DISTRICT OF MISSION
MISSION MUNICIPAL FOREST

Type 1 Incremental Silviculture Strategy

-TREE FARM LICENCE #26 -

Submitted to the B.C. Ministry of Forests

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Executive Summary

General Strategy

The emphasis of the silviculture strategy for District of Mission's TFL 26 is to maximize the quality of their timber supply subject to available funding and market conditions for forest products. Mission also wishes to increase the available harvest through incremental silviculture and other investments.

Working Targets

WT 1 (Quantity)

Manage short and mid-term timber supplies to yield a 4.5% increase in harvest level from 43,000 m^3 per year to 45,000 m^3 per year.

WT 2 (Quality)

Manage regenerated stands to yield 10% premium logs by volume, with the majority of the remainder being of sawlog quality.

Product Objectives

Premium Log

1. Douglas fir, clear, pruned — 45+ cm min dbh, pruned 5.3 m log.
2. Douglas fir, large timber — 45+ cm min dbh, unpruned.
3. Hem/Bal, large timber — 45+ cm min dbh, unpruned.
4. Cedar, large timber — 45+ cm min dbh, unpruned.

Sawlog

1. Minimum average stand dbh of 30 cm.
2. Minimum stand volume of 350 m^3 per hectare.

Major Silviculture Strategies

Timber Supply – Quality (H)

1. Increase the piece size and the clear wood component of timber supply through a combination of density control, pruning and fertilization.

Timber Supply – Quantity (H)

1. Increase the timber supply in the short-term by fertilizing existing stands that are scheduled for harvesting within the next 20 years.

2. Increase the timber supply in the mid term by repeat fertilizing existing stands that are scheduled for harvesting 20 to 80 years from now.

3. Increase THLB by converting some of the deciduous stands, which are not currently utilized, to conifer.

4. Minimize the impact of green-up and VQO on timber supply through quick planting using large stock types and early brushing.

5. Minimize the impact of green-up and VQO on timber supply using commercial thinning and retention harvesting.

6. Increase the timber supply using genetically improved seed.

7. Determine true site indices for the TFL.

Biodiversity

1. Create old growth conditions through partial harvesting within riparian areas where feasible.

Table of Contents

EXECUTIVE SUMMARY ..... *i*

GENERAL STRATEGY ..... *i*
WORKING TARGETS ..... *i*
PRODUCT OBJECTIVES ..... *i*
MAJOR SILVICULTURE STRATEGIES ..... *i*
Timber Supply – Quality (H) ..... *i*
Timber Supply – Quantity (H) ..... *ii*
Biodiversity ..... *ii*

1 INTRODUCTION **1**

1.1 METHODOLOGY 1
1.2 ACKNOWLEDGEMENTS 2

2 HIGHER LEVEL GOALS AND OBJECTIVES **3**

2.1 PROVINCIAL GOALS 3
2.1.1 Provincial Objectives *3*
2.2 REGIONAL OBJECTIVES 4

3 ISSUES AND STRATEGIES **5**

3.1 IDENTIFICATION OF ISSUES AND STRATEGIES 5
3.1.1 Issue 1: Timber Supply – Quality (H) *5*
3.1.2 Issue 2: Timber Supply – Quantity (H) *5*
3.1.3 Issue 3: Biodiversity *6*
3.1.4 Issue 4: Forest Health *6*

4 PRODUCT OBJECTIVES **7**

5 POTENTIAL TREATMENTS AND TREATABLE AREA **8**

6 POTENTIAL STRATEGIES BY RESPONSE TIME FRAME **9**

7 INCREMENTAL SILVICULTURE STRATEGY **12**

7.1 GENERAL STRATEGY 12
7.2 WORKING TARGETS 12
7.2.1 WT 1 (Quantity) *12*
7.2.2 WT 2 (Quality) *12*
7.3 IDENTIFICATION OF TARGETS, REGIMES AND ACTIVITIES 12

8 SILVICULTURE PROGRAM **15**

8.1 TACTICAL PRIORITIES 15
8.2 PROGRAM COSTS AND BENEFITS 15

APPENDIX 1 ..... **17**

TIMBER SUPPLY CONTEXT OF SILVICULTURE IN TFL 26 17

HISTORY OF THE ALLOWABLE ANNUAL CUT 17
BASE CASE HARVEST FORECAST 17
ALTERNATIVE TIMBER FLOWS 18
AGE CLASS DISTRIBUTION 19
TRANSITION FROM NATURAL TO MANAGED STANDS 20
AVERAGE HARVEST AGE 21
AVERAGE HARVEST VOLUME 21
SENSITIVITY ANALYSES 22
Summary of Timber Supply Dynamics *22*

APPENDIX 2 24

COST AND EMPLOYMENT ASSUMPTIONS 24

REFERENCES 25

List of Figures

FIGURE 1 - BASE CASE TIMBER SUPPLY FORECAST 18
FIGURE 2 – BASE CASE AND NO LAND BASE CONSTRAINTS HARVEST FORECAST 18
FIGURE 3- CURRENT AGE CLASS DISTRIBUTION (THLB) 19
FIGURE 4– BASE CASE HARVEST VOLUME FROM EXISTING AND MANAGED STANDS 20
FIGURE 5 - AVERAGE HARVEST AGE 21
FIGURE 6 - AVERAGE HARVEST VOLUME 21

List of Tables

TABLE 1 – POTENTIAL TREATMENTS AND TREATMENT AREA 8
TABLE 2 - POTENTIAL STRATEGIES BY TIME FRAME TO IMPROVE THE QUALITY OF TIMBER SUPPLY 10
TABLE 3 - POTENTIAL STRATEGIES BY TIME FRAME TO IMPROVE THE QUANTITY OF TIMBER SUPPLY 11
TABLE 4 - SILVICULTURE STRATEGIES 13
TABLE 5 - AREA (HA) TREATED BY ACTIVITY AND YEAR 16
TABLE 6 - EXPENDITURE BY ACTIVITY AND YEAR 16
TABLE 7 - SHORT-TERM EMPLOYMENT BENEFITS (PERSON-DAYS) BY YEAR AND ACTIVITY 16
TABLE 8 – COST AND EMPLOYMENT ASSUMPTIONS 24

1 Introduction

This strategy is part of a province-wide initiative to develop a silviculture strategy for each management unit in the province by March 31, 2001. These strategies are limited to FRBC funded silviculture activities, i.e., incremental silviculture.

