5.0 APPENDIX A - TIMBER SUPPLY ANALYSIS

TREE FARM LICENCE #48
MANAGEMENT PLAN #5
EXPEDITED TIMBER SUPPLY ANALYSIS
ANALYSIS REPORT

Prepared for:

Canadian Forest Products Ltd

All interested parties are invited to view and comment on the Draft Timber Supply Analysis Report for Management Plan #5, from February 10th, 2014 through to April 11th, 2014. Comments will be accepted until 4:00 pm April 11th, 2014.
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EXECUTIVE SUMMARY

Following Management Plan #4 for Tree Farm License 48, the allowable annual cut (AAC) determination (effective May 25th, 2007) set the AAC to 900,000 m^3/year of which 100,000 m^3/year is from deciduous-leading stands.

This analysis is in support of Management Plan # 5, which through discussions between Canfor and the Ministry, was constructed as an update to the Management Plan #4 analysis to support an expedited timber supply review. This document describes the results of the recently completed timber supply analysis for Tree Farm Licence 48 and should be viewed in conjunction with the detailed description of the data and assumptions provided in the *Tree Farm Licence #48 Management Plan #5 Data Package* (Ecora, 2013) document.

Updates from the previous analysis include: mountain pine beetle modelling, a new visual landscape inventory, the implementation of patch size targets, updated site productivity estimates and genetic gains, new ungulate winter ranges and wildlife habitat areas, old seral targets by landscape unit and biogeoclimatic zone instead of natural disturbance unit, and the removal of watershed constraints from the base case to a sensitivity analysis.

Through a land base classification process, area is systematically removed from the gross land base area to establish both the productive forest and timber harvesting land base. The timber harvesting land base assumptions are consistent with previous the analysis but have been updated with additional removals for ungulate winter ranges and wildlife habitat areas. The harvestable land base for the analysis is calculated at 359,717 ha.

The base case timber supply analysis includes:

- A timber harvesting land base of 359,717 ha;
- Spatial modelling of mountain pine beetle mortality and non-recoverable losses;
- Land base constraints including: old seral targets, visually sensitive areas, patch size targets and restrictions within the Dunlevy special management area;
- Minimum harvest age and minimum volume of 140 m^3/ha;
- A sustainable future growing stock; and
- A sustainable long-term conifer and deciduous harvest level.

The base case harvest forecast is shown in Figure i where the conifer harvest level starts at approximately 1.63 million m^3/yr for five years, dropping to approximately 738,000 m^3/yr for the second five-year period. Through the next 50 years the conifer harvest decreases slightly to an average of 663,000 m^3/yr before gradually increasing to the long-term harvest level of approximately 708,000 m^3/yr. The deciduous harvest level remains relatively constant throughout the planning horizon at approximately 100,000 m^3/yr.

Sensitivity analysis provides information on the degree to which uncertainty in the base case data and assumptions might affect the proposed harvest level for the land base. A summary of the sensitivity analysis results and their variation from the base case is shown in Table i. In general, the sensitivities show that limiting salvage operations in the first 10 years has an adverse impact to both the mid and long-term timber supply of between 3% and 8% depending on the initial harvest level.

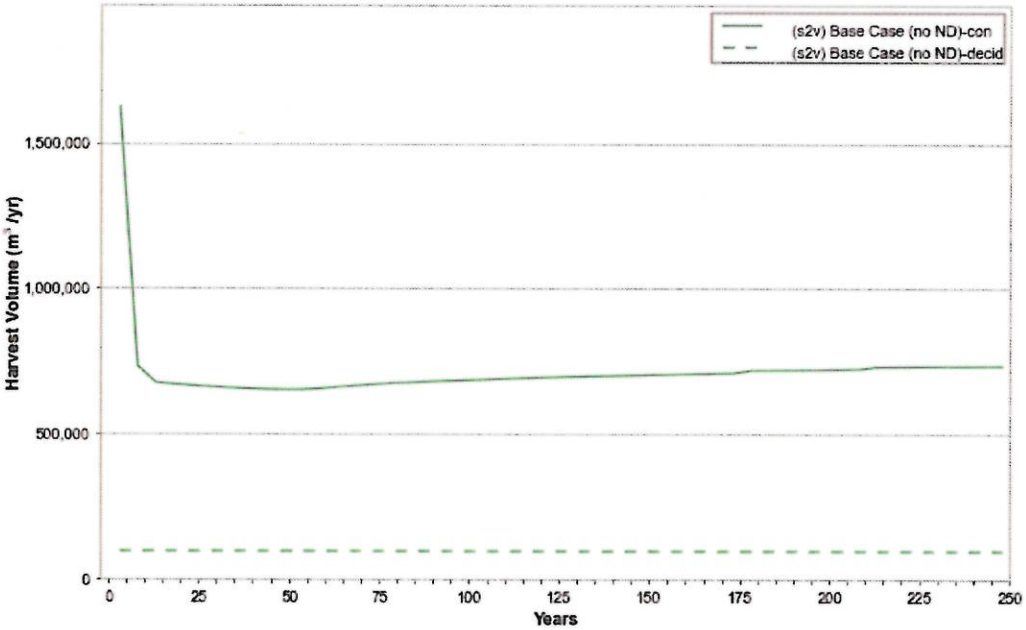

Figure i: Base Case Harvest Forecast

Table i: Summary of Analysis Results

Scenario		Harvest Levels By Harvest Year							
		Average Conifer Harvest				Average Deciduous Harvest			
		1 to 10	11 to 20	21 to 50	51 to 250	1 to 10	11 to 20	21 to 50	51 to 250
Base Case	***1,000's m^3/yr***	***1,184***	***679***	***663***	***708***	***100***	***100***	***100***	***100***
Base Case w 1.5M Max IHL	1,000's m^3/yr	1,119	656	636	696	100	100	100	100
	% Change	-6%	-3%	-4%	-2%	-0%	-0%	-0%	-0%
Base Case w Flatline Harvest	1,000's m^3/yr	756	648	608	648	100	100	100	100
	% Change	-36%	-5%	-8%	-8%	-0%	-0%	-0%	-0%
1.45M 10yr conifer min; no max	1,000's m^3/yr	1,370	634	605	715	100	100	100	100
	% Change	16%	-7%	-9%	1%	-0%	-0%	-0%	-0%
Base Case; Max Salvage	1,000's m^3/yr	1,593	623	608	700	100	100	100	100
	% Change	34%	-8%	-8%	-1%	-0%	-0%	-0%	-0%
Base Case; Max Salvage; Relax VQO	1,000's m^3/yr	1,649	698	691	728	100	100	100	100
	% Change	39%	3%	4%	3%	0%	-0%	-0%	-
Base Case w Nat. Dist.;	1,000's m^3/yr	1,206	665	647	696	99	99	99	100
	% Change	2%	-2%	-3%	-2%	-1%	-1%	-1%	-0%
MPB 15yr Regen. Delay w 1.5M Max IHL	1,000's m^3/yr	852	694	682	720	100	100	100	100
	% Change	-28%	2%	3%	2%	-	-	-	-
MPB 15yr Regen. Delay w Flatline	1,000's m^3/yr	756	692	675	721	100	100	100	100
	% Change	-36%	2%	2%	2%	-	-	-	-
MPB 15yr Regen. Delay	1,000's m^3/yr	813	692	680	721	100	100	100	100
	% Change	-31%	2%	2%	2%	0%	-	-	0%
10yr Shelf-Life w 1.5M Max IHL	1,000's m^3/yr	731	710	682	707	100	100	100	100
	% Change	-38%	5%	3%	-0%	-0%	-0%	-0%	-0%
10yr Shelf-Life	1,000's m^3/yr	731	711	683	708	100	100	100	100
	% Change	-38%	5%	3%	-0%	-0%	-0%	-0%	-0%
Add Recommended VQO w 1.5M Max IHL	1,000's m^3/yr	1,133	649	625	679	97	97	96	98
	% Change	-4%	-4%	-6%	-4%	-3%	-3%	-4%	-2%
Add Recommended VQO	1,000's m^3/yr	1,182	645	622	685	97	96	95	97
	% Change	-0%	-5%	-6%	-3%	-3%	-4%	-5%	-3%
No VQO w 1.5M Max IHL	1,000's m^3/yr	1,161	692	679	713	100	100	100	100
	% Change	-2%	2%	2%	1%	0%	0%	0%	0%
No VQO	1,000's m^3/yr	1,350	705	698	730	100	100	100	101
	% Change	14%	4%	5%	3%	0%	0%	0%	1%
NDU Seral w 1.5M Max IHL	1,000's m^3/yr	1,144	689	668	688	99	99	99	100
	% Change	-3%	2%	1%	-3%	-1%	-1%	-1%	-0%
NDU Seral	1,000's m^3/yr	1,211	683	660	692	98	97	97	98
	% Change	2%	1%	-1%	-2%	-2%	-3%	-3%	-2%
ECA Targets ON w 1.5M Max IHL	1,000's m^3/yr	1,107	647	623	679	97	96	96	98
	% Change	-7%	-5%	-6%	-4%	-3%	-4%	-4%	-2%
ECA Targets ON	1,000's m^3/yr	1,118	649	624	679	97	96	95	97
	% Change	-6%	-4%	-6%	-4%	-3%	-4%	-5%	-3%
No Patch Size Targets w 1.5M Max IHL	1,000's m^3/yr	1,143	662	641	689	99	99	99	100
	% Change	-3%	-2%	-3%	-3%	-1%	-1%	-1%	-0%
No Patch Size Targets	1,000's m^3/yr	1,197	664	646	696	99	99	99	100
	% Change	1%	-2%	-3%	-2%	-1%	-1%	-1%	-0%
Phase II Adjustment	1,000's m^3/yr	1,397	712	705	727	117	119	118	102
	% Change	18%	5%	6%	3%	17%	19%	18%	2%
Phase II Adj. w 1.45M 10yr conifer min/max	1,000's m^3/yr	1,424	694	670	722	100	100	100	100
	% Change	20%	2%	1%	2%	-0%	-0%	-0%	-0%
Phase II Adj w1.45M 10yr conifer min; no max	1,000's m^3/yr	1,471	698	678	732	100	100	100	100
	% Change	24%	3%	2%	3%	-0%	-0%	-0%	-0%

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS

AAC	Allowable Annual Cut
AU	Analysis Unit
BEC	Biogeoclimatic Ecosystem Classification
BEO	Biodiversity Emphasis Option
CFLB	Crown Forested Land Base
ECA	Equivalent Clearcut Area
ERA	Ecosystem Representation Analysis
FDU	Forest Development Unit
FPPR	Forest Planning and Practices Regulations
FRPA	Forest and Range Practices Act
FSP	Forest Stewardship Plan
FSW	Fisheries Sensitive Watershed
GWM	General Wildlife Measure
IHL	Initial Harvest Level
IWA	Interior Watershed Assessment
IWAP	Interior Watershed Assessment Procedures
LRDW	Land and Resource Data Warehouse
LTHL	Long-Term Harvest Level
M	Modification VQO Classification
MFLNRO	Ministry of Forests, Lands and Natural Resource Operations
MHA	Minimum Harvest Age
MOE	Ministry of Environment
MOF	Ministry of Forests
MP	Management Plan
MPB	Mountain Pine Beetle
NCD	No Channel Defined
NDT	Natural Disturbance Type
NRL	Non-Recoverable Losses
NSR	Not Sufficiently Restocked
OAF	Operational Adjustment Factor
OGMA	Old Growth Management Areas
PFI	Peak Flow Index
PFLB	Productive Forest Land Base
PSI	Potential Site Index
PR	Partial Retention VQO Classification
RESULTS	Reporting Silviculture Updates and Land status Tracking System
RMA	Riparian Management Area
RMZ	Riparian Management Zone
RRZ	Riparian Reserve Zone
SPH	Stems Per Hectare
TEM	Terrestrial Ecosystem Mapping
TFL	Tree Farm Licence
THLB	Timber Harvesting Land Base
TIPSY	Table Interpolation Program for Stand Yields
TSA	Timber Supply Area
TSM	Terrain Stability Mapping
VDYP	Variable Density Yield Prediction Growth and Yield Model
VEG	Visually Effective Green-up Height
VLI	Visual Landscape Inventory
VQO	Visual Quality Objectives
VRI	Vegetation Resource Inventory
VSU	Visually Sensitive Unit
WTP	Wildlife Tree Patch

1.0 INTRODUCTION

The timber supply analysis for Tree Farm Licence (TFL) #48 in support of Management Plan #4 (MP4) was completed in 2006, followed by the allowable annual cut (AAC) determination effective May 25th, 2007 in which the AAC was set at 900,000 m^3/year, of which 100,000 m^3/year is from deciduous-leading stands.

In November 2011, Canfor completed an analysis (Ecora, 2011) to support a request for an increase in AAC to address the expanding mountain pine beetle (MPB) epidemic on the TFL. This analysis was undertaken using the MP4 Woodstock forest estate model with modifications to the MPB assumptions. The uplift request was denied based on uncertainty in the degree to which MPB had impacted TFL 48 and the impacts to mid-term timber supply based on the shelf-life assumptions used. Through subsequent discussions between Canfor and the Ministry of Forests, Lands and Natural Resource Operations (MFLNRO) it was mutually agreed that an update to the MP4 analysis would be sufficient to support an expedited timber supply review for TFL 48.

Canfor has initiated a timber supply analysis in support of Management Plan #5 (MP5) and this document describes the results of the recently completed timber supply analysis for TFL 48.

The *Tree Farm Licence #48 Management Plan #5 Data Package* (Ecora, 2013) was published in September 2013 and contains a detailed description of the data and assumptions used in the timber supply analysis. This document, to be viewed in conjunction with the Data Package, provides the results of the timber supply analysis. Section 3.0 of this report presents the results of the base case analysis and Section 4.0 summarizes the results of the sensitivity analysis that has been completed.

2.0 LAND BASE DESCRIPTION

2.1 Location

Tree Farm Licence #48 is located west of Dawson Creek in the Dawson Creek timber supply area (TSA) (Figure 1). The TFL covers a total of 643,239 ha in five distinct blocks.

