Appendix VI Timber Supply Analysis Report

CANADIAN FOREST PRODUCTS LTD.
NIMPKISH TREE FARM LICENCE 37
MANAGEMENT PLAN 8

TIMBER SUPPLY ANALYSIS REPORT

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98.08.17

Reference: 9640060.4.1

EXECUTIVE SUMMARY

The availability of timber on Canadian Forest Products (Canfor) Nimpkish Tree Farm Licence 37 (TFL 37) has been examined as part of Management Plan 8 (MP 8). The analysis evaluates how "current management" affects the supply of wood available for harvesting over the next 250 years. All analysis simulations were completed with CASH6, a computer simulation model that incorporates forest cover constraints to address non-timber resource needs. Four options plus a number of sensitivity analyses were completed to evaluate the availability of timber under various sets of assumptions.

The initial harvest rate was maintained at 1,068,000m3/year, the current AAC, plus non-recoverable losses of 3,165m3/year for all options. Minor declines of approximately 2% to 4% are required between years 11 and 110 in all analysis options. Following this period harvest levels increase by approximately 12% to 20% for the remainder of the 250-year planning horizon. This increase is possible because of the improved productivity expressed by managed stands established after the harvest of existing natural stands. Future managed stands, which have an estimated culmination MAI of 11.5m3/ha/year (area-weighted average), reach minimum harvest age more quickly than existing natural stands.

Simulation results indicate that the critical period for developing the short-term harvest rate is 40 to 70 years into the future. During this period the inventory of existing naturally established timber (stands that are both mature and currently between 35 and 100 years of age) is at a minimum and the harvest must be supported by managed second growth forest. Harvest levels in the early decades are dictated by the state of the forest during this period. Any increases in annual harvest during the first 100 years have to be balanced with at least an equivalent decline at some other time during that period.

Sensitivity analyses indicate that the timber supply is not significantly impacted by changes in forest cover requirements for green-up, old growth or maximum disturbance. Only in the Goshawk sensitivity analysis, where additional forest cover constraints were included for all eight nest sites, did the harvest decline below 1,000,000m3/year.

Changes to managed stand volumes and minimum harvest ages result in the most noticeable changes to the harvest rate during the first 100 years of the planning horizon. Reducing future managed stand yields by 10% or increasing future managed stand minimum harvest ages by 10 years forces a reduction of 10% in the short-term harvest compared to the MoF Base Case. Alternatively, increasing future managed stand volumes by 10% or reducing future managed stand minimum harvest ages by 10 years avoids any short-term decline in the harvest and improves the long-term harvest rate by up to 10% compared with the MoF Base Case.

Managing the future forest to specific product objectives permits an immediate increase in the annual harvest rate to 1,086,100m3/year and a further increase to 1,182,500m3/year after 15 decades. This increase is related to reducing managed stand minimum harvest ages.

Results of the timber supply analysis for TFL 37 support a proposed AAC of

1,068,000m3/year for the period of MP 8. The inventory information gathered for the forest resources on the TFL leave few uncertainties in the potential growth that is expected from the landbase. Requirements associated with the Vancouver Island Land Use Plan (VILUP) and Forest Practices Code (Code), and consideration for important wildlife have been addressed. Landscape level biodiversity objectives have been maintained by modelling old growth requirements at the LU-BEC/NDT level in the analysis.

A 20-Year Spatial Feasibility Analysis was also completed for the TFL using all of the landbase, growth and yield and management inputs associated with the non-spatial analysis options and sensitivities. Cutblock adjacency and silviculture green-up were also included to reflect additional operational requirements. This analysis also supports a harvest rate of 1,068,000m3/year for the period of MP 8. Cutblocks selected for harvest in the 20-Year Analysis are presented on the map included in the 20-Year Spatial Feasibility Analysis report.

A summary of the annual harvest schedules developed for the key timber supply analysis options are included in table 1.0.