Incremental silviculture forms a part of many possible strategies that are available today to improve future quality and quantity of habitat and timber supply. This document broadly analyzes a range of potential incremental silviculture activities to form a basis for an incremental silviculture strategy.

This analysis is a type 1 analysis using existing timber supply review (TSR) summary information to identify issues and opportunities for silviculture investments. It provides realistic targets, strategies and silviculture regimes that can be used to guide investments, and further as inputs in the more in-depth type 2 analyses.

It is important not to confuse this initiative with timber supply review (TSR). TSR determines harvest levels that can be supported with current management practices and information. Incremental silviculture strategy assesses the impact of a variety of potential investments on the future quality and quantity of harvest levels as well as habitat supply.

1.1 Methodology

The following process was used to prepare this strategy:

1. A working session was held February 21, 2001 in Mission, attended by representatives of District of Mission (Mission) and Ministry of Forests (MoF). Antti Makitalo from Forest Ecosystem Solutions Ltd. led the session. The participants brought up issues, opportunities and priorities that are listed later in this document.

2. Forest Ecosystem Solutions Ltd. incorporated the results of the working session into the draft document and added forecasts of future harvest quantity and quality and of job outcomes.

3. After stakeholder review, Forest Ecosystem Solutions Ltd. submitted the completed strategy to the MoF.

1.2 Acknowledgements

The participation of the following organizations at the working session is acknowledged:

Kim Allan	District of Mission
Craig Wickland	Ministry of Forests, Chilliwack Forest District
Larry Sigurdson	Ministry of Forests, Vancouver Forest Region

The project was managed by Kim Allan. Funding was provided by Forest Renewal BC.

2 Higher Level Goals and Objectives

This incremental silviculture strategy is based on higher level provincial goals and objectives, which are as follows:

2.1 Provincial Goals

Government's goals are (Atherton, 1999):

1. Sustainable Use
2. Community Stability
3. A strong Forest Sector

2.1.1 Provincial Objectives

2.1.1.1 Guiding Principles

1. Minimize risk and maintain options.
2. BC's forests are important from the local to global levels and should be managed in this context.
3. Each generation has a moral obligation to preserve the province's forest resources for future generations.

The Provincial Incremental Silviculture Strategy specifies a working target of increasing volume and maintaining or enhancing future premium wood quality supplies. More specific objectives are to:

1. Minimize interim reduction in timber supply so that the allowable annual cut is not less than 65 million cubic meters;
2. Increase timber supply over the mid-term to a long-term level of 75 million m^3; and,
3. Maintain the production of premium quality logs at or above 10% of total harvest. (Atherton, 1999)

2.2 Regional Objectives

The objectives of the regional incremental silviculture strategy are to:

1. Ensure a long term sustainable harvest which approximates the current harvest value and volume levels and that produces a diversified mix of products necessary to create and maintain sustainable forest employment.

2. Balance treatments that enhance growth and yield such as fertilizing, spacing and forest health activities with those that increase the value of the wood such as pruning.

3. Utilize incremental silviculture treatments to contribute to sustainable management of non-timber values at the landscape level. (MoF, 1998)

3 Issues and Strategies

3.1 Identification of Issues and Strategies

3.1.1 Issue 1: Timber Supply – Quality (H)

Mission wishes to maximize the quality of their timber supply subject to available funding and market conditions for forest products. Forest product prices have a direct impact on Mission's ability to invest in incremental silviculture.

Strategies:

1. Increase the piece size and the clear wood component of timber supply through a combination of density control, pruning and fertilization.

3.1.2 Issue 2: Timber Supply – Quantity (H)

Mission also wishes to increase the available harvest volume through incremental silviculture and other investments. There are opportunities to mitigate the timber supply impacts of current green-up and visual quality rules using silviculture. Also, several silviculture regimes are available to increase the yields of existing and regenerated stands.

The issue of site indices and their accuracy, although not a silviculture matter, deserves further investigation. If the current site indices are underestimated, as has been the case throughout the province, the impact on timber supply can be significant. The costs of determining the correct site indices are likely to be moderate compared to the benefits through increased timber supply.

Strategies:

1. Increase the timber supply in the short-term by fertilizing existing stands that are scheduled for harvesting within the next 20 years. Mission has recently completed a fertilization assessment giving direction in choosing the proper stands for fertilization.

2. Increase the timber supply in the mid term by repeat fertilizing existing stands that are scheduled for harvesting 20 to 80 years from now.

3. Increase THLB by converting some of the deciduous stands that are not currently utilized to conifer.

4. Minimize the impact of green-up and VQO on timber supply through quick planting using large stock types and early brushing. This is a basic silviculture activity and it is already practiced on the TFL.

5. Minimize the impact of green-up and VQO on timber supply using commercial thinning and retention harvesting.

6. Increase the timber supply using genetically improved seed. Genetically improved seed has not always been available for Mission. The next generation genetically improved seed is predicted to be available by 2010.

7. Determine true site indices for the TFL.

3.1.3 Issue 3: Biodiversity

Maintain or create old growth seral conditions.

Strategy:

1. Create old growth conditions through partial harvesting within riparian areas where feasible.

3.1.4 Issue 4: Forest Health

Forest health problems in the TFL are not significant. There are some mistletoe infected Hw stands and endemic level of root rot.