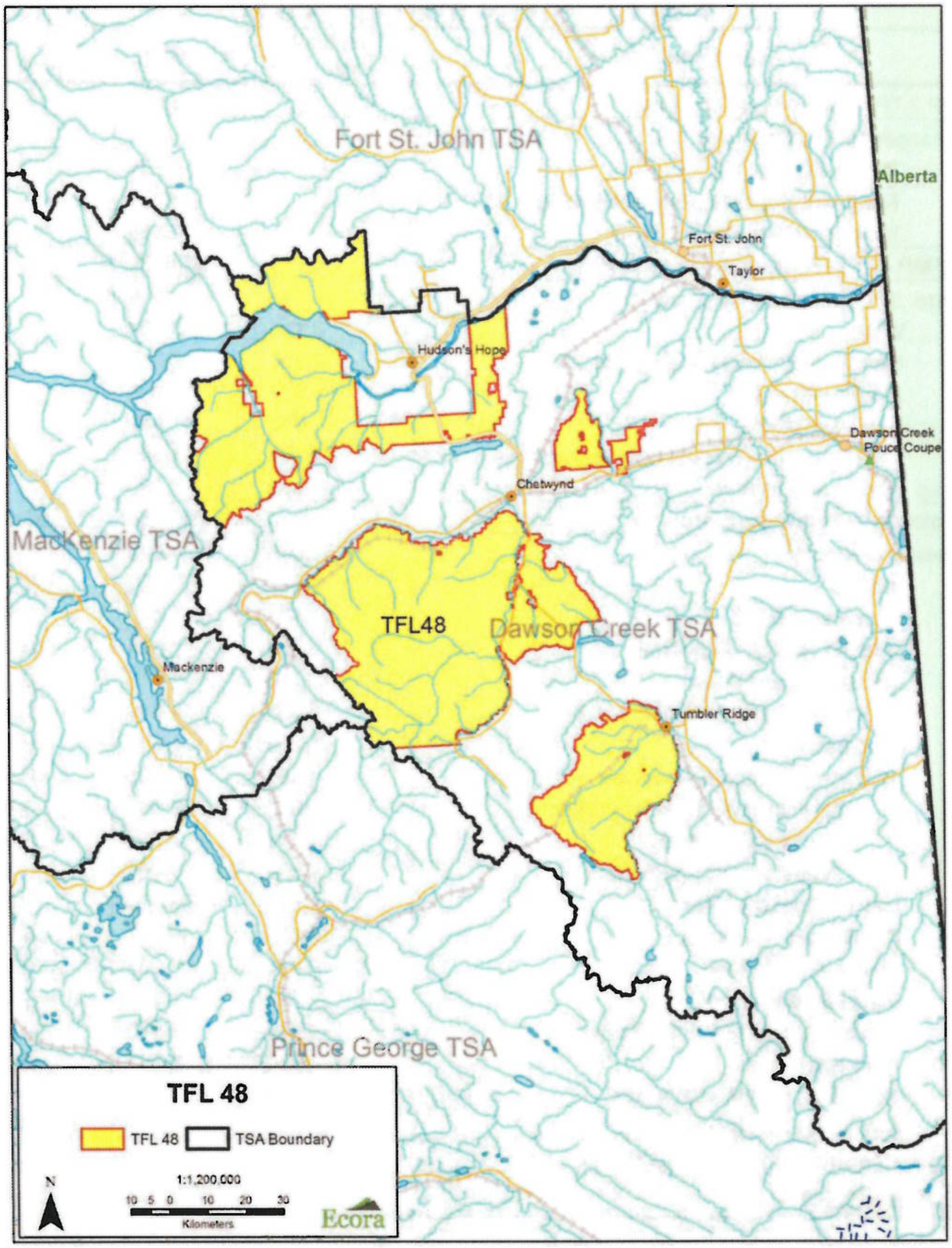

Figure 1: Location of TFL 48

2.2 Land Base Classification

The land base classification (netdown) process starts with the gross area of the land base and removes area in a stepwise fashion according to detailed classification criteria. A complete description of the data and assumptions used in the analysis is documented in the Data Package. Through the netdown, area is systematically removed in order to establish both the productive forest and timber harvesting land base (THLB). Table 1 shows the area removed under each netdown category to reach a THLB of 359,717 ha.

Table 1: Land Base Classification.

Classification	Gross Area (ha)	Area (ha)	% Prod. Forest
MP 3 TFL Total Area (incl. Water)		643,511	
Changes to TFL Boundary			
Removed woodlots		794	
Removed "Rice Property" farm fields		1231	
Inclusion of the Stewart Block		1,753	
SFMP 4 TFL Total Area (incl. Water)		**643,239**	
Less: TFL Boundary sliver polygons		112	
Water	3,104	3,104	
Mine Sites (existing and proposed)	2,236	2,236	
Existing Roads	5,567	3,830	
Non-Vegetated Land	971	949	
Vegetated Non-Treed (no disturbance history)	67,171	66,943	
Plus: Sukunka Falls Park	426	330	
Potentially Productive Area		**566,394**	**100.0%**
Less: Inoperable	34,038	34,038	6.0%
NDT 5	14,942	13,765	2.4%
Forested Islands	195	141	0.0%
Wildlife Habitat - Bull Trout	86	74	0.0%
Archaeological Sites	10	10	0.0%
Protected Areas (including parks)	14,853	12,849	2.3%
Recreation	1,270	418	0.1%
Buffers: Lakeshore Reserves	28	25	0.0%
Stream/River Riparian Buffers	31,082	27,597	4.9%
Forested Wetlands	4,001	3,558	0.6%
Forested Wetland Buffers	1,882	1,760	0.3%
Low Productivity Sites	72,618	55,710	9.8%
Problem Forest Types	62,497	48,077	8.5%
Sukunka Falls Park	426	286	0.1%
Visual Preservation	723	167	0.0%
Dunlevy Ungulate Winter Range	4,480	1,983	0.4%
Rare Site Series	4,080	2,572	0.5%
New UWR No Harvest Areas	21,918	2,271	0.4%
New WHA No Harvest Areas	22,252	1,377	0.2%
Total Reductions to Productive Forest		206,678	36.5%
Net Land Base		**359,717**	**63.5%**

A map showing the location of the THLB and each netdown category is included in Appendix I.

The netdown process also classifies the land base into three broad categories:

- **Non- Productive**: areas that are non-crown or non-forested and unable to grow viable timber;
- **Productive non-THLB**: the productive land base that is unlikely to be harvested for reasons such as inoperability or non-timber resource management; and
- **THLB**: the productive land base that is expected to be available for harvest over the long-term.

Figure 2 shows the distribution of these categories within the TFL. Of the TFL area, 359,717 ha (56% of the total area) falls within the THLB. Of the non-THLB area, 206,678 ha (32% of the total area) is productive forest lands with the remainder in non-productive or non-forested area.

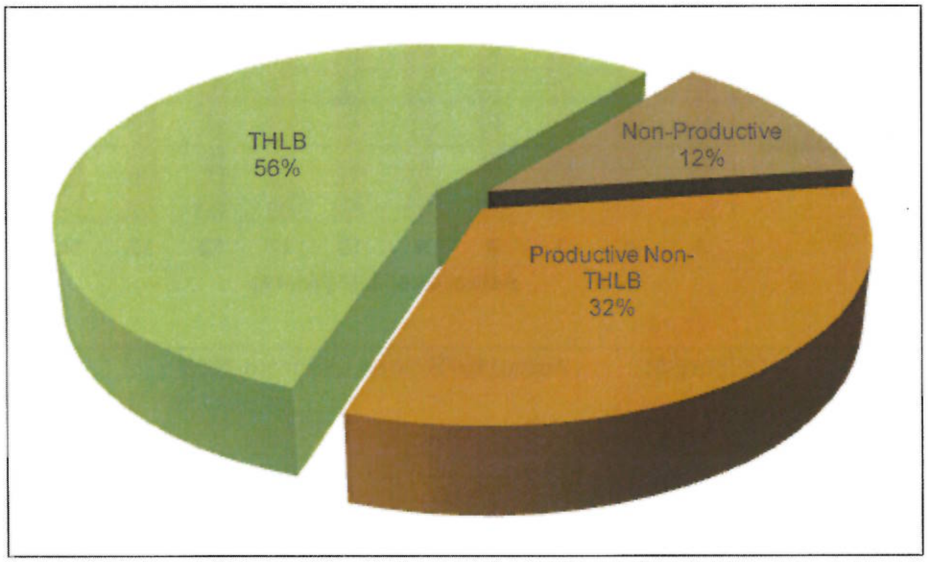

Figure 2: Area by Land Classification

2.2.1 Changes from the Data Package

There have been some minor changes to the data and assumptions described in the Data Package that was originally sent out for public review and comment on September 4th, 2013. The following summarizes these changes:

- A new blocks layer was incorporated, updating logging disturbance to December 31st, 2012 and incorporating new planned blocks from January 1st, 2013 through to 2020. This layer also included several older cutblocks that were not included in the initial data set.

- In the original Data Package the shelf-life for MPB-affected stands was five years from 2013. With the majority of attack across the TFL occurring in 2008 and 2009 this equates to a total shelf life of between 9 and 10 years. In the development of the forest estate model it was necessary to group stands into 10-year age classes in order to limit the number of unique yield (shelf life) curves required. For example, stands between 95 and 104 years of age all follow the "age 100" shelf life curve. However, in order to maintain the correct inventory ages in the model, individual stand ages remain unrounded. The result is that the actual shelf life curves in the model vary from 5 to 14 years in duration assuming a death year of 2008. For example, a stand currently 95 years old will become part of the "age 100" class and will become uneconomic at age 105, a 15 year shelf life (starting in 2008). However a 104 year old stand will be part of that same analysis unit but will only have a 6 year shelf life (from 2008) and will die in year 1 of the planning horizon. Figure 3 shows the distribution of the shelf life estimates across the 13.7 million m^3 of MPB-affected volume on the TFL. Overall, the dispersed nature of the shelf life is likely a better reflection of reality as stands were likely killed in different years with shelf life varying based on the size of the trees and site and weather conditions.

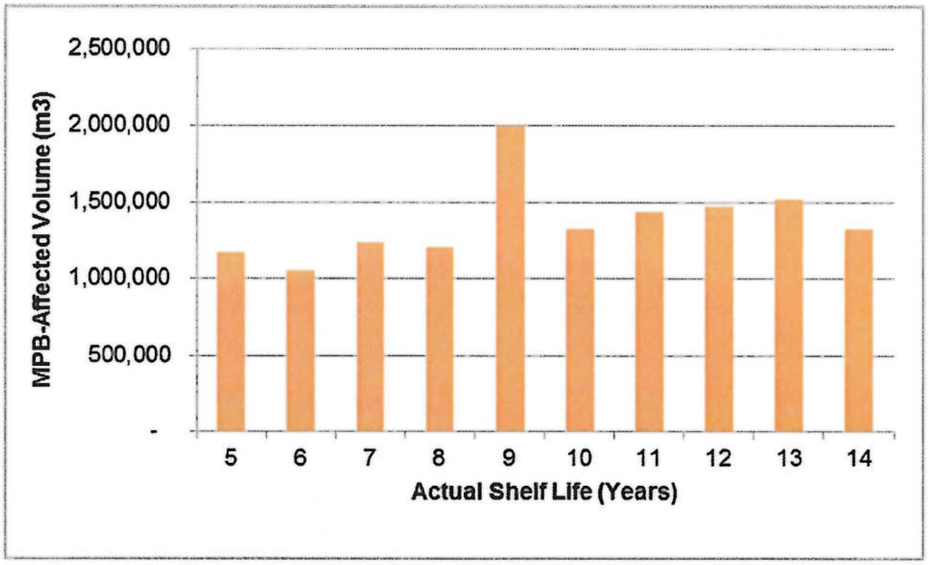

Figure 3: Actual MPB Shelf Life from 2008

2.2.2 Vegetation Resource Inventory

The current forest cover inventory is based on a re-inventory performed by Canfor during the term of MP 2. The photography for this inventory was taken in 1993/94 for TFL Blocks 4 and 5, and in 1997 for TFL Blocks 1, 2 and 3. The inventory exists in the form of a Vegetation Resource Inventory (VRI). Phase I (the re-inventory) has been adjusted to incorporate extensive timber and ecology ground sampling (e.g. the Phase II part of a VRI).

The (VRI) has been updated for logging disturbances to December 31st, 2012 and has been projected to January 1st, 2013.

Leading Species

Figure 4 show the productive non-THLB and THLB area by leading species. Most of the stands within the THLB are either pine or spruce-leading. There are approximately 865 hectares of THLB in the VRI with no leading species information. All of these stands have been assigned to a managed stand yield curve based on the yield curve assigned in the last analysis. Ages for these stands have been adjusted based on the logging year information.

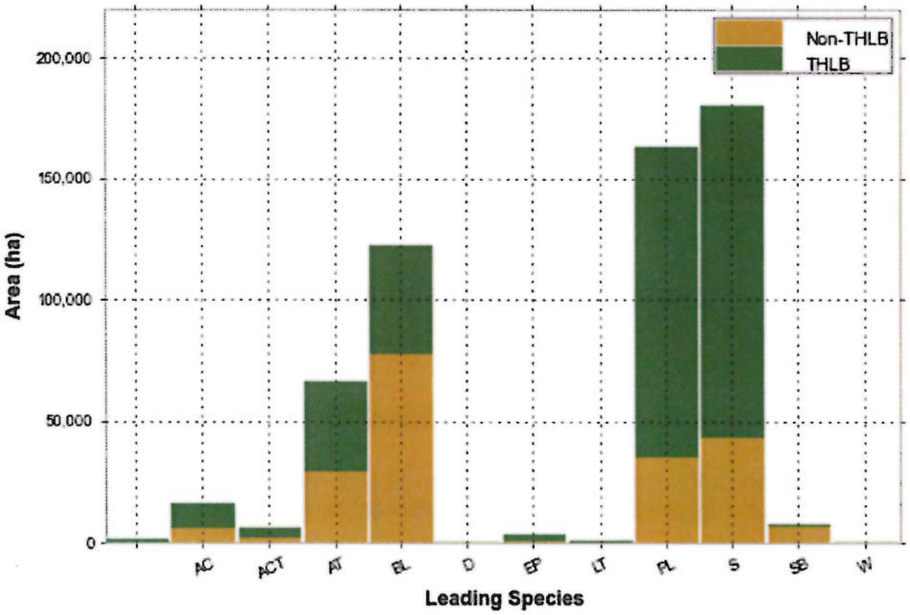

Figure 4: Leading Species Summary

Inventory Site Index

Figure 5 shows a summary of the inventory site index for the TFL with the majority of the THLB between 9 and 18 m. Similar to stands without a leading species, stands that were recently harvested at the time the inventory was completed do not have site index information and are identified as '0'. As managed stands, these areas will utilize site index estimates from SIBEC as described below.

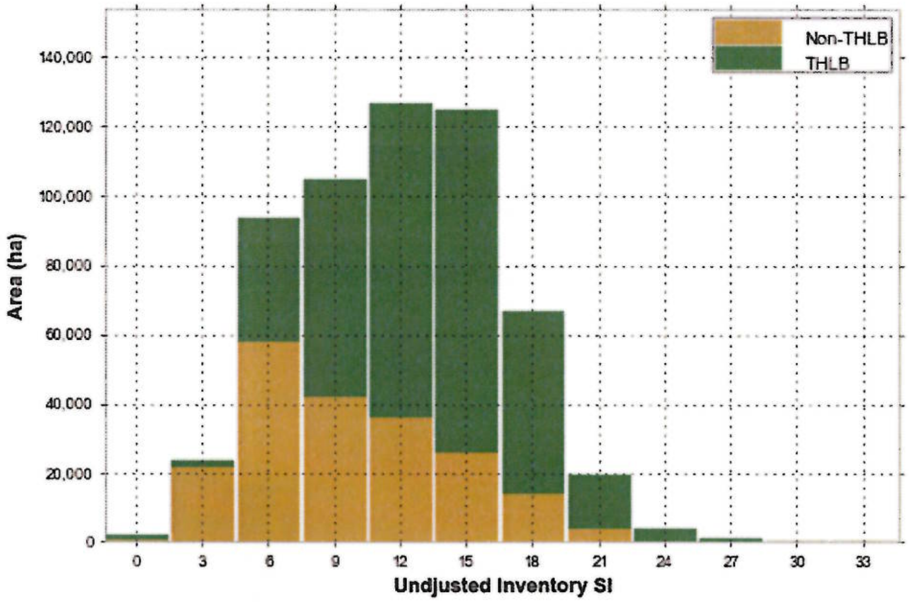

Figure 5: Inventory Site Index Summary

2.2.3 Biogeoclimatic Ecosystem Classification (BEC)

The TFL is distributed between the BEC zones: Boreal White and Black Spruce (BWBS), Engelmann Spruce Sub-Alpine Fir (ESSF) and Sub-Boreal Spruce (SBS) as shown in Figure 6.

