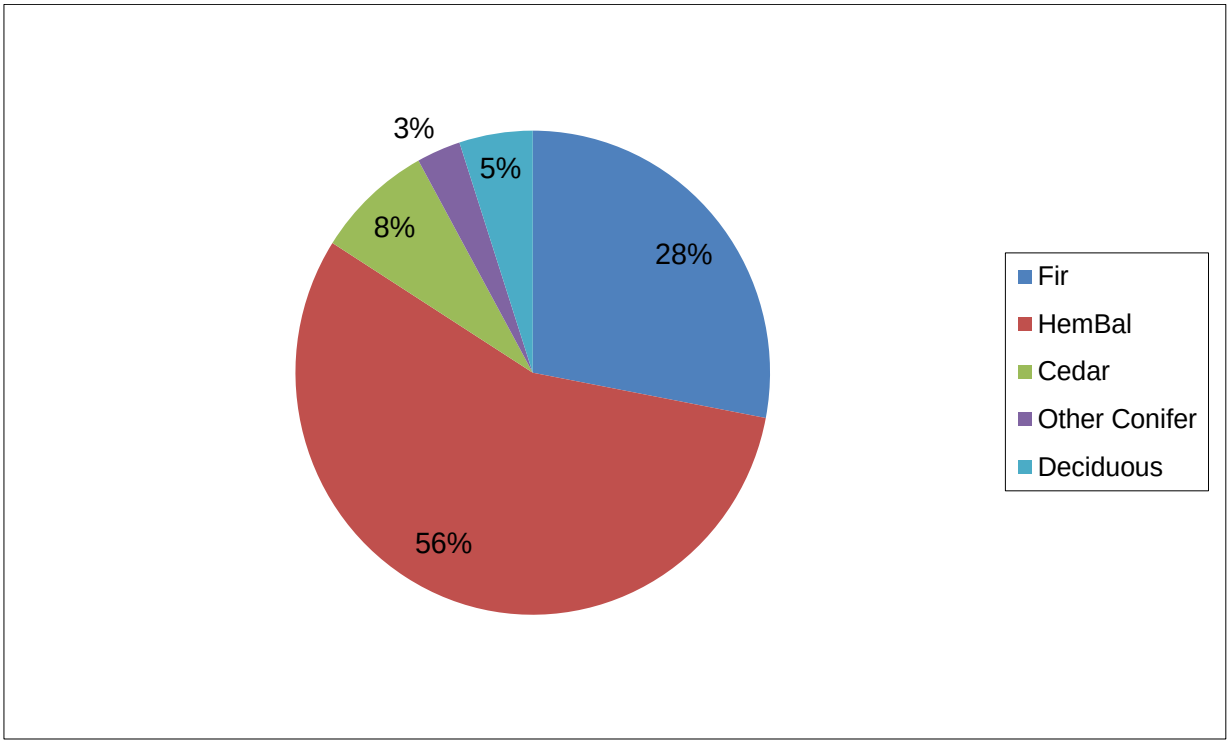

Figure 3: Inventory volume by species, Fraser TSA

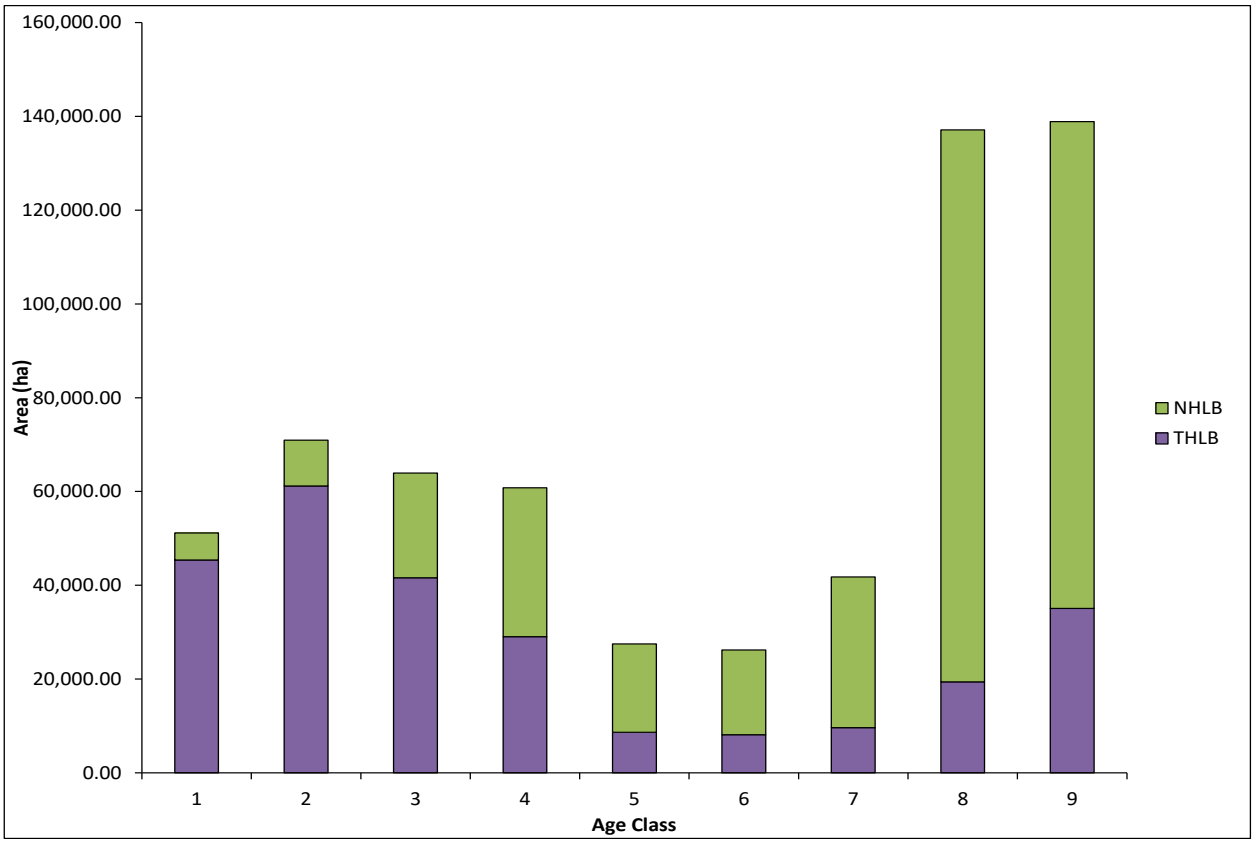

Figure 4: Age class distribution, Fraser TSA

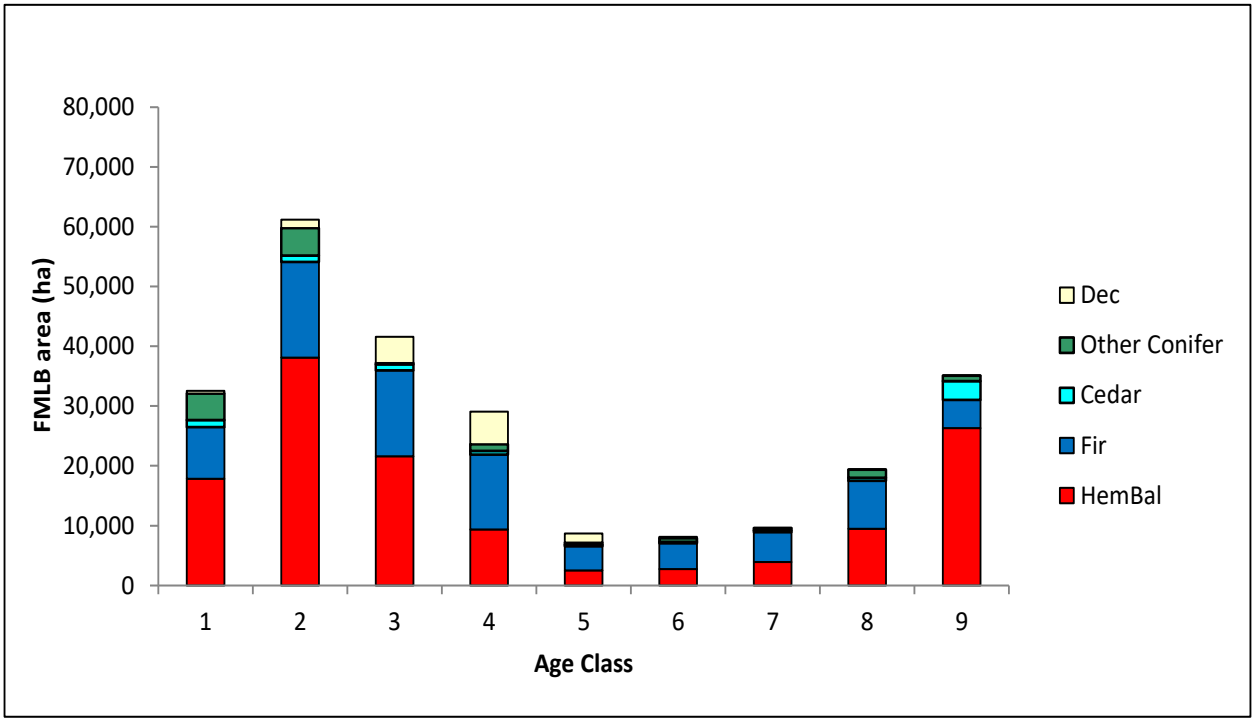

Figure 5: Age class distribution by leading species in the THLB, Fraser TSA

4.5 Current Timber Supply Situation

4.5.1 Base Case

Figure 6 illustrates the harvest forecast for the Fraser TSA from the latest timber supply review (TSR). The base case predicts an even flow of 1.26 million m^3 per year. The long-term harvest forecast is 17% lower than the predicted long-term harvest level in the previous TSR (TSR 3). Revised site productivity estimates for managed stands are the main reason for the predicted lower long-term harvest.