Table 1.0 - TFL 37 MP8 - Timber Supply Analysis Harvest Schedules

Simulation Year	Annual Harvest by Scenario (m3/year)			
	MoF Base Case	Products-Based Silviculture[1]	Enhanced Incremental Silviculture[2]	VILUP+Addition of New Parks
1-10	1,068,000	1,086,100	1,068,000	1,089,400
11-20	1,048,900	1,086,100	1,052,700	1,089,400
21-30	1,034,200	1,086,100	1,052,700	1,089,400
31-40	1,034,200	1,086,100	1,052,700	1,089,400
41-50	1,034,200	1,086,100	1,052,700	1,089,400
51-60	1,034,200	1,086,100	1,052,700	1,089,400
61-70	1,034,200	1,086,100	1,052,700	1,089,400
71-80	1,034,200	1,086,100	1,052,700	1,089,400
81-90	1,034,200	1,086,100	1,052,700	1,089,400
91-100	1,034,200	1,086,100	1,052,700	1,089,400
101-110	1,034,200	1,086,100	1,166,400	1,089,400
111-120	1,034,200	1,086,100	1,264,200	1,153,400
121-130	1,172,100	1,086,100	1,264,200	1,216,800
131-140	1,172,100	1,086,100	1,264,200	1,216,800
141-150	1,172,100	1,086,100	1,264,200	1,216,800
151-250	1,172,100	1,182,500	1,264,200	1,216,800
Total	27,753,700	28,116,500	29,407,500	28,955,200

[1] - based on MoF Base Case
[2] - includes additional tree improvement only

Table of Contents

List of Figures

List of Tables

1.0 INTRODUCTION

This is the report of a timber supply analysis completed as part of the process for submission of Management Plan 8 (MP 8) for the Nimpkish Tree Farm Licence 37 (TFL 37)held by Canadian Forest Products Ltd. (Canfor). Timber supply is the quantity of timber available for harvest over time. The methodology includes use of a forest-level simulation model which predicts the development of a forest over a 250 year planning horizon given a description of initial forest conditions, expected patterns of growth, and a set of rules related to harvesting and regenerating the forest. In addition, management assumptions related to non-timber forest resources are included in the analysis process.

The Chief Forester of British Columbia uses results of the timber supply analysis and other considerations in determining the allowable annual cut (AAC) for the management unit. However, because of the dynamic nature of forest inventories, and improvements surrounding both the information used in analysis and future forest management objectives, these projections are not viewed as static or prescriptive. They remain relevant only as long as the information in them is current. TFL licensees are therefore required to re-evaluate timber supply every five years.

Timber supply analysis involves three main steps:
Collection and preparation of information and data. This information has been summarised and documented in the Timber Supply Analysis Information Package[1] (information package) which was accepted by MoF Timber Supply Branch, 98.03.12.
Using the data in CASH6, a computer forest estate model, to develop harvest forecasts. A number of sensitivity analyses are also conducted to test the impact of alternative inputs on timber supply during this step.
Interpretation and reporting of results.

2.0 DESCRIPTION OF LICENCE AREA

Canfor was granted TFL 37 in December 1960. TFL 37 is located on northern Vancouver Island at Nimpkish Lake in the Port McNeill Forest District. Western hemlock and Douglas-fir dominate the forests of TFL 37 with minor components of western redcedar and balsam. The landbase is distributed among the CWHvm, CWHxm and MHmm Biogeoclimatic Ecological Classification (BEC) subzones. Non-productive areas also include the AT zone.

Primary access to TFL 37 is from Highway 19 between Woss and Port McNeill. In addition, logging road access is also possible from Gold River on western Vancouver Island. Due to the long history of forestry activities on the landbase, there is excellent year-round access to most areas of the TFL. A railway system is used to transport logs from the various areas on the TFL to the log sort at Beaver Cove. The railway line runs from Vernon Lake to Beaver Cove.