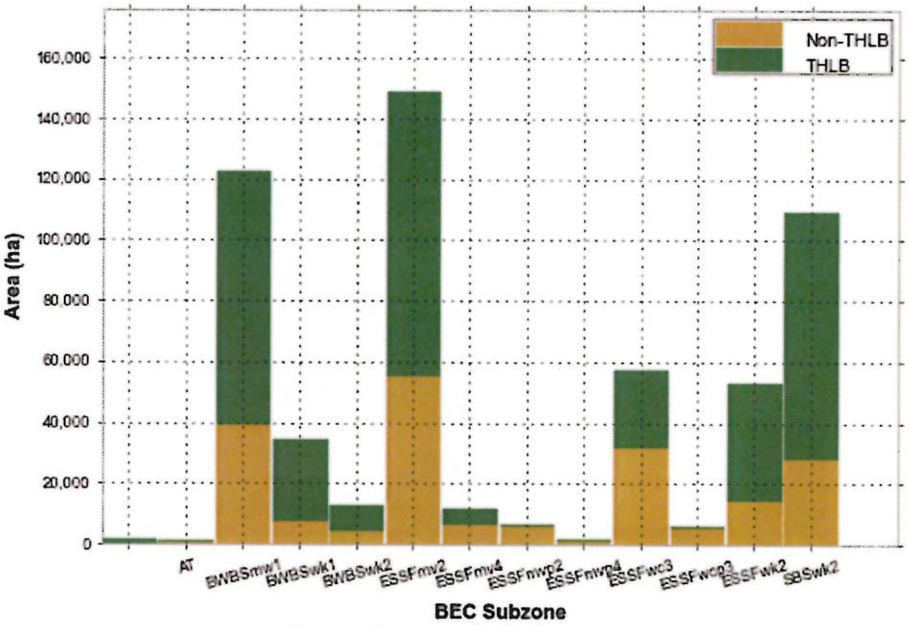

Figure 6: BEC Summary

2.2.4 SIBEC

In March 2008, the TFL 48 Predictive Ecosystem Mapping (PEM) accuracy assessment (Bio-Geo Dynamics Ltd, 2009) was completed demonstrating that the PEM has achieved the minimum accuracy requirement of 65%. This means that site index by biogeoclimatic classification (SIBEC) site productivity estimates for managed stand yields are included in the base case.

The BEC zone and site series from each stand was used along with the planted species from the managed analysis unit input tables to link SIBEC estimates from the 2013 approximation (http://www.for.gov.bc.ca/hre/sibec/). These were area-weight averaged into each managed stand analysis unit. Figure 7 shows the distribution of SIBEC values across the productive land base.

Those areas shown with SIBEC value = 0 (16,397 ha THLB) did not have an analogous site series and species combination available in the 2013 site productivity estimates. These areas were defaulted to the inventory site index for the calculation of managed stand yields.

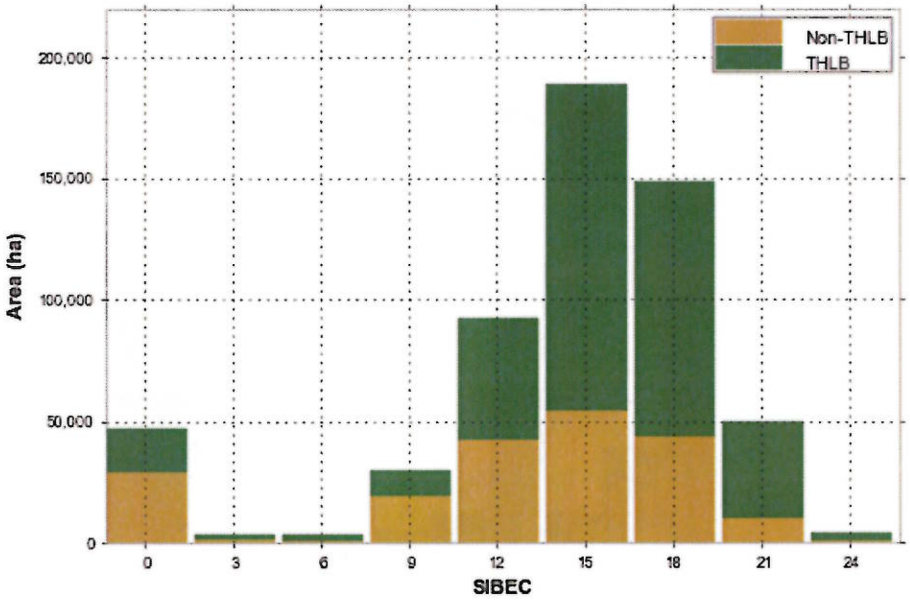

Figure 7: SIBEC Summary

2.2.5 Harvest History and Age Class Distribution

Figure 8 summarizes the THLB and non-THLB by the decade of harvesting, showing a history of forest management back to the 1950s. Harvesting activity on the TFL has gradually increased every decade since then with the increase in MPB salvage.

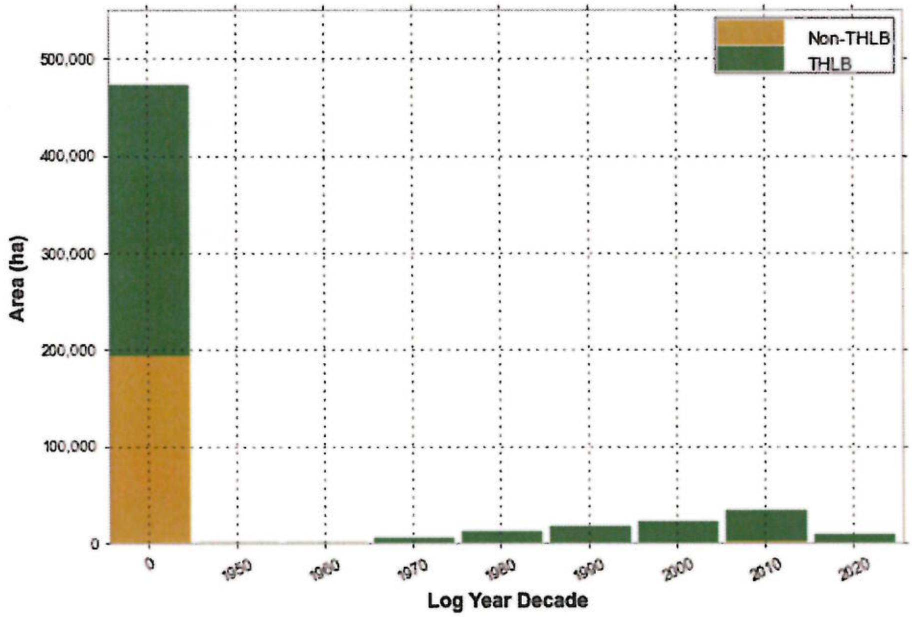

Figure 8: Harvest History

The current age class distribution of the forest is shown in Figure 9 with the area in age classes 1 and 2 largely a product of past harvesting activity. MPB mortality has not been factored into this figure.

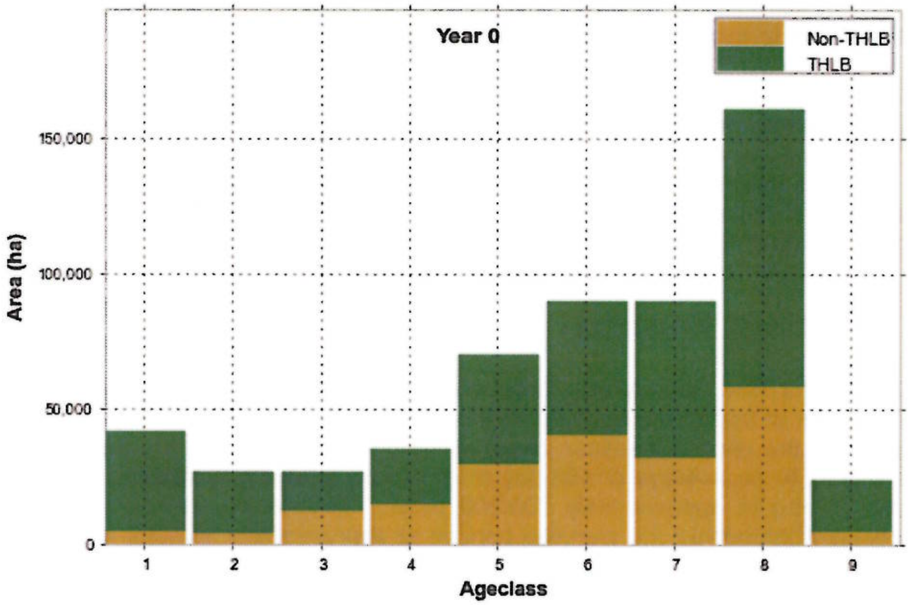

Figure 9: **Initial Age Class Distribution**

3.0 BASE CASE TIMBER SUPPLY ANALYSIS

The base case depicts the best representation of 'current management' on the TFL. It contains the data and assumptions that combine to form our best estimate of timber supply on the TFL. Recognizing that uncertainty exists in both data and assumptions we undertake sensitivity analyses to attempt to quantify the impact of this uncertainty on the overall harvest level for the TFL.

This section presents the results of the base case timber supply analysis and provides background information on different aspects of the timber supply. The base case and all sensitivity analyses have been carried out using the forest estate model *Patchworks*. All harvest levels reported are net of non-recoverable losses. The forest estate model uses five-year planning periods over a 250-year planning horizon.

3.1 Harvest Forecast

Figure 10 shows the base case harvest forecast over the 250-year planning horizon. The conifer harvest level starts at approximately 1.63 million m^3/yr for five years, dropping to approximately 738,000 m^3/yr for the second five-year period. Through the next 50 years the conifer harvest decreases slightly to an average of 663,000 m^3/yr before gradually increasing to the long-term harvest level (LTHL) of approximately 708,000 m^3/yr. The deciduous harvest level remains relatively constant throughout the planning horizon at approximately 100,000 m^3/yr. Targets in *Patchworks* are not generally absolute – the levels of targets such as harvest volume are allowed to vary somewhat from the target value and therefore harvest levels may vary from period to period. As such, harvest volumes for each scenario have been summarized as average values for the first 10 years, the second 10 years, year 21 to year 50, and year 51 to year 250. Table 2 shows the average harvest levels over these periods for the base case.

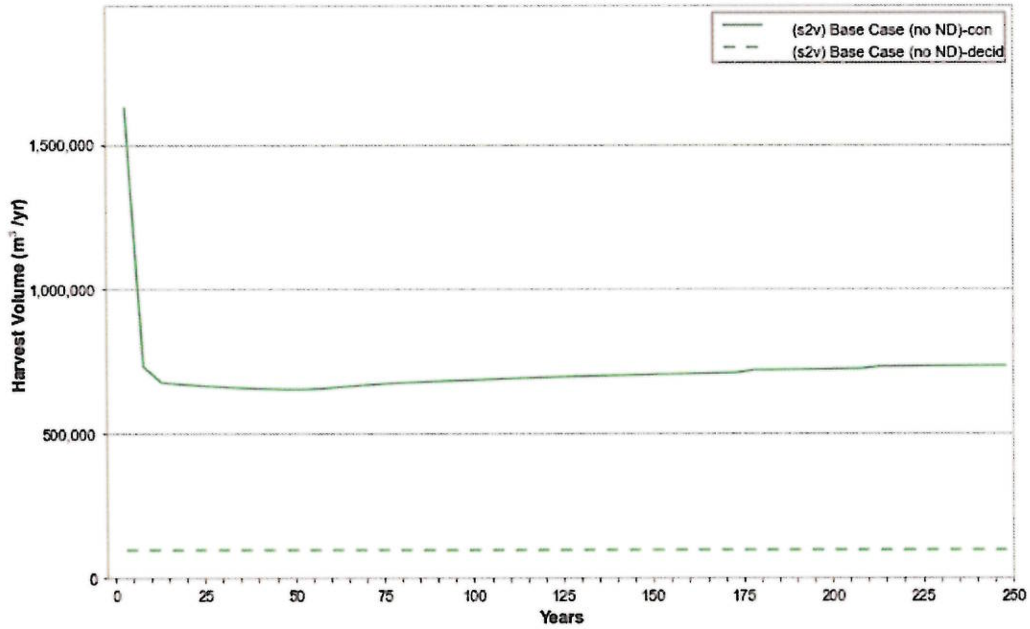

Figure 10: Base Case Harvest Forecast

Table 2: Base Case Harvest Forecast

Scenario		Harvest Levels By Harvest Year							
		Average Conifer Harvest				Average Deciduous Harvest			
		1 to 10	11 to 20	21 to 50	51 to 250	1 to 10	11 to 20	21 to 50	51 to 250
Base Case	1,000's m^3/yr	1,184	679	663	708	100	100	100	100

Total merchantable growing stock on the THLB is shown in Figure 11. The starting growing stock of approximately 59 million m^3 decreases as the older, existing natural stand growing stock is harvested and standing volume decays from MPB mortality. The growing stock reaches its lowest point at around year 40. At this point much of the existing natural growing stock has been harvested and many of the future managed stands have not yet reached harvestable age. Harvesting is most constrained at this point in time and represents the 'pinch point' in the harvest schedule. As the more productive managed stands grow and become harvestable the growing stock begins to rise.

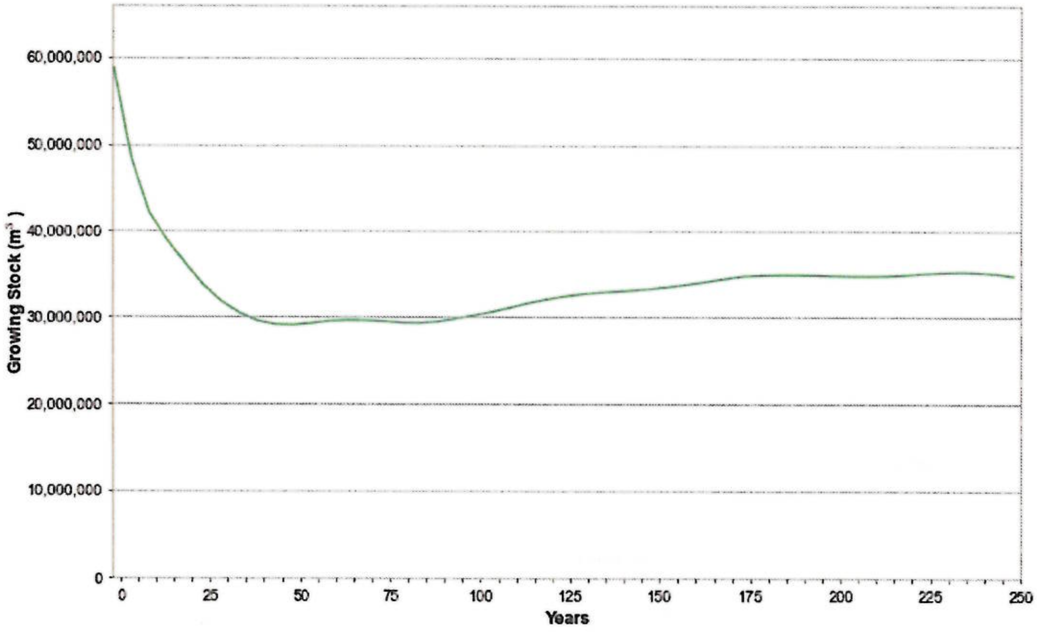

Figure 11: Base Case Growing Stock

3.2 Management Plan #4 Comparison

The timber supply analysis for MP4 was completed in 2006 (IFS, 2006) and produced a flat line base case harvest level of approximately 643,000 m^3/yr from conifer-leading stands and approximately 94,000 m^3/yr from deciduous-leading stands. These harvest forecasts are shown relative to the MP5 base case harvest forecast levels in Figure 12. Citing a need to address the current MPB infestation, the Chief Forester in his 2006 rationale (MoF) set the AAC for the TFL at 800,000 m^3/yr from conifer-leading stands and 100,000 m^3/yr from deciduous-leading stands. These harvest levels are also shown as even flow levels in Figure 12 although there is nothing to suggest that these levels are intended to remain constant beyond the term of the 2007 determination.

