Type 2 Forest Level Silviculture Analysis Report for the Williams Lake Timber Supply Area

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EXECUTIVE SUMMARY

BACKGROUND

Type 2 Forest Level Analysis was conducted to assess the impact of implementing various incremental silviculture scenarios, including two land base classification issues, on timber supply in the Williams Lake Timber Supply Area. Administered by the Ministry of Forests (MOF), the analysis was performed by Inland Timber Management Ltd. Forest Renewal BC provided project funding.

The objective is to identify, at a strategic level, options which may be implemented to enhance timber productivity in the Williams Lake TSA. In addition to the "base case", scenario analysis includes the evaluation of Old Growth Site Index adjustments (OGSI), Site Index Biogeoclimatic Ecological Classification adjustments (SIBEC) and several silvicultural scenarios in terms of their impact on timber supply. Analysis is provided for the "Main TSA" as well as the combined "Three Western Supply Blocks" (Chilcotin, Tatla and Anahim Supply Blocks) in order to maintain consistency with the Timber Supply Review (TSR) process.

Land use assumptions and management strategies, as defined in the *Williams Lake TSA TSR II Information Report and Data Package (August 1999)*, were used to model the "base case[1]". An additional reduction to mature species volumes was incorporated to reflect the results of the MOF's 1998 mature inventory audit since it is likely the Timber Supply Branch will embody the audit results in the *TSR ll Analysis Report*. Silviculture modelling criteria were developed in co-operation with several local working groups[2] and drew on a range of local knowledge as well as the results of past and present timber supply reviews and existing silvicultural analysis.

[1] The role of the "base case" in timber supply evaluations is essentially to reflect the status of current management techniques and assumptions on the available timber supply over time.

[2] primarily the Timber Investment Strategy Committee and the Williams Lake TSA Options Working Group

A significant issue highlighted in the TSR I analysis was the existence of a short term fall down - largely a result of the high percentage of the TSA falling into the lower age classes. The "base case" used in this analysis reflects a redefinition of the Timber Harvesting Land Base (THLB) which provides an additional 745,540 ha available for harvest. This has resulted in a substantial improvement in the current age class distribution thus eliminating the short term fall down which was projected in TSR I. The "base case" analysis results in a projected even flow harvest rate of 2,419,000 m3/year following the first decade[3] for the Main TSA. This is an increase of 12.7 % or 308,000 m3/year in the long term sustainable harvest level from the Chief Forester's TSR I determination. The base case results in the Western Supply Blocks indicate a harvest level of 658,600 m3/year for the first decade with a reduction to 550,400 m3 for the remaining 25 decades. Therefore, the sustainable harvest flow could potentially be increased by 34% from the TSR 1 determination.

RESULTS

Main TSA (excludes Chilcotin, Tatla and Anahim Supply Blocks)

Two scenarios offering the potential to significantly impact harvest flow are inclusion of OGSI and SIBEC adjustments.

1) When the OGSI adjustments were added to the base case assumptions the result was a long term harvest of 2,740,000 m3/year - an increase of 13.27 % or 321,000 m3/year after the first decade.
2) The addition of the SIBEC adjustments has had an even more dramatic effect, increasing the sustainable harvest flow to 3,060,800 m3/year - an increase of 26.49% or 641,000 m3/year after the first decade.

[3] *TSR ll Information Report and Data Package* provides for a strategy in the first decade to elevate harvest levels to access legacy mountain pine beetle attacked stands

Obviously these adjustments have a significant impact on the potential harvest flow in the long term. Further refinement of these adjustments will be crucial in illustrating that a secure and sustainable long term harvest flow is achievable in the Williams Lake TSA.

ISSUE	VOLUME (m3/year) INCREASE	PERCENT INCREASE
SIBEC	641,000	26.49
OGSI	321,000	13.27

Silviculture scenarios were also assessed against the base case to determine potential impacts of implementing specific treatment regimes. Increases to the sustainable harvest volume ranged from 0% to 5.25 %, depending on the scenario that was assessed, as summarised in the table below.

ISSUE	VOLUME (m3/year) INCREASE	PERCENT INCREASE
Genetically improved stock	126,990	5.25
Rehabilitation of Repressed Pli	35,800	1.45
Reduction of net downs due to future roads	23,000	0.95
Reductions in green-up timelines by five years	19,000	0.62
Fertilisation which increases volume by 15m3/ha	8,800	0.33
Immediate elimination of backlog NSR	2,000	0.1
Elimination of backlog NSR within 5 years	< 2,000	< 0.1
Alternate spacing densities	0	0

Three Western Supply Blocks (Chilcotin, Tatla and Anahim Supply Blocks)

Similar to the results of analysis in the Main TSA, the impacts of including OGSI and SIBEC adjustment factors are the two potential initiatives that provide the largest opportunity:

1) The OGSI adjustment contributes to a 31.06 % increase in harvest flow.
2) SIBEC adjustment contributes to a 56 % increase in sustainable harvest flow.

As in the Main TSA, silviculture scenarios had a lesser impact, but still have potential to enhance the overall availability of timber. The most significant impact was the implementation of a stand rehabilitation program of 20, 000 ha (4000 ha/year for 5 years) which has a result of increasing the minimum available volumes by 2.49%.

Strategic Focus

The key factors that have the most significant impact on the harvest flow for the Williams Lake TSA are the redefinition of the THLB, and the recognition of appropriate OGSI and SIBEC adjustments. The continued development of accurate, fully representative site index estimates will undoubtedly identify greater harvesting opportunity than what is currently believed to be available over the long term. Further refinement of site productivity estimates in this TSA should be considered a priority.

As indicated in this analysis, continued increase in the use of genetically improved stock will have a positive impact on the available long term volumes. Other silvicultural treatments (eg. commercial thinning and juvenile spacing), although not having a significant impact on long term harvest levels, may help to mitigate 'access to timber' and scheduling issues at the operational level.

Under the Cariboo-Chilcotin Land Use Plan (CCLUP) enhancement opportunities are not singularly focused on the acquisition of volume. Instead enhancement opportunities are intended to provide a mechanism to maintain an even flow rate within specific areas where harvesting may be limited due to other constraints. This type of enhancement approach will provide greater management flexibility and operational certainty in the short and long term. To determine the true potential of enhancement opportunities in the context of the CCLUP, further assessment is required at a sub-regional and landscape unit level.

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1 INTRODUCTION

This analysis has been completed in response to a provincial initiative to develop comprehensive silviculture investment strategies for all management units in British Columbia. The development of such strategies will help to identify incremental silviculture treatment priorities and ensure that opportunities for timber enhancement are maximized.

In 1996 the Timber Supply Review and Allowable Annual Cut (AAC) determination was released for the Williams Lake Timber Supply Area (TSA). The analysis identified a significant short term decline in timber supply for the Main TSA. This shortfall was largely a result of a high component of younger stands that were projected to be unavailable for harvest until later in the planning horizon. This projected decline necessitated a refocus of efforts to further research and identify management practices that may reduce the shortfall and help improve the availability of harvestable timber. Initiatives such as assessing site productivity, clearly defining the harvesting landbase and identifying silviculture activities to increase timber production have been key areas where efforts have been focused.

In 1998 a *Stand Treatment Analysis* was conducted for the Williams Lake TSA under the direction of the Cariboo Region Timber Investment Strategy Committee. (TISC). The results of the analysis identified 'opportunities' for an increase in timber supply in the Williams Lake TSA, some which could be driven by an enhancement of incremental silviculture activities. The *Stand Treatment Analysis* used, for the most part, the data and assumptions generated for TSR 1.

The Williams Lake TSA Options Working Group (OWG), comprised of Ministry of Forests and Industry representatives, was formed in late 1998, to "...aggressively research, determine and document mitigating factors which (have a high probability to) alleviate the downward AAC pressures in the Williams Lake TSA….”[4]. The OWG broadened the scope of issues defined as impacting timber supply, took an active role in redefining ‘current management’ and initiated the development of a range of modelling scenarios.

The analysis contained within this report has built on the strategies and scenarios introduced by TISC and the OWG. The input provided by the various working groups during the past several months has further refined modeling criteria and more clearly identified realistic opportunities for enhancement of timber supply. The work conducted to date in the Cariboo Forest Region, by various working groups, has successfully contributed to the provincial initiative of developing comprehensive silviculture investment strategies in all TSAs.

1.1 Objectives

Although a broad range of management strategies have been assessed by TISC and OWG in an attempt to enhance timber supply, the primary focus of this report is to identify *potential silviculture strategies* and present the supporting analysis results. The results presented herein will include a ‘base case’ (which closely parallels TSR II) and will also present specific ‘scenario’ analysis around the base case to test the impacts of selected silviculture treatments. This analysis also presents the impact of incorporating Old Growth Site Index (OGSI) adjustments, and the ‘new’ ‘Site Index - Biogeoclimatic Ecological Classification’ (SIBEC) factors for the Cariboo Forest Region. Specific analysis scenarios and results are presented in the ANALYSIS section of this report. The results will be utilized to define the potential for an enhanced incremental program that is intended to focus on incremental regimes presenting the greatest potential for timber enhancement.

[4] Options Working Group “Terms of Reference” (November, 1998)

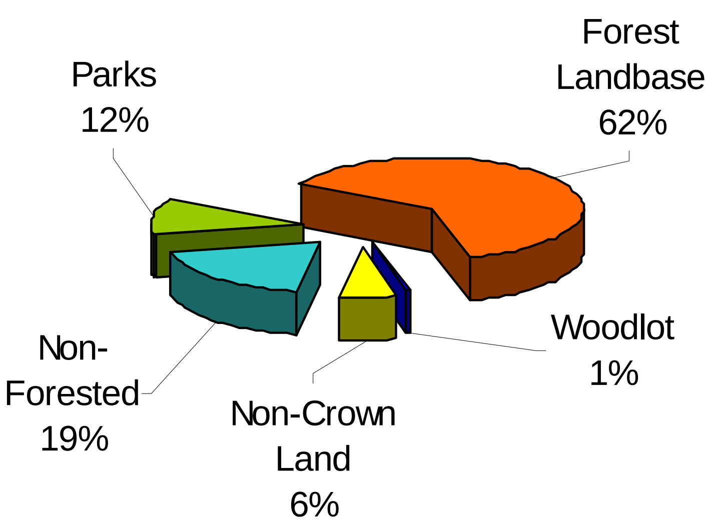
2 TSA DESCRIPTION

The Williams Lake TSA is located within Cariboo Forest Region in south-central British Columbia. The area falls under the administration of three Ministry of Forests (MoF) Districts: Williams Lake, Horsefly and Chilcotin (Alexis Creek). The Williams Lake TSA is bordered by two provincially significant parks (Tweedsmuir and Wells Gray) and has several smaller provincial parks within is boundaries. The characteristic diverse terrain , climate and vegetation throughout the area present numerous forest management challenges.

The following chart illustrates the area breakdown for the TSA. A complete set of figures illustrating the timber landbase, species composition and site indices are included in the Landbase Inventory Section (5.1.1) of this report.

Figure 1.

Williams Lake TSA



	Area (ha)
Gross Landbase:	4,908,159
Prod. Forest Landbase:	3,063,158
Non-Crown Land:	297,584
Woodlots:	35,743
Non- Forested:	936,673
Parks:	575,002

3 MANAGEMENT ISSUES

Historically, forest management practices in the WL TSA have been influenced by a variety of ecological and economic factors.

The following summary outlines some of the key management issues in the WL TSA.

Issue	Management Implication
Currently Unharvested Stand Types	This issue has had a significant influence in determining the timber harvesting landbase. Base Case – has redefined and reduced the area defined as 'unharvested' within the Main TSA and three Western Supply Blocks. The result has been an increase in the timber harvesting land base (THLB) by approximately 745,000 ha. **Opportunity:** potential rehabilitation of a portion of the remaining 'unharvested' stand types may present an additional opportunity for influencing the THLB as well as maximising overall productivity.
Age Distribution	Due to recurrent fires, beetle infestation, and harvest history, TSR I identified a predominance of lower age classes in the THLB, especially in the Williams Lake and Chilcotin Forest Districts. The short term fall down in TSR I was a result of this concentration of area in the lower age classes. The re-definition of unharvested stand types in the new base case has significantly improved the age class distribution in the THLB thus eliminating the short term falldown effect.
Volume Estimates (unmanaged stands)	Volumes in existing stands have a significant impact on the outcome of timber supply analysis. TSR 1 analysis has shown extreme sensitivity to changes in mature stand volumes. Audit results suggest that VDYP was providing an overestimate of mature volumes. To improve estimates, a Volume Adjustment Factor (OAF) in the FSSIM has been applied to account for the volume overestimation

	by VDYP for the mature stands. These adjustments are reflected in the base case run.
Lake and Riparian Buffers	A portion of the timber harvesting landbase is within designated lake and riparian buffers. 'Special Management' criteria in these areas will not always impact long term harvest flows, but short term access to timber may be restricted depending on specific management objectives.
Visual Management	The requirement to meet visual management objectives may, in specific instances, have the effect of lengthening rotations and restricting short term access to timber.
Site Productivity	Site productivity estimates have a significant impact on harvest flow projections. Ongoing SIBEC and OGSI projects are continuing to refine site productivity estimates throughout the TSA. **OGSI and SIBEC scenarios have been tested (section 5.2.2)**
Greenup/ Adjacency	Greenup timelines can influence short term access to timber due to adjacency constraints. Realistic greenup timelines, especially in IDF areas, are poorly represented at this time. Ongoing work to refine greenup estimates will introduce more realistic results. A 2m greenup has been suggested for some areas in the TSA, although the implications of utilising this timeline have not been fully assessed. The improvement in age distribution has reduced the impact of adjacency issues on timber supply, however, ensuring that greenup timelines are minimised will further maximise timber availability and harvesting flexibility. **Opportunity: reduce greenup timelines to minimise adjacency constraints. A greenup scenario has been tested to identify potential impacts on the base case (section 5.3.2).**
Roads Trails and Landings	Reductions for roads trails and landings have a direct impact on the timber harvesting land base. It is believed that current reductions to RTL's are somewhat conservative. Additional work is required to accurately define net losses as a result for RT and L's **Opportunity: reduce RTL net down factors to a representative level. Minimise reductions to THLB. A reduction in future roads scenario has been tested (section 5.3.3)**

Forest Health	Mountain Pine Beetle has historically had a significant influence on harvesting in this TSA. The re-definition of areas eligible for 'pine beetle' harvest in the base case has improved the identification of beetle harvest areas. Issues around assessing biodiversity impacts and establishing reforestation regimes still prevail. Redefinition of pine beetle harvest areas since TSR I has helped clarify actual volume removal within beetle damaged areas.

3.1 Cariboo-Chilcotin Land Use Plan

Under the Cariboo – Chilcotin Land Use Plan (CCLUP), several management strategies are now in place within the Cariboo Forest Region. Three of major significance are:

Strategy	**Management Implications**
Mule Deer Winter Range Strategy	Harvesting is limited to partial cutting regimes within MDWR areas, effectively increasing rotation ages. Block size and distribution also will impact harvest flow. Currently, growth and yield information for partially cut stands is under refinement through ongoing Prognosis BC development. Incremental treatments may be very effective at meeting habitat enhancement objectives, although direct enhancement to timber supply may be minimal due to limited access and lengthened rotations

Caribou Management Strategy	'No Harvest' areas have been defined. Harvesting within modified harvest areas limits blocks sizes, re-entry timing, block location and orientation. The need to meet caribou management objectives may impact short term timber availability as well as lengthen rotations In higher elevation areas, reforestation becomes expensive and difficult to achieve especially in areas with cool soils, short growing seasons and high brush hazard.
The Biodiversity Conservation Strategy	Harvesting must address biodiversity requirements on a landscape unit basis. The need to manage old growth can affect harvest flow and re-entry periods. TSR currently applies old growth draw downs, for the first 100 years in the ERDZ and SRDZ areas. Current base case results indicate approximately 46 landscape unit/NDT/BEC areas (within 32 landscape units) are exhibiting old growth deficits. (see Appendix 6)

These strategies provide direction under the CCLUP, in a more specific context, and attempt to define site specific management requirements. Implementing management regimes to meet wildlife and biodiversity objectives can have significant impact on the amount of timber available for harvest in a specific timeframe. "Modified" silviculture prescriptions under these strategies will likely have an impact on harvest flow and will further emphasise the need for a clearly defined incremental silviculture program in the Region. Almost one half of the THLB is managed recognising other land use issues and uses some form of modified harvest, other than conventional clearcutting with a 'normal' rotation (Figure 2).