Some hemlock looper is present adjacent to the TFL.

Strategy:

1. Remove infected Hw trees promptly.

4 Product Objectives

The following are products objectives used for this analysis:

Premium Log

Douglas fir, clear, pruned	45+ cm min dbh, pruned 5.3 m log.
Douglas fir, large timber	45+ cm min dbh, unpruned.
Hem/Bal, large timber	45+ cm min dbh, unpruned.
Cedar, large timber	45+ cm min dbh, unpruned.

Sawlog

Minimum average stand dbh of 30 cm. Minimum stand volume of 350 m^3 per hectare.

5 Potential Treatments and Treatable Area

Table 1 – Potential Treatments and Treatment Area

Treatment	Comment	Treatable Area
♦ Spacing	Spacing can be used to control species composition. Density management can affect sizes and average diameters of stands at harvest. Spacing is usually a prerequisite for pruning, unless densities are sufficiently low that no spacing is required.	Approximately 80% of harvested area (51ha) is spaced.
♦ Commercial Thinning	Little commercial thinning is practiced in the TFL. It has a role in visually sensitive areas.	5 ha per year.
♦ Pruning	Pruning is done only on good and medium fir sites. Two lifts is the normal practice.	16 ha per lift, total of 32 ha per year.
♦ Fertilization	Currently there is little fertilization, however, the potential is significant.	40 ha of existing stands, 7.5 ha of stands scheduled for harvest 20-80 years from now, 11 ha out of all harvested areas for a total of 58.5 ha/yr

6 Potential Strategies by Response Time Frame

Tables 2 and 3 identify potential strategies and their estimated results by time frame; short-term= 0-20 years, mid term = 21-80 years, long term = 81+ years.

Table 2 - Potential strategies by time frame to improve the quality of timber supply

Response Time Frame	Objective/Action	Anticipated Results
Short Term	None	
Mid Term	1. Prune in 2 lifts to yield a 5.3 m clear log. Fd good and medium sites only at less than 600 m elevation. There are about 1,900 ha of good and medium Fd sites < 600 m in the TFL. This is 25% of the THLB. Assume 25% harvest on good and medium Fd sites, i.e., 25% x 65 ha = 16 ha x 2 lifts = 32 ha of potential pruning per year.	Assume 15% clear wood from pruning (MoF, 2000). If 25% of harvest areas are pruned = 25% x 15% = 3.75% clear wood.
	2. Manage for large dimension timber through spacing and prepare stands for fertilization and pruning. Timber supply analysis assumes spacing of all good and medium Fd, Cw and HemBal sites. Grand total of 6,358 ha. This is about 88 % of the THLB. In practice about 10% of this does not require spacing. Assume 88% -10% = 78% of annual harvest area is spaced annually, 78% x 65ha = 51 ha.	Spaced stands produce larger diameters. According to TIPSY, the spaced stands will produce on average 5.5% larger average diameters for the largest 250 stems.
Long Term	As above.	

Table 3 - Potential strategies by time frame to improve the quantity of timber supply

Response Time Frame	Objective/Action	Anticipated Results
Short Term	1. Achieve green-up asap in VQO zones by: a. Planting promptly after harvesting. b. Planting large stock. c. Early brushing.	Current practice.
	2. Fertilize suitable existing stands 10 years prior to harvest. Harvesting within the next 20 years.	Approximately 800 ha of age class 3, 4 and 5 stands have been identified suitable for fertilization. 800 ha constitute about 60% of the area harvested in 20 years. Potential treatment area per year = 800 ha/20years = 40 ha/yr. Assuming 5% volume gain from fertilization: 60 % X 5% = 3% increase timber in supply.
	3. Convert 200 ha of deciduous stands in coniferous stands.	+ 4%, area multiplied by 10 m^3/ha/year.
	4. CT and partial harvesting in visually sensitive areas.	Modelling required to estimate impact.
	5. Complete site index estimation studies. The impact will be realized throughout the planning horizon.	20% increase in timber supply as per sensitivity analysis; however, studies may prove neutral.
Mid Term	6. Repeat fertilize all suitable existing stands scheduled for harvest 20 to 80 years from now to raise existing stand volumes.	Approximately 450 ha of age class 1 and 2 stands have been identified suitable for fertilization. 450 ha constitute about 10% of the area harvested within the next 60 years. Potential treatment area per year = 450ha/60years = 7.5 ha/yr. Assuming 10% volume gain from repeated fertilization: 10% X 10% = 1% increase in timber supply.
	7. Increase Regenerated stand volumes by repeat fertilizing suitable Fd stands.	Approximately 1,200 ha (17%) are suitable stands in the TFL of the long-term THLB of 7,200 ha. Assume fertilization for 17% of all harvested areas, 17% of annual harvest area of 65 ha = 11 ha. Assume 30% increase in volume, 30% X 17% = 5% impact.
Long Term	8. Increase Regenerated stand volumes by using second generation genetically improved seed.	Second generation seed should be available for 2010. Assuming an average of 10% genetic gain for all species would result in 10% increase in long-term timber supply.
	9. Increase Regenerated stand volumes by repeat fertilizing suitable Fd stands.	Approximately 1,200 ha (17%) of suitable sites in the TFL out of long-term THLB of 7,200 ha. Assume fertilization for 17% of all harvested areas, 17% of annual harvest area of 65 ha = 11 ha. Assume 30% increase in volume, 30% X 17% = 5% impact.

7 Incremental Silviculture Strategy

This section synthesizes the preceding background information and analysis into an incremental silviculture strategy for the TSA.

7.1 General Strategy

The Mission TFL has several options to utilize silviculture to improve both the quality and quantity of their timber supply. Pruning and spacing treatments combined with fertilization can bring quality improvements. Fertilization and genetic improvement will also be important tools to increase future harvest volumes.