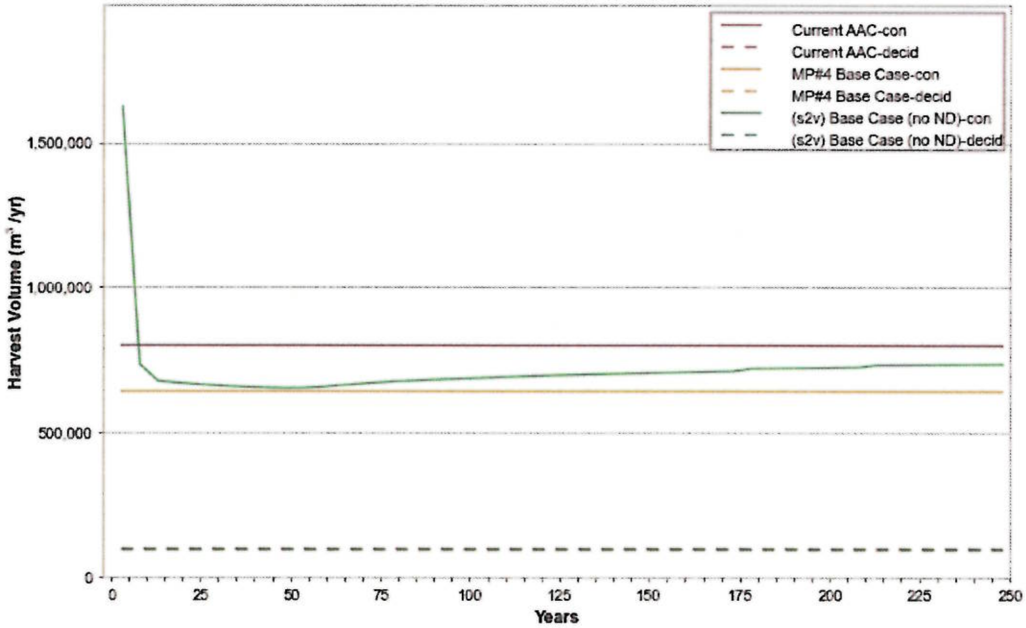

Figure 12: Harvest Forecast – MP #4 and MP#5

Sensitivity analysis conducted in MP4 demonstrates that an even flow conifer harvest level of approximately 747,800 m^3/yr is sustainable when SIBEC site productivity estimates are used. In his rationale, the Chief Forester accepted the use of SIBEC as the best available estimate of managed stand productivity and recognized the 100,000 m^3/yr increase in conifer supply attributable to the use of SIBEC. This was confirmed in 2011 when Ecora conducted a preliminary analysis for TFL 48 using the actual Woodstock model that was used in the MP4 timber supply analysis (Ecora, 2011). The model includes SIBEC site productivity estimates and could produce an even flow conifer harvest level of 750,000 m^3/yr while meeting all of the MP4 base case non-timber objectives.

3.2.1 Timber Harvesting Land Base

The THLB in this analysis is 3,648 ha less than MP4 due to 2 new netdowns: UWR no harvest areas and WHA no harvest areas. See the data package for more details.

3.2.2 Model Constraints

The management for non-timber objectives through constraints on harvest in the forest estate model can have a significant impact on harvest levels throughout the planning horizon. As discussed below, the impact of these constraints are generally more pronounced in simulation models versus optimization models due to the ability of optimization models to plan for "pinch points" in the harvest schedule. There are several differences in how non-timber objectives have been accounted for in this analysis versus the MP4 analysis as discussed below.

Patch Size

MP4 used a green-up constraint where a maximum of 33% of the THLB is less than 3m in height at any point in time. This analysis utilizes patch targets to model spatial disturbance requirements instead.

New Visual Landscape Inventory

In 2012 the VLI was updated for the TFL. MP4 used a 2005 version of the VLI.

Shelterwood Harvesting

A review of recent harvesting practices on the TFL demonstrates that shelterwood harvesting has not been utilized on the TFL since 2005 and there are no plans to utilize it in the near future. As such it has not been modelled in MP5.

Seral Stage Objectives

The MP4 analysis applied seral targets by natural disturbance unit (NDU)/BEC. The TFL is subject to the Provincial Non-Spatial Old Growth Order and as such must manage old seral targets by landscape unit (LU)/BEC as has been modelled in the base case. NDU/BEC old seral targets are modelled as a sensitivity.

Equivalent Clearcut Area (ECA)

Equivalent clearcut area targets were included in the base case assumption for MP4. As these targets are not legally binding they have been modelled as a sensitivity in this analysis.

3.2.3 Managed Stand Yields

Managed stand yield assumptions were very similar between MP4 and MP5 with the exceptions of updated SIBEC estimates and genetic gains information as described in the Data Package.

3.2.4 Natural Stand Yields

In MP4, natural stand yield curves used in the base case were adjusted based on the results of the VRI Phase II adjustment resulting in a significant increase in the starting growing stock. In this analysis we have examined the impacts of the VRI Phase II adjustment in a sensitivity analysis and have used unadjusted yield curves in the base case.

Furthermore, MP4 used VDYP version 6 whereas VDYP version 7 was used in this analysis.

3.3 Base Case Harvest Characteristics

Figure 13 shows the distribution of the harvest volume between natural and managed stands. For the first 55 years, harvesting is almost exclusively in natural stands. Harvesting quickly transitions to managed stands over the next 20 years. Some existing natural stands do not get harvested for over 100 years because they are needed to meet old seral and other non-timber objectives.

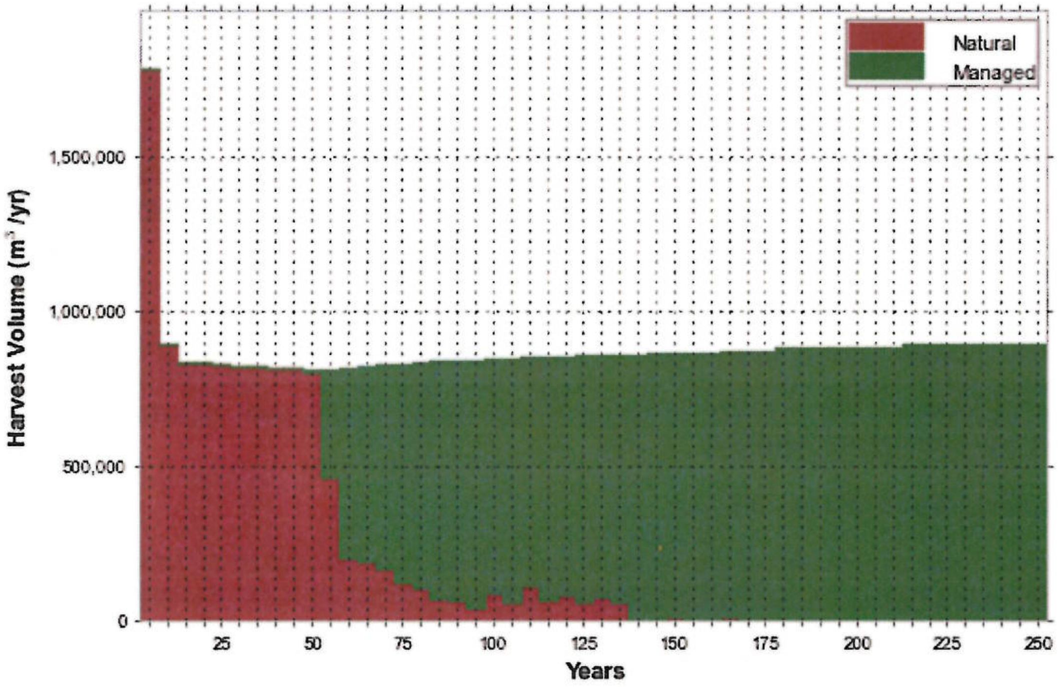

Figure 13: **Base Case – Harvest from Natural and Managed Stands**

Figure 14 shows the total harvest volume by leading species. With a significant focus on MPB salvage, the vast majority of harvesting occurs in pine-leading stands (88% of the conifer volume in period 1 and 76% in period 2). It is also important to note that MPB-affected volume also exists as a minor component in many non-pine leading stands harvested in the first 10 years.

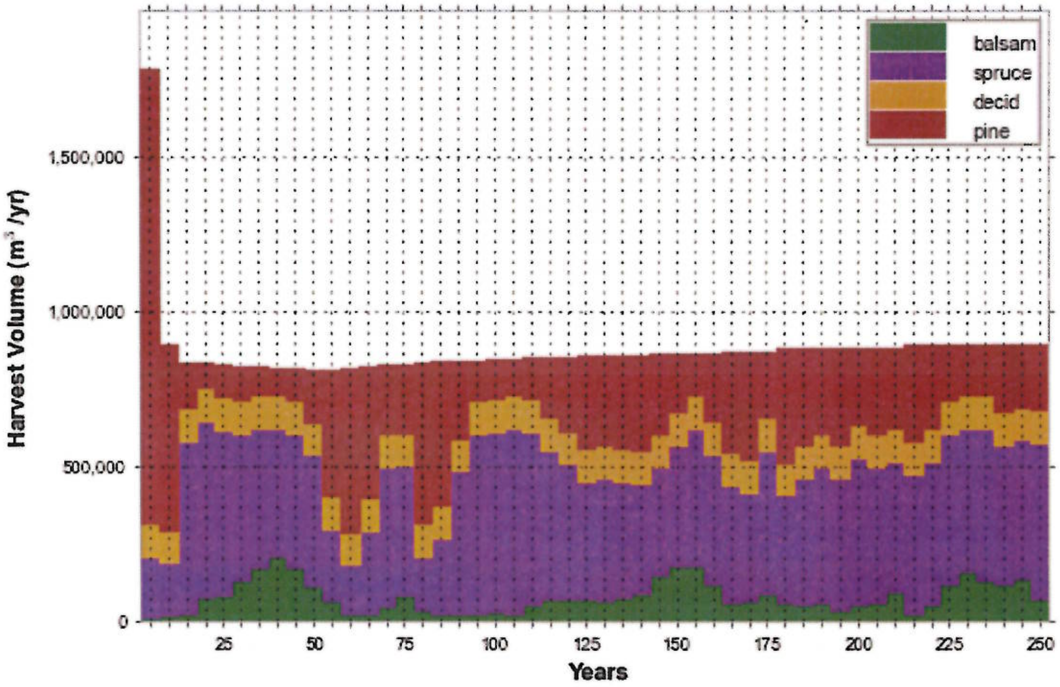

Figure 14: **Base Case – Harvest Volume by Leading Species**

Figure 15 shows how average harvest age changes over the planning horizon. It starts at approximately 170 years of age and increases to just over 200 years over the next 55 years as existing natural stands are harvested. As the harvest transitions into younger, more productive managed stands the average harvest age drops to between 60 and 100 years of age.

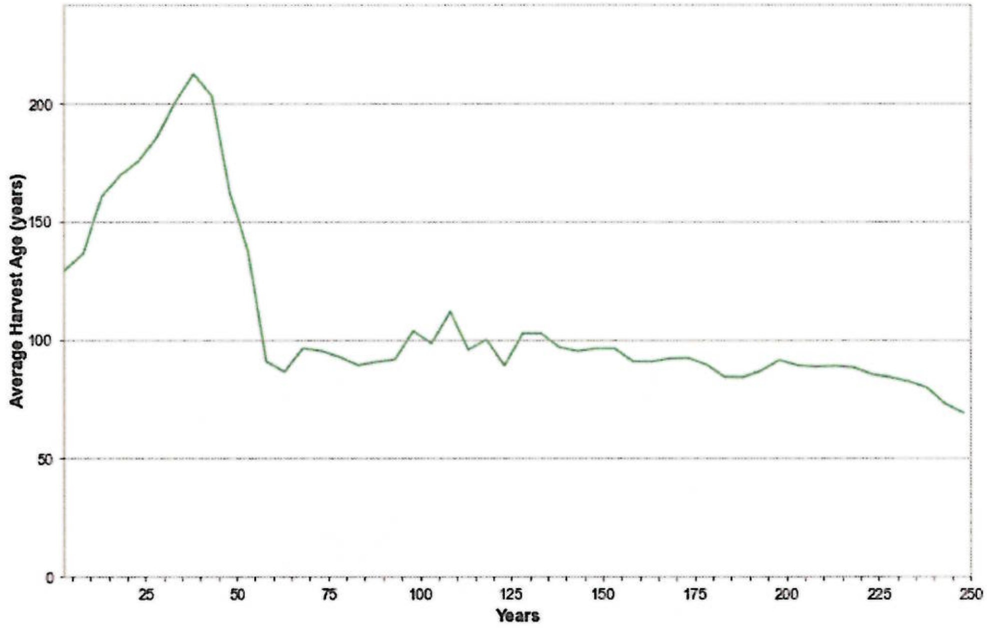

Figure 15: Base Case – Average Harvest Age

As shown in Figure 16, average volume per hectare starts off at approximately 200 m^3/ha and fluctuates between 280 m^3/ha and 200 m^3/ha for most of the planning horizon.

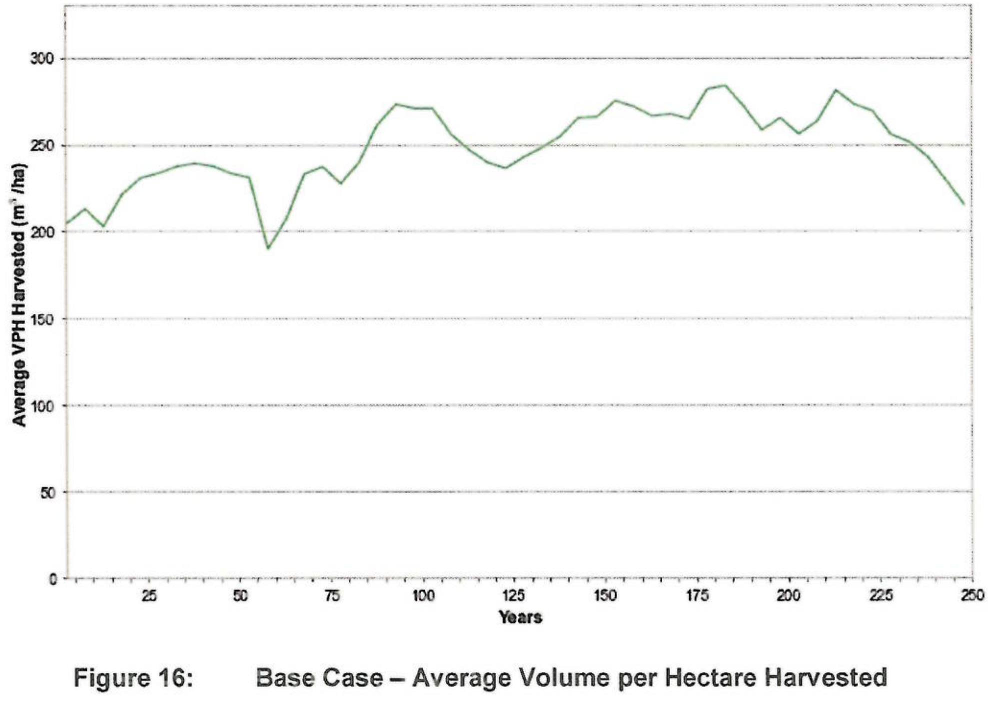

Figure 16: Base Case – Average Volume per Hectare Harvested

Figure 17 shows that in the base case, approximately 8,700 ha/yr is harvested for the first five years of the planning horizon. For the rest of the planning horizon, the average area harvested per year generally remains between 3,000 ha and 4,000 ha.