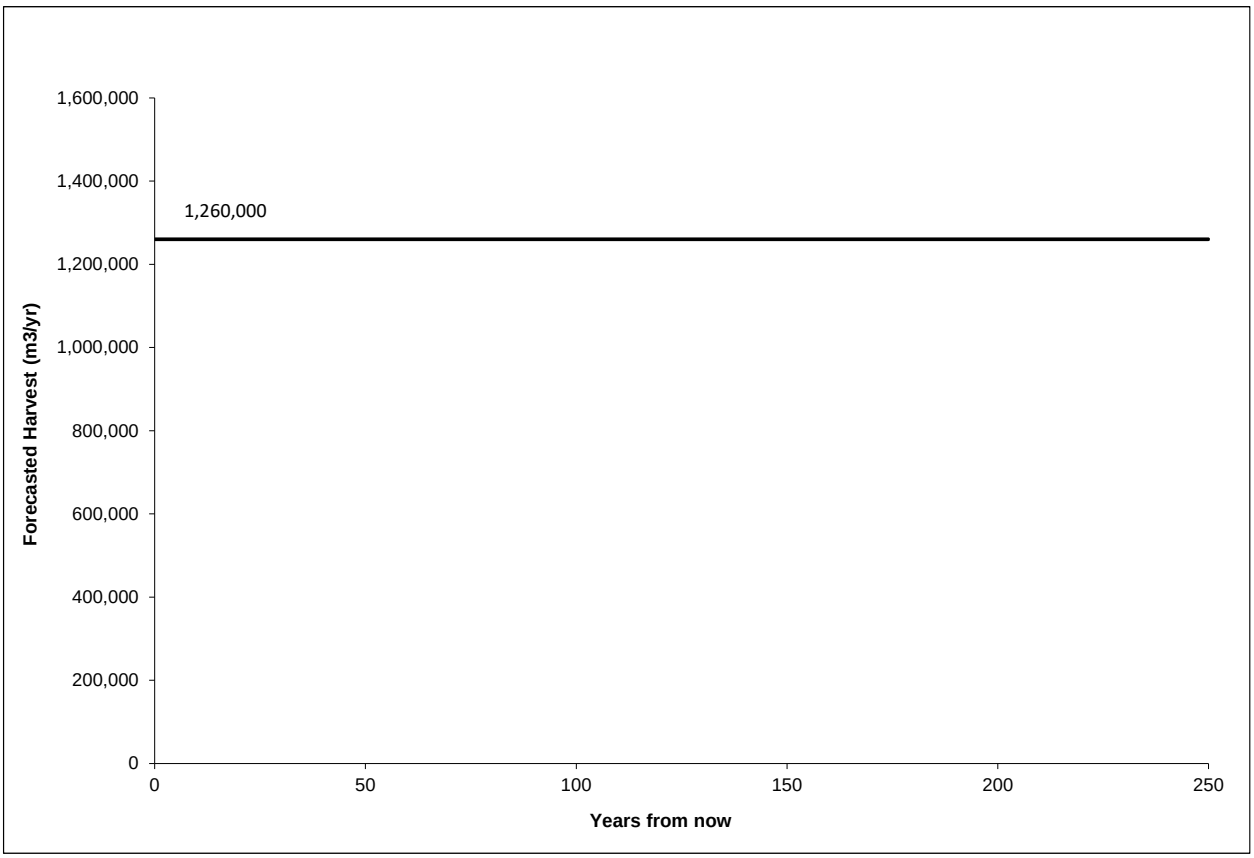

Figure 6: Timber supply forecast for the Fraser TSA; TSR 2016

Most of the harvesting in the TSA takes place in second-growth stands. The TSR base case set constraints on the harvest of conifer stands to mimic current harvest performance in the TSA (Figure 7). The harvest volume from stands older than 115 years was limited to 40 percent of the total harvest (516,000 m^3/year). This volume was consistent with the share of old-conifer volume scaled in the TSA between 2005 and 2014.

The sensitivity of the forecast was tested for increases and decreases in the old growth harvest. The forecast is sensitive to the constraint of harvesting old growth. The short-term harvest level can be increased if more old growth is harvested. Increasing the contribution of older stand to 1 million m^3 per year in the short term increased the short-term harvest forecast between 6 % and 9% depending on the adopted harvest rule. Limiting the contribution of old forests to 350,000 m^3 per year reduced the short-term timber supply by 4%.

Harvesting of old forest is predicted to continue for the next 50 to 60 years. After 65 years the forecast is almost entirely dependent on second-growth stands (below 115 years of age in TSR).

It is important for the harvest profile in the TSA to remain approximately consistent with inventory profile. As over 50% of the inventory volume in the TSA consists of hemlock-balsam stands, the future timber supply depends on the steady harvest of these stands. The latest TSR tested the impact of reduced harvest of hemlock-balsam stands on the TSA timber supply. If their contribution was reduced to 45% the, the projected harvest level was reduced by 10% after 20 years. Further, if both hemlock-balsam harvesting and old growth harvesting were limited to 45%and 21% correspondingly, the harvest forecast declined 14% after 20 years.

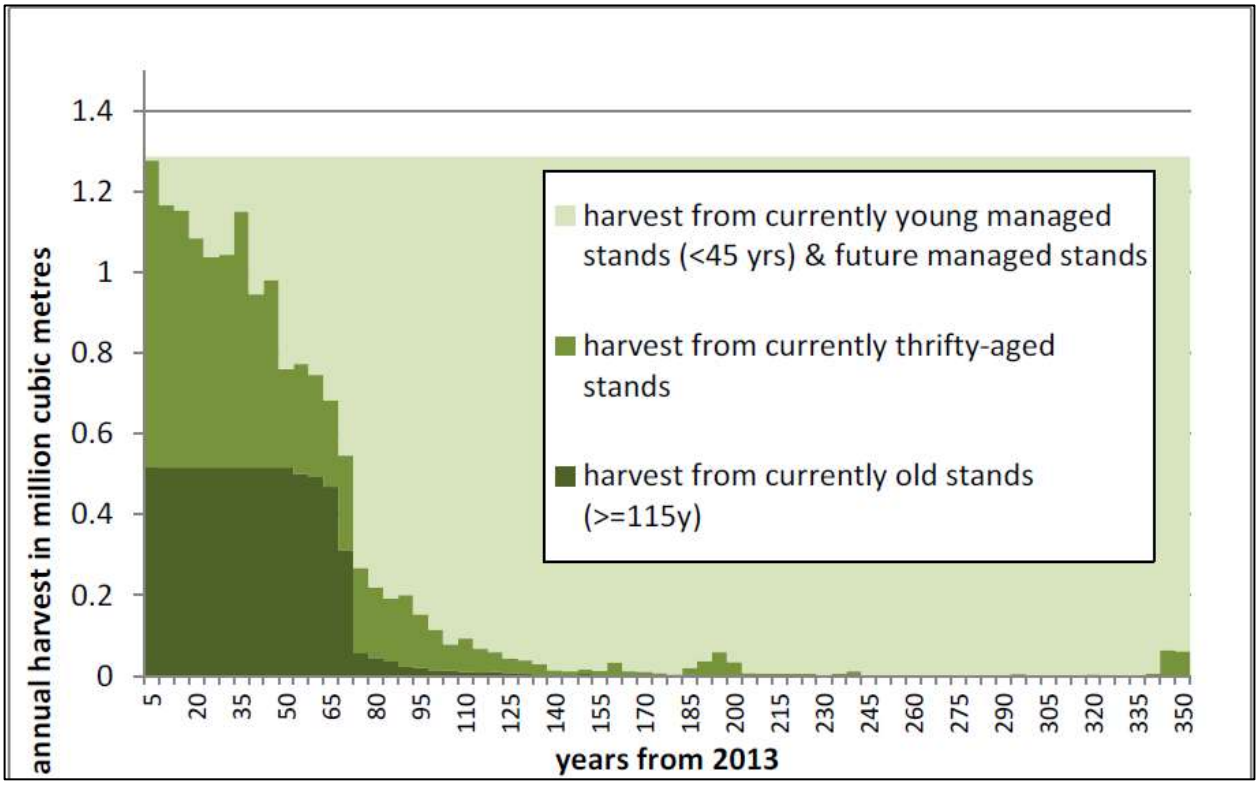

Figure 7: Timber supply forecast for the Fraser TSA, base case by stand class, Source: FLNRO 2015

4.5.1.1 Harvest Age and Harvest Volume

The TSR set the minimum harvest criteria based on a minimum volume per ha and 95% of MAI culmination as per Table 7.

Table 7: Minimum harvest criteria, TSR 3

Analysis Unit Group	Volume/ha (helicopter)	Corresponding Age	MAI Culmination Age
Fir; site index (SI) ≤ 20	350 m³/ha	100-260	100-110
Fir; SI 21+	350 (400) m³/ha	40-90	60-100
Cedar – all sites	350 (400) m³/ha	60-110	80-90
Hemlock/balsam; SI ≤ 14	350 m³/ha	140-350	160-240
Hemlock/balsam; SI 15+	350 (400) m³/ha	50-120	100-170
Pine/larch	300 m³/ha	90	70
Spruce	350 m3/ha	80	130
Alder	150 m3/ha	40	N/A

Figure 8 illustrates the projected mean harvest age and mean harvest volume per hectare for the TSR base case forecast.