7.2 Working Targets

7.2.1 WT 1 (Quantity)

Manage short and mid-term timber supplies to yield a 4.5% increase in harvest level from 43,000 m^3 per year to 45,000 m^3 per year.

7.2.2 WT 2 (Quality)

Manage regenerated stands to yield 10% premium logs by volume, with the majority of the remainder being of sawlog quality.

7.3 Identification of Targets, Regimes and Activities

Table 4 documents the issues and strategies identified earlier in section 1.1.

Note that fertilization treatment areas are quoted as ha per year. In practice, it is more efficient and cost effective to concentrate fertilization areas and carry out the treatment once in 5 to 7 years, rather than annually. In this strategy, a total of 58.5 ha per year of fertilization is recommended. It will be up to Mission how they choose to aggregate their fertilization areas. In section 8 - Silviculture Program – it is assumed that 50% (292.5 ha) of the 10 year fertilization program takes place in year 3 and another 50% between years 6 and 10.

Table 4 - Silviculture Strategies

Issue	Objective	Strategy	Target	Regime	Activities	Area ha/yr	Timber Supply Effects				Habitat Effects	Jobs pd/ha	Cost/ha	Rank	Impact on premium sawlog prod	AAC
							S	M	L	Q						
Quality of Timber Supply	Max Quality	Increase piece size and clear wood.	Medium and high fir sites at less than 600 m elevation.	Density control and pruning.	1. Space to 600 – 800 sph. 2. Prune 350 sph 1st lift. 3. Prune 300 sph 2nd lift.	5 5 5				 + 		3.5 4 5	1,000 1,000 1,400	1	+	0
		Increase piece size and clear wood.	As per fertilization assessment.	Add fertilization to the previous regime.	1. Space to 600 – 800 sph. 2. Prune 350 sph 1st lift. 3. Fertilize 200 kg pure N/ha. 4. Prune 300 sph 2nd lift.	11 11 11 11		 + 	 + 	 + 		3.5 4 0.1 5	1000 1000 300 1,400	1	++	+
		Increase piece size.	All good and medium Fd, Cw and HemBal sites.	Density control.	Space to 600 – 800 sph,	35				+		3.5	1,000	1	+	0
Quantity of Timber Supply	Max Quantity	Increase volume per hectare in the short term.	Existing stands scheduled for harvesting within the next 20 years as per fertilization assessment.	Fertilize once 10 years prior to harvest.	Fertilize suitable stands.	40	+					0.1	300	2		+
		Increase volume per hectare in the mid term.	Existing stands scheduled for harvesting 20 to 80 years from now as per fertilization assessment.	Repeat fertilize starting at 15 to 20 years of age (or at pruning) until 10 years prior to harvest.		7.5		+	+	+		0.1	300	3		+

Issue	Objective	Strategy	Target	Regime	Activities	Area ha/yr	Timber Supply Effects				Habitat Effects	Jobs pd/ha	Cost/ha	Rank	Impact on premium sawlog prod	AAC
							S	M	L	Q						
		Minimize the impact of green-up and VQOs on timber supply.	Visually sensitive areas.	Quick planting, large stock, early brushing. Basic silviculture.	1. Plant 2. Brush	65 85						2 1.5	1,100 450			0
		Minimize the impact of green-up and VQOs on timber supply.	Visually sensitive areas.	Commercial thinning, retention harvesting.		5	+								+	
		Increase THLB.	Deciduous stands.	Convert a grand total of 200 ha of deciduous stands to conifer.	1. Harvest 2. Plant 3. Brush 4. Space	5 5 5 5	 + 	 + 	 + 	 		 2 1.5 3.5	 2 450 1,000			 +
		Increase regenerated yields.	Regenerated areas.	Use genetically improved seed. The 2nd generation seed likely not available until 2008.					+	+					+	+
		Determine true site indices in the TFL.	All analysis units.	Site index study.	Not incremental silviculture, however, potential impact and value significant.		+	+	+	+						+
Biodiversity	Enhance	Create old growth habitat conditions.	Riparian areas	Partial cutting in riparian areas where feasible.			+	+	+		+					+
Forest Health	Prevent and mitigate.	Reduce mistletoe infections..	Mistletoe infected Hw stands.	Remove infected trees.												

8 Silviculture Program

8.1 Tactical Priorities

As table 4 illustrates, individual regimes were not ranked higher than others. Rather, the several groups received the same ranking indicating their overall high priority. Quality enhancing regimes ranked highest, but they all received the same rank.

The highest priority activities are the different combinations of spacing, pruning and fertilization. The second highest priority was given to the timber quantity enhancing activities of existing stand fertilization. It was considered less attractive to convert deciduous stands into coniferous stands and undertake a substantial commercial thinning program.

In reality funds for incremental silviculture are limited. If adequate resources do not exist to follow the regimes in table 4, the following order of priority will be used:

- Spacing;
- Fertilization;
- Prune 2nd lift (stands have been pruned for 1st lift);
- Prune 1st lift.

As the uncertainty regarding the accuracy of site indices in the TFL is not directly related to incremental silviculture it was not given a rank. However, a site index study is a high priority, should there be available funds.

8.2 Program Costs and Benefits

Table 5 contains the area treated by each activity and year.

Table 6 contains the expenditure by activity and year, based on the unit costs recorded in the treatment table.

Table 7 contains the silviculture employment benefits associated with the program.

The cost and employment assumptions used in creating the tables are listed in Appendix 2.

Planting and brushing in tables 5, 6 and 7 fall under the definition of basic silviculture and are thus not eligible for FRBC funding.