The 'Enhanced Resource Development Zone' (ERDZ), approximately 54 % of the WL TSA, has the largest area available for timber production. As a result, the greatest opportunities for incremental enhancement will likely be found within this zone. Due to a smaller area targeted for timber access in the 'Special Resource Development Zone' (SRDZ) and 'Integrated Management Zone' (IRMZ), the implementation of an incremental program may be more limited in these areas than in the ERDZ. In some cases, incremental silviculture treatments may help to enhance other forest attributes, but this will not likely be true in all instances. At this time, we are able to make broad assumptions about various silviculture treatments and their contribution to other forest resources. However, actual impacts are still largely undefined.

The uncertainty around managing under the CCLUP zone designations clearly outlines the need for more comprehensive analysis regarding timber availability and harvest flow rates under the CCLUP.

4 ENHANCEMENT OF TIMBER QUALITY

Historically timber quality objectives in the Williams Lake TSA have not focused on identification of the premium saw log component of the inventory profile. Instead the focus has traditionally centred on identifying the "lower end" of the timber profile from a "Problem Forest Type (PFT)" or "Opportunity Wood" perspective. In spite of the absence of pulp mills in the TSA, the major licensees have demonstrated substantial harvesting performance down to 65 m3 per hectare. The *1992 20 Year Availability Assessment Report* determined there were insufficient sources of timber from the "traditional" saw log land base. Therefore, the PFT land base was accessed in order to stabilise the short term harvest level in the main TSA and to help offset the pending medium term short fall identified in the *TSR 1 Analysis Report*. The definition of the PFT land base was revised in the *TSR ll Data Package* to reflect current performance levels. Local sawmill capacity has evolved to efficiently process the lower spectrum of the inventory profile.

From a fibre supply perspective, local proponents of this exercise felt that identification of saw log and premium log quality objectives was not required at this time. Instead, resolution of other opportunities (eg. CCLUP, land base classification and genetic gain issues) was felt to be more pressing. Timber quality objectives will be assessed under a separate initiative[5].

[5] regional, district and licensee stakeholders are currently formulating a process for a regional timber enhancement strategy

5 ANALYSIS

This analysis has modelled a base case and evaluated several silviculture scenarios in terms of their impacts on timber supply. In modelling the base case, the land use assumptions and management strategies defined in the Williams Lake Timber Supply Area Timber Supply Review II (TSR II) Data Package (August, 1999) were used. MoF Cariboo Region provided the land base and forest inventory information (FC1, non-standard coverages and FIP files). The FIP files were issued in 1998 and projected to year 2000. The data set used by the MoF Timber supply data set differed from the data used in this analysis due to:

- FIP files and the FC1 were issued one year earlier, and
- Chilcotin Depletion Coverage of mountain pine beetle harvest was not in the data set.

The main TSA and three Western Supply Blocks were modelled separately. However, the basic modelling process and management assumptions were the same unless specifically noted.

The scenarios evaluated were: application of SIBEC, application of OGSI adjustments, fertilisation, juvenile spacing, backlog NSR elimination, future road reductions, green-up age reduction and planting genetically-improved stock. Although commercial thinning/partial cutting scenarios were not specifically modelled, it is believed that a commercial thinning program may have a significant impact on alleviating short term adjacency issues and biodiversity constraints. Further discussion on the potential role of commercial thinning is included in the Partial Cutting section (5.3.7) of this report.

The FSSIM (version 3.0a, BC Ministry of Forests), a forest estate simulation model, was used to forecast the harvest flows for 250 years. The MoF Variable Density Yield Projection (VDYP 6.4) model was used to develop yield curves for natural stands and the Table Interpolation

Projection System for Yields (TIPSY 2.1) model was used to develop yield curves for managed stands.

5.1 Information Preparation

Three categories of inputs are required to complete a timber supply analysis:

- land base inventory,
- timber volume growth curves,
- management practices.

5.1.1 Landbase Inventory

In addition to the forest inventory information (FIP and FC1), the MoF provided the non-standard coverages (Caribou habitat, Mule Deer Winter Range, Landscape Unit boundaries etc.) needed for this analysis. The FC1 and the non-standard coverages were overlaid using the GIS tool ARC/INFO. The FIP files were projected to year 2000.

The timber harvesting landbase (THLB) was obtained by reducing the total landbase according to the land use and management assumptions defined in the TSR II Data Package.

Table 1. details the landbase net down in hectares for the TSA.

Table 1. Willams Lake TSA OWG/TSRII Area Netdown Summary

CATEGORY	*Area(ha) of the Three Components*						*Area (ha) of the Whole TSA*		
	Main TSA	+	Three WSB	+	PA16	=	Whole TSA	% of Gross	% of GPA
Gross area	**2,877,516**		**1,839,017**		**191,625**		**4,908,159**	**100.00%**	
Less:									
Non_Crown land	441,438		359,080		70,129		870,647	17.74%	
Woodlot	14,883		19		596		15,498	0.32%	
Parks	15,816		8,857		1,290		25,964	0.53%	
Non_Forest_ Area (NFA + NPFA)	317,228		543,935		72,359		933,522	19.02%	
Gross Productive Area (GPA)	**2,088,225**		**927,125**		**47,251**		**3,062,601**	**62.40%**	**100.00%**
less:									
Classified roads	50,477		8,658		919		60,054		1.96%
Non_commercial Cover	914		509		9		1,432		0.05%
ESA	49,267		43,055		7,354		99,676		3.25%
Inoperable	38,765		29,163		1,191		69,119		2.26%
Current unharvested stand type	124,423		173,919		0		298,342		9.74%
Unclassified road	0		0		0		0		0.00%
Wildlife (Caribou)	66,536		2,345		499		69,380		2.27%
Lake buffer	2,894		0		95		2,989		0.10%
Riparian	33,596		15,382		652		49,630		1.62%
Current Timber Harvesting Land base	1,721,354		654,095		36,531		**2,411,980**		**78.76%**
less:									
Future roads	65,335		25,264		1,815		92,414		3.02%
Long term THLB	**1,656,019**		**628,831**		**34,716**		**2,319,566**		**75.74%**

The THLB includes all area available for timber extraction, even those subject to constraints such as selection harvesting or visual quality requirements.

The gross landbase of TSR I and TSRII is of the same size, but the THLB in TSR II is 745,540 ha greater than that in TSR I. The increase is mainly due to the redefinition of Problem Forest Types. The reduction for 'Problem Forest Types' in TSR I was 1,214,566 ha while the reduction in TSR II under the comparable category 'Currently Unharvested Stand Types' was 298,342 ha.

The following chart illustrates the components of the THLB by management and land use issues. (Refer to Appendix 4 for tabular summary)

Figure 2.

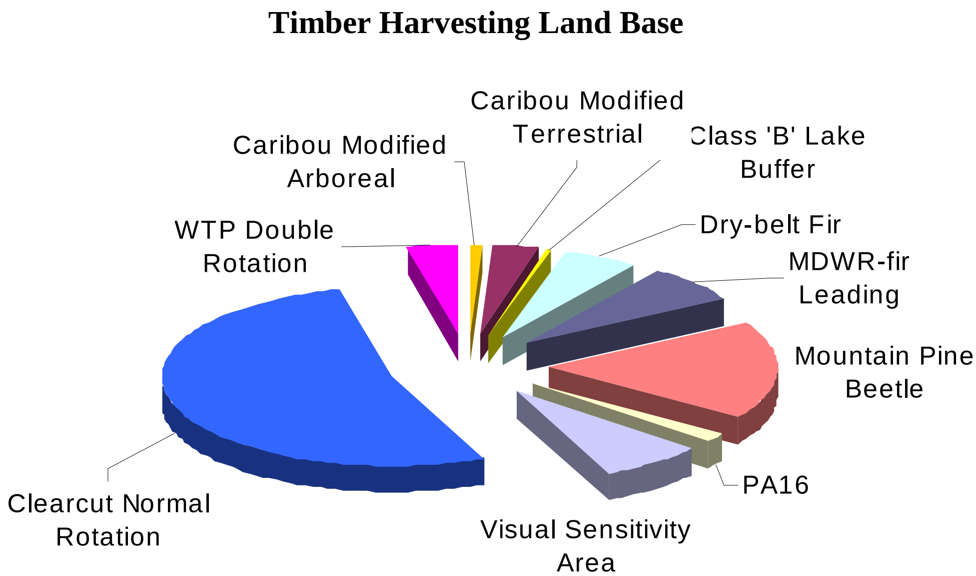


Figure 3.

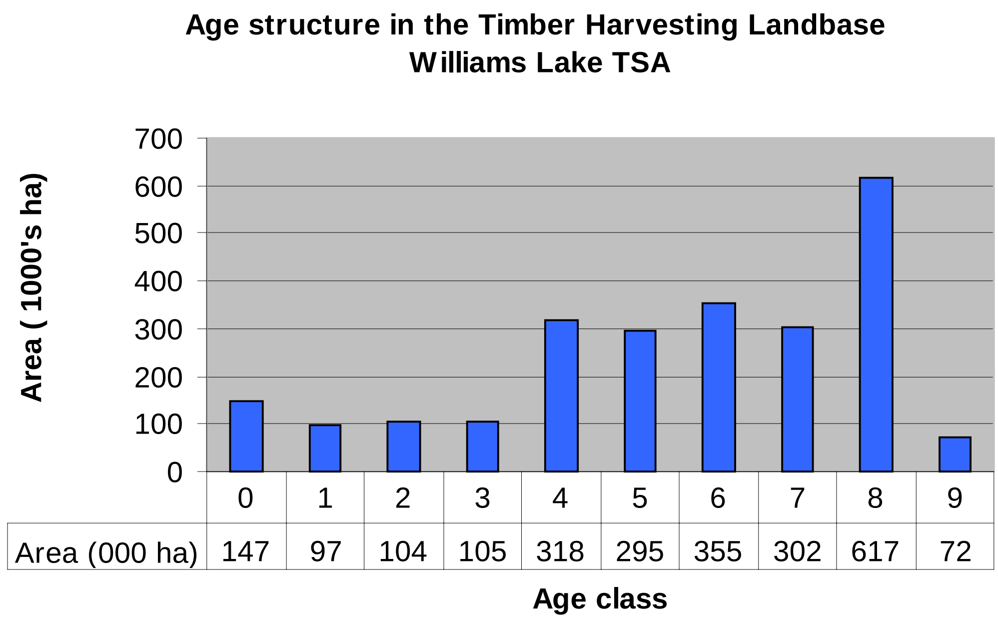


Figure 4. Site Index Distribution

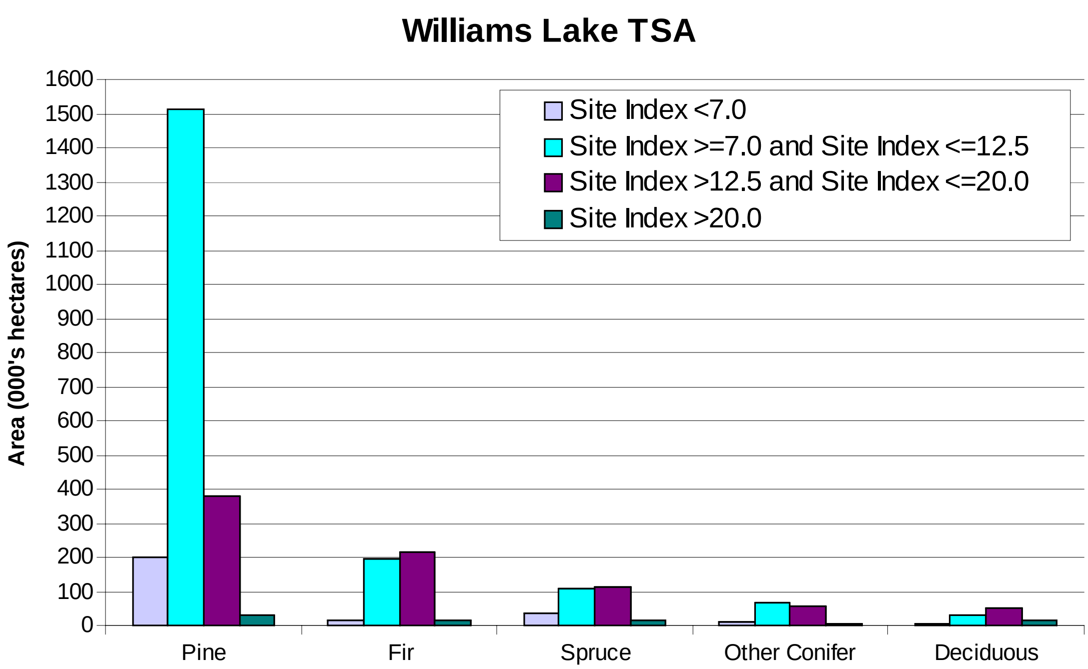
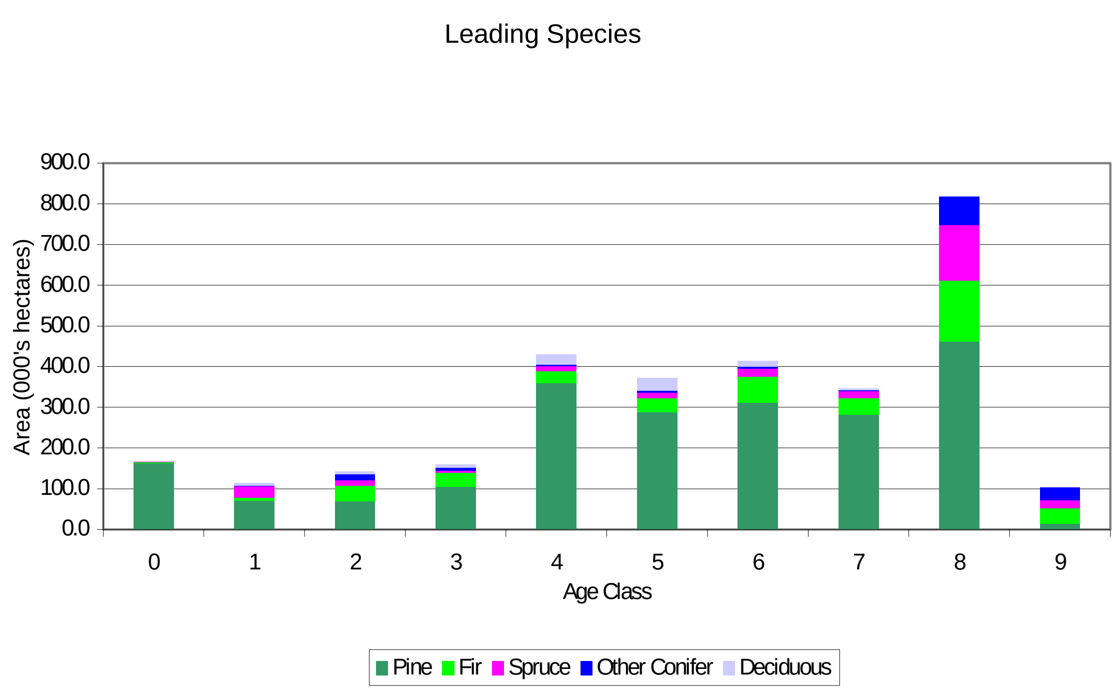


Figure 5. Species Composition



5.1.2 Timber Growth and Yeild

The height and volume growth of stands was projected by inputting stand attributes (species composition, crown closure or stand density, and site productivity) and silvicultural treatments (planting, thinning etc) into growth models.

1 The VDYP model was used to project the growth of the following stand types:

- existing stands of current age 34 or older;
- existing stands of current age between 21 and 34 and having density above 10,000 stems/ha;
- existing stands for selection harvesting (Dry-belt Fir stands and Mule Deer Winter Range Fir leading stands);
- deciduous-leading stands and low site stands (in PA 16 area); and
- mountain pine beetle attacked stands (attack class > 3) and not harvested during the first five years.

2 The TIPSY model was used to project the growth of the following managed stands

- existing stands of age 20 or younger;
- existing stands of current age between 21 and 34 and having density below 10,000 stems/ha; and
- regeneration non-selection harvesting stands.

3 The volume growth of selection harvesting stands (Dry-belt Fir stands and MDWR fir leading stands) after the first entry was not projected using growth models. Instead, following current Timber Supply Branch standards, growth is assumed to be 1 m3/year/ha in Dry-belt Fir stands and MDWR Fir leading low crown closure stands and 0.66 m3/year/ha in MDWR Fir leading medium and high crown closure stands.

5.1.3 Management Practices

Forest management practices were modelled as described in the TSR II Data Package. Following is a summary:

Green-up	Applied to all areas by landscape unit. Visual Sensitivity Area (VSA) and lakeshore buffer have stricter requirements than the rest of the landbase. Green-up requirement did not apply to selection harvesting stands.
Old Growth	Area requirement and old + mature area requirement were applied by landscape unit/NDT/BEC.
Selection Harvesting	Criteria were applied to the dry-belt Douglas fir stands, MDWR fir leading stands and 'Caribou Area' selection harvesting stands. (clearcut vs. selection harvest areas - Appendix 4)
Utilisation Level	12.5 cm (DBH) for lodgepole pine stands and 17.5 for all other stands.
Minimum Stand Height for Harvesting	14-16 meter cruise height varying with leading species and forest district.
Minimum Volume for Harvesting	65m3/ha. Minimum volume for harvesting and minimum stand height for harvesting were used together to determine the minimum harvest age.
Regeneration Delay	2 years for plantation stands 4 years for natural regeneration stands
Mountain Pine Beetle attacked stands	Harvest target of 500,000 m3/year for the first five years from the Mountain Pine Beetle stands with attack class > 3.