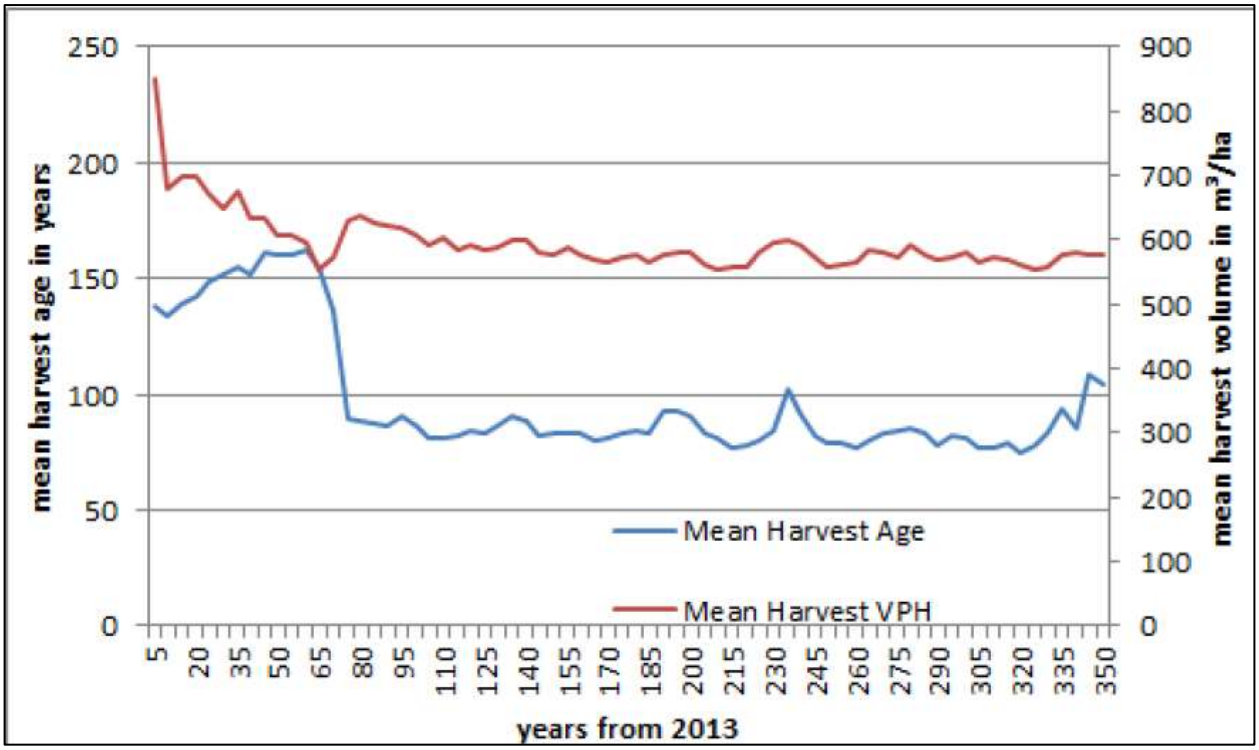

Figure 8: Projected mean harvest age and volume, Source: FLNRO 2015

4.6 Harvest Performance and Trends

Figure 9 illustrates the past harvest by species in the Fraser TSA. The harvest has not met the AAC between years 2005 and 2016; approximately 82% of the AAC was harvested during this time period (Table 8).

The harvest of hemlock-balsam leading stands is generally less than their share of the inventory Figure 10.

Figure 11 and Table 9 show the harvest by old growth – second growth for the Fraser TSA. The share of old growth of the total harvest has increased in recent years. This can also be seen in Figure 12.