Table 5 - Area (ha) treated by activity and year

Year	Surveys	Site Prep	[1]Plant	[1]Brush	[1]Space	Fertilize	Prune	Total
1	200		70	90	56	0	32	448
2	200		70	90	56	0	32	448
3	200		70	90	56	292.5	32	740.5
4	200		70	90	56	0	32	448
5	200		70	90	56	0	32	448
Subtotal	1000		350	450	280	292.5	160	2532.5
Yr. 6-10	1000		350	450	280	292.5	160	2532.5
Total	2000		700	900	560	585	320	5065

[1]Planting, spacing and brushing areas include 5 ha from proposed deciduous conversion.

Table 6 - Expenditure by activity and year

Year	Surveys	Site Prep	Plant	Brush	Space	Fertilize	Prune	Total
1	$8,000		$77,000	$40,500	$56,000	$0	$38,400	$219,900
2	$8,000		$77,000	$40,500	$56,000	$0	$38,400	$219,900
3	$8,000		$77,000	$40,500	$56,000	$87,750	$38,400	$307,650
4	$8,000		$77,000	$40,500	$56,000	$0	$38,400	$219,900
5	$8,000		$77,000	$40,500	$56,000	$0	$38,400	$219,900
Subtotal	$40,000		$385,000	$202,500	$280,000	$87,750	$192,000	$1,187,250
Yr. 6-10	$40,000		$385,000	$202,500	$280,000	$87,750	$192,000	$1,187,250
Total	$80,000		$770,000	$405,000	$560,000	$175,500	$384,000	$2,374,500

Table 7 - Short-term employment benefits (person-days) by year and activity

Year	Surveys	Site Prep	Plant	Brush	Space	Fertilize	Prune	Total
1	20		140	135	196	0	144	635
2	20		140	135	196	0	144	635
3	20		140	135	196	29.25	144	664.25
4	20		140	135	196	0	144	635
5	20		140	135	196	0	144	635
Subtotal	100		700	675	980	29.25	720	3204.25
Yr. 6-10	100		700	675	980	29.25	720	3204.25
Total	200		1400	1350	1960	58.5	1440	6408.5

9 Appendix 1

9.1 Timber Supply Context of Silviculture in TFL 26

This section provides information on the timber supply history and dynamics within TFL 26. The objective is to identify the factors that shape timber supply within the TFL and identify opportunities for the use of silviculture to mitigate shortfalls in timber supply. Background information was drawn from Management Plan #8 draft (2001), Timber Supply Analysis Report (2001) and the Rationale for Allowable Annual Cut Determination (1996) for TFL 26.

9.2 History of the Allowable Annual Cut

TFL 26 was originally awarded as a Forest Management Licence to the Corporation of the District of Mission in 1958. The Allowable Annual Cut (AAC) was set at 12,035 m^3 in 1958 and increased over time to 41,200 m^3 by 1989 due to new inventory data, changes in utilization standards, additions to the TFL land base and a reclassification of site productivity. In 1996, the AAC was set at 45,000 m^3. This included a coniferous leading component of 42,000 m^3 and a partition of 3,000 m^3 attributable to deciduous leading stands

9.3 Base Case Harvest Forecast

Figure 1 shows the base case harvest forecast of the Timber Supply Analysis prepared for MP8. Figure 8 shows the base case harvest forecast for TFL 26. It suggests that a harvest level of 43,168 m^3 per year can be maintained for 9 decades following an increase up to 46,877 m^3 at 95 years and yet another increase at 155 years up to the long-term harvest level (LTHL) of 50,187 m^3.

The short-term harvest level of 43,168 m^3 in the base case is 4% higher than the current coniferous AAC, despite the smaller THLB (9.5%) compared to the last timber supply review. The current, less restrictive VQOs and changes in minimum harvestable ages since the last timber supply review account for most of this increase.