5.2 Analysis Methods

In this analysis, all modelling was completed using FSSIM 3.0 (MoF, 1998) and the simulation horizon was set to be 250 years. The "Relative Oldest First" harvest rule was used.

The following rules were applied when selecting harvest flows to be evaluated:

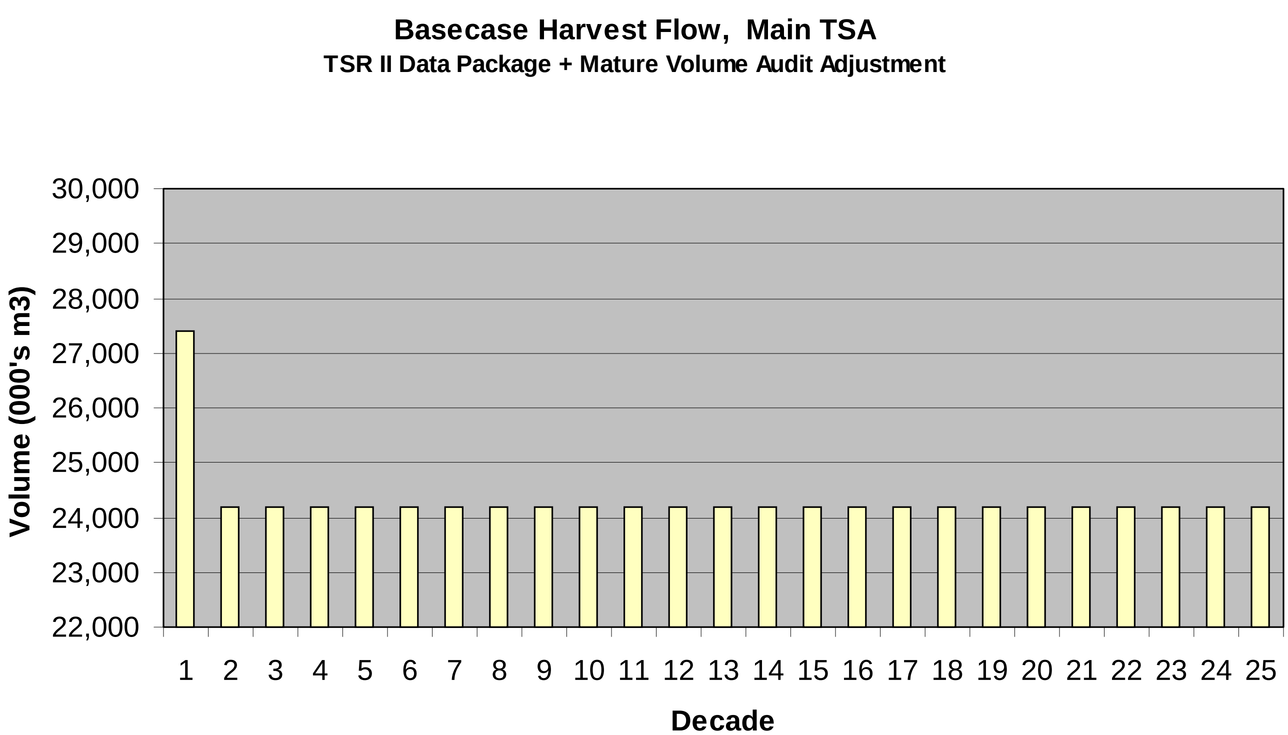
- For the first five years, the mountain pine beetle stands with attack class > 3 had a higher harvesting priority than other stands but they could only contribute up to 500,000 m3/year.
- Among the total non-recoverable losses of 53,500 m3/year, a portion of 39,000 m3/year was assumed to be from the main TSA and 13,500 m3/year from the three Western Supply Blocks. The split was made based on the relative size of the timber harvesting landbase.
- Main TSA: to support a harvest level of 2,883,000 m3/year (including 2,600,000 m3/year for current AAC and 288,300 m3/year from mountain pine beetle stand) plus the non-recoverable losses for the first five years; 2,600,000 m3/year plus the non-recoverable losses from year 6 to year 10; then to lower the period harvest level by up to 10% until a sustainable harvest level for the remaining 240 years was found.
- In the three Western Supply Blocks, to find the sustainable maximum even flow harvest level plus the non-recoverable losses. For the first five years, the mountain pine beetle stands contribute up to 217,000 m3/year.
- In the main TSA, if any scenarios can support a even-flow harvest level higher than 2,883,300 m3/year plus the non-recoverable losses, to find the maximum even flow harvest level.

5.3 Main TSA Results

5.3.1 Base Case

This analysis was completed using the land use assumptions and management strategies defined in the Williams Lake TSR II Data Package. The mature inventory audit adjustment was built into the yield curves of existing stands. MoF Timber Supply Branch provided the equations for mature volume adjustments.
(The following results for the Main TSA are summarised in a tabular format in Appendix 2.)

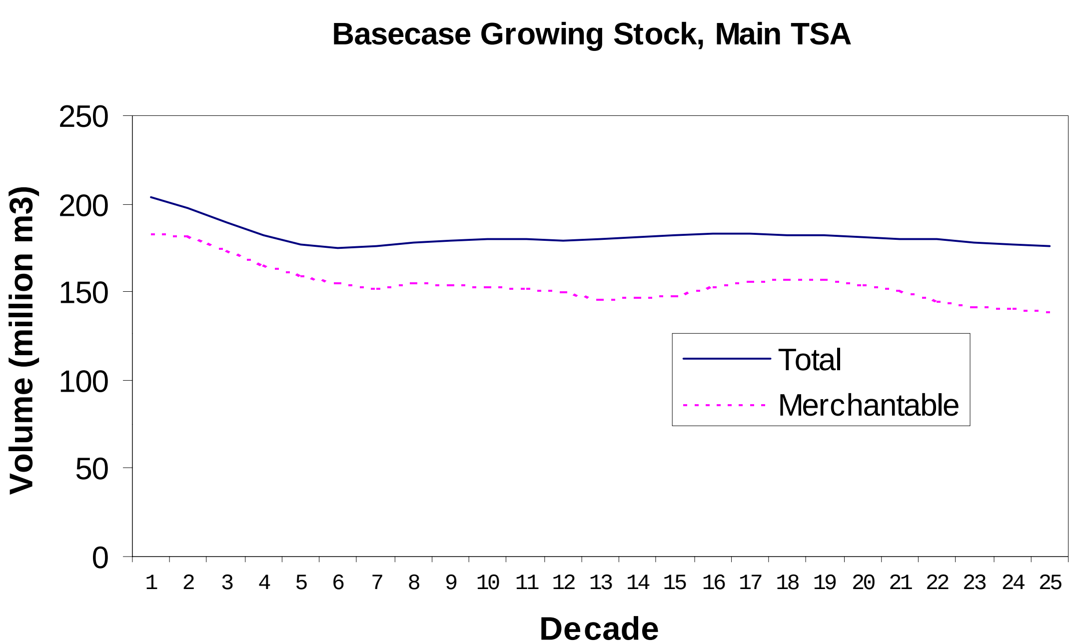
Figure 6 - shows the harvest flow by decade in the Main TSA.



The harvest rate in decade 1 is composed of annual harvest volume 2,883,000 m3 for the first five years and 2,600,000 m3 for the following five years. Among the 2,883,000 m3/year for the first five years, a portion of 283,000 m3/year is the result of mountain pine beetle salvage harvesting. After decade 1, the annual harvest volume needs to be lowered to 2,419,800 m3/year in order to be maintained for the remaining 240 years. Both clearcut and selection harvesting stands contribute to the harvest volume. The average contribution of selection harvesting stands (i.e., Fir stands in Mule Deer Winter Ranges, Dry-belt Fir stands and Caribou Modified Harvest stands) is about 7.3% varying between 2.3% (decade 4) and 14.5% (decade 13). Refer to Appendix 4 for a table illustrating the proportion of clearcut versus selectively harvested stands

Figure 7 shows that current inventory volume on the ground is high. This is due to the high percentage of stands with age class 4 and higher (see Figure 3). Due to the effect of harvesting on growing stock projections, availability of growing stock is specific to a harvest flow.

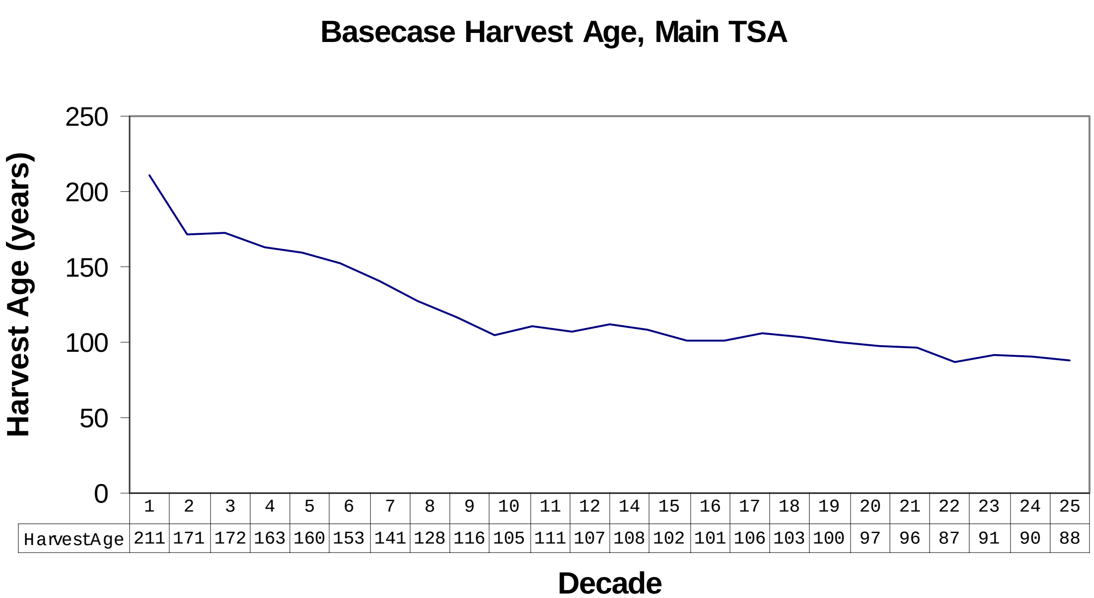
Figure 7.



The critical time, which is the time with minimum available merchantable growing stock and limiting the harvest flow from further increase, is at the end of the simulation (in 250 years). The fact that the critical period is far in the future indicates that there are opportunities to increase the harvest flow. Any treatments which can increase the growing stock before the critical period can help to increase the overall harvest flow.

The area-weighted harvest age by decade decreases over time (Figure 8). In 250 years, the average age of the stands harvested is about 80 years. Figure 10 also indicates that current stands can support the harvest flow for about 110 years.

Figure 8.



Old growth requirements are a limiting factor in some landscape units. In 46 LU/BEC/NDT units there is not enough old growth area and these units are inaccessible for harvest for a period of time ranging from 5 to 130 years (Appendix 6). More detailed review of the ‘inaccessible’ landscape units will be required to fully determine harvest potential and impacts to short term timber availability.

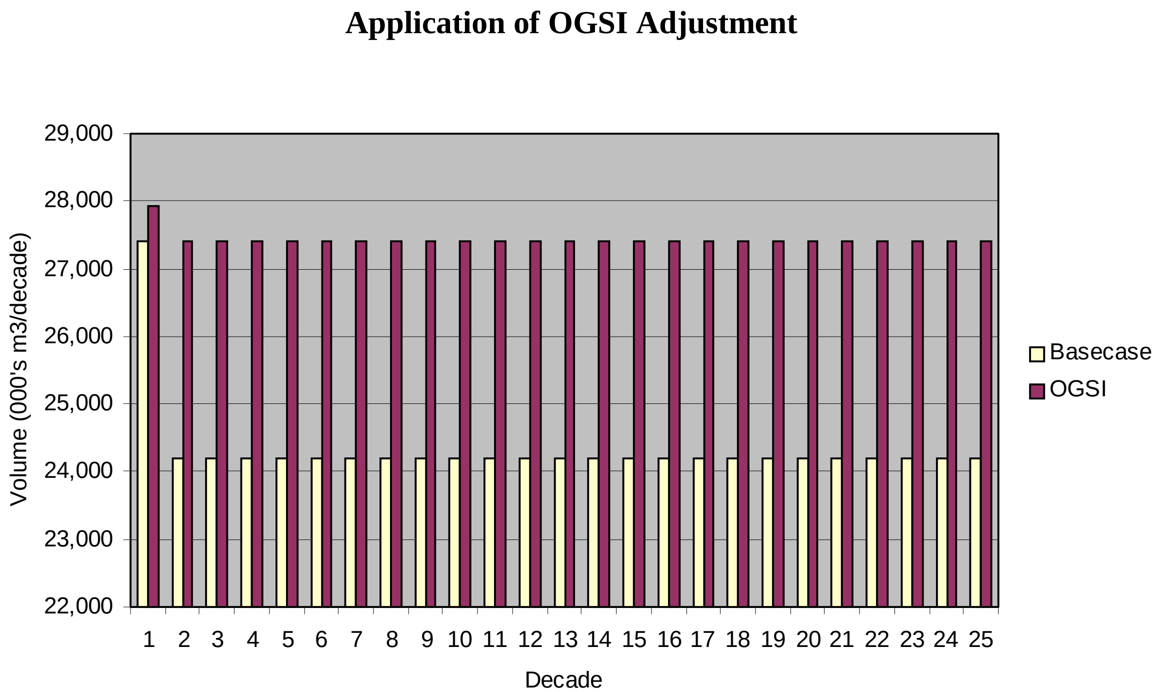
5.3.2 Old Growth Site Index Adjustments

The site index estimates on old growth (>140 years old) stands are underestimated for managed stands of the same species on the same site. In 1998 the MoF Research Branch updated the adjustment equations and defined the application of these equations in terms of stand type, inventory site index range and biogeoclimatic ecological classification (BEC) zone (Nussbaum 1998). Adjustment equations for interior spruce and lodgepole pine stands are available in the document. Eligible spruce stands are those with age > 140, within site index range 5.7 to 25.4 and located in BEC zones ESSF, ICH, MS and SBS. Eligible lodgepole pine stands are those with age >140, within site index range 7.3 to 26.7 and located in BEC zones BWBS, ESSF, ICH, IDF, MS, SBPS and SBS.

In analysing the scenario, the yield curves, green-up ages and minimum harvesting ages of each analysis unit were recalculated using the adjusted site indices and applied after the eligible stands are clearcut for the first time.

With OGSI adjustments, the harvest flow can be increased to 2,740,800 m3 per year starting from decade 2, which is 13.3% higher than that in the base case (Figure 9).

Figure 9.



With OGSI adjustments, the managed stands of the eligible species have greater volume growth rate, less time needed for reaching green-up height and lower minimum harvest age than in the base case. Even though only managed stands benefit from the adjustments, the harvest flow can be increased from the beginning of the simulation because the effects of OGSI adjustments take effect before the critical period.