[1] Appendix V of TFL 37 MP 8

3.0 DESCRIPTION OF OPTIONS

Four options were identified for analysis in MP 8 as listed below:

- MoF Base Case option includes many assumptions related to current management such as Forest Practices Code requirements, landscape level biodiversity, new parks and updated managed stand yields based on ecologically-based productivity assignments.
- Products-Based Silviculture Option reflects input from Canfor staff related to target log sizes and species preferences in order to meet future product expectations.
- Enhanced Incremental Silviculture Option considers the timber supply impacts of enhancing the level of incremental silviculture on TFL 37 by including productivity gains associated with second-generation tree improvement, spacing, and fertilisation.
- The Vancouver Island Land Use Plan (VILUP) Option reviews the impacts of the various management requirements and landbase designations associated with the Plan. Recommended biodiversity emphasis (old growth) was assigned to each Landscape Unit Biogeoclimatic Ecosystem Classification/ Natural Disturbance Type (LU-BEC/NDT) compared with the weighted average old growth requirement used in the MoF Base Case.

A fifth, Proposed Management Option was initially planned but not completed as other analysis options and sensitivity analyses provide a thorough review of timber supply issues on TFL 37.

In addition to the main options listed above, a number of sensitivity analyses were completed to evaluate the impacts of modified inputs on annual harvest. Sensitivity analyses were conducted for each of the main options. The information package describes inputs and assumptions for each of the options and sensitivity analyses.

4.0 INFORMATION PREPARATION

Many pieces of information are required to conduct a timber supply analysis. Each piece falls into one of three categories:
Landbase inventory.
Timber growth and yield.
Management practices.

4.1 Landbase Inventory

Landbase inventory information used in this analysis comes from Canfor's digital map database. The spatial data is managed using Geographic Information System (GIS) software. The digital database contains information for all areas within TFL 37 including those areas where harvesting is not expected to take place.

The net operable landbase, also called the working forest or timber harvesting landbase, consists of all the productive forest within the TFL that is, or will be, available for timber management over the long term. This landbase is determined by reducing the total landbase according to specified management assumptions. Complete details of the reductions made in developing the net operable landbase are provided in the information package. Table 4.1 summarises the landbase netdowns for the MoF Base Case option.

Table 4.1 - Timber Harvesting Landbase Determination - MoF Base Case

Land Classification	Total Area[1] (ha)	Net Reduction		Net Remainder	
		Area (ha)	Volume (1000s m^3)	Area (ha)	Volume (1000s m^3)
Total Area	188,745			188,745	77,176
New parks	11,422	11,422	5,348		
Non-prod forest & Non-forest	21,916	21,916	0		
Roads	2,223	1,626	304		
Non-commercial (NCBr)	175	175	0		
Productive Forest	153,607			153,607	71,524
Productive reductions:					
Physically inoperable	17,422	13,132	7,621		
RRZs & RMZ exclusions	5,841	5,053	2,298		
ESAs:					
Wildlife	6,328	5,385	4,396		
Campsites/Recreation	62	37	13		
Avalanche track	8,826	1,663	431		
Soils (Terrain V)	11,697	4,043	2,185		
Soils (Terrain IV)	32,192	2,381	1,264		
Regeneration(colluvium)	5,202	311	208		
NSR	541	480	0		
Wildlife tree patches	1,110	1,021	360		
Uneconomic forest	27,799	17,332	6,527		
Total Reductions		50,838	25,303		
Reduced landbase				102,768	46,221
Additions of NSR				480	0
Current Net Operable Landbase				103.248	46,221
Less future roads (3.5%)		2,168			
Long-term Net Operable Landbase				101,080	46,221

[1] Total area includes all non-park area for a given land classification within TFL 37

Figures 4.1 and 4.2 graphically present the distribution of land classification and current species distribution within the TFL 37 landbase.