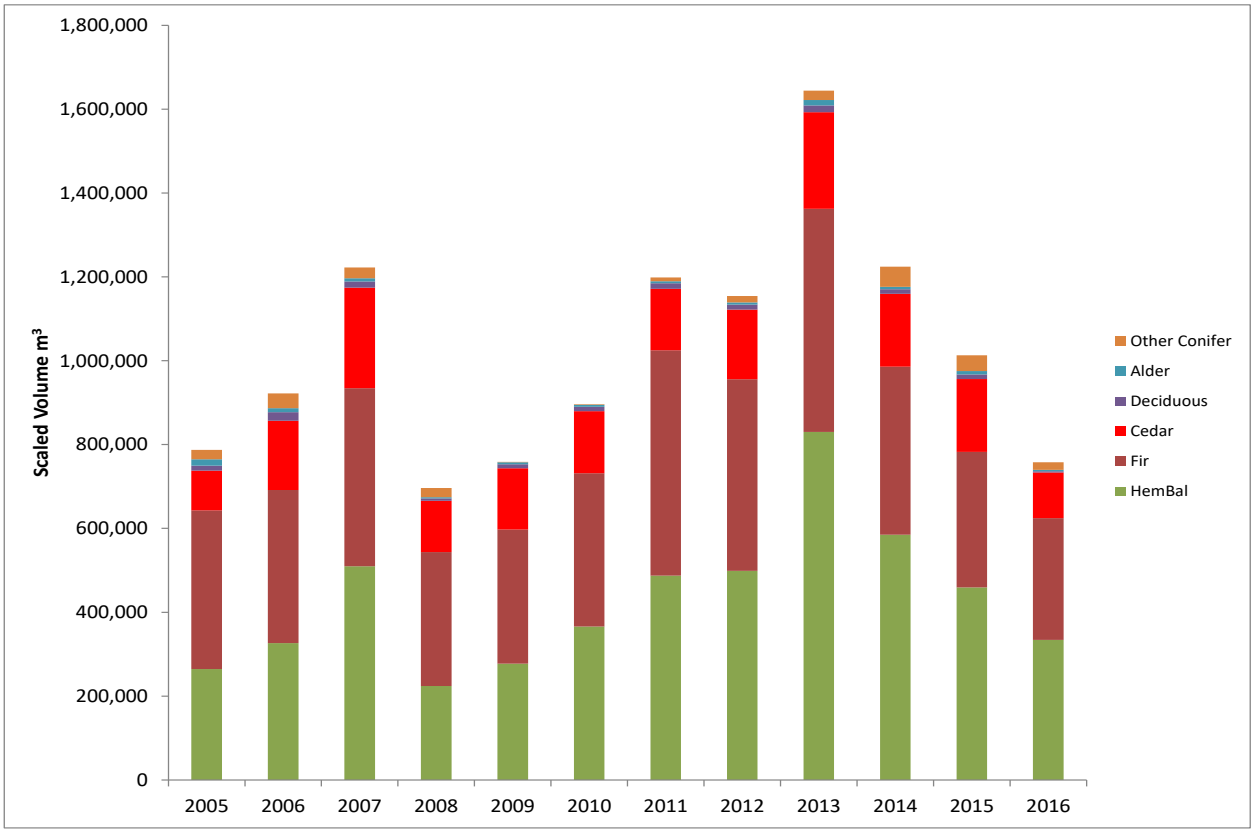

Figure 9: Harvest by species in the Fraser TSA

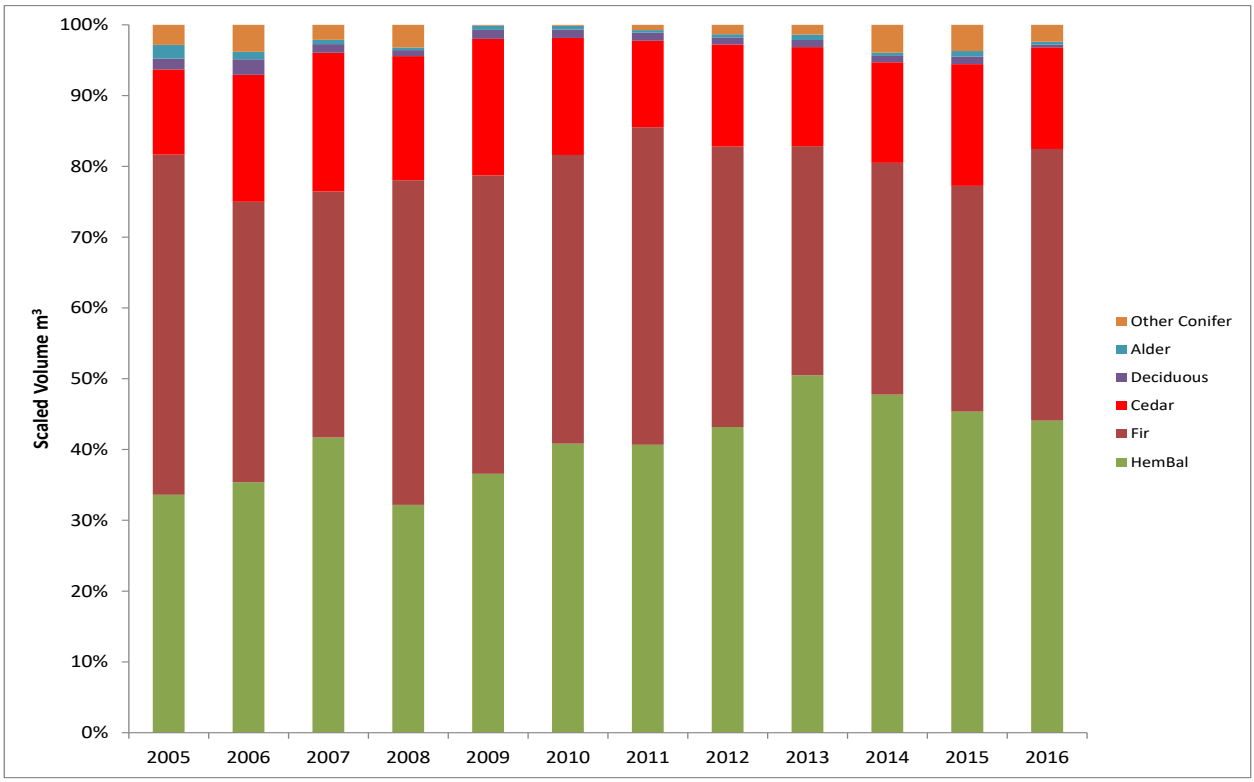

Figure 10: Harvest by species in the Fraser TSA, % of total

Table 8: Billed volume by species 2006 – 2015, Fraser TSA

Scale Year	Cedar	Fir	HemBal	Deciduous	Alder	Other Conifer	Total	% of AAC
2005	94,693	378,325	264,609	12,192	15,095	22,437	787,351	62%
2006	165,375	365,359	326,243	20,277	9,651	35,222	922,127	73%
2007	239,636	424,929	509,686	14,825	7,442	25,933	1,222,451	96%
2008	122,299	319,298	224,179	5,752	2,721	22,258	696,508	55%
2009	146,380	319,724	277,466	9,616	4,721	728	758,34	60%
2010	148,054	365,467	366,001	10,633	4,855	1,163	896,173	71%
2011	146,487	537,408	487,593	13,548	4,593	8,878	1,198,506	97%
2012	166,362	457,147	498,587	11,643	5,158	15,372	1,154,270	93%
2013	230,297	532,182	830,154	16,549	12,498	22,712	1,644,392	133%
2014	173,604	400,995	584,907	11,037	5,750	48,232	1,224,524	99%
2015	174,154	323,156	459,155	10,915	7,785	37,545	1,012,710	82%
2016	108,913	290,646	333,979	2,682	3,330	18,007	757,557	61%
Total	**1,916,255**	**4,714,637**	**5,162,558**	**139,667**	**83,600**	**258,488**	**12,275,205**	**82%**