Availability of growing stock and harvest ages follow similar trends to what was identified in the base case

5.3.3 Application of SIBEC

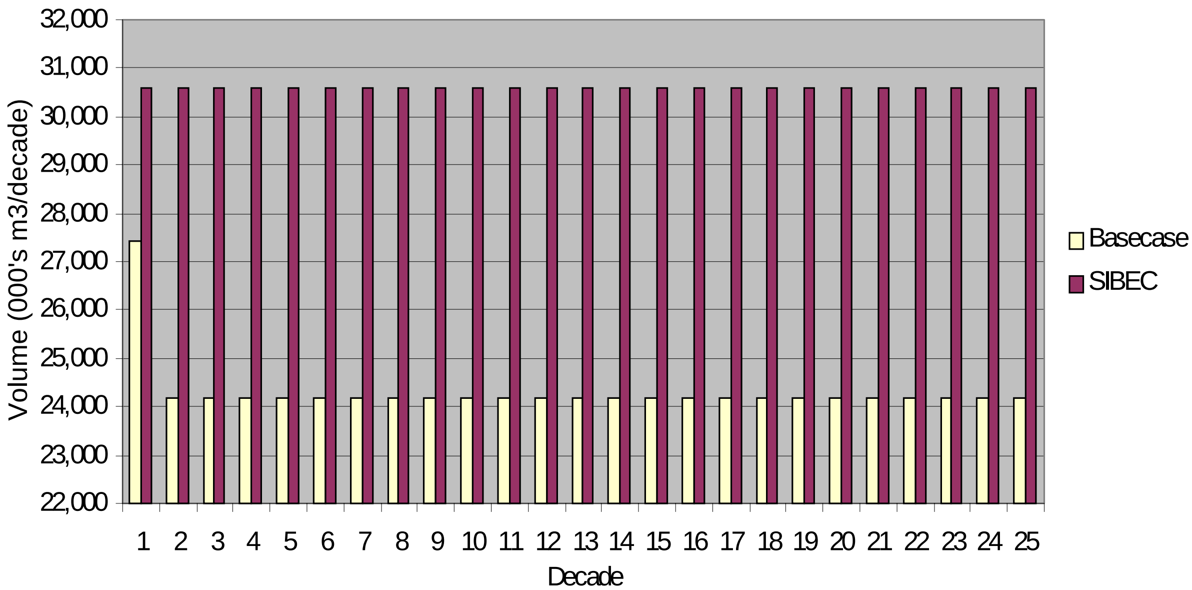
The MoF updated the research results of using BEC units to classify the site productivity and published the Site Index – Biogeoclimatic Ecological Classification (SIBEC) in 1997 (Site Index Estimates by Site Series, 1997). The document provides a site index for each applicable combination of leading species/site series/BEC subzone. In analysing this scenario, the SIBEC site index was used to replace the inventory site index in calculating yield curves, green-up ages and minimum harvest ages for managed stands.

Since site series were not available in the inventory files, this scenario used the site index of site series 1 to represent the site productivity of *all* sites. This method was employed in an attempt to obtain a reasonable average for all sites across the TSA. Site series 1 is the most common site series and was determined to provide the most 'representative' estimate, in the absence of more detailed information. (Appendix 5).

After application of SIBEC, an even-flow harvest level of 3,060,800 m3/year can be maintained through the entire simulation horizon. The increase is 11.65% for decade 1 and 26.49% thereafter from the base case (Figure 10). This increase occurs because the SIBEC site indices are generally higher than what the current inventory supplies.

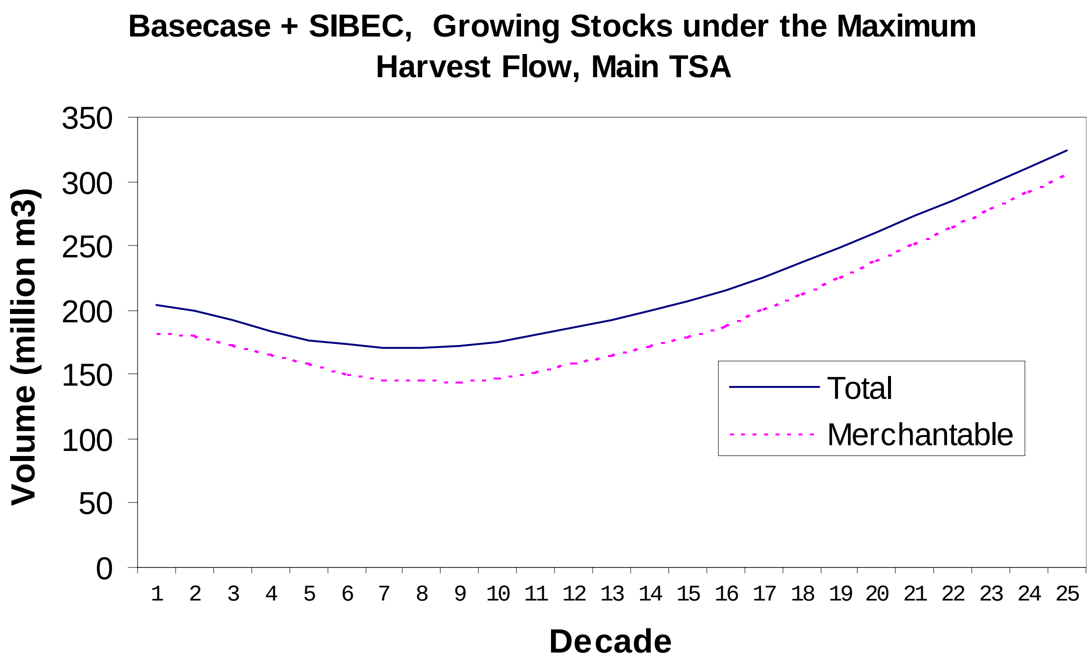
Figure 10.

Application of SIBEC Adjustments



After application of the SIBEC and increase in the harvest flow, the growing stock projection is different from the base case . Figure 11 shows that the critical period under this scenario is moved forward to decade 8 or decade 9. After the critical period, the growing stock increases, which indicates that the harvest flow after decade 8 can be increased above 3,060,000 m3/year.

Figure 11.



The impact of the OGSI and SIBEC adjustments is very apparent in these scenarios. To ensure that future analysis fully represents true site potential, it is critical that further work be conducted to refine site productivity estimates across the TSA.

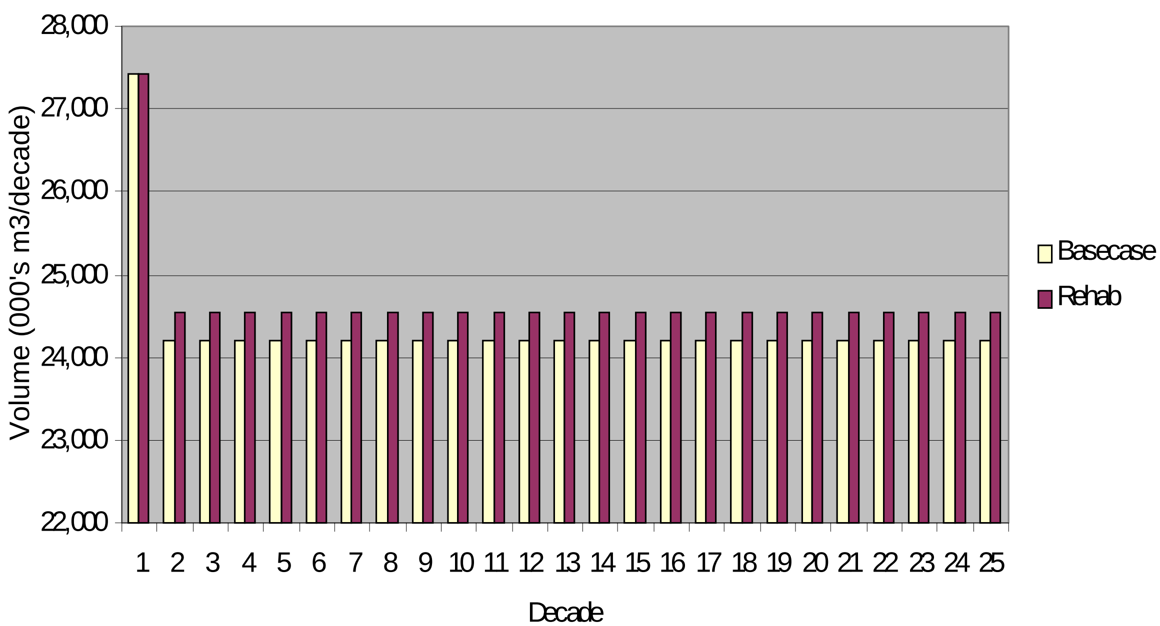
5.3.4 Rehabilitation of Repressed Pine Stands

There are about 35,000 ha of Pli stands with an inventory site index less than 7 outside of the PA16 area in the main TSA. These areas are excluded from the timber harvesting landbase as 'low sites' in the base case.

This scenario tests the impacts of rehabilitating 30,000 ha of these stands in the main TSA and 20,000 ha in three Western Supply Blocks. The stands are rehabilitated in five years, 6,000 ha/year in the main TSA and 4,000 ha/year in the three Western Supply Blocks. The stands are harvested with no volume extraction and then planted with genetically improved stock. The site index after the rehabilitation is assumed to be 12.

With 30,000 ha repressed Pli stands rehabilitated, the harvest flow from decade 2 can be increased to 2,454,800 m3/year, which is 1.45% higher than the base case (Figure 12).

Figure 12.



5.3.5 Silviculture Scenarios

The following silviculture scenarios represent 'preferred' treatment regimes which are consistent with current management priorities and expected to be operationally achievable during the next several years. The scenarios illustrated in this report have been developed as a result of input received from operational staff as well as the refinement of previous analysis scenarios (TISC).

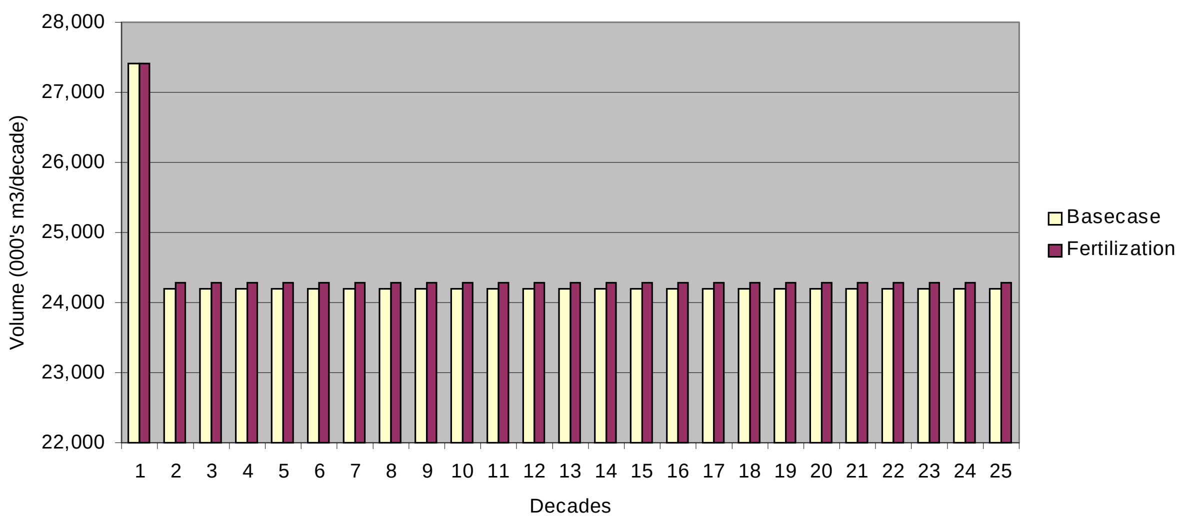
Scenarios testing the effects of greenup periods, fertilisation, alternate spacing densities, elimination of backlog NSR, use of genetically improved stock and reduction in roads were tested in the Main TSA. The following results focus on the harvest flow of each scenario and its comparison to the base case. All harvest flows are net of non-recoverable losses.

5.3.5.1 Fertilization

This scenario assumes that fertilised stands have an average volume increase of 15 m3 /ha at harvest. The number of stands eligible for fertilisation (i.e., Pli leading and of site index 18 or above) is about 1,200 ha/year, only a small portion of the total timber harvesting landbase.

With fertilisation, the annual harvest rate starting from decade 2 can be increased to 2,427,800 m3, which is 0.33% higher than in the base case (Figure 13).

Figure 13.



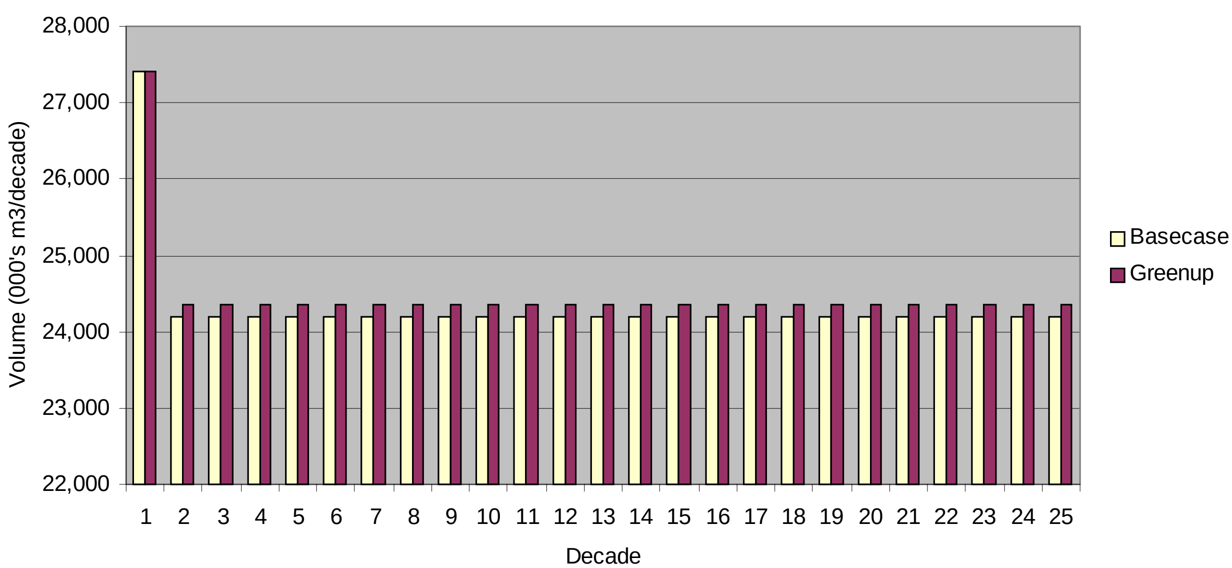
5.3.5.2 Green-up Age Reduction

Reduction in green-up age by 5 years can increase the sustainable harvest rate from decade 2 to 2,438,000/year, which is 0.62% above the base case (Figure 14).

Since FSSIM is a non-spatial model, the greenup requirement is modelled as a percentage limit of stands lower than the green-up height. This requirement is then applied to each landscape unit. With this non-spatial approach, the impacts of green-up requirements on harvest flow depend not only on the green-up age and the percentage limit, but also the relative age structure between landscape units. In landscape units where mature stands and young stands are not evenly distributed, the greenup requirement has a greater negative effect on the harvest flow than in a case where mature stands and young stands are more evenly distributed throughout the landscape unit.

The result of this scenario illustrates that the impact over the TSA is not particularly significant. However in specific landscape units with poor age class distribution, green-up requirements may have a very significant impact.

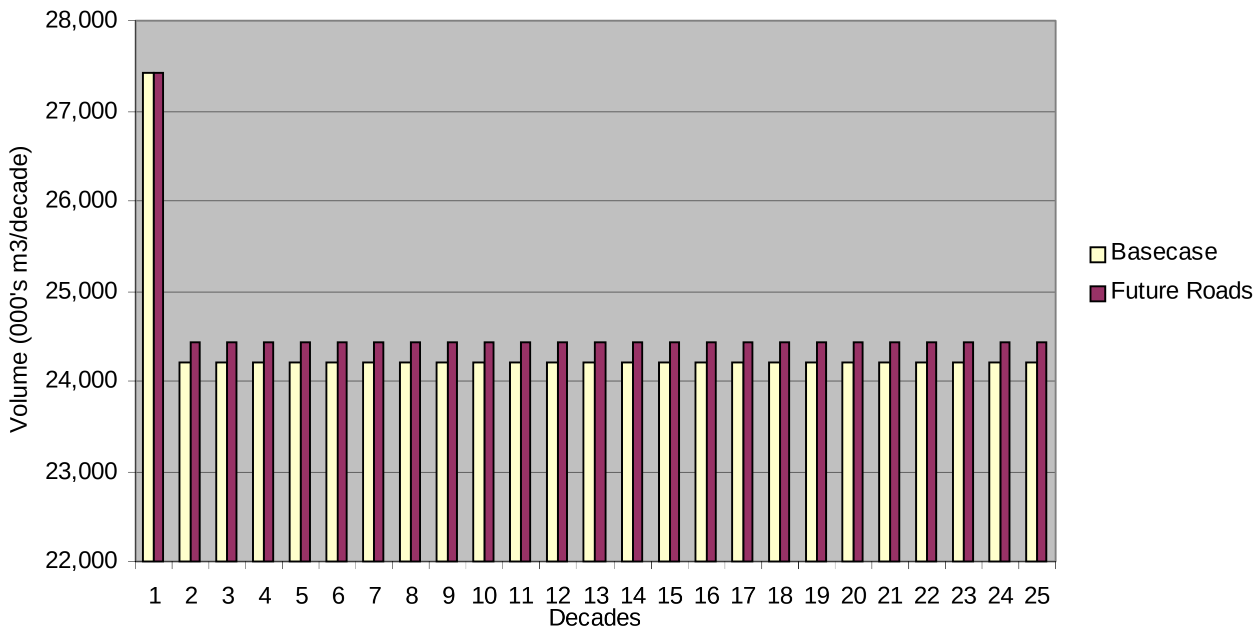
Figure 14.



5.3.5.3 Decrease in Future Roads Reduction

By lowering the future road reduction by 2%, the annual harvest rate can be increased to 2,442,800 m3 from decade 2, which is 0.95% higher than in the base case (Figure 15).