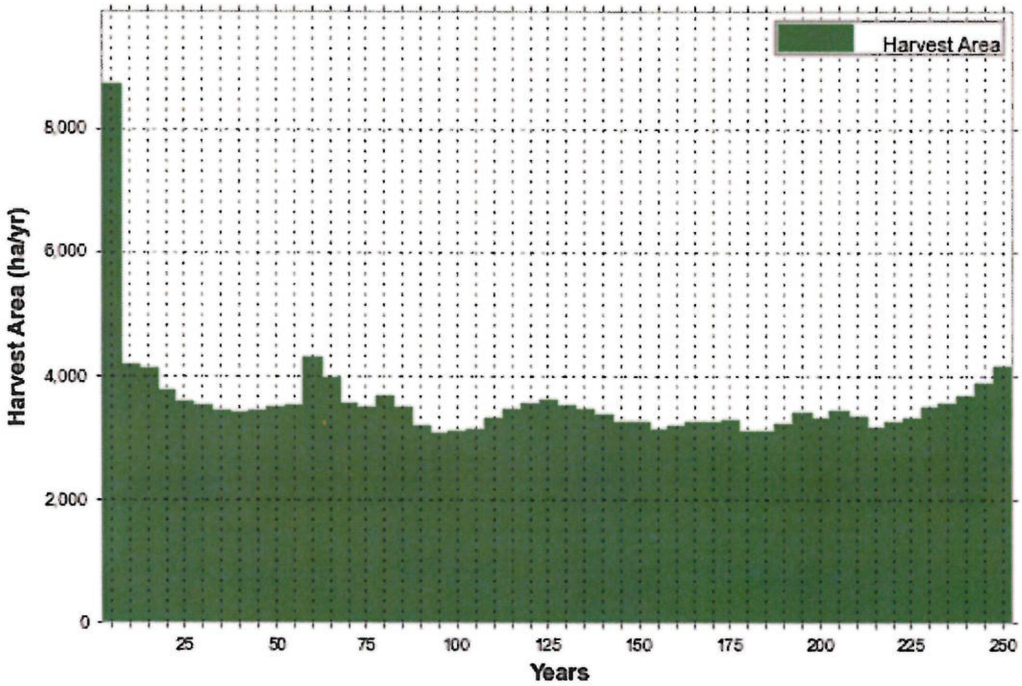

Figure 17: Base Case – Annual Harvest Area

3.4 Age Class Distribution

The age class graphs shown in Figure 18 describe the changing age class distribution of the forest over the 250-year planning horizon. Initially the age class distribution has a small deficit of stands in age classes 2, 3 and 4. As time progresses the THLB area concentrates in age classes less than or equal to 5, with some area in older age classes as required to fulfill land base requirements such as old growth requirements.

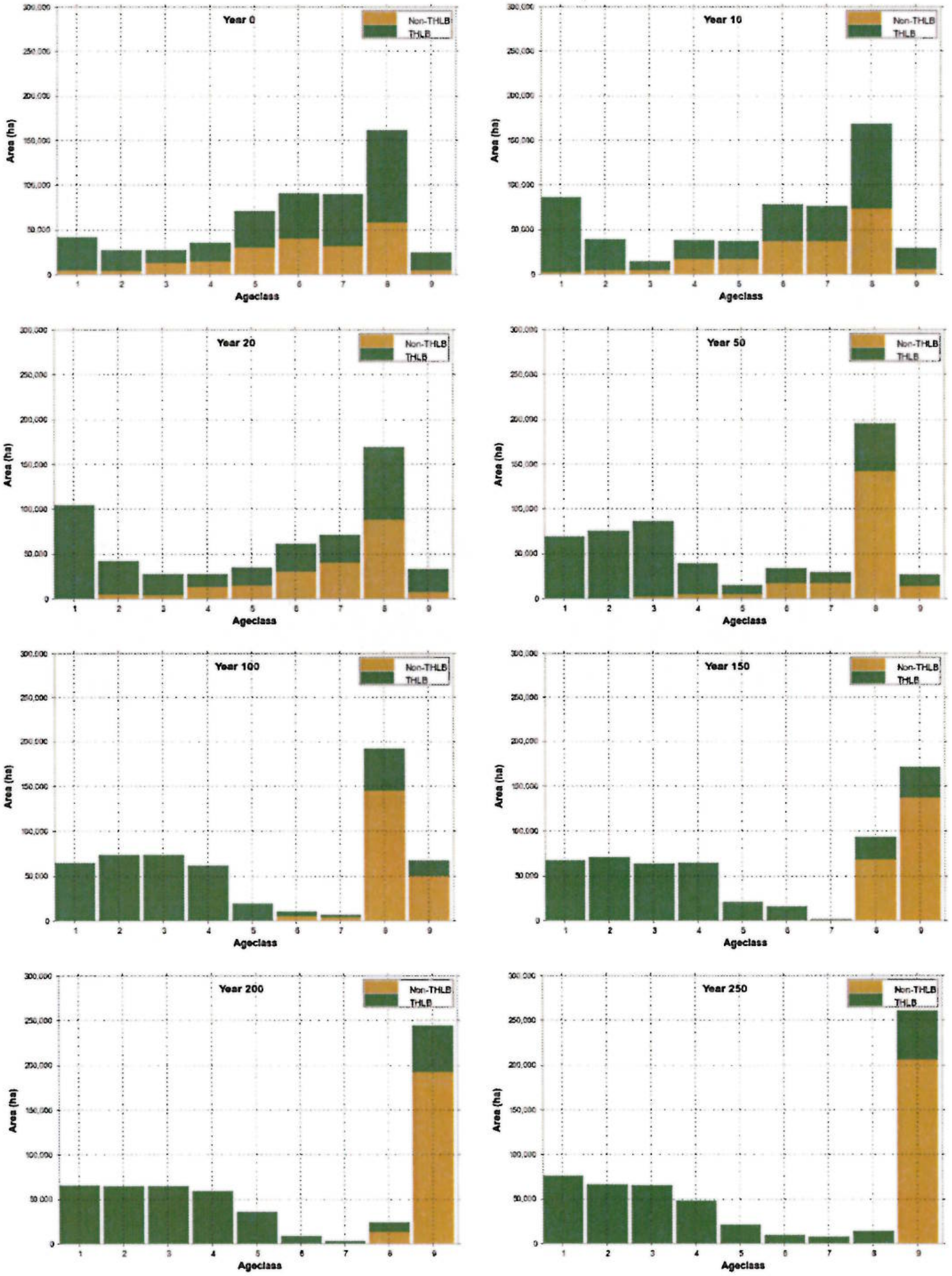

Figure 18: Age Class Distribution – Base Case

4.0 SENSITIVITY ANALYSIS

Sensitivity analysis provides information on the degree to which uncertainty in the base case data and assumptions might affect the proposed harvest level for the land base. The magnitude of the change in the sensitivity variable(s) reflects the degree of risk associated with a particular uncertainty – a very uncertain variable that has minimal impact on the harvest forecast represents a low risk. By developing and testing a number of sensitivity issues, it is possible to determine which variables most affect results and provide information to guide management decisions in consideration of uncertainty.

Each of the sensitivities shown in Table 3 test the impact of a specific variable (or variables) with impacts measured relative to the base case harvest forecast.

Table 3: Sensitivity Analyses

Sensitivity	Range Tested
Alternative Harvest Flows	Assess the impacts of various levels of MPB salvage on mid and long-term timber supply
Natural Disturbance	Assess the impacts of applying natural disturbance to the non-THLB.
Post Mountain Pine Beetle (MPB) Regeneration Delay	Assess the implications of assuming natural regeneration within stands using a 15-year regeneration delay following stand break-up.
Shelf Life	Assess the impacts of changing the shelf life of MPB killed stands from 5 to 10 years.
VLI	Assess the impacts of applying RVQC objectives in addition to the EVQOs currently applied in the base case. Examine impacts of no VQOs.
Old Seral Management	Utilize NDU seral stage targets
Equivalent Clearcut Area (ECA) Objectives	Examine impacts of applying watershed ECA constraints as per the SFMP.
Patch Size Targets	Remove patch size targets
Phase II volume adjustment	Assess the impacts of applying the VRI Phase II volume adjustment.

4.1 Alternative Harvest Flow Patterns

The goal of the base case harvest forecast is to maximize the salvage of MPB-affected stands and minimize the impact to mid-term timber supply. As harvest is supported by future managed stands, the harvest level will gradually increase to a sustainable long-term harvest level (LTHL). In the base case there is no maximum harvest level specified, the model is free to select the initial harvest level that maximizes the mid-term harvest while meeting non-timber objectives.

The scenarios in Figure 19 and Table 4 show the impacts of alternate harvest flow patterns. The *flatline* scenario attempts to maintain an even flow harvest level over the entire 250-year planning horizon. As discussed above, the harvest *pinch point* occurs around year 40 and therefore this represents a low point in the harvest schedule. Without limitation on the maximum initial harvest level, the model seeks to maximize salvage in period 1 in order to minimize the impact on mid-term timber supply. Setting a maximum limit of 1.5 million m^3/yr on the initial harvest level results in both mid and long-term timber supply impacts as MPB salvage is not maximized in the first 10 years. As shown in Table 4, the mid and long-term conifer harvest levels drop between 2% and 8% when the initial salvage is reduced from the base case.

Scenario s14 (*s2v w 1.45M 10yr conifer min; no max)* attempts to maintain an initial harvest level of 1.45 million m^3/yr over the first 10 years of the planning horizon. As shown in Figure 19 and Table 4, the model is able to harvest an average of 1.37 million m^3/yr over the first 10 years before dropping down to the mid-term harvest level. This represents an increase in harvest of approximately 16% over the first 10 years but results in a 7% to 9% decrease in the mid-term harvest.

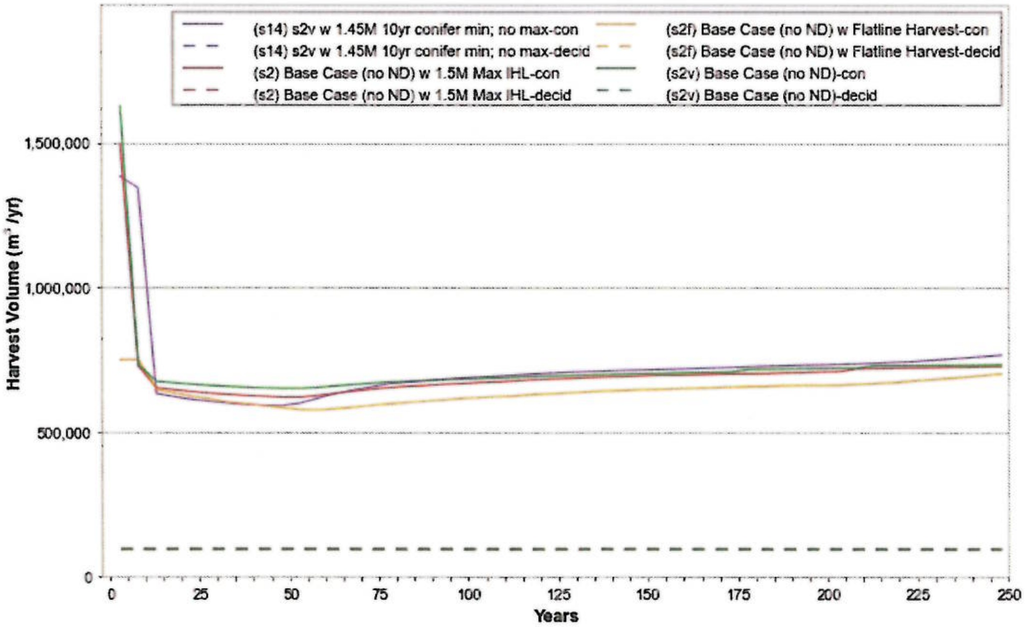

Figure 19: Alternative Harvest Flow Patterns

The two scenarios examined in Figure 20 and also summarized in Table 4 examine the impact of forcing a higher harvest level in period 1 to attempt to maximize salvage. In the 2nd *Max Salvage* scenario the VQO constraints are relaxed to assess the degree to which they limit salvage and affect the mid-term harvest level.

The two *Max Salvage* scenarios have a period 1 harvest level of between 2.53 million m^3/yr and 2.58 million m^3/yr – substantially higher than the base case. However, when full visual quality objectives (VQOs) are applied the mid-term harvest level is approximately 8% lower than the base case, suggesting that this increased harvest level does not result in a more effective salvage strategy than the base case.

When VQOs are relaxed along with an increased period 1 harvest level, the mid and long-term harvest levels increase by between 3% and 4%. However, this scenario causes the VQO disturbance thresholds to be exceeded for much of the planning horizon and not necessarily a more effective salvage strategy.

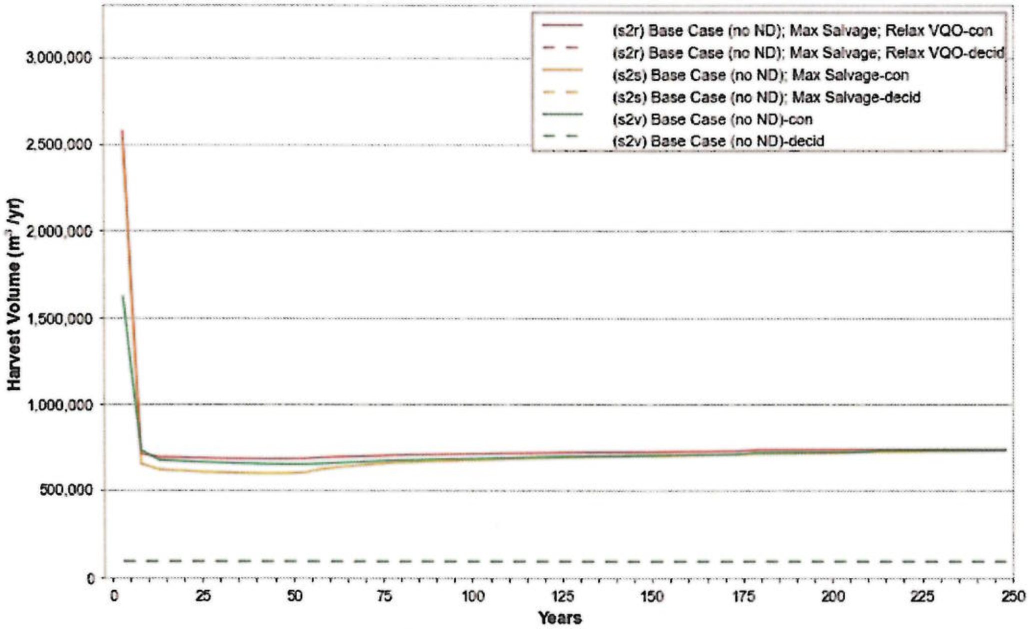

Figure 20: Increased Salvage Levels

The results of these scenarios all support the fact that in the base case, the model has selected an appropriate initial harvest level that maximizes salvage while minimizing mid-term timber supply impacts. When the initial harvest level is reduced the mid-term harvest level decreases; when the initial harvest level increases the mid-term also decreases.

Table 4: Alternate Harvest Flow Patterns

Scenario		Harvest Levels By Harvest Year							
		Average Conifer Harvest				Average Deciduous Harvest			
		1 to 10	11 to 20	21 to 50	51 to 250	1 to 10	11 to 20	21 to 50	51 to 250
Base Case	***1,000's m³/yr***	***1,184***	***679***	***663***	***708***	***100***	***100***	***100***	***100***
Base Case w 1.5M Max IHL	1,000's m³/yr	1,119	656	636	696	100	100	100	100
	% Change	-6%	-3%	-4%	-2%	-0%	-0%	-0%	-0%
1.45M 10yr conifer min; no max	1,000's m³/yr	1,370	634	605	715	100	100	100	100
	% Change	16%	-7%	-9%	1%	-0%	-0%	-0%	-0%
Base Case w Flatline Harvest	1,000's m³/yr	756	648	608	648	100	100	100	100
	% Change	-36%	-5%	-8%	-8%	-0%	-0%	-0%	-0%
Base Case; Max Salvage	1,000's m³/yr	1,593	623	608	700	100	100	100	100
	% Change	34%	-8%	-8%	-1%	-0%	-0%	-0%	-0%
Base Case; Max Salvage; Relax VQO	1,000's m³/yr	1,649	698	691	728	100	100	100	100
	% Change	39%	3%	4%	3%	0%	-0%	-0%	-

4.2 Natural Disturbance in the Non-THLB

Forested areas outside of the THLB generally contribute to meeting many of the non-timber objectives. The occurrence of natural disturbances outside the THLB has the potential to impact how this area contributes to meeting these objectives. While it is uncertain when or where these disturbances will take place we can rely on historical information to estimate the average annual level of disturbance.