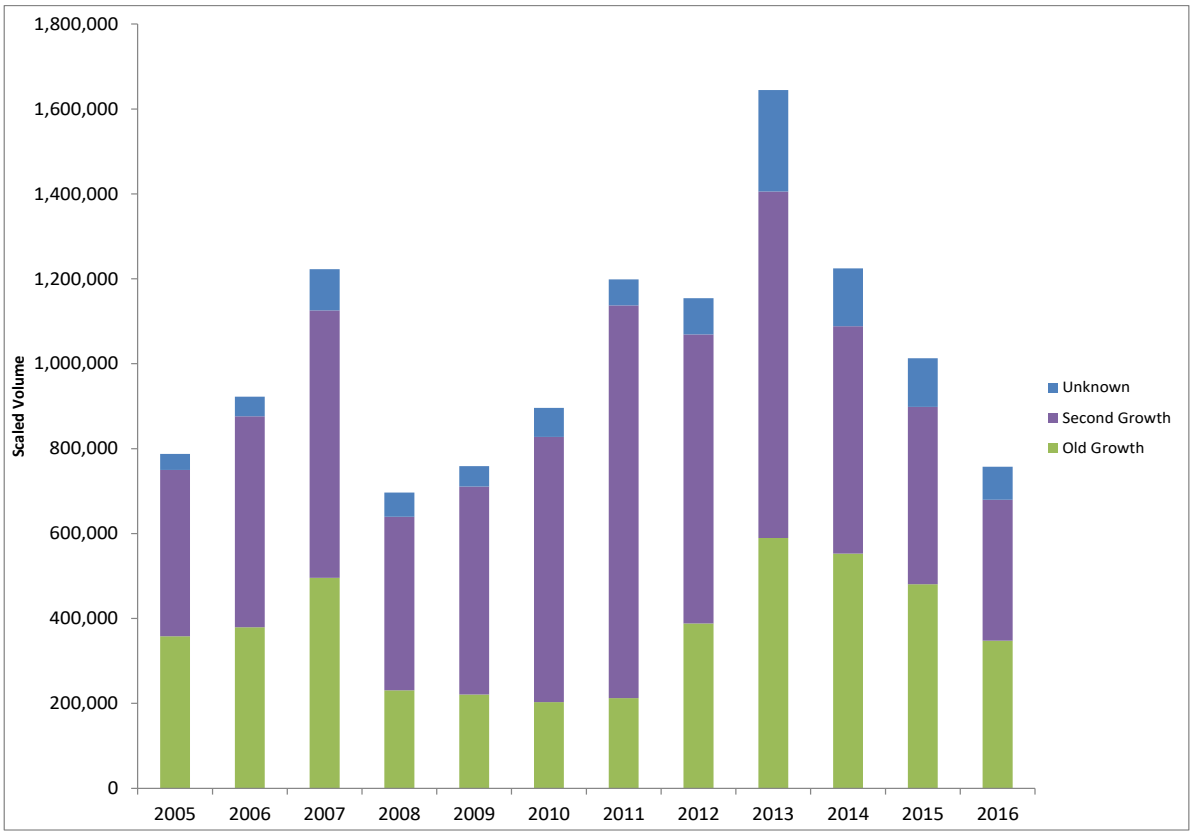

Figure 11: Harvest by old growth-second growth in the Fraser TSA

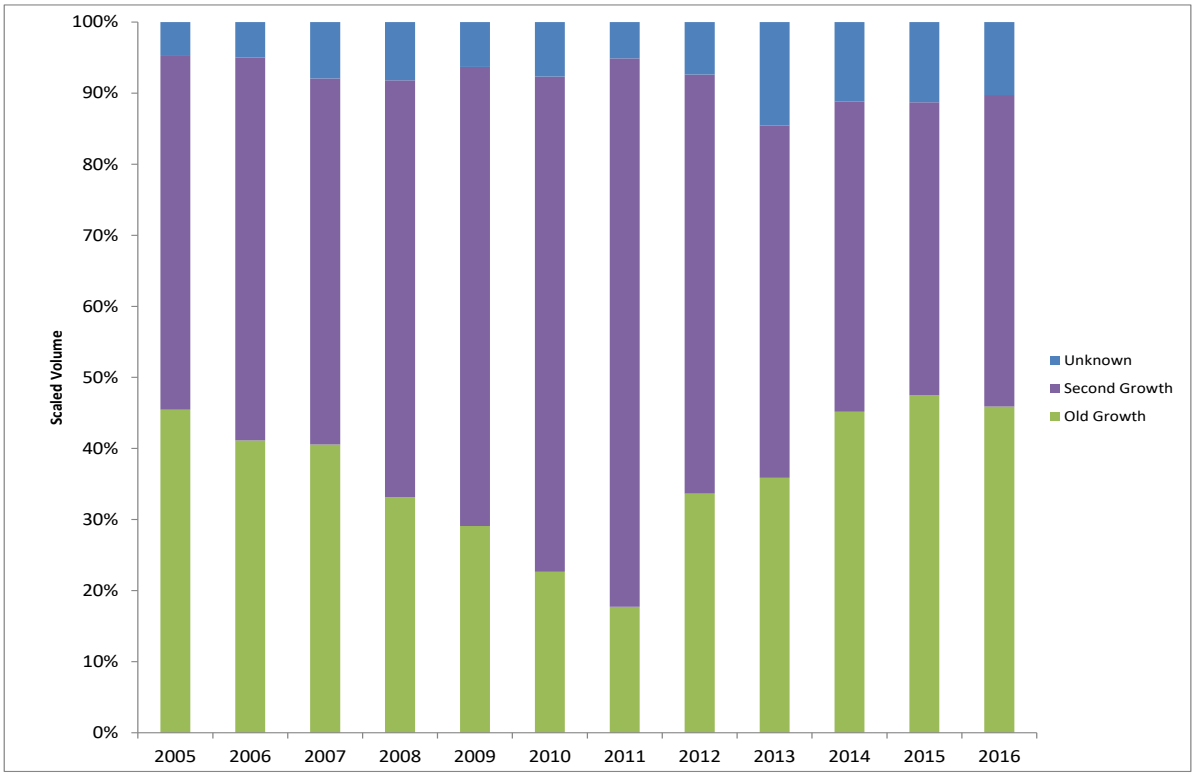

Figure 12: Harvest by old growth-second growth in the Fraser TSA, % share of total

Table 9: Harvest by old growth-second growth in the Fraser TSA

Scale Year	Old Growth	Second Growth	Unknown
2005	357,913	391,926	37,513
2006	379,184	496,762	46,181
2007	495,655	629,761	97,035
2008	230,615	408,791	57,101
2009	220,726	490,040	47,868
2010	202,800	624,684	68,689
2011	212,429	924,838	61,239
2012	388,269	680,916	85,085
2013	589,629	815,883	238,880
2014	552,915	535,182	136,427
2015	480,861	417,488	114,362
2016	347,761	331,995	77,801
Total	**4,458,756**	**6,748,267**	**1,068,182**

4.6.1 Chief Forester's AAC Determination

In her determination the Chief Forester noted a factor that creates downward pressure on the timber supply.

Cutblock adjacency and green up: the latest TSR applied adjacency constraints aspatially in the base case. The Chief Forester concluded that this may result in up to a 2.5 percent overestimation of the timber supply over the entire planning horizon.