Figure 15



5.3.5.4 Acceleration of Backlog NSR elimination

By eliminating backlog NSR immediately, the annual harvest flow from decade 2 can be increased by about 2,000 m3/year, approximately 0.1% above the base case. By eliminating the backlog NSR in 5 years, the increase on the harvest flow is less than 0.1%.

The total backlog NSR area in the main TSA is about 6,000 ha. Accelerating reforestation of this relatively small landbase by 5 or 10 years will have an insignificant impact on harvest flows over the TSA as a whole.

Due to the minimal impact of this scenario on the long term harvest flow, no graph has been provided.

5.3.5.5 Alternative Spacing Densities

Changing the spacing density from 1800 stem/ha to 2800 stem/ha or to 1200 stems/ha does not have a positive impact on the harvest flow. The volume growth curves under the three spacing densities are only slightly different. In most cases, spacing density 1800 stems/ha has slightly higher volume at culmination age than 2800 stems/ha or 1200 stems/ha.

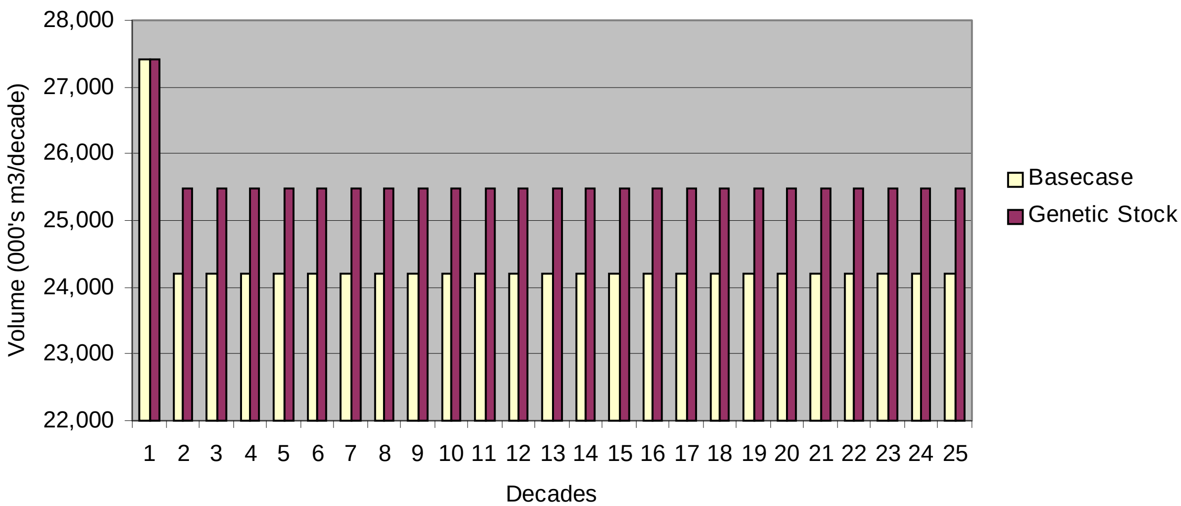
The spacing intensity under this scenario was the same as in the base case. The intensity varies between 0% to 40% among BEC zones and leading species. The average area treated is about 4,000 ha per year, which is consistent with programs conducted in the past.

5.3.5.6 Planting Genetically Improved Stock

By planting genetically improved stock, starting from decade 2 the annual harvest level can be increased by 5.25% above the base case (Figure 16).

In analysing this scenario, the site index was adjusted so that the managed stands could have a 12% volume gain at the culmination age. The green-up age and minimum harvest age were recalculated using the adjusted site index.

Figure 16.



5.3.5.7 Partial Cutting and Commercial Thinning

For the purpose of this analysis, a specific scenario assessing the impacts of implementing a commercial thinning program has not been conducted. The TISC analysis conducted in 1998 illustrated that the use of a commercial thinning program could significantly increase the volume of timber available for harvest. This result was largely a function of the fact that there was a significant short term fall down in wood supply. Commercial thinning activities were identified as a significant contributor to alleviating the perceived shortfall.

In this revised base case, the redefinition of the THLB has eliminated the shortfall and reduced the need to find alternate methods to access timber volume in the short term. As a result, if the objective is simply to provide additional volume, the implementation of an extensive partial cutting program is not required. However, it is believed that this type of harvest regime can play a significant role in meeting other objectives. Improving short term accessibility to timber in specific areas such as visually sensitive areas, wildlife management areas and areas constrained by the necessity to maintain old growth should be considered a priority. Implementing a more aggressive partial cutting program may provide greater harvest scheduling flexibility as well as ensure that other resource needs are met.

The option to utilise partial cutting regimes in 'constrained areas' should be assessed as a viable alternative to a 'no harvest' scenario. Most significantly, the 33 landscape units (Appendix 6) currently constrained by old growth requirements may in fact be accessible to a partial cutting program which ensures that old growth attributes are maintained within the stands that are harvested. In addition, partial cutting can play a valuable role in habitat enhancement (ie MDWR) and will significantly alleviate concerns in areas that are visually sensitive.

Partial cutting and commercial thinning harvest regimes must be recognised as valuable management tools which will not only provide access to timber volume, but may also help to enhance other resources and provide greater flexibility to forest managers.

5.4 Three Western Supply Blocks Results

The analysis conducted for the Three Western Supply Blocks has used the same methodology and management assumptions that were utilised in the Main TSA analysis, unless specifically noted. (The results for the ‘base case’ and scenario analysis are also presented in tabular format in Appendix 3)

5.4.1 Base case (WSB)

Figure 19 presents the harvest flow in the three Western Supply Blocks by decades. The harvest volume of decade 1 is composed of 766,000 m3/year for the first five years and 550,300 m3/year for the remaining 5 years. The harvest volume of 550,300/year can then be maintained to the end of the simulation. The harvest rate of the first five years in decade 1 includes 217,000 m3/year of mountain pine beetle salvage volume. Under this harvest rate, the growing stock remains relatively constant over time (Figure 18).

Figure 17.

Base Case Harvest Flow, Three Western Supply Blocks

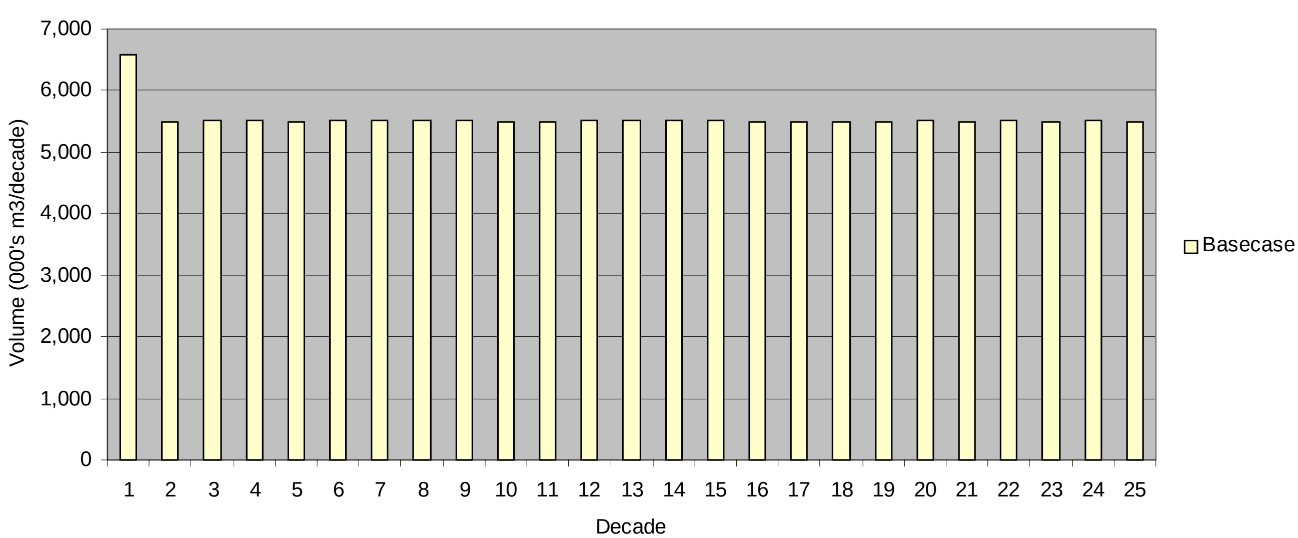
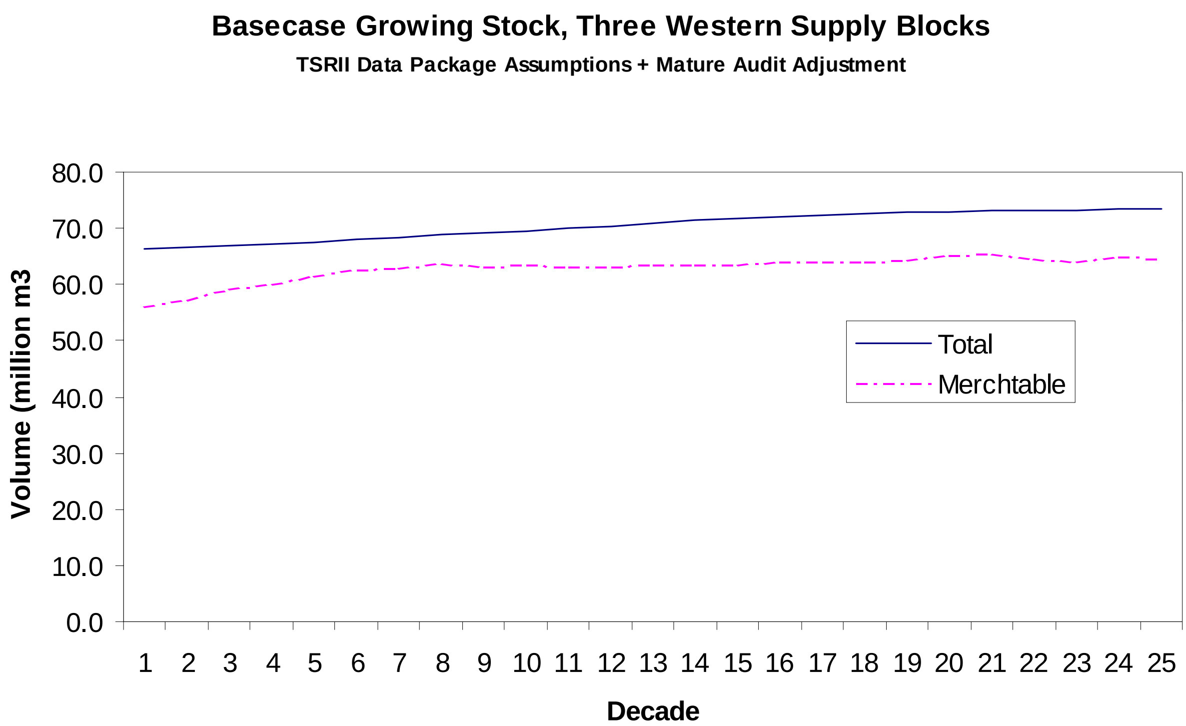


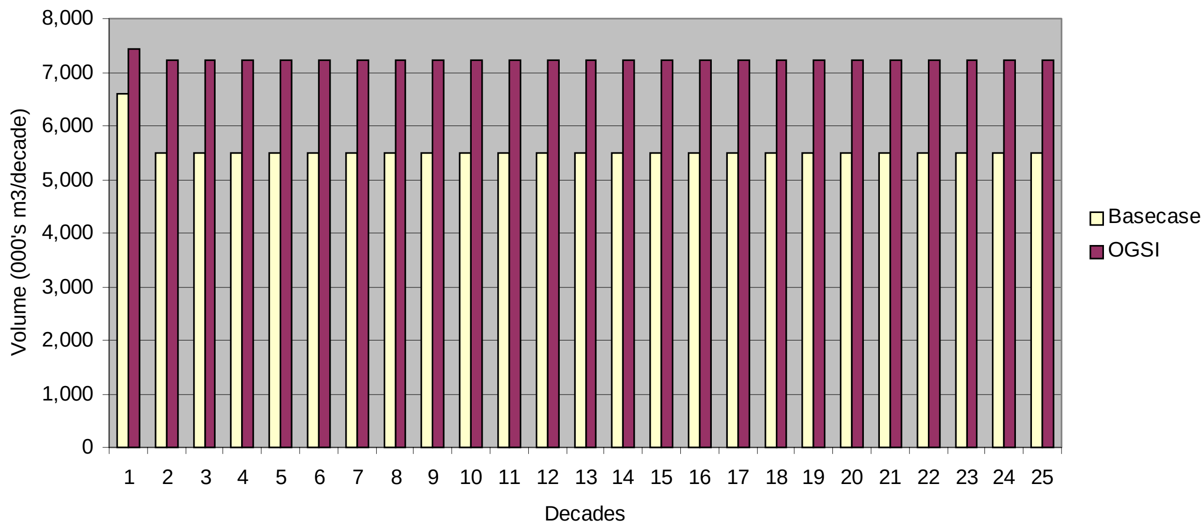
Figure 18.


Basecase Growing Stock, Three Western Supply Blocks
TSRII Data Package Assumptions + Mature Audit Adjustment
Volume (million m3
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Decade
Total
Merchtable

5.4.2 Old Growth Site Index (OGSI) Adjustments (WSB)

After applying the OGSI adjustments, the harvest flow can be increased by 13.01% for decade 1 and 31.06% for decade 2 and thereafter (Figure 19).

Figure 19.

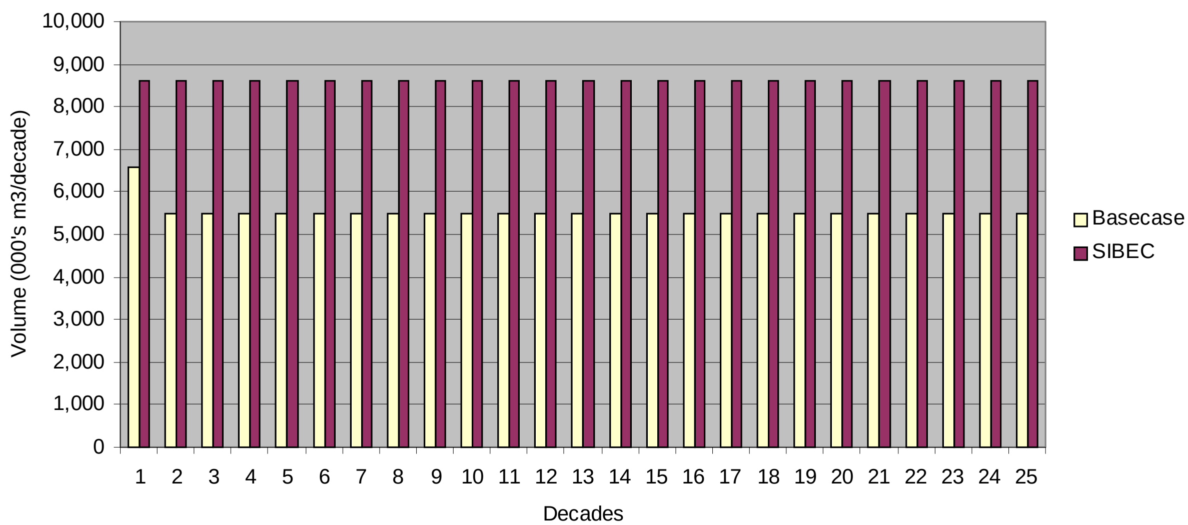


This scenario indicates that the OGSI adjustment increases the harvest flow in the three Western Supply Blocks by a greater percentage than in the Main TSA. The main reason for this is that the OGSI adjustment has a more significant impact on stands with lower site indices. For example, the OGSI adjustment would increase lodgepole pine stands of site index of 8 to site index 17.1 and lodgepole pine stands of site index 20 to site index 21.5. The Three Western Supply Blocks generally have lower inventory site indices than the Main TSA, resulting in a more dramatic impact to the harvest flow.

5.4.3 Application of SIBEC (WSB)

After application of the SIBEC, an even-flow harvest level of 859,200 m3/year can be maintained through the whole simulation horizon (Figure 20). The increase is 30.47% for decade 1 and 56.14% for decade 2 and beyond.