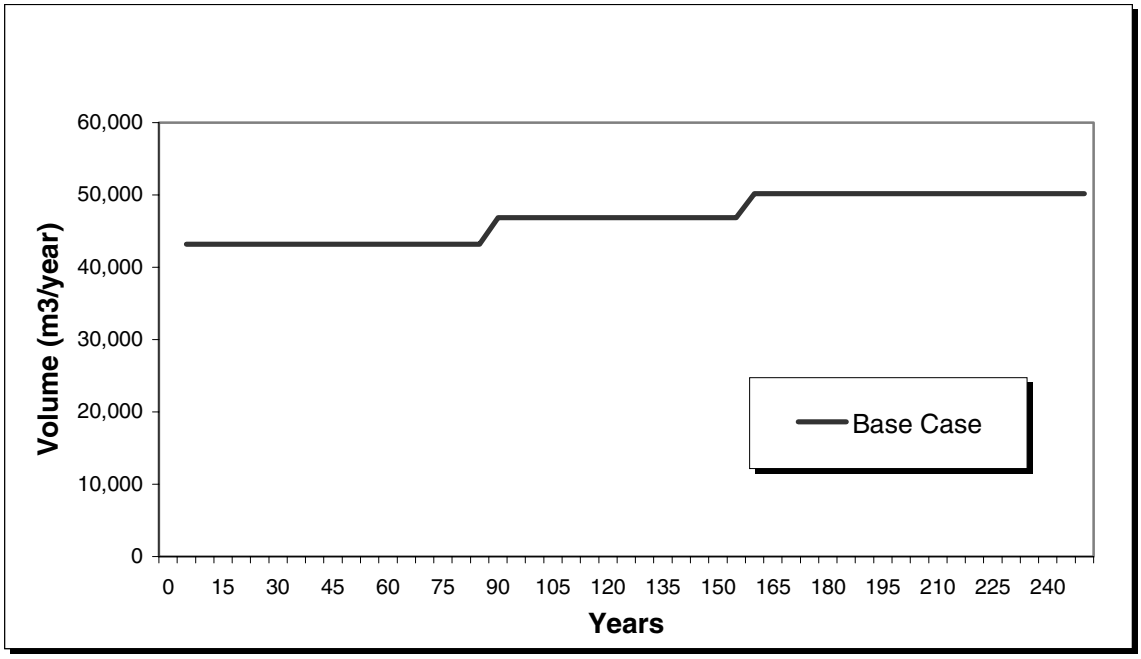

Figure 1 - Base case timber supply forecast

9.4 Alternative Timber Flows

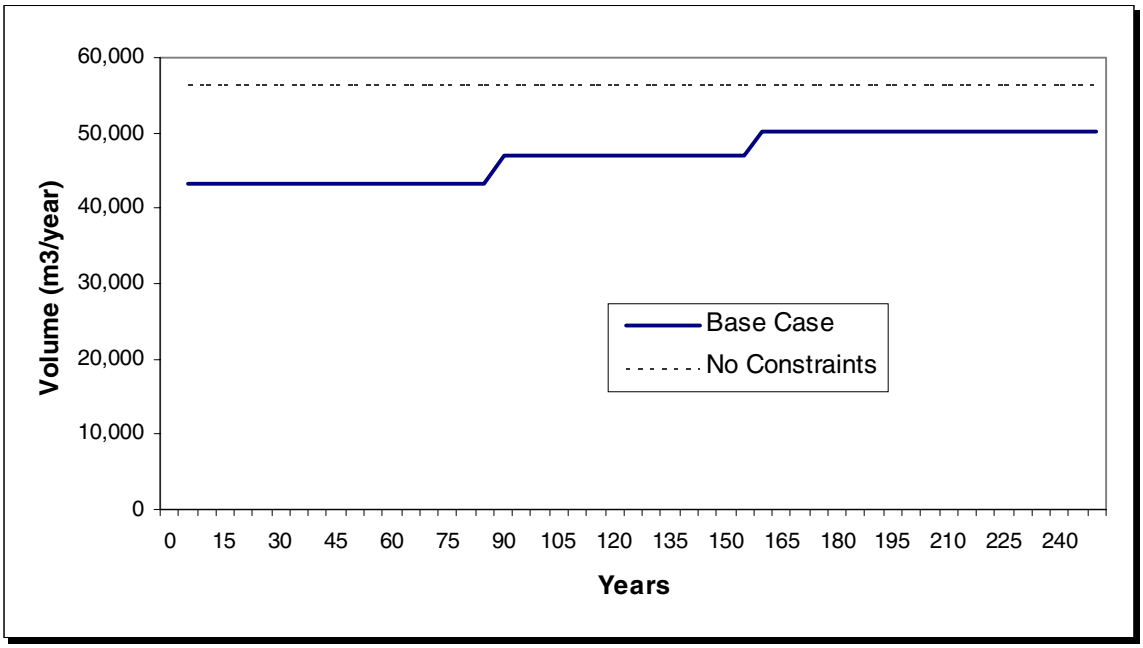

Figure 2 – Base Case and no land base constraints harvest forecast

Figure 2 shows the sustainable even-flow harvest level with no land base constraints. The harvest flow is 56,492 m^3, 31%, 21% and 13% higher than the base case short-, mid and long-term levels, respectively. The unconstrained scenario illustrates the maximum potential timber supply available from the THLB if there were no restrictions required.

9.5 Age Class Distribution

Figure 3 illustrates the current age class composition of the total Provincial Crown forested area and the THLB. Forested areas within the Crown land base outside the THLB may contribute to landscape seral stage targets but are not eligible for harvesting. Approximately 15% of the THLB is less than 20 years old and about 68% of the THLB is between 21 and 80 years old leaving 17% for stands older than 80 years. Only 1.45 % of the THLB is older than 250 years.

The forested stands outside of the THLB represent 26% percent of the total forested land base and are a significant factor in the availability of timber supply. Currently about 12% of the forested area outside of the THLB is older than 250 years and does not fulfill all of the old forest seral objectives. Therefore, some THLB may have to be recruited for old forest seral objectives, as there is relatively little non-THLB area in the 141-200 and 201-250 age class.

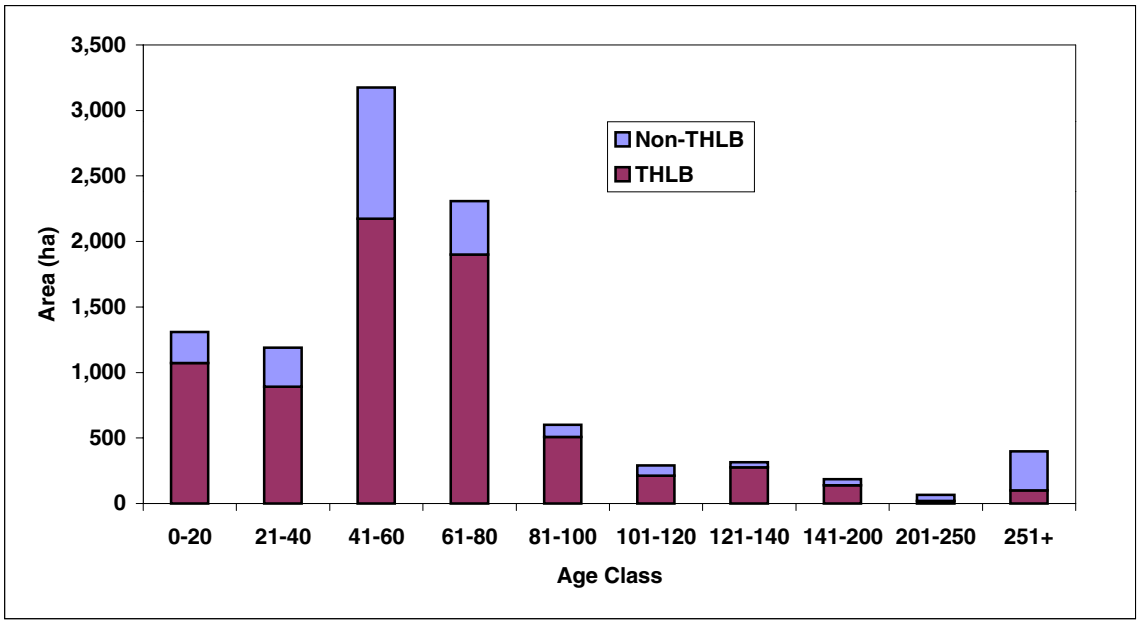

Figure 3- Current age class distribution (THLB)