The following factors were identified as creating upward pressure on the timber supply.

Merchantability specifications: the differences between operational specifications and base case assumptions is expected to result in a small underestimation in the short-term harvest level;

Volume estimates for managed stands: The Chief Forester concluded that OAF 1 values applied in Douglas-fir leading stands may underestimate the timber supply up to two percent throughout the planning horizon.

4.6.1.1 Implementation

In her implementation notes the Chief Forester requested following for the subsequent AAC determinations:

- Reduce uncertainty about the size of the operable land base;
- Collect information on managed stand yield estimates (existing and future) for the Fraser TSA to reduce uncertainty;
- Monitor harvesting practices and the degree to which stands are harvested before they reach the culmination age of their mean annual increment;
- Develop a planning-level karst inventory;

- Gather additional information to support analysis assumptions for designated community watersheds;
- Monitor harvest performance in old hemlock- and balsam-leading stands;
- Confirm that the spatial information for cultural values related to the S'ólh Téméxw Use Plan informs operational decisions and that the locations of these values are used as initial areas for reserve placement to protect other resource values;
- Monitor plantations for impacts from needle cast or other pathogens.

4.7 Silviculture

4.7.1 Basic Silviculture

The success of basic silviculture is crucial to future timber supply. Basic silviculture is also the basis for future incremental treatments. The following questions have been discussed throughout British Columbia in the silviculture strategy workshops:

- Are the initial stocking densities sufficient to ensure the production of a reasonable volume of timber on a given site?
- Are the initial densities sufficient to provide the quality of timber for future markets?
- Are the initial densities sufficient to buffer against future abiotic and biotic damaging agents?
- Should there be more of a mix of species, where ecologically feasible, to buffer against future abiotic and biotic damaging agents? This question applies to both block and landscape levels.
- What is the potential impact of climate change on species choices; should some species be demoted or promoted?

4.7.2 Incremental Silviculture

This ISS will investigate options to increase and/or maintain timber supply using incremental silviculture. It will contain stakeholder determined targets and strategies for timber quantity and form an effective vehicle to plan the use of public funds for new and existing initiatives.

5 Timber Quality

The current provincial target for premium logs is 10% of the AAC for each TSA. In the past, a premium log was frequently defined by such characteristics as: species, taper (lack of), tightness of grain, clear wood, and size, often diameter. Today many of the above-listed traits still signify quality; however, size tends to be less important. Also, different forestry companies may value different quality aspects in their operations.

Past analyses have demonstrated that the harvest volume of larger stems can be increased significantly by increasing the rotation ages past the mean annual increment (MAI) culmination age, usually at the cost of total volume harvested, at least in the short and medium terms. Stem sizes can be increased through various incremental silviculture regimes as well.

This ISS will contain stakeholder determined definitions for timber quality. It may also recommend strategies to maintain or enhance the quality of current and future managed stands.

This project will also attempt to assess managed - stand values resulting from different regeneration and treatment regimes. These will include estimations of future stand value using varying establishment densities and species compositions. The value estimations will use industrial log sorts and prices and milling studies, where available.

6 Habitat Supply

Wildlife habitat is established and managed through various policy and legislative instruments including the Identified Wildlife Management Strategy (IWMS), approval of ungulate winter ranges (UWR) and wildlife habitat areas (WHA), and management practices identified in plans establishing legal objectives.

6.1 Ungulate Winter Range

Two Government Action Regulations (GAR) have established two ungulate winter ranges (UWR) for mountain goat and black-tailed deer in the Fraser TSA. General Wildlife Measures (GWM) prohibit or constrain harvesting in each UWR unit. There are 115 separate UWR units for deer with no harvesting in 17 of them, while the rest allow harvesting under complex harvest regimes. The goat winter ranges are 100 percent reserved from harvesting.

6.2 Wildlife Habitat Areas

There are 111 WHAs in the Fraser TSA covering a gross area of 119,586 ha. In these areas timber harvesting is either limited or not allowed (Table 10).

Table 10: WHAs in the Fraser TSA

Species	# of WHAs	Gross area (ha)	Management activity
Grizzly Bear	63	13 418	No harvest or road construction
Spotted Owl	17	104 812	No harvest in LTOHA. Some harvesting allowed in MFHA. Harvesting may be allowed in LTOHA, if area replaced from MFHA.
Mountain Beaver	1	79	No harvest or road construction
Pacific Water Shrew	3	45	Core area and a management zone. No harvest or road construction in the core area. Partial harvesting permitted in the management zone.
Tall Bugbane	7	460	Core area and a management zone. No harvest or road construction in the core area. Partial harvesting permitted in the management zone.
Pacific Giant Salamander	20	772	Core area and one or two management zones. Harvesting and road construction are not permitted in the core area. Partial harvesting management zones permitted.
Total	111	119,586	

7 Biodiversity

Biodiversity in the Fraser TSA is managed through OGMAs and wildlife tree retention (WTR).

7.1 Landscape Level Biodiversity

Landscape level biodiversity is managed through OGMAs. OGMAs have been approved in 21 of the 24 landscape units (LU) in the TSA. The approved OGMAs satisfy all old-seral biodiversity requirements as the LUs without OGMA designations are mostly parks, protected areas or areas where timber harvesting is not allowed.

7.2 Stand Level Biodiversity

Stand level biodiversity is managed through WTR as per FRPA and the Landscape Unit Planning Guide (MFR, 1999). Where LU plans exist, WTR targets are specified; for all other landscape units and BEC variants the WTR target is 7%.

8 Climate Change Adaptation

Climate change is projected to impact both timber supply and environmental values and it must be accounted for in longer term plans and strategies. The speed and the scope of this predicted change is not known; however, it is expected that ecological niches of tree species will be altered. The occurrence of various diseases is also expected to rise as a result of the stress brought on by climate change

8.1 Forest Stewardship Action Plan for Climate Change Adaptation

Ministry of Forests, Lands and Natural Resource Operations has prepared a ***Forest Stewardship Action Plan for Climate Change Adaptation***.

https://www.for.gov.bc.ca/ftp/HFP/external/!publish/ClimateChange/Adaptation/MFLNR_CCAdaptation_Action_Plan_2012_final.pdf

The plan is consistent with the provincial timber management goals and objectives. It sets three broad goals:

- Foster Resilient Forests
- Maintain Future Options and Benefits
- Build Adaptive Capacity

8.1.1 Foster Resilient Forests

Forests should be well adapted to the full range of both current and future climatic conditions. This can be accomplished by anticipating and managing climate change and by maintaining and enhancing biodiversity.