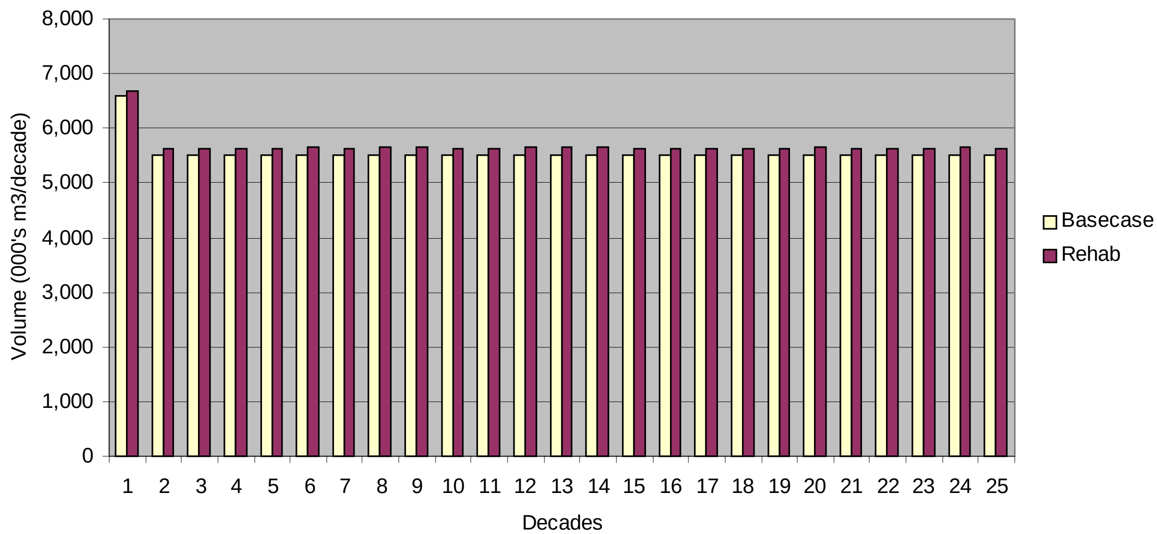
Figure 20.



5.4.4 Rehabilitation of Repressed Pli Stands (WSB)

There are currently 87,000 ha in the Three Western Supply Blocks identified as 'low sites' and excluded from the THLB. After rehabilitating 20,000 hectares of these repressed lodgepole pine stands, the harvest flow can be increased by 1.28% for decade 1 and 2.49% for decade 2 and beyond (Figure 21).

Figure 21.



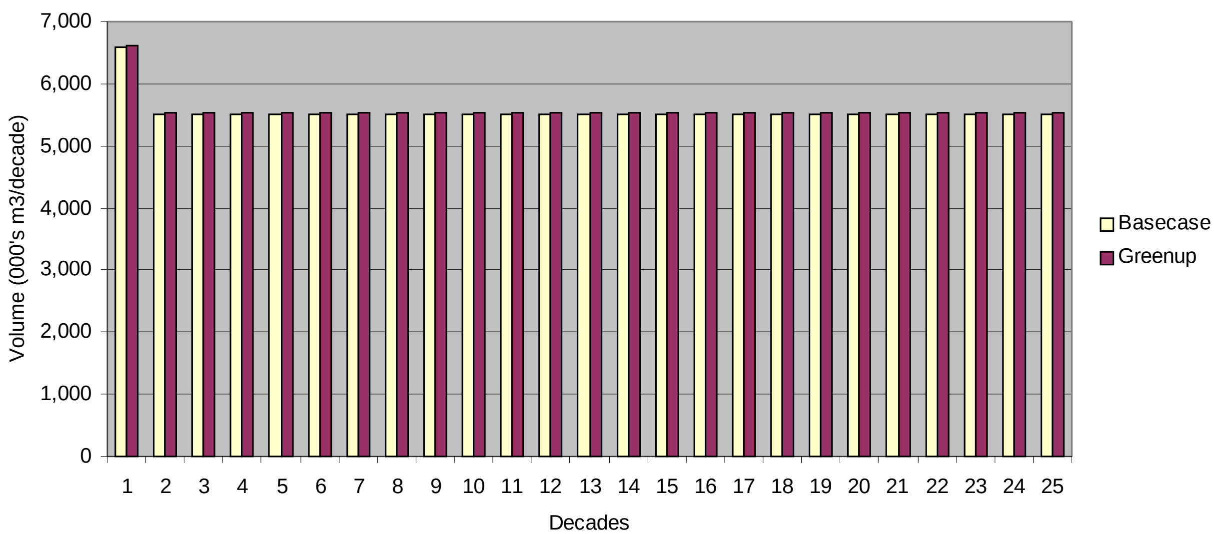
5.4.5 Silviculture Scenarios

In the three Western Supply Blocks, the same scenarios were tested with the exception of fertilisation, elimination of Backlog NSR and planting genetically improved stock. These were not analysed because, currently there is limited opportunity to implement these.

5.4.5.1 Green-up age reduction by 5 years

Reduction in green-up age by 5 years can increase the harvest rate by 0.26% for decade 1 and 0.55% for decade 2 and beyond (Figure 22).

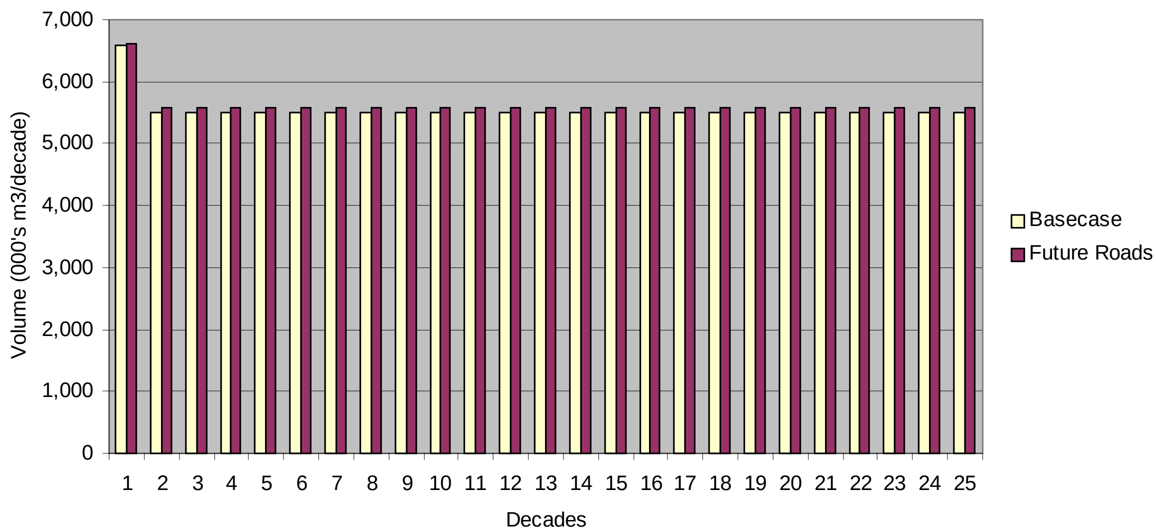
Figure 22.



5.4.5.2 Decrease in Future Roads Reduction

By lowering the future road reduction by 2%, the annual harvest rate can be increased by 0.56% in decade 1 and 1.27% for decade 2 and thereafter (Figure 23).

Figure 23.



5.4.5.3 Alternative Spacing Densities

Changing the spacing density from 1800 stem/ha to 2800 stem/ha or to 1200 stems/ha does not have positive impact on the harvest flow. The volume growth curves under the three different spacing densities are only slightly different. In most cases, spacing density 1800 stems/ha has slightly higher volume at culmination age than 2800 stems/ha and 1200 stems/ha.

6 INCREMENTAL SILVICULTURE

6.1 History

In the Williams Lake TSA, the primary incremental treatment has been juvenile spacing, and on a smaller scale, fertilisation and pruning. Commercial thinning has also been conducted on a limited scale in the Horsefly Forest District. Historically, incremental treatments have been conducted in a small portion of the TSA and have been limited by long travel distances and limited availability of resources.

The following table provides a summary of incremental silviculture treatments conducted to date in the Williams Lake TSA.

Table 2. Incremental Silviculture Treatments

TREATMENT	DISTRICT		
	(ha) **Williams Lake**	(ha) **Horsefly**	(ha) **Chilcotin**
Juvenile Spacing	50401	8778	45551
Fertilisation	950	5394	173
Pruning	134	575	4
TOTAL	**51485**	**14747**	**45728**
			Data Source: ISIS (March, 2000).

Figure 24. Treatment Trends in the Williams Lake TSA

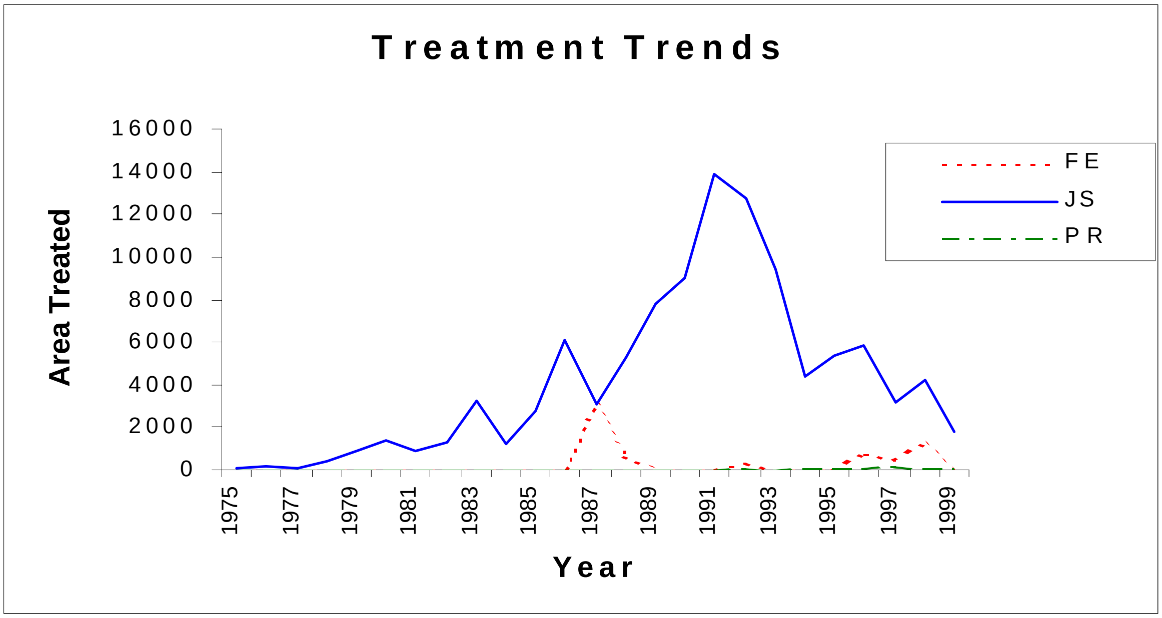
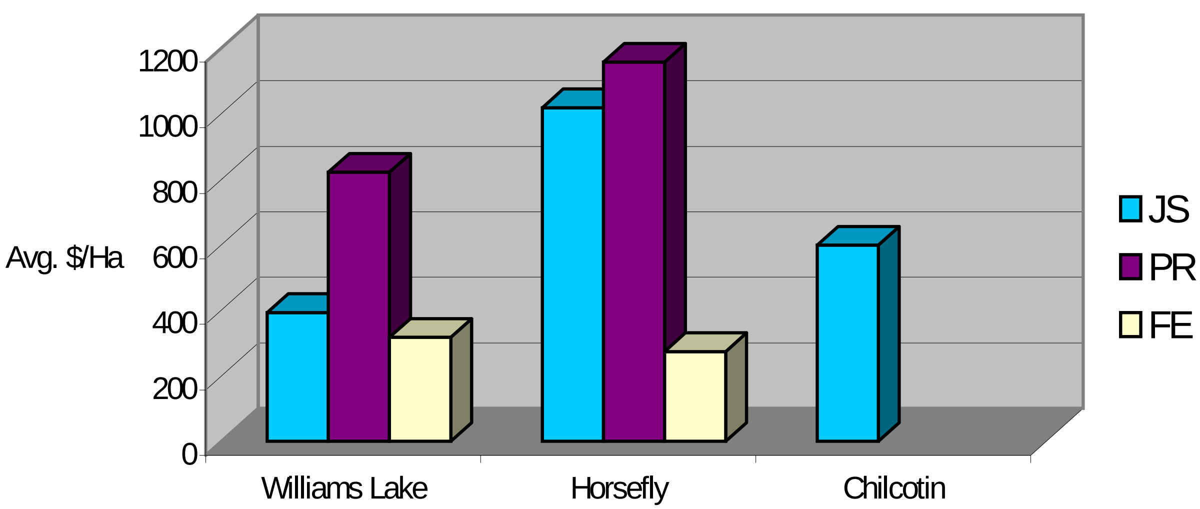


Figure 25. Average Treatment Costs



6.2 Strategic Silviculture Priorities

The results of this analysis have clearly illustrated that site productivity plays a significant role in the development of harvest flow projections. Updating site index estimates to reflect newer, more refined data can have a very large positive impact on the long term volume projections. To fully understand the harvest flow in this TSA it will be imperative to complete the ongoing work in defining the OGSI adjustments as well as the SIBEC or Site Index Adjustments. Ensuring that site productivity estimates are accurate and representative of the stands within this TSA will help identify a secure long term timber supply.

In addition to continuing site productivity work, an incremental program for this TSA should focus in the following during the next five years:

- Closely assess biodiversity issues in constrained landscape units (Appendix 6) and examine the potential for commercial thinning programs and partial cutting regimes to provide access to timber while maintaining biodiversity objectives. Preparatory juvenile spacing may be required in many of these areas to fully facilitate future commercial thinning.

- Target the rehabilitation of repressed Pli stands. This type of work will immediately increase the THLB and also increase site index estimates as well, contributing to an overall increase in harvest flow.

- Juvenile spacing activities should be implemented with the intention of addressing values such as biodiversity, wildlife habitat, enhancing wood quality and facilitating the more efficient implementation of partial cutting. Although this analysis has shown that juvenile spacing at current levels does not contribute to an increase in harvest flow, a well focused program can enable the maintenance of site productivity as well as contribute to the enhancement of other values.

- The use of genetically improved stock should be maximised wherever possible. The 5% increase in harvest flow as a result of these practices, illustrates a need to continue to improve the viability of genetically improved stock types and ensure that it is available for future use.

The following summary illustrates general cost estimates for implementing the incremental treatments detailed in the analysis results:

Treatment	**Proposed Ha/yr**	**Estimated $/ha**	**Total $/year**	**Five year Total Cost**
Plant Genetically Improved stock	2000	40	80000	400,000
Backlog NSR	1000	1000	1,000,000	5,000,000
Juvenile Spacing	6000	550	3,300,000	16,500,000
Pli Rehabilitation	10000*	1250	12,500,000	62,500,000
Fertilisation	1200	295	354,000	1,770,000
TOTAL			**17,234,000**	**86,170,000**

* Although silviculturally 'suitable' and available for treatment, this level of activity may not be operationally achievable.

Clearly, the gains achievable through the use of improved stock types provide maximum benefit, since the relative cost of treatment is much lower than other treatment regimes. Increased growth rates will also help alleviate greenup constraints which is a further benefit in mitigating short term access to timber concerns.

Due to the nature of the CCLUP and the requirement to meet established timber 'targets', the impacts of various treatment regimes must be further assessed on a more localised CCLUP subzone and landscape unit level.

7 SUMMARY AND RECOMMENDATIONS

The analyses conducted for this project illustrates that several key issues have a significant impact on the timber availability in the Williams Lake TSA:

1. Ensuring that the THLB is accurately defined, in terms of current management and current opportunity, will help to provide realistic estimates and define where harvesting operations will be focused.

2. Site productivity levels must be closely assessed and current OGSI and SIBEC initiatives must be completed. The results should be incorporated into any subsequent timber supply analysis. Realistic site productivity estimates will aid in confirming realistic, long term sustainable harvest levels.

3. The opportunity for improving 'access to timber' in constrained landscape units must be assessed more closely. Specific opportunities include:
   - Strategies to minimise greenup (i.e.: fertilisation, genetically improved stock) will help alleviate adjacency constraints in landscape units with poor age distribution.
   - Continued use of genetically improved stock will help ensure the maintenance of a long term, even flow harvest.
   - Rehabilitation of repressed pine sites will effectively increase growth potential and provide access to a larger timber harvesting landbase in the long term.
   - Introduction of a viable commercial thinning and partial cutting program may provide access into constrained landscape units not available for conventional harvest.

- Treatments such as juvenile spacing and commercial thinning may provide enhancement to timber productivity as well as other resource uses

On a broad TSA basis, an even flow harvest level can be maintained in the long term. However, there are significant challenges to overcome to ensure that CCLUP objectives are met while still maintaining the harvest flow in the long as well as short term. Future planning initiatives must consider issues not only at a TSA level, but also on a more specific landscape unit level which will meet the requirements defined by the CCLUP. More extensive analysis to address a variety of enhancement issues as they relate to the CCLUP is being initiated in 2000 by a restructured Regional Timber Investment Strategy Committee. The mandate of this committee will be to more closely assess the impacts of operating to meet the specific objectives identified in the CCLUP.