This scenario examines the impact of applying natural disturbances to the non-THLB on the timber supply of the TFL with the results shown in Figure 21 and Table 5. Overall the impact on timber supply is minimal with a small increase in the cut in the first 10 years followed by a small decrease in the mid and long-term. Deciduous harvest levels decreased slightly when natural disturbances are applied.

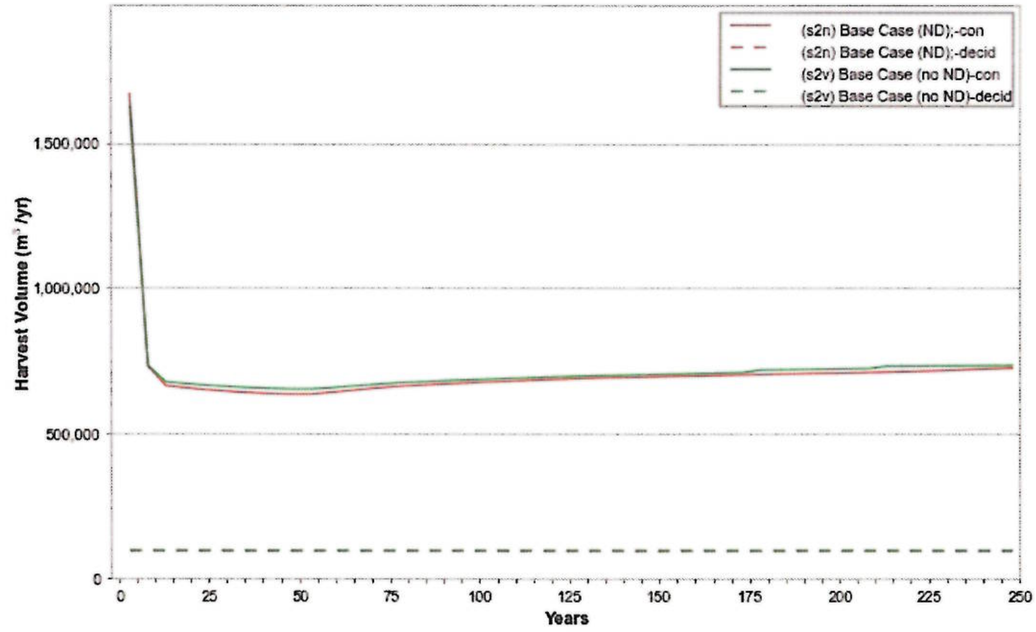

Figure 21: Disturbing the Non-THLB

Table 5: Disturbing the Non-THLB

Scenario		Harvest Levels By Harvest Year							
		Average Conifer Harvest				Average Deciduous Harvest			
		1 to 10	11 to 20	21 to 50	51 to 250	1 to 10	11 to 20	21 to 50	51 to 250
Base Case	***1,000's m³/yr***	***1,184***	***679***	***663***	***708***	***100***	***100***	***100***	***100***
Base Case w Nat. Dist	1,000's m³/yr	1,206	665	647	696	99	99	99	100
	% Change	2%	-2%	-3%	-2%	-1%	-1%	-1%	-0%

4.3 Post-MPB Regeneration

The base case assumes that MPB-affected stands that fall below the economic threshold volume of 140 m^3/ha and are not salvaged do not regenerate. While natural regeneration may occur in some areas it is difficult to know the degree, scale and time frames in which this will occur. This uncertainty is addressed through the following sensitivity analyses whereby stands affected by MPB that are not salvaged regenerate naturally back to the same yield curves as before using a 15-year regeneration delay.

Three different harvest level targets are tested: a flatline target, a 1.5 million m^3/yr initial maximum harvest and no maximum initial harvest. The results shown in Figure 22 and Table 6 demonstrate that natural regeneration in unsalvaged stands generally reduces the volume the model chooses to salvage in period 1. With unsalvaged stands regenerating naturally, the model can defer harvesting in some MPB-affected stands without losing them for the remainder of the planning horizon.

With no initial maximum, the model harvests an average of 813,000 m^3/yr in the first 10 years. Mid-term harvest levels under this scenario are slightly higher than without natural regeneration. When the initial harvest level is restricted the mid and long-term harvest levels do not vary significantly from the scenario without an initial harvest limit as regenerated stands are able to support mid-term harvest.

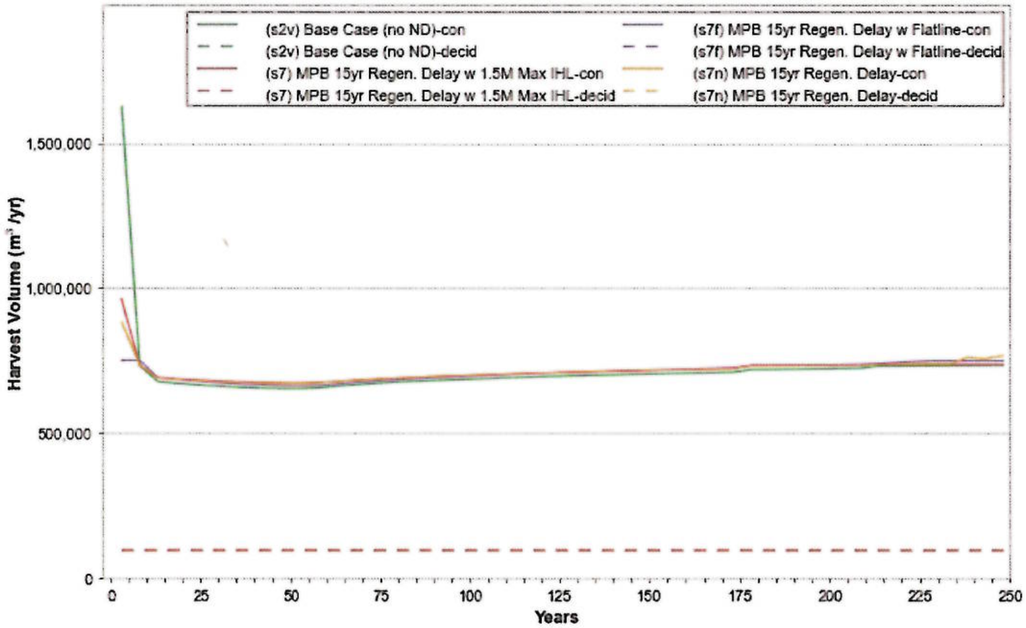

Figure 22: Post-MPB Regeneration Harvest Forecasts

Table 6: Post-MPB Regeneration Harvest Forecasts

Scenario		Harvest Levels By Harvest Year							
		Average Conifer Harvest				Average Deciduous Harvest			
		1 to 10	11 to 20	21 to 50	51 to 250	1 to 10	11 to 20	21 to 50	51 to 250
Base Case	***1,000's m³/yr***	***1,184***	***679***	***663***	***708***	***100***	***100***	***100***	***100***
MPB 15yr Regen. Delay w 1.5M Max IHL	1,000's m³/yr	852	694	682	720	100	100	100	100
	% Change	-28%	2%	3%	2%	-	-	-	-
MPB 15yr Regen. Delay w Flatline	1,000's m³/yr	756	692	675	721	100	100	100	100
	% Change	-36%	2%	2%	2%	-	-	-	-
MPB 15yr Regen. Delay	1,000's m³/yr	813	692	680	721	100	100	100	100
	% Change	-31%	2%	2%	2%	0%	-	-	0%

4.4 Shelf Life

Shelf life describes the length of time that a stand remains economically viable following MPB attack. The base case reflects an average shelf life of 10 years from an average death year of 2008 (five years from 2013). As discussed in Section 2.2.1 above, the shelf life years in the model range from 5 to 14 years depending on stand age. In these scenarios we examine the implications of applying an average shelf life of 15 years (10 years from 2013). As with the base case, the actual shelf life years will be dispersed between 10 and 19 years in the same pattern as shown in Figure 3.

Figure 23 and Table 7 demonstrate that extending the shelf life by five years results in a decrease in the initial harvest level as salvage is extended over a longer period of time. Mid-term harvest levels increase as a result of these extended shelf life estimates.

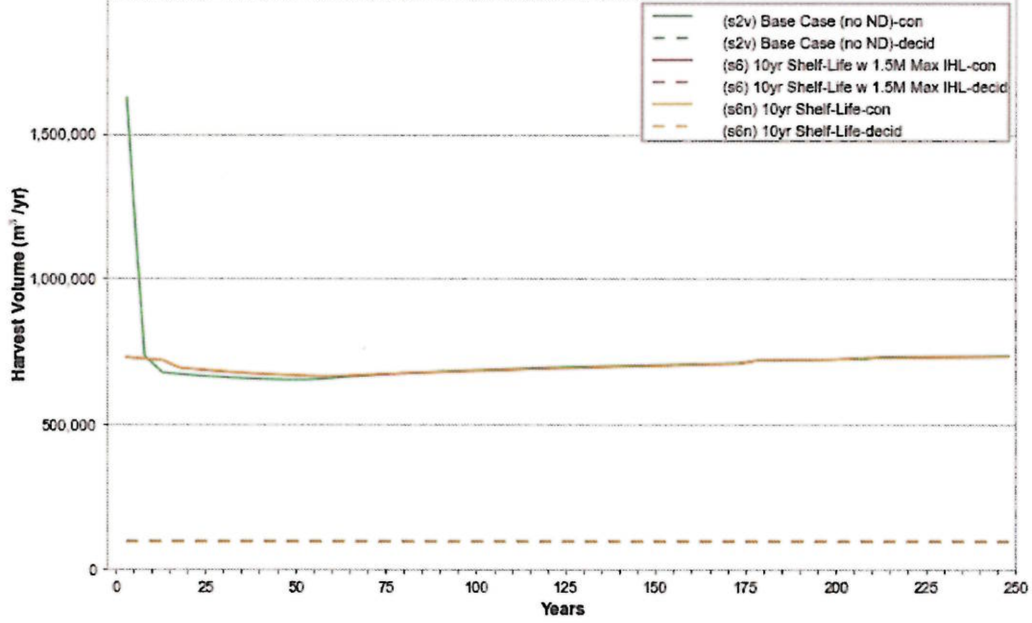

Figure 23: Shelf Life Harvest Forecasts

Table 7: Shelf Life Harvest Forecasts

Scenario		Harvest Levels By Harvest Year							
		Average Conifer Harvest				Average Deciduous Harvest			
		1 to 10	11 to 20	21 to 50	51 to 250	1 to 10	11 to 20	21 to 50	51 to 250
Base Case	***1,000's m^3/yr***	***1,184***	***679***	***663***	***708***	***100***	***100***	***100***	***100***
10yr Shelf-Life w 1.5M Max IHL	1,000's m^3/yr	731	710	682	707	100	100	100	100
	% Change	-38%	5%	3%	-0%	-0%	-0%	-0%	-0%
10yr Shelf-Life	1,000's m^3/yr	731	711	683	708	100	100	100	100
	% Change	-38%	5%	3%	-0%	-0%	-0%	-0%	-0%

4.5 Visual Landscape Inventory

This sensitivity examines the impacts of applying the recommended VQO from the 2012 VLI in addition to the existing VQOs that are applied in the base case. The addition of these constraints results is a 3% to 6% decrease in the mid and long-term conifer harvest as shown in Figure 24 and summarized in Table 8.

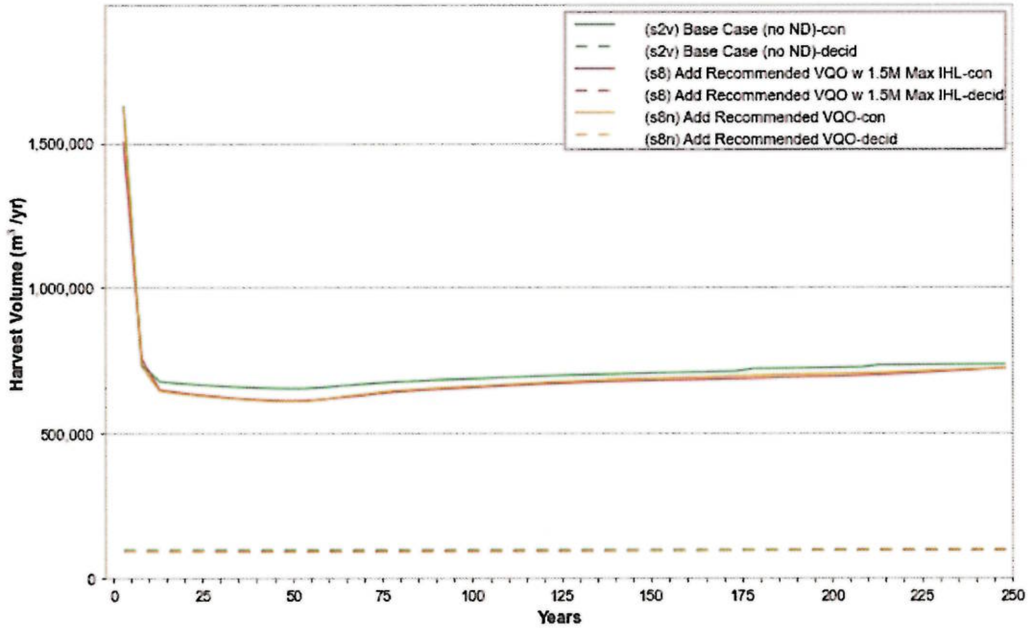

Figure 24: Visual Landscape Inventory Harvest Forecasts

Removing VQO constraints entirely results in a 14% increase in the short-term harvest followed by a 3% to 5% increase in the mid and long-term.

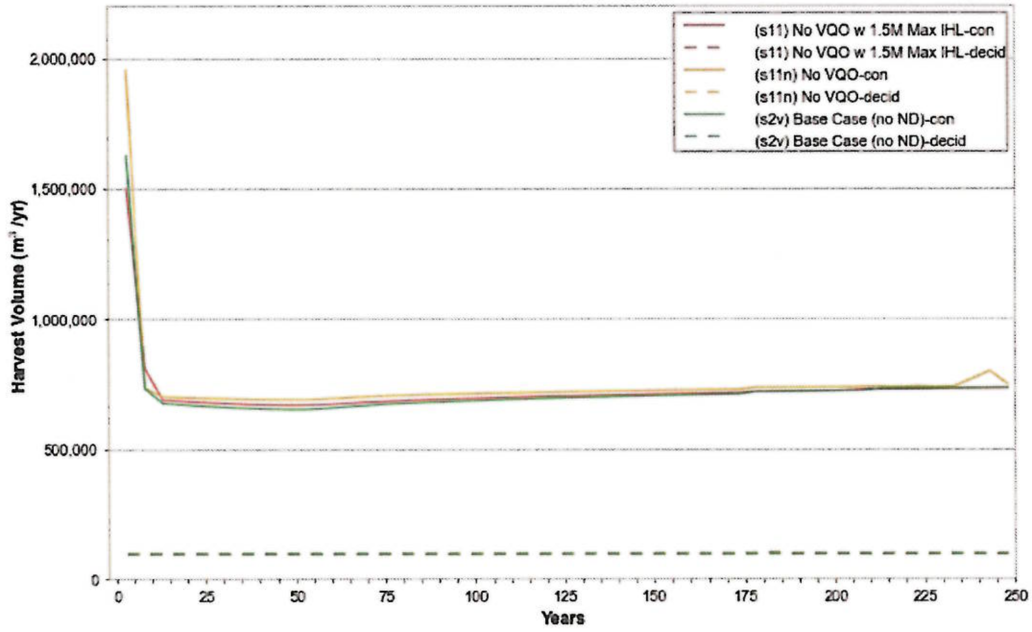

Figure 25: No Visual Quality Objectives Harvest Forecasts

Table 8: Visual Landscape Inventory Harvest Forecasts

Scenario		Harvest Levels By Harvest Year							
		Average Conifer Harvest				Average Deciduous Harvest			
		1 to 10	11 to 20	21 to 50	51 to 250	1 to 10	11 to 20	21 to 50	51 to 250
Base Case	***1,000's m³/yr***	***1,184***	***679***	***663***	***708***	***100***	***100***	***100***	***100***
Add Recommended VQO w 1.5M Max IHL	1,000's m³/yr	1,133	649	625	679	97	97	96	98
	% Change	-4%	-4%	-6%	-4%	-3%	-3%	-4%	-2%
Add Recommended VQO	1,000's m³/yr	1,182	645	622	685	97	96	95	97
	% Change	-0%	-5%	-6%	-3%	-3%	-4%	-5%	-3%
No VQO w 1.5M Max IHL	1,000's m³/yr	1,161	692	679	713	100	100	100	100
	% Change	-2%	2%	2%	1%	0%	0%	0%	0%
No VQO	1,000's m³/yr	1,350	705	698	730	100	100	100	101
	% Change	14%	4%	5%	3%	0%	0%	0%	1%

4.6 Old Seral Objectives

The MP4 analysis applied seral targets by NDU/BEC. The TFL is subject to the Provincial Non-Spatial Old Growth Order and as such must manage old seral targets by LU/BEC as has been modelled in the base case. NDU/BEC old growth targets are modelled in this sensitivity.