9.6 Transition from Natural to Managed Stands

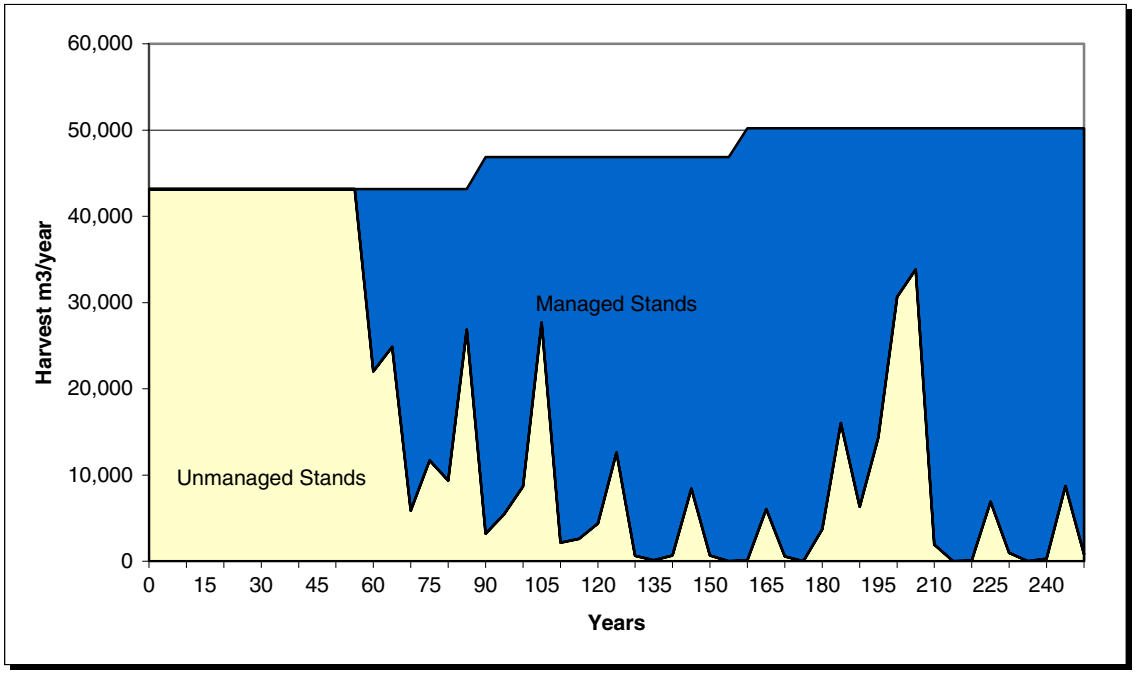

Figure 4– Base case harvest volume from existing and managed stands

Figure 4 illustrates the transition of harvest from existing to managed stands and their contribution to the overall harvest volume projected in the base case. Over the first six decades the timber supply is provided almost entirely by existing stands. In the 7th decade most managed stands have reached a harvestable age and form 80% of the harvest. The maintenance of VQOs and landscape level biodiversity, particularly old growth, result in the harvest of significant volumes of natural existing stands later in the planning horizon as demonstrated by the "peaks" in Figure 4.

9.7 Average Harvest Age

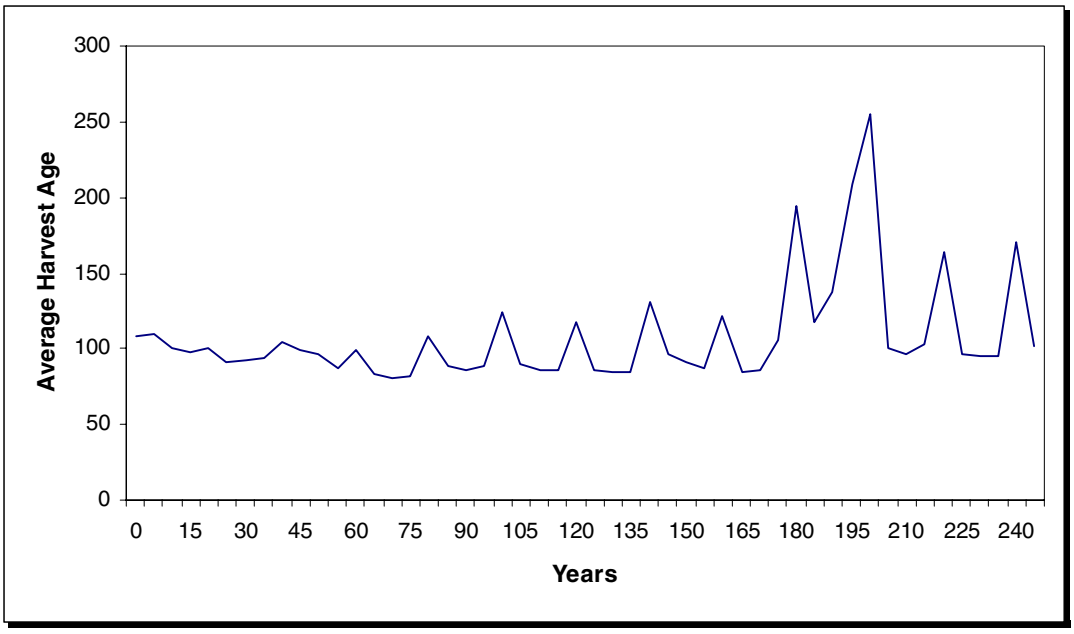

Figure 5 - Average harvest age

As illustrated in Figure 5 the average harvest age fluctuates around 100 years until the 17th decade after which it exhibits great variation reaching 270 years at year 200 and maintaining a slightly higher average near the end of the planning horizon. Retaining stands to meet VQO and old growth requirements and eventually harvesting these stands, some of them at very old ages, cause the large variation in the average harvest age.