APPENDIX 1

Treatment Summary Tables

TREATMENT SUMMARY TABLE

MAIN TSA				Timber Supply Impacts		Impacts to Other Land Uses?					
Regime	Objective	Target Stand Description	Response TimeFrame	Vol. Increase (000's m3\yr)	% Vol increase	OG	Wildlife	Visuals	Estimated Treatment Area	Estimated Cost/ha	Estimated Job Outcome (person-days/ha)
OGSI Adjustment	Accurately Define site productivity	Pli, Sx >140 ICH,ESSF, MS,SBS	Short - Mid Long	321	13.3	Y	N	N	n/a		
SIBEC Adjustment	Accurately Define site productivity	All sites: assumed site series 1.	Short - Mid Long	641	26.5	Y	N	N	n/a		
Pli Rehab	Increase THLB, increase site productivity	Repressed Pli SI <7	Mid - Long	35	1.45	N	N	N	10,000 ha (available area)*	1250	5
Fertilisation	Increase site productivity, reduce rotation	Pli, SI >18	Mid - Long	8.8	0.33	N	N	Y	1200 ha/yr	295	1
Plant Genetically Improved Stock	Reduce rotation length, reduce greenup age	All planted sites 12% volume gain	Mid - Long	127	5.25				2000 ha/yr	40	n/a
Greenup Age Reduction	alleviate adjacency, reduce rotation	all managed stands, reduce by 5 yrs.	Short - Mid	19	0.62	Y	N	Y	n/a		n/a
Decrease Future Roads	Increase THLB		Short	23	0.95	N	N	N	reduce area by 2%		n/a
Backlog NSR	Alleviate adjacency, increase productivity	all backlog NSR sites	Mid- Long	2	0.10	N	N	N	1000 ha/yr	1000	1.5
Juvenile Spacing	Increase productivity, prep for CT/PC	% of AU as per Base Case 12-1800 sph	Mid - Long	0	0	N	N	N	6000 ha/yr	550	4.5
Partial Cutting/ Commercial Thin.	Alleviate adjacency, biodiversity issues and habitat supply	various	Short - Mid - Long	Not Tested	Not Tested	Y	Y	Y	further assessment required		2.5

TREATMENT SUMMARY TABLE

3 WSB's				Timber Supply Impacts		Impacts to Other Land Uses?					
Regime	Objective	Target Stand Description	Response TimeFrame	Vol. Increase (000's m3)	% Vol increase	OG	Wildlife	Visuals	Estimated Treatment Area	Estimated Cost/ha	Estimated Job Outcome
OGSI Adjustment	Accurately define site productivity	Pli, Sx >140 ICH,ESSF, MS,SBS	Short - Mid Long	170	31	Y	N	N	n/a		
SIBEC Adjustment	Accurately define Site productivity	All sites: assumed site series 1.	Short - Mid Long	309	56	Y	N	N	n/a		
Pli Rehab	Increase THLB, increase site productivity	Repressed Pli SI <7	Mid - Long	137	2.5	N	N	N	20,000 (available area)*	1250	5
Greenup Age Reduction	alleviate adjacency, reduce rotation	all managed stands, reduce by 5 yrs	Short - Mid	3	0.55	Y	N	Y	n/a	n/a	n/a
Decrease Future Roads	Increase THLB		Short	7.2	1.3	N	N	N	n/a	n/a	n/a
Juvenile Spacing	Increase productivity,	% of AU, as per base case, target 1200 - 1800 sph.	Mid-Long	0	0	N	N	N	2000 (available area)*	600	4.5

*Although this area is silviculturally suitable for treatment, economic feasibility to complete this level of treatment in the 3 WSB's may be limited.

APPENDIX 2

Main TSA Harvest Flows

Tabular Summaries

OGSI Harvest Flow
Main TSA

Harvest flow, Basecase vs Basecase + OGSI

Decade	Volume (000's m3/Decade)		Increase/Decade	
	OGSI	Basecase	000's m3	%
1	27,923	27,413	510	1.86%
2	27,408	24,198	3,210	13.27%
3	27,409	24,199	3,210	13.26%
4	27,409	24,199	3,210	13.26%
5	27,408	24,199	3,210	13.26%
6	27,408	24,198	3,209	13.26%
7	27,409	24,198	3,211	13.27%
8	27,409	24,199	3,210	13.26%
9	27,408	24,199	3,210	13.26%
10	27,409	24,199	3,210	13.27%
11	27,408	24,200	3,209	13.26%
12	27,408	24,199	3,209	13.26%
13	27,408	24,199	3,209	13.26%
14	27,408	24,199	3,209	13.26%
15	27,408	24,199	3,209	13.26%
16	27,409	24,198	3,211	13.27%
17	27,408	24,198	3,210	13.27%
18	27,409	24,198	3,211	13.27%
19	27,408	24,199	3,210	13.26%
20	27,408	24,199	3,209	13.26%
21	27,407	24,199	3,208	13.26%
22	27,408	24,199	3,209	13.26%
23	27,408	24,199	3,210	13.26%
24	27,409	24,199	3,210	13.27%
25	27,409	24,198	3,210	13.27%

SIBEC Harvest Flow
Main TSA

Harvest flow, Basecase vs Basecase + SIBEC

Decade	Volume (000's m3/Decade)		Increase/Decade	
	SIBEC	Basecase	000's m3	%
1	30,608	27,413	3,195	11.65%
2	30,608	24,198	6,410	26.49%
3	30,609	24,199	6,409	26.49%
4	30,608	24,199	6,410	26.49%
5	30,608	24,199	6,409	26.49%
6	30,609	24,198	6,410	26.49%
7	30,609	24,198	6,411	26.49%
8	30,609	24,199	6,410	26.49%
9	30,608	24,199	6,409	26.48%
10	30,608	24,199	6,410	26.49%
11	30,608	24,200	6,408	26.48%
12	30,608	24,199	6,409	26.48%
13	30,609	24,199	6,410	26.49%
14	30,608	24,199	6,409	26.48%
15	30,608	24,199	6,409	26.49%
16	30,609	24,198	6,411	26.49%
17	30,609	24,198	6,411	26.49%
18	30,608	24,198	6,410	26.49%
19	30,608	24,199	6,409	26.49%
20	30,609	24,199	6,410	26.49%
21	30,607	24,199	6,408	26.48%
22	30,608	24,199	6,410	26.49%
23	30,607	24,199	6,409	26.48%
24	30,609	24,199	6,411	26.49%
25	30,608	24,198	6,410	26.49%

Rehabilitation Harvest Flow
Main TSA

Harvest flow, Basecase vs Basecase + Rehab				
Decade	Volume (000's m3/Decade)		Increase/Decade	
	Rehab	Basecase	000's m3	%
1	27,413	27,413	0	0.00%
2	24,548	24,198	350	1.45%
3	24,549	24,199	350	1.45%
4	24,549	24,199	350	1.45%
5	24,549	24,199	350	1.45%
6	24,548	24,198	350	1.45%
7	24,548	24,198	350	1.45%
8	24,549	24,199	350	1.45%
9	24,549	24,199	350	1.45%
10	24,548	24,199	349	1.44%
11	24,550	24,200	350	1.45%
12	24,549	24,199	350	1.45%
13	24,549	24,199	350	1.45%
14	24,549	24,199	350	1.45%
15	24,549	24,199	350	1.45%
16	24,549	24,198	350	1.45%
17	24,548	24,198	350	1.45%
18	24,549	24,198	351	1.45%
19	24,548	24,199	349	1.44%
20	24,549	24,199	350	1.45%
21	24,549	24,199	350	1.45%
22	24,549	24,199	350	1.45%
23	24,548	24,199	349	1.44%
24	24,549	24,199	350	1.45%
25	24,548	24,198	350	1.45%

Fertilization Harvest Flow
Main TSA

Harvest flow, Basecase vs Basecase + Ferti				
Decade	Volume (000's m3/Decade)		Increase/Decade	
	Fertilization	Basecase	000's m3	%
1	27,413	27,413	0	0.00%
2	24,278	24,198	80	0.33%
3	24,279	24,199	80	0.33%
4	24,279	24,199	80	0.33%
5	24,279	24,199	80	0.33%
6	24,278	24,198	80	0.33%
7	24,278	24,198	80	0.33%
8	24,279	24,199	80	0.33%
9	24,279	24,199	80	0.33%
10	24,279	24,199	80	0.33%
11	24,280	24,200	80	0.33%
12	24,279	24,199	80	0.33%
13	24,279	24,199	80	0.33%
14	24,279	24,199	80	0.33%
15	24,279	24,199	80	0.33%
16	24,278	24,198	80	0.33%
17	24,278	24,198	80	0.33%
18	24,278	24,198	80	0.33%
19	24,279	24,199	80	0.33%
20	24,279	24,199	80	0.33%
21	24,279	24,199	80	0.33%
22	24,279	24,199	80	0.33%
23	24,279	24,199	80	0.33%
24	24,279	24,199	80	0.33%
25	24,278	24,198	80	0.33%

Reduced Greenup
Harvest Flow
Main TSA

Harvest flow, Basecase vs Basecase + greenup				
Decade	Volume (000's m3/Decade)		Increase/Decade	
	Greenup	Basecase	000's m3	%
1	27,413	27,413	0	0.00%
2	24,349	24,198	150	0.62%
3	24,349	24,199	150	0.62%
4	24,349	24,199	150	0.62%
5	24,349	24,199	150	0.62%
6	24,349	24,198	150	0.62%
7	24,348	24,198	150	0.62%
8	24,349	24,199	150	0.62%
9	24,349	24,199	150	0.62%
10	24,348	24,199	150	0.62%
11	24,349	24,200	150	0.62%
12	24,349	24,199	150	0.62%
13	24,349	24,199	150	0.62%
14	24,349	24,199	150	0.62%
15	24,349	24,199	150	0.62%
16	24,349	24,198	150	0.62%
17	24,348	24,198	150	0.62%
18	24,350	24,198	151	0.63%
19	24,347	24,199	149	0.62%
20	24,349	24,199	150	0.62%
21	24,349	24,199	150	0.62%
22	24,349	24,199	150	0.62%
23	24,348	24,199	150	0.62%
24	24,349	24,199	150	0.62%
25	24,348	24,198	150	0.62%

Future Roads
Reduction
Harvest Flow
Main TSA

Harvest flow, Basecase vs Basecase + Future Roads				
Decade	Volume (000's m3/Decade)		Increase/Decade	
	Fu_roads	Basecase	000's m3	%
1	27,413	27,413	0	0.00%
2	24,428	24,198	230	0.95%
3	24,429	24,199	230	0.95%
4	24,429	24,199	230	0.95%
5	24,429	24,199	230	0.95%
6	24,428	24,198	230	0.95%
7	24,428	24,198	230	0.95%
8	24,429	24,199	230	0.95%
9	24,429	24,199	230	0.95%
10	24,429	24,199	230	0.95%
11	24,429	24,200	230	0.95%
12	24,429	24,199	230	0.95%
13	24,429	24,199	230	0.95%
14	24,429	24,199	230	0.95%
15	24,429	24,199	230	0.95%
16	24,428	24,198	230	0.95%
17	24,428	24,198	230	0.95%
18	24,428	24,198	230	0.95%
19	24,429	24,199	230	0.95%
20	24,429	24,199	230	0.95%
21	24,429	24,199	230	0.95%
22	24,429	24,199	230	0.95%
23	24,429	24,199	230	0.95%
24	24,429	24,199	230	0.95%
25	24,428	24,198	230	0.95%

Use of Genetically Improved Stock

Harvest flow, Basecase vs Basecase + Genetically Improved Stock

Decade	Volume (000's m3/Decade)		Increase/Decade	
	Genetic	Basecase	000's m3	%
1	27,413	27,413	0	0.00%
2	25,468	24,198	1,270	5.25%
3	25,469	24,199	1,270	5.25%
4	25,469	24,199	1,270	5.25%
5	25,468	24,199	1,270	5.25%
6	25,468	24,198	1,270	5.25%
7	25,468	24,198	1,270	5.25%
8	25,470	24,199	1,270	5.25%
9	25,469	24,199	1,270	5.25%
10	25,468	24,199	1,270	5.25%
11	25,469	24,200	1,270	5.25%
12	25,469	24,199	1,270	5.25%
13	25,468	24,199	1,269	5.25%
14	25,469	24,199	1,270	5.25%
15	25,468	24,199	1,269	5.24%
16	25,469	24,198	1,270	5.25%
17	25,468	24,198	1,270	5.25%
18	25,468	24,198	1,270	5.25%
19	25,469	24,199	1,270	5.25%
20	25,469	24,199	1,270	5.25%
21	25,468	24,199	1,269	5.24%
22	25,469	24,199	1,270	5.25%
23	25,468	24,199	1,270	5.25%
24	25,468	24,199	1,270	5.25%
25	25,469	24,198	1,271	5.25%

APPENDIX 3

Western Supply Blocks Harvest Flows

Tabular Summaries

OGSI Harvest Flow
Western Supply Blocks

WSBS

Harvest flow, Basecase vs Basecase + OGSI

Decade	Volume (000's m3/Decade)		Increase/Decade	
	OGSI	Basecase	000's m3	%
1	7,443	6,586	857	13.01%
2	7,213	5,503	1,709	31.06%
3	7,213	5,504	1,709	31.06%
4	7,213	5,504	1,710	31.06%
5	7,214	5,503	1,711	31.09%
6	7,214	5,505	1,709	31.05%
7	7,214	5,504	1,710	31.07%
8	7,212	5,504	1,708	31.02%
9	7,213	5,504	1,709	31.05%
10	7,214	5,503	1,710	31.07%
11	7,214	5,502	1,712	31.11%
12	7,213	5,504	1,709	31.05%
13	7,214	5,504	1,709	31.06%
14	7,214	5,505	1,709	31.05%
15	7,213	5,504	1,709	31.06%
16	7,214	5,503	1,711	31.08%
17	7,213	5,503	1,710	31.08%
18	7,214	5,503	1,710	31.08%
19	7,214	5,504	1,710	31.07%
20	7,213	5,504	1,709	31.05%
21	7,213	5,503	1,710	31.07%
22	7,214	5,504	1,710	31.07%
23	7,214	5,504	1,710	31.08%
24	7,213	5,504	1,709	31.05%
25	7,213	5,504	1,710	31.07%

SIBEC Harvest Flow
Western Supply Blocks

WSBS

Harvest flow, Basecase vs Basecase + SIBEC

Decade	Volume (000's m3/Decade)		Increase/Decade	
	SIBEC	Basecase	000's m3	%
1	8,592	6,586	2,006	30.47%
2	8,593	5,503	3,090	56.14%
3	8,593	5,504	3,089	56.12%
4	8,594	5,504	3,090	56.14%
5	8,594	5,503	3,090	56.15%
6	8,593	5,505	3,089	56.11%
7	8,593	5,504	3,090	56.13%
8	8,593	5,504	3,089	56.11%
9	8,594	5,504	3,089	56.12%
10	8,594	5,503	3,090	56.15%
11	8,592	5,502	3,090	56.17%
12	8,595	5,504	3,091	56.15%
13	8,593	5,504	3,089	56.12%
14	8,594	5,505	3,089	56.13%
15	8,592	5,504	3,088	56.11%
16	8,595	5,503	3,091	56.17%
17	8,593	5,503	3,090	56.15%
18	8,594	5,503	3,091	56.17%
19	8,592	5,504	3,088	56.12%
20	8,592	5,504	3,088	56.11%
21	8,595	5,503	3,092	56.19%
22	8,595	5,504	3,091	56.16%
23	8,593	5,504	3,089	56.13%
24	8,592	5,504	3,088	56.10%
25	8,595	5,504	3,091	56.16%

Rehabilitation Harvest Flow
Western Supply Blocks

WSBS				
Basecase vs Basecase + Rehab				
Decade	Volume (000's m3/Decade)		Increase/Decade	
	Rehab	Basecase	000's m3	%
1	6,670	6,586	84	1.28%
2	5,640	5,503	137	2.49%
3	5,641	5,504	137	2.49%
4	5,641	5,504	137	2.49%
5	5,640	5,503	137	2.49%
6	5,642	5,505	137	2.49%
7	5,641	5,504	137	2.49%
8	5,641	5,504	137	2.49%
9	5,641	5,504	137	2.49%
10	5,641	5,503	137	2.49%
11	5,639	5,502	137	2.49%
12	5,641	5,504	137	2.49%
13	5,641	5,504	137	2.49%
14	5,642	5,505	137	2.49%
15	5,641	5,504	137	2.49%
16	5,640	5,503	137	2.49%
17	5,640	5,503	137	2.49%
18	5,640	5,503	137	2.49%
19	5,641	5,504	137	2.49%
20	5,641	5,504	137	2.49%
21	5,640	5,503	137	2.49%
22	5,641	5,504	137	2.49%
23	5,641	5,504	137	2.49%
24	5,641	5,504	137	2.49%
25	5,641	5,504	137	2.49%