As shown in Figure 26 and Table 9, the application of seral stage targets by NDU results in a 2% increase in conifer harvest in the first 10 years with a 1% to 2% decrease in the mid and long-term.

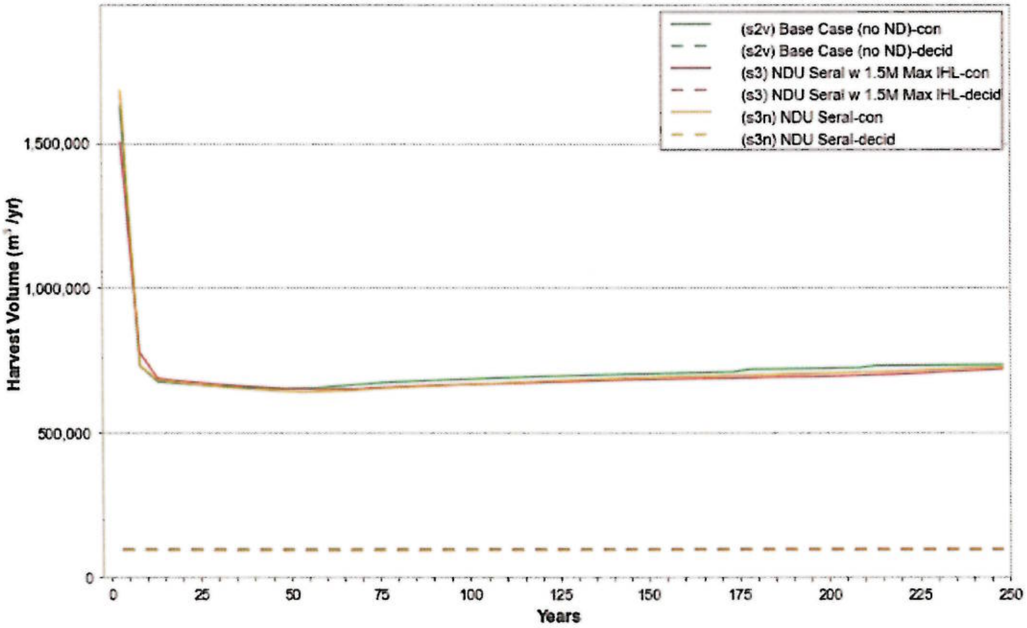

Figure 26: Old Seral Objectives by NDU Harvest Forecasts

Table 9: Old Seral Objectives by NDU Harvest Forecasts

Scenario		Harvest Levels By Harvest Year							
		Average Conifer Harvest				Average Deciduous Harvest			
		1 to 10	11 to 20	21 to 50	51 to 250	1 to 10	11 to 20	21 to 50	51 to 250
Base Case	***1,000's m³/yr***	***1,184***	***679***	***663***	***708***	***100***	***100***	***100***	***100***
NDU Seral w 1.5M Max IHL	1,000's m³/yr	1,144	689	668	688	99	99	99	100
	% Change	-3%	2%	1%	-3%	-1%	-1%	-1%	-0%
NDU Seral	1,000's m³/yr	1,211	683	660	692	98	97	97	98
	% Change	2%	1%	-1%	-2%	-2%	-3%	-3%	-2%

4.7 Equivalent Clearcut Area Objectives

Equivalent clearcut area targets were included in the base case assumption for MP4. As these targets are not legally binding they have been modelled as a sensitivity in this analysis.

Figure 27 and Table 10 show that the application of these targets has a 6% impact on conifer harvest in the first 10 years with a 4% to 6% impact on the mid and long-term. Deciduous harvest levels are also impacted negatively by the application of these targets.

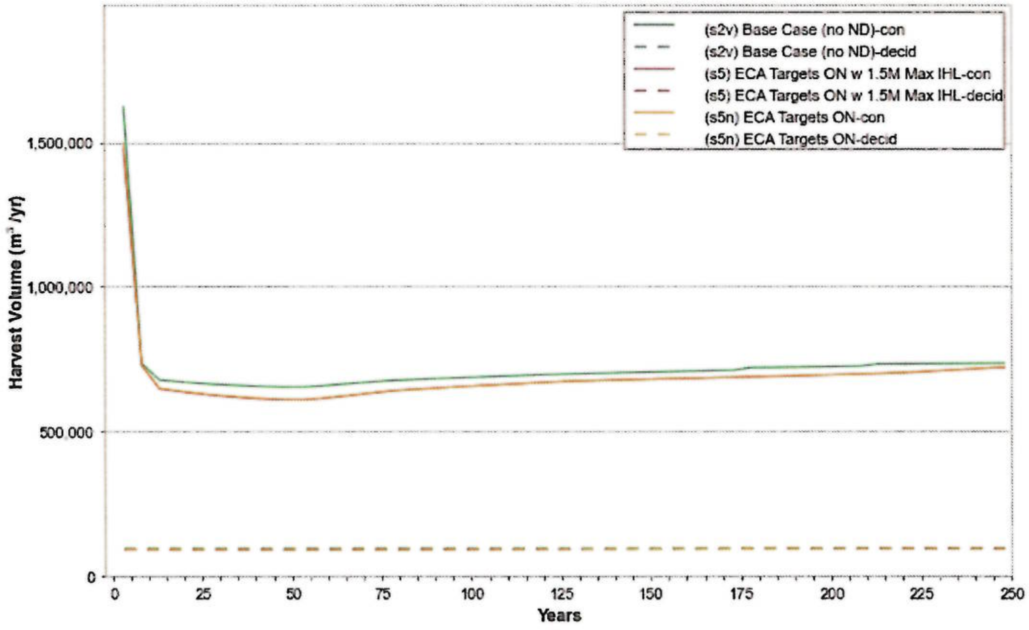

Figure 27: ECA Objectives Harvest Forecasts

Table 10: ECA Objectives Harvest Forecasts

Scenario		Harvest Levels By Harvest Year							
		Average Conifer Harvest				Average Deciduous Harvest			
		1 to 10	11 to 20	21 to 50	51 to 250	1 to 10	11 to 20	21 to 50	51 to 250
Base Case	*1,000's m^3/yr*	*1,184*	*679*	*663*	*708*	*100*	*100*	*100*	*100*
ECA Targets ON w 1.5M Max IHL	1,000's m^3/yr	1,107	647	623	679	97	96	96	98
	% Change	-7%	-5%	-6%	-4%	-3%	-4%	-4%	-2%
ECA Targets ON	1,000's m^3/yr	1,118	649	624	679	97	96	95	97
	% Change	-6%	-4%	-6%	-4%	-3%	-4%	-5%	-3%

4.8 Patch Size Objectives

Through their Forest Stewardship Plan, Canfor has committed to trending towards the patch size distribution targets shown in Table 33 of the Data Package. These targets have been applied in the base case and all other sensitivities. This scenario examines the timber supply impact of removing these targets.

The information presented Figure 28 and Table 11 demonstrates these targets have minimal impact on timber supply, with a slight increase in conifer harvest in the first 10 years and a 2% to 3% reduction in the mid and long-term. Deciduous harvest levels are also impacted slightly by the removal of these targets.

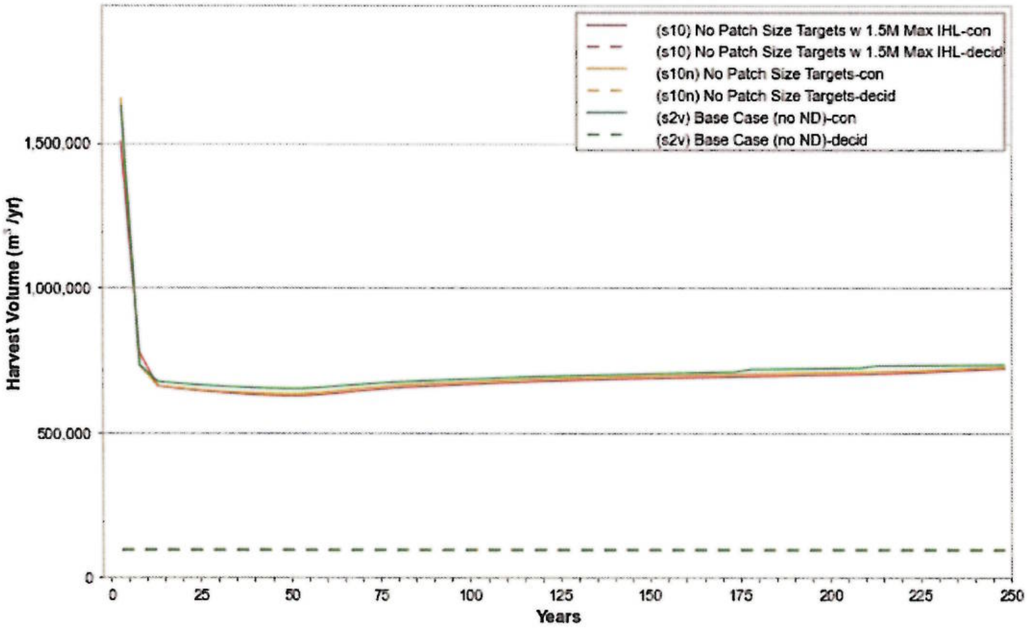

Figure 28: Remove Patch Size Objectives Harvest Forecasts

Table 11: Remove Patch Size Objectives Harvest Forecasts

Scenario		Harvest Levels By Harvest Year							
		Average Conifer Harvest				Average Deciduous Harvest			
		1 to 10	11 to 20	21 to 50	51 to 250	1 to 10	11 to 20	21 to 50	51 to 250
Base Case	***1,000's m^3/yr***	***1,184***	***679***	***663***	***708***	***100***	***100***	***100***	***100***
No Patch Size Targets w 1.5M Max IHL	1,000's m^3/yr	1,143	662	641	689	99	99	99	100
	% Change	-3%	-2%	-3%	-3%	-1%	-1%	-1%	-0%
No Patch Size Targets	1,000's m^3/yr	1,197	664	646	696	99	99	99	100
	% Change	1%	-2%	-3%	-2%	-1%	-1%	-1%	-0%

4.9 Phase II Volume Adjustment

A phase II VRI adjustment, completed for TFL 48 in 2005 (J.S. Thrower and Associates), found that on average phase I VRI volumes on the TFL were underestimated by approximately 34%. The analysis utilized 128 phase II VRI plots with 44 trees sampled as part of the net volume adjustment factor (NVAF) program.

The 2005 phase II adjustment analysis was conducted using volumes generated from VDYP 6 and therefore the validity of the previous adjustment when applied using VDYP 7 volumes was in question. The expedited nature of this analysis did not provide for a complete re-analysis of the phase II adjustment and therefore a modified adjustment procedure was developed in close consultation with the provincial forest biometrics team lead. This process recalculates the phase II volume adjustment ratios based on a comparison of the phase II volume samples with the revised VDYP 7 volume projections for the polygons sampled. The ratio of means (ROM) between the two volumes are then summarized for each of the phase II sampling stratum as shown in Table 12 . These adjustment ratio are then applied to each analysis unit yield curve based on the THLB area distribution of each phase II stratum within each analysis unit as shown in Table 13.

Table 12: Phase II Volume Adjustment Ratio of Means

Phase II Stratum	**Phase II Volume Total**	**VDYP 7 Volume Total**	**Ratio of Means**	**Number of Plots**
High	23,624	21,988	1.0744	86
Low	3,239	2,769	1.1698	20
Moderate	1,692	953	1.7758	22
Total	**28,554**	**25,709**	**1.1107**	**128**

Table 13: Phase II Yield Curve Adjustment Ratio

Analysis Unit	THLB Area (ha) by Phase II Stratum					Area-Weighted Volume Adjustment Ratio
	High	Low	Moderate	(blank)	Grand Total	
Ac_g	5,030	1,289	629	267	**7,215**	1.150
Ac_m	437	2,258	159	773	**3,626**	1.149
Ad_g	14,613	2,450	3,131	1,756	**21,950**	1.179
Ad_m	28	1,892	119	397	**2,437**	1.171
Bl_all	138	3,829	250	550	**4,767**	1.179
Bl_s	313	12,599	284	770	**13,967**	1.171
Bx_o	212	8,319	-	11	**8,542**	1.167
Bx_y	1,363	8,027	983	2,132	**12,505**	1.178
Ct_con	2,888	25	478	823	**4,214**	1.140
Ct_dec	5,547	1,396	1,021	380	**8,344**	1.173
LwStk_c	0	11		242	**253**	1.008
LwStk_d	0	4		452	**456**	1.002
Pc_og	4,982	60	59	17	**5,118**	1.083
Pc_om	6,251	3,016	93	17	**9,378**	1.112
Pc_yg	14,358	60	1,444	5,261	**21,123**	1.104
Pc_ym	20,985	7,008	4,385	2,117	**34,495**	1.178
Pd_g	8,148	412	2,610	309	**11,479**	1.235
Pd_m	654	429	891	40	**2,014**	1.404
Pl_g	11,772	24	3,611	1,321	**16,728**	1.220
Pl_m	17,646	5,144	5,101	995	**28,886**	1.213
Sc_og	11,206	484	6	27	**11,723**	1.079
Sc_om	9,309	13,174	11	49	**22,543**	1.130
Sc_yg	24,105	422	3,065	9,681	**37,272**	1.114
Sc_ym	5,710	1,510	1,165	1,870	**10,255**	1.155
Sd_g	8,215	272	1,245	4,027	**13,758**	1.118
Sd_m	3,048	180	899	1,341	**5,468**	1.175
Ss_g	3,196	3,211	506	986	**7,901**	1.149
Ss_m	2,255	9,743	15	585	**12,599**	1.146
Sw_og	5,058	224	2	18	**5,302**	1.078
Sw_om	1,291	1,402	3	6	**2,701**	1.124
Sw_yg	5,445	235	1,479	304	**7,462**	1.213
Sw_ym	422	146	74	4,592	**5,235**	1.022
Grand Total	**194,628**	**89,257**	**33,716**	**42,116**	**359,717**	**1.155**

As a result of the phase II volume adjustment the starting total THLB growing stock has increased from 58.9 million m^3 to 69.3 million m^3 - an increase of approximately 18% shown in Figure 30.

With this additional volume the initial harvest level increases by an average of 18% over the first 10 years with a period 1 conifer harvest level of approximately 1.63 million m^3/yr dropping down to approximately 738,000 m^3/yr in period 2, as shown in Figure 29 and Table 14. Mid-term harvest levels are approximately 6% higher than the base case.