8.1.2 Maintain Future Options and Benefits

Manage and protect all resources and values and manage risks:

1. Developing strategies at the TSA level to address climate change considerations, including tree species diversity objectives and forest health strategies.
2. Strengthen the content of district level forest health strategies by through revisions to stocking standards, recommendations on changes to current practices etc.
3. Apply best adaptation principles, goals, objectives and tools through the Land Based Investment Strategy and its Forests for Tomorrow program.
4. Investigate options and devise an approach to free growing that ensures all harvested stands are stocked with healthy crop trees at age twenty.
5. Build fire resilient landscapes: conduct landscape wildfire risk assessments, and implement treatments on priority areas

8.1.3 Build Adaptive Capacity

- Develop adaptation information, knowledge and tools so that forest managers have easy access to information and tools to adapt to a changing climate.
- Increase extension and collaboration among natural resource agencies, universities, forest managers and other research organizations working towards climate change adaptation to leverage limited funds and resources.
- Ensure guidance and coordination so that the Ministry's adaptation actions are appropriately guided and coordinated strategic ally both internally and externally.

8.2 Ministry of Forests Lands and Natural Resource Operations Climate Change Strategy 2015-2020

Ministry of Forests, Lands and Natural Resource Operations has completed a climate change strategy. It can be found here:

https://www.for.gov.bc.ca/het/climate/strategy/climate_change_strat_2015-20.pdf

9 First Nations and Cultural Heritage

The Fraser TSA has the highest concentration of First Nations in the Province. Within the Fraser TSA; 38 First Nations Bands and 5 tribal organizations have asserted traditional territories. There are an additional 16 First Nations and 7 tribal organizations whose traditional territories extend into the Fraser TSA. A key to reconciliation and relationship building are many collaborative understandings between government and First Nation communities through, but not limited by, agreements, tenures, and treaties. Conducting assessments pertaining to heritage and cultural use are also a means to build relationships and reach reconciliation by recognizing possible important areas of aboriginal interests.

9.1 Agreements and Tenures

In June, 2008, the Kweh-Kwuch-Hum (Mt Woodside) Spiritual Areas were identified as cultural heritage resource features by a GAR Order. The Kweh-Kwuch-Hum protects and conserves spiritual areas as noted in the order.

In June, 2012, twelve Stó:lō First Nations and the BC Government signed a Stó:lō First Nations Strategic Engagement Agreement (SEA) Pilot - to create more streamlined consultation processes and promote more effective engagement between government and First Nations in the upper Fraser Valley. Since this date the SSEA has become a full SEA and four more First Nations have been added to the Agreement, bringing the total number of bands under the agreement to sixteen.

Since 2010, approximately 31 of the 38 First Nations with asserted traditional territories within the Fraser TSA have signed Forest Consultation and Revenue Sharing Agreements (FCRSA). These agreements provide First Nation communities with economic benefits returning directly to their community based on harvest activities in their traditional territory.

As well, several First Nations have obtained area or volume based forest tenures within the Fraser TSA allowing them to increase their participation in the Forest Sector.

9.2 Treaties and Treaty Negotiations

There are several First Nations within the Fraser TSA that are in treaty negotiations and one First Nation with a signed treaty, the Tsawwassen First Nation.

On April 3, 2009, the Tsawwassen First Nation Treaty came into effect. It is the first urban treaty in British Columbia and the first treaty negotiated under the British Columbia Treaty Commission (BCTC) process. The treaty brings certainty with respect to all of Tsawwassen First Nation's Aboriginal rights throughout the Tsawwassen First Nation claimed traditional territory, which covers approximately 279,600 hectares including the waters of the southern Strait of Georgia. The treaty land package consists of approximately 724 hectares of treaty settlement land for Tsawwassen First Nation. This includes approximately 290 hectares of former reserves and 372 hectares of former provincial Crown land.

The Katzie First Nation entered the treaty process in February 1994, and is now in Stage 4 of the six-stage process, negotiating an AIP which includes the identification of an area of interest. Negotiations with Katzie are currently focused on land identification, fish and forest resources.

In addition to the Katzie, the Stó:lō Nation (which includes Aitchelitz, Leq'a:mel, Popkum, Skawahlook, Skowkale, Tzeachten, and Yakweakwioose), Musqueam First Nation, and Tsleil-Waututh Nation are in Stage 4 negotiations.

10 Watersheds

10.1 Community Watersheds

Harvesting is allowed in community watersheds; however, operations must be planned in such a way that no harmful substance may enter the water. There are 77 officially designated community watersheds in the Fraser TSA.

10.2 Non-Designated Watersheds

In the past communities that depend on the Hatzic Valley watershed have expressed concerns regarding the potential impacts of roadbuilding, road use and logging activity on water quality, flow rate and sustainability in the watershed. The Hatzic Valley with approximately 1,246 ha of THLB, is not a legally designated community watershed.

The impacts of harvesting are currently mitigated by rigorous review of cutting permit and road permit applications in the watershed. This review and diligence exhibited by the TSA licensees are thought to have reduced the harvest in the Hatzic Valley watershed to a level consistent with harvest rates in designated community watersheds.

10.3 Fisheries Sensitive Watersheds

There are no fisheries sensitive watersheds in the Fraser TSA.

11 Multiple Resource Value Assessment

The utilization of natural resources influences ecosystem conditions. The Multiple resource value assessments (MRVA) gauge how natural resources utilization impacts the state of public natural resource values. MRVAs show the results of stand and landscape-level monitoring carried out under the Forest and Range Evaluation Program (FREP). The MVRA may be carried out for all 11 FRPA values.

The MRVA helps to:

- Measure whether the impacts of resource development result are consistent with sustainable resource management;
- Provide transparency and accountability for the management of public resources;
- Support the balance in decision making between environmental, social, and economic factors;
- Advise on the improvement of resource management practices, policies, and legislation.

The MRVAs are localized and do not reflect the potential impacts or lack of them on a larger, landscape level scale.

Further information regarding MRVA for the Fraser TSA (Chilliwack Natural Resource District) can be found here:

http://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/frep/frep-docs/mrva_chilliwack_district_-_final.pdf

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