9.8 Average Harvest Volume

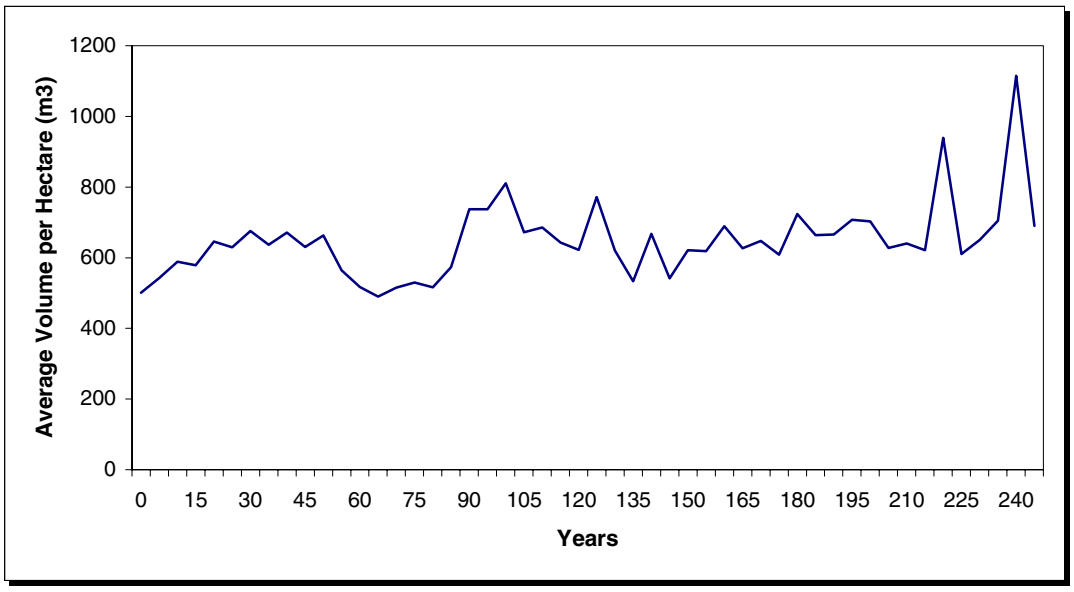

Figure 6 - Average harvest volume

As shown in Figure 6, the average volume per hectare harvested within the base case forecast increases slightly over the planning horizon. This is not typical, particularly for coastal forest estates, which often have a large portion of old forest remaining, resulting in high per hectare harvest volumes at the beginning of the planning horizon. As older age stands must be retained and recruited for landscape level biodiversity and VQOs, they have somewhat higher per hectare volumes when harvested.

9.9 Sensitivity Analyses

9.9.1.1 Synopsis

Description	Test	% Difference from Base Case
Land base	+10%, -10%	+10%, -10% s-t
Existing stand volume	+10%, -10%	+10% s-t, -8% s-t
Regenerated stand volume	+10%, -10%	+8% l-t, -8% l-t
Site Index	Sibec	+14 - 23%
OGSI		No impact
Minimum harvest age	+10 years, -10 years	-9% s-t, +2%
Green-up	+5 years, -5 years	-14% m-t, +9%
VQO targets	+5% points, -5% points	-26% s-t, +14% s-t
Old growth targets	Low BEO, old growth now	-4% m-t, No impact l-t

9.9.2 Summary of Timber Supply Dynamics

Short Term (1 – 20 years)

- The short –term timber supply is sensitive to changes in forest cover constraints; an increase in green-up ages produces an immediate drop in short-term timber supply. Similarly, uncertainty of VQO target % has a significant effect on timber supply over the short term.
- Timber supply is sensitive to size of THLB in the short, medium and long term.
- Timber Supply is sensitive to the accuracy of the estimates of existing stand volumes in the short and medium term.
- Having to meet all old seral targets immediately would have a 4% impact on the long-term timber supply.

- Overall site index adjustment would have a significant impact on timber supply in the short, medium and long term.

Mid Term (21-80 years)

- Increase of green-up ages has a large impact on the mid term timber supply. Uncertainty of VQO % also has a significant effect on timber supply over the mid-term.
- A 10% increase in minimum harvest ages results in a 9% decrease in the mid-term timber supply.
- Timber Supply is sensitive to the accuracy of the estimates of existing stand volumes in the short and medium term.
- Overall site index adjustment would have a significant impact on timber supply in the short, medium and long term.

Long Term (80 + years)

The long-term timber supply is sensitive to several factors:

- Changing the VQO class by 5% results in a 10% increase or decrease in the long-term harvest level.
- Having to meet all old seral targets immediately would have no impact on the long-term timber supply.
- The long term is sensitive to changes in regenerated stand volumes. A 10% increase or decrease in volume results in an 8% change to the long-term harvest.
- Overall site index adjustment would have a significant impact on timber supply in the short, medium and long term.

10 Appendix 2

10.1 Cost and Employment Assumptions

Table 8 – Cost and employment assumptions

Activities	Area ha/year	Cost $/ha	Jobs P-days/ha	Source
Surveys	200	40	0.1	Kim Allan
Planting[1]	70	1,100	2	Kim Allan
Brushing[1]	90	450	1.5	Kim Allan
Spacing[1]	56	1,000	3.5	Kim Allan
Fertilization	58.5	300	0.1	Kim Allan
Pruning 1st lift	16	1,000	4	Kim Allan
Pruning 2nd lift	16	1,400	5	Kim Allan

[1]Planting, spacing and brushing areas include 5 ha from proposed deciduous conversion.

11 References

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