With the additional volume under the phase II adjustment, two other scenarios examine the opportunity to extend salvage operations over 10 years as opposed to 5. These two scenarios attempt to harvest 1.45 million m^3/yr over 10 years both with and without an initial maximum harvest level of 1.45 million m^3/yr. With the maximum limit applied, an average conifer harvest of approximately 1.42 million m^3/yr is achievable over the first 10 years with a slight 1% to 2%

increase in the mid-term over the base case levels. With the maximum harvest level removed an average of 1.47 million m^3/yr is achievable over 10 years with a slight increase in the mid-term.

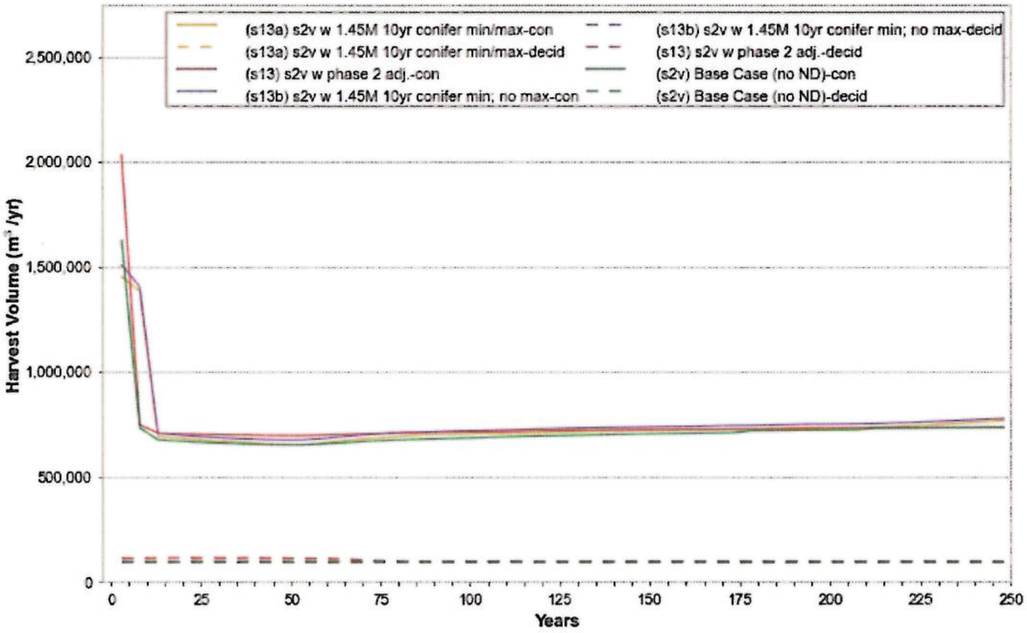

Figure 29: Phase II Volume Adjustment – Harvest Forecast

Table 14: Phase II Volume Adjustment – Harvest Forecast

Scenario		Harvest Levels By Harvest Year							
		Average Conifer Harvest				Average Deciduous Harvest			
		1 to 10	11 to 20	21 to 50	51 to 250	1 to 10	11 to 20	21 to 50	51 to 250
Base Case	***1,000's m^3/yr***	***1,184***	***679***	***663***	***708***	***100***	***100***	***100***	***100***
Phase II Adjustment	1,000's m^3/yr	1,397	712	705	727	117	119	118	102
	% Change	18%	5%	6%	3%	17%	19%	18%	2%
Phase II Adj. w 1.45M 10yr conifer min/max	1,000's m^3/yr	1,424	694	670	722	100	100	100	100
	% Change	20%	2%	1%	2%	-0%	-0%	-0%	-0%
Phase II Adj w1.45M 10yr conifer min; no max	1,000's m^3/yr	1,471	698	678	732	100	100	100	100
	% Change	24%	3%	2%	3%	-0%	-0%	-0%	-0%

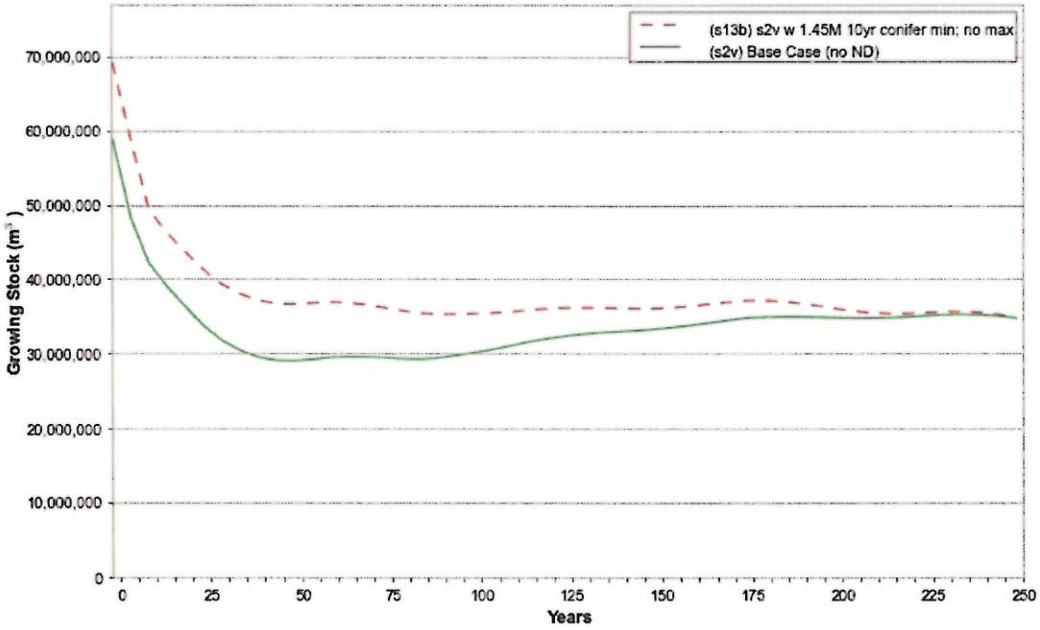

Figure 30: Phase II Volume Adjustment – Growing Stock Comparison

The phase II volume adjustment only applies to existing natural stands and therefore the average volume per hectare harvested increases while natural stands are being harvested. As the harvest gradually moves into future managed stands, the average volume per hectare becomes closer to the base case values is shown in Figure 31.

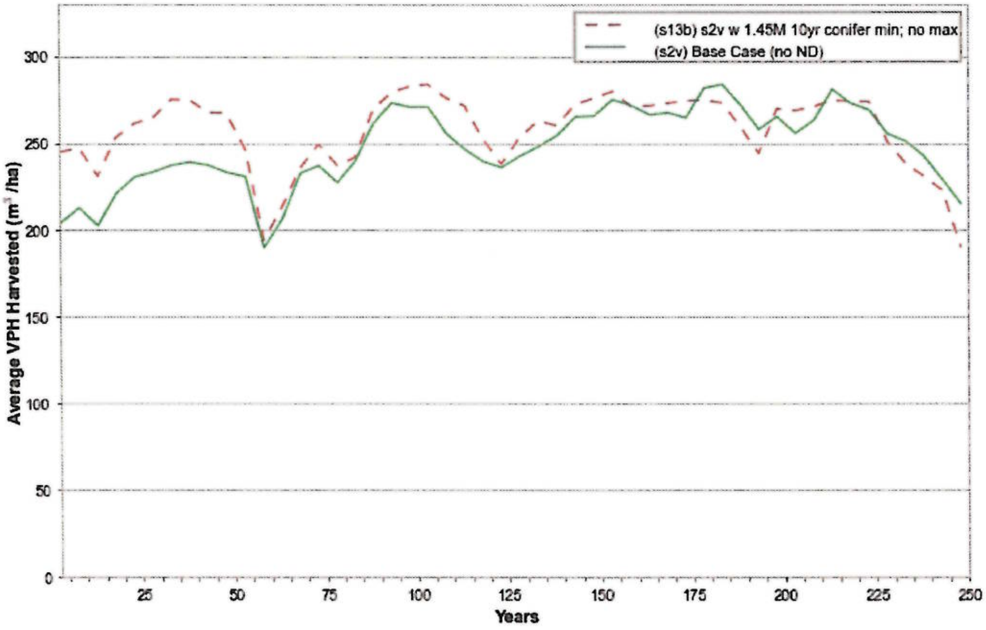

Figure 31: Phase II Volume Adjustment – Average Volume per Hectare Harvested

5.0 DISCUSSION

The role of the base case in timber supply analysis is to present the set of data and assumptions that best reflects current management on the TFL. The base case harvest forecast presented above provides the best representation of timber supply on the TFL over the next 250 years. This scenario demonstrates that an increased level of salvage is required over the next five years in order to minimize the impacts on mid-term timber supply. This analysis shows that limiting salvage operations in the first 10 years has an adverse impact on both mid and long-term timber supply of between 3% and 8% depending on the initial harvest level.

Sensitivity analysis seeks to quantify the degree to which uncertainty in data and assumptions might affect timber supply. Table 15 shows a summary of the harvest impacts of each scenario relative to the base case.

Assumptions regarding shelf life and the natural regeneration of unsalvaged stands have the largest overall impact on determining the initial harvest level that best mitigates the mid-term timber supply impacts of the MPB infestation. Operational experience in the TFL suggests that MPB-killed stands will remain economically viable for the next 5 years (until 2019) as is modelled in the base case. However, if the shelf-life of MPB stands extends out as far as 2024 (10 years) then a lower harvest level extended over a longer period of time is sufficient to salvage MPB-affected stands.

In the base case, stands that fall below the minimum economic criteria of 140 m^3/ha and never grow back above this level become unavailable for harvest in the model. While natural regeneration may occur in some of these stands it is difficult to quantify the degree, scale and time frames in which this will occur. Through a sensitivity analysis we explored the timber supply implications of modelling natural regeneration 15 years after MPB attack. These results demonstrate that a lower initial harvest level is possible under this assumption without negatively impacting mid-term timber supply levels.

The 2005 phase II VRI adjustment for TFL 48 (J.S. Thrower and Associates) found that on average phase I VRI volumes on the TFL were underestimated by approximately 34%. These volume adjustments were applied to the base case in the MP4 analysis. Given the significant increase in existing stand volume as a result of this adjustment and Canfor's desire to err on the side of caution, coupled with the fact that the requested uplift is supported by an unadjusted inventory, the phase II volume adjustment has been explored as a sensitivity analysis as opposed to a base case assumptions.

However, the harvest levels that are achievable when the adjustment is applied suggest that the short-term harvest in the base case may underestimate the conifer harvest potential by up to 24% in the first 10 years and between 2% and 3% in the mid and long-term. By taking this conservative approach to the base case provides a degree of confidence that increasing the short-term harvest on the TFL will not negatively affect mid or long-term harvest levels. In fact, the analysis results demonstrate that maintaining a lower harvest level on the TFL negatively affects mid and long-term timber supply by between 2% and 8%.

Table 15: Summary of Analysis Results

Scenario		Harvest Levels By Harvest Year							
		Average Conifer Harvest				Average Deciduous Harvest			
		1 to 10	11 to 20	21 to 50	51 to 250	1 to 10	11 to 20	21 to 50	51 to 250
Base Case	***1,000's m^3/yr***	***1,184***	***679***	***663***	***708***	***100***	***100***	***100***	***100***
Base Case w 1.5M Max IHL	1,000's m^3/yr	1,119	656	636	696	100	100	100	100
	% Change	-6%	-3%	-4%	-2%	-0%	-0%	-0%	-0%
Base Case w Flatline Harvest	1,000's m^3/yr	756	648	608	648	100	100	100	100
	% Change	-36%	-5%	-8%	-8%	-0%	-0%	-0%	-0%
1.45M 10yr conifer min; no max	1,000's m^3/yr	1,370	634	605	715	100	100	100	100
	% Change	16%	-7%	-9%	1%	-0%	-0%	-0%	-0%
Base Case; Max Salvage	1,000's m^3/yr	1,593	623	608	700	100	100	100	100
	% Change	34%	-8%	-8%	-1%	-0%	-0%	-0%	-0%
Base Case; Max Salvage; Relax VQO	1,000's m^3/yr	1,649	698	691	728	100	100	100	100
	% Change	39%	3%	4%	3%	0%	-0%	-0%	-
Base Case w Nat. Dist.;	1,000's m^3/yr	1,206	665	647	696	99	99	99	100
	% Change	2%	-2%	-3%	-2%	-1%	-1%	-1%	-0%
MPB 15yr Regen. Delay w 1.5M Max IHL	1,000's m^3/yr	852	694	682	720	100	100	100	100
	% Change	-28%	2%	3%	2%	-	-	-	-
MPB 15yr Regen. Delay w Flatline	1,000's m^3/yr	756	692	675	721	100	100	100	100
	% Change	-36%	2%	2%	2%	-	-	-	-
MPB 15yr Regen. Delay	1,000's m^3/yr	813	692	680	721	100	100	100	100
	% Change	-31%	2%	2%	2%	0%	-	-	0%
10yr Shelf-Life w 1.5M Max IHL	1,000's m^3/yr	731	710	682	707	100	100	100	100
	% Change	-38%	5%	3%	-0%	-0%	-0%	-0%	-0%
10yr Shelf-Life	1,000's m^3/yr	731	711	683	708	100	100	100	100
	% Change	-38%	5%	3%	-0%	-0%	-0%	-0%	-0%
Add Recommended VQO w 1.5M Max IHL	1,000's m^3/yr	1,133	649	625	679	97	97	96	98
	% Change	-4%	-4%	-6%	-4%	-3%	-3%	-4%	-2%
Add Recommended VQO	1,000's m^3/yr	1,182	645	622	685	97	96	95	97
	% Change	-0%	-5%	-6%	-3%	-3%	-4%	-5%	-3%
No VQO w 1.5M Max IHL	1,000's m^3/yr	1,161	692	679	713	100	100	100	100
	% Change	-2%	2%	2%	1%	0%	0%	0%	0%
No VQO	1,000's m^3/yr	1,350	705	698	730	100	100	100	101
	% Change	14%	4%	5%	3%	0%	0%	0%	1%
NDU Seral w 1.5M Max IHL	1,000's m^3/yr	1,144	689	668	688	99	99	99	100
	% Change	-3%	2%	1%	-3%	-1%	-1%	-1%	-0%
NDU Seral	1,000's m^3/yr	1,211	683	660	692	98	97	97	98
	% Change	2%	1%	-1%	-2%	-2%	-3%	-3%	-2%
ECA Targets ON w 1.5M Max IHL	1,000's m^3/yr	1,107	647	623	679	97	96	96	98
	% Change	-7%	-5%	-6%	-4%	-3%	-4%	-4%	-2%
ECA Targets ON	1,000's m^3/yr	1,118	649	624	679	97	96	95	97
	% Change	-6%	-4%	-6%	-4%	-3%	-4%	-5%	-3%
No Patch Size Targets w 1.5M Max IHL	1,000's m^3/yr	1,143	662	641	689	99	99	99	100
	% Change	-3%	-2%	-3%	-3%	-1%	-1%	-1%	-0%
No Patch Size Targets	1,000's m^3/yr	1,197	664	646	696	99	99	99	100
	% Change	1%	-2%	-3%	-2%	-1%	-1%	-1%	-0%
Phase II Adjustment	1,000's m^3/yr	1,397	712	705	727	117	119	118	102
	% Change	18%	5%	6%	3%	17%	19%	18%	2%
Phase II Adj. w 1.45M 10yr conifer min/max	1,000's m^3/yr	1,424	694	670	722	100	100	100	100
	% Change	20%	2%	1%	2%	-0%	-0%	-0%	-0%
Phase II Adj w1.45M 10yr conifer min; no max	1,000's m^3/yr	1,471	698	678	732	100	100	100	100
	% Change	24%	3%	2%	3%	-0%	-0%	-0%	-0%

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APPENDIX I – NETDOWN MAP

A PDF map of the netdown areas can be downloaded here:
https://dl.dropboxusercontent.com/u/24626685/THLB_jan29.pdf