Reduced Greenup Harvest Flow
Western Supply Blocks

WSBS				
Basecase vs Basecase + greenup				
Decade	Volume (000's m3/Decade)		Increase/Decade	
	greenup	Basecase	000's m3	%
1	6,603	6,586	17	0.26%
2	5,533	5,503	30	0.55%
3	5,534	5,504	30	0.54%
4	5,534	5,504	30	0.55%
5	5,533	5,503	30	0.55%
6	5,535	5,505	30	0.54%
7	5,534	5,504	30	0.55%
8	5,534	5,504	30	0.55%
9	5,534	5,504	30	0.54%
10	5,533	5,503	30	0.54%
11	5,532	5,502	30	0.55%
12	5,534	5,504	30	0.54%
13	5,534	5,504	30	0.55%
14	5,535	5,505	30	0.54%
15	5,534	5,504	30	0.54%
16	5,534	5,503	30	0.55%
17	5,533	5,503	30	0.55%
18	5,533	5,503	30	0.55%
19	5,534	5,504	30	0.54%
20	5,533	5,504	29	0.53%
21	5,533	5,503	31	0.55%
22	5,534	5,504	31	0.55%
23	5,533	5,504	30	0.54%
24	5,534	5,504	30	0.55%
25	5,534	5,504	30	0.54%

Reduction in Future Roads
Western Supply
Blocks

WSBS				
Basecase vs Basecase + less future roads reduction				
Decade	**Volume (000's m3/Decade)**		**Increase/Decade**	
	future roads	**Basecase**	**000's m3**	**%**
1	6,623	6,586	37	0.56%
2	5,573	5,503	70	1.27%
3	5,574	5,504	70	1.27%
4	5,574	5,504	70	1.27%
5	5,573	5,503	70	1.27%
6	5,575	5,505	70	1.27%
7	5,574	5,504	70	1.27%
8	5,574	5,504	70	1.27%
9	5,574	5,504	70	1.27%
10	5,573	5,503	70	1.27%
11	5,572	5,502	70	1.27%
12	5,574	5,504	70	1.27%
13	5,574	5,504	70	1.27%
14	5,574	5,505	70	1.27%
15	5,574	5,504	70	1.27%
16	5,574	5,503	70	1.28%
17	5,573	5,503	70	1.28%
18	5,573	5,503	70	1.27%
19	5,573	5,504	70	1.27%
20	5,573	5,504	69	1.26%
21	5,574	5,503	71	1.29%
22	5,574	5,504	70	1.28%
23	5,574	5,504	70	1.28%
24	5,574	5,504	70	1.27%
25	5,573	5,504	70	1.26%

APPENDIX 4

Timber Harvesting Landbase Components

Clearcutting vs Selection Harvest Areas

Components of the Timber Harvesting Landbase, William Lake TSA

Category	Area (ha)	%
Caribou Modified Arboreal	18,228	0.76%
Caribou Modified Terrestrial	81,687	3.39%
Class 'B' Lake Buffer	8,691	0.36%
Dry-belt Fir	125,104	5.19%
MDWR-fir Leading	167,216	6.93%
Mountain Pine Beetle	430,282	17.84%
PA16	36,531	1.51%
Visual Sensitivity Area	176,350	7.31%
Clearcut Normal Rotation	1,277,896	52.98%
WTP Double Rotation	89,996	3.73%
Total	2,411,980	100.00%

Basecase Harvest Flow, Williams Lake Main TSA

Decade	Annual Harvest Volume (m3)		
	Clearcut	Selection	Total
1*	2,528,600	212,600	2,741,200
2	2,323,700	96,100	2,419,800
3	2,336,200	83,700	2,419,900
4	2,364,200	55,600	2,419,800
5	2,350,800	69,100	2,419,900
6	2,245,400	174,400	2,419,800
7	2,204,800	215,000	2,419,800
8	2,202,300	217,600	2,419,900
9	2,229,600	190,300	2,419,900
10	2,280,300	139,500	2,419,800
11	2,305,700	114,300	2,420,000
12	2,198,700	221,200	2,419,900
13	2,067,800	352,100	2,419,900
14	2,288,600	131,200	2,419,800
15	2,262,100	157,800	2,419,900
16	2,229,500	190,300	2,419,800
17	2,137,000	282,800	2,419,800
18	2,323,300	96,500	2,419,800
19	2,240,000	179,800	2,419,800
20	2,169,700	250,200	2,419,900
21	2,124,300	295,600	2,419,900
22	2,324,600	95,300	2,419,900
23	2,167,400	252,500	2,419,900
24	2,196,500	223,400	2,419,900
25	2,311,500	108,300	2,419,800

* The first five year is 2,883,000 m3/year and the following five years is 2,600,000 m3/year.

APPENDIX 5

SIBEC Factors for the Williams Lake TSA

Estimated SIBEC Site Index of Williams Lake TSA					
Biogeozone	**BG_subzone**	**Var**	**Leading Species**	**Area**	**SIBEC_SI**
BG	xh	3	FD	58	12
BG	xw	2	FD	1,832	13
CWH	ds	1	CW	14	22
CWH	ds	1	FD	23	26
CWH	ds	1	PL	158	16
CWH	ds	1	S	11	28
ESSF	mw		PL	60	16
ESSF	mw		S	27	15
ESSF	wc	3	B	4,163	15
ESSF	wc	3	BL	3,695	15
ESSF	wc	3	CW	144	10
ESSF	wc	3	FD	626	12
ESSF	wc	3	PL	2,847	12
ESSF	wc	3	S	14,024	15
ESSF	wc	3	SE	25	15
ESSF	wc	3	SW	355	15
ESSF	wk	1	AC	48	16
ESSF	wk	1	AT	418	15
ESSF	wk	1	B	4,101	15
ESSF	wk	1	BL	5,043	15
ESSF	wk	1	CW	4,620	10
ESSF	wk	1	EP	48	10
ESSF	wk	1	FD	5,263	14
ESSF	wk	1	H	295	10
ESSF	wk	1	HW	1,072	10
ESSF	wk	1	PL	20,684	18
ESSF	wk	1	S	48,549	15
ESSF	wk	1	SE	88	15
ESSF	wk	1	SW	303	15
ESSF	xv		PL	5,345	15
ESSF	xv		S	527	12
ESSF	xv	1	B	184	10
ESSF	xv	1	FD	397	10
ESSF	xv	1	PA	666	12
ESSF	xv	1	PL	27,876	15
ESSF	xv	1	S	1,307	12
ESSF	xv	1	SE	180	12
ESSF	xv	2	B	507	10
ESSF	xv	2	PL	31,576	15
ESSF	xv	2	S	2,740	12
ESSF	xv	2	SW	84	12

Biogeozone	BG_subzone	Var	Leading Species	Area	SIBEC_SI
ICH	mk	3	AC	277	16
ICH	mk	3	AT	1,298	10
ICH	mk	3	B	610	16
ICH	mk	3	BL	1,565	16
ICH	mk	3	CW	4,128	12
ICH	mk	3	EP	794	10
ICH	mk	3	FD	17,500	22
ICH	mk	3	H	33	12
ICH	mk	3	HW	21	12
ICH	mk	3	PL	9,871	22
ICH	mk	3	S	19,058	21
ICH	mk	3	SB	10	21
ICH	mk	3	SW	55	21
ICH	wk	2	AC	20	16
ICH	wk	2	AT	32	10
ICH	wk	2	B	664	16
ICH	wk	2	BL	1,009	16
ICH	wk	2	CW	21,795	15
ICH	wk	2	EP	103	10
ICH	wk	2	FD	23,383	23
ICH	wk	2	H	2,906	12
ICH	wk	2	HM	68	12
ICH	wk	2	HW	13,936	12
ICH	wk	2	PL	9,076	22
ICH	wk	2	S	16,261	21
ICH	wk	2	SB	5	21
ICH	wk	2	SE	172	21
ICH	wk	2	SW	72	21
ICH	wk	4	B	204	18
ICH	wk	4	BL	189	18
ICH	wk	4	CW	318	16
ICH	wk	4	FD	1,438	22
ICH	wk	4	H	259	16
ICH	wk	4	HW	51	16
ICH	wk	4	PL	3,676	22
ICH	wk	4	S	4,626	22
IDF	dk	3	AT	1,362	10
IDF	dk	3	EP	8	10
IDF	dk	3	FD	116,492	15
IDF	dk	3	PL	68,207	18
IDF	dk	3	S	4,056	18
IDF	dk	3	SW	12	18
IDF	dk	4	AC	10	10
IDF	dk	4	AT	44	10
IDF	dk	4	FD	72,290	12
IDF	dk	4	PL	184,357	12

Biogeozone	BG_subzone	Var	Leading Species	Area	SIBEC_SI
IDF	dk	4	SW	144	15
IDF	dw		FD	8,815	15
IDF	dw		PL	12,191	18
IDF	dw		S	188	12
IDF	dw		SE	64	12
IDF	unv		FD	97	12
IDF	unv		PL	1,696	12
IDF	unv		S	125	12
IDF	xm		AT	93	10
IDF	xm		FD	52,823	15
IDF	xm		PL	8,861	12
IDF	xm		S	607	18
MH	mm	2	S	113	16
MS	dc	2	FD	1,488	15
MS	dc	2	PA	88	10
MS	dc	2	PL	8,405	18
MS	dc	2	S	786	15
MS	dc	2	SE	25	15
MS	dv		PA	30	10
MS	dv		PL	9,905	18
MS	dv		S	718	15
MS	xk		FD	129	15
MS	xk		PL	2,575	15
MS	xk		S	42	12
MS	xv		B	8	10
MS	xv		FD	594	10
MS	xv		PA	149	10
MS	xv		PL	332,699	18
MS	xv		S	13,921	12
MS	xv		SE	1,059	12
MS	xv		SW	501	12
SBPS	dc		FD	127	12
SBPS	dc		PL	73,481	16
SBPS	dc		S	1,530	16
SBPS	dc		SB	7	12
SBPS	mc		PL	26,831	12
SBPS	mc		S	4,236	10
SBPS	mk		AC	312	12
SBPS	mk		AT	2,643	10
SBPS	mk		EP	228	10
SBPS	mk		FD	3,631	16
SBPS	mk		PL	51,653	18
SBPS	mk		S	5,714	16
SBPS	mk		SB	7	12
SBPS	xc		AT	16	10
SBPS	xc		FD	9,380	12

Biogeozone	BG_subzone	Var	Leading Species	Area	SIBEC_SI
SBPS	xc		SE	4,341	16
SBPS	xc		SW	776	16
SBS	dw	1	AC	937	12
SBS	dw	1	AT	7,067	12
SBS	dw	1	B	70	15
SBS	dw	1	BL	835	15
SBS	dw	1	CW	59	10
SBS	dw	1	EP	444	10
SBS	dw	1	FD	25,975	21
SBS	dw	1	PL	28,483	24
SBS	dw	1	S	14,010	22
SBS	dw	1	SW	42	22
SBS	dw	2	AC	16	12
SBS	dw	2	AT	946	12
SBS	dw	2	B	16	15
SBS	dw	2	BL	68	15
SBS	dw	2	FD	15,250	18
SBS	dw	2	PL	23,271	21
SBS	dw	2	S	4,092	18
SBS	dw	2	SB	8	18
SBS	mc	1	AT	141	12
SBS	mc	1	B	141	15
SBS	mc	1	BL	35	15
SBS	mc	1	EP	13	10
SBS	mc	1	FD	355	18
SBS	mc	1	PL	7,647	18
SBS	mc	1	S	2,619	18
SBS	mh		FD	1,800	21
SBS	mh		PL	506	21
SBS	mh		S	652	21
SBS	mw		B	22	15
SBS	mw		BL	10	15
SBS	mw		CW	35	10
SBS	mw		FD	1,236	21
SBS	mw		PL	927	21
SBS	mw		S	360	21
SBS	wk	1	B	77	15
SBS	wk	1	BL	282	15
SBS	wk	1	CW	39	10
SBS	wk	1	FD	863	21
SBS	wk	1	PL	4,051	21
SBS	wk	1	S	3,178	18
SBS	wk	1	SW	59	18

APPENDIX 6

Old Growth Deficits

LU/BEC/NDTs currently without sufficient old-growth or mature stands in Williams Lake Main TSA

Lsc_name	BEC zone	NDT	Basearea (ha)	% required	% achieved	Area achieved (ha)	Status	Age criteria	Years locked up
Alkali	IDFFD	NDT4	23,627	**21**	**2**	521	VIOLATED	250	20
Anaham	IDFFD	NDT4	9,232	**21**	**16**	1504	VIOLATED	250	10
Anaham	IDFOT	NDT4	11,788	**11**	**6**	679	VIOLATED	140	5
Beaver Valley	ICH	NDT2	8,931	**6**	**4**	336	VIOLATED	250	20
Beaver Valley	SBS	NDT3	32,637	**8**	**7**	2130	VIOLATED	140	5
Beece Creek	ESSF	NDT2	5,051	**9**	**0**	0	VIOLATED	250	10
Black Creek	ESSF	NDT1	13,029	**19**	**4**	554	VIOLATED	250	50
Black Creek	SBS	NDT3	20,872	**11**	**4**	845	VIOLATED	140	10
Cariboo Lake	ESSF	NDT1	21,207	**17**	**10**	2125	VIOLATED	250	10
Chimney	IDFFD	NDT4	34,918	**32**	**2**	849	VIOLATED	250	10
Chimney	IDFOT	NDT4	6,372	**16**	**7**	452	VIOLATED	140	5
Clisbako	MS	NDT3	7,672	**14**	**10**	772	VIOLATED	140	20
Clusko	MS	NDT3	40,970	**14**	**11**	4586	VIOLATED	140	10
Dash	ESSF	NDT2	12,962	**9**	**0**	0	VIOLATED	250	10
Dog Creek	IDFFD	NDT4	14,780	**21**	**6**	891	VIOLATED	250	20
Dog Creek	IDFOT	NDT4	7,411	**11**	**6**	451	VIOLATED	140	5
Eastside	ESSF	NDT1	12,497	**19**	**13**	1579	VIOLATED	250	20
Farwell	IDFFD	NDT4	12,665	**21**	**4**	500	VIOLATED	250	50
Hawks Creek	IDFFD	NDT4	20,426	**21**	**1**	241	VIOLATED	250	50
Hawks Creek	IDFOT	NDT4	8,553	**11**	**4**	372	VIOLATED	140	5
Horsefly	ESSF	NDT1	9,765	**19**	**12**	1215	VIOLATED	250	20
Horsefly	ICH	NDT2	18,394	**9**	**4**	666	VIOLATED	250	100
Little River	ESSF	NDT1	24,473	**19**	**15**	3681	VIOLATED	250	20
Lower Cariboo	ESSF	NDT1	16,202	**18**	**11**	1709	VIOLATED	250	20
Lower Cariboo	ICH	NDT1	9,315	**12**	**4**	332	VIOLATED	250	40
Lower Cariboo	SBS	NDT2	7,888	**6**	**1**	57	VIOLATED	250	130
Mackin	IDFFD	NDT4	8,236	**15**	**4**	359	VIOLATED	250	10
McKay	ESSF	NDT1	17,188	**19**	**7**	1190	VIOLATED	250	20
McKinley	ICH	NDT2	14,024	**13**	**2**	289	VIOLATED	250	70
McKuskey	ESSF	NDT1	11,934	**19**	**11**	1270	VIOLATED	250	5
Meldrum	IDFFD	NDT4	18,893	**21**	**4**	819	VIOLATED	250	5
Meldrum	IDFOT	NDT4	8,691	**11**	**5**	423	VIOLATED	140	5
Minton	IDFFD	NDT4	16,455	**32**	**13**	2177	VIOLATED	250	30
Moffat	ESSF	NDT1	13,801	**13**	**9**	1290	VIOLATED	250	10
Polly	ICH	NDT2	22,880	**46**	**46**	10505	VIOLATED	100	5
Polly	ICH	NDT2	22,880	**13**	**7**	1533	VIOLATED	250	60
Polly	SBS	NDT3	12,212	**16**	**2**	204	VIOLATED	140	10
Pyper	IDFOT	NDT4	27,072	**6**	**4**	1145	VIOLATED	140	10
Pyper	SBPS	NDT3	32,638	**4**	**3**	879	VIOLATED	140	10
Riske	IDFFD	NDT4	20,735	**21**	**4**	816	VIOLATED	250	10
Riske	IDFOT	NDT4	15,862	**11**	**9**	1436	VIOLATED	140	5
Twan	IDFOT	NDT4	6,620	**16**	**14**	896	VIOLATED	140	5
Upper Churn	ESSF	NDT2	10,004	**9**	**3**	313	VIOLATED	250	10
Wasko/Lynx	ESSF	NDT1	7,814	**15**	**14**	1112	VIOLATED	250	5
Williams Lake	IDFFD	NDT4	25,697	**21**	**0**	28	VIOLATED	250	20