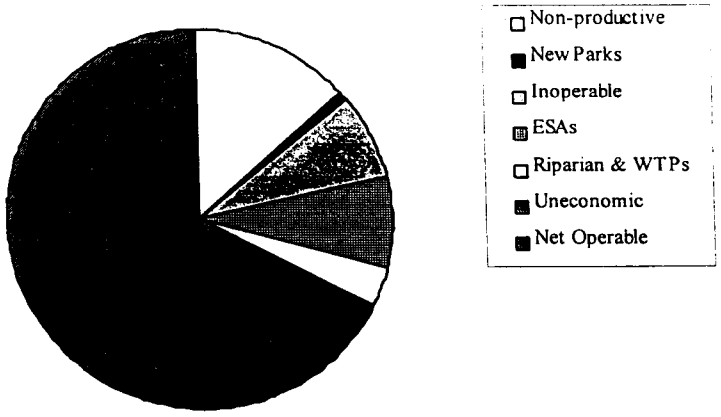

Figure 4.1 – Area Distribution by Land Classification

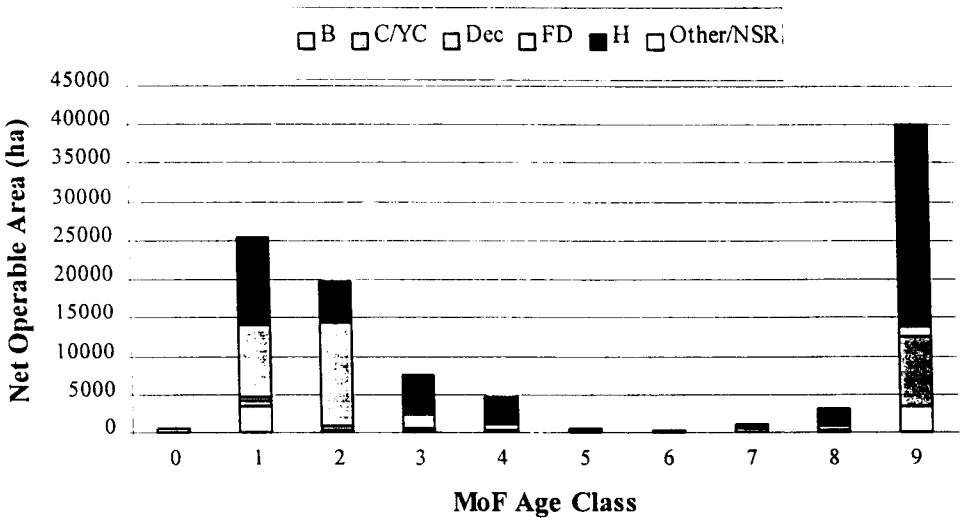

Figure 4.2 – Area Distribution by Species & MoF Age Class

4.2 Inventory Aggregation

In order to reduce the complexity of the forest description for the purposes of timber supply analysis simulation, aggregation of individual forest stands is necessary. However, it is critical that this aggregation does not obscure either the biological differences in forest stand productivity or differences in management objectives and prescriptions.

Three levels of aggregation were used in preparing the inventory for analysis:
Landscape Unit-Biogeoclimatic Ecological Classification/Natural Disturbance Types (LU-BEC/NDTs) were defined based on the Vancouver Island Resource Targets Technical Team's (VIRTT) recommended landscape units and MoF 1:250,000 BEC mapping. Landscape level biodiversity objectives were assigned to these broad landbase aggregates in the form of minimum old growth requirements. Eight LU-BEC/NDTs were created for the analysis.

Resource Emphasis Areas (REAs) are the areas with similar non-timber resource concerns. Visually sensitive areas, Goshawk fledgling and foraging areas, Low Intensity Areas (LIAs), General Forestry Areas (GFAs) and High Intensity Areas (HIAs) are the REAs included in the analysis database. Specific forest cover constraints related to green-up, disturbance and mature/old growth were assigned to each of the REAs based on management objectives. 24 REAs were defined for the analysis.

Analysis Units (AUs) were assigned to stands with similar biological (species composition and site productivity), management and/or silviculture regimes to model the growth of individual stands during the analysis process. Canfor Average Volume Lines (AVLs), natural stand yield tables and managed stand yield tables were used to represent the growth of the various stands on the TFL.

A complete description of the landbase aggregates listed above are provided in the information package.

4.3 Timber Growth and Yield

Timber growth and yield refers to the prediction of growth and development of individual forest stands over time. Stand volumes are estimated by using stand attributes (species composition, site productivity, density/crown closure and allowances for decadence) in various growth models.

Estimates for existing mature stands were based on Canfor's AVLs which were developed with approximately 1,500 plots established on stands across the TFL. Natural stands not included in the AVLs were modelled with the MoF Variable Density Yield Prediction model (VDYP version 6.4).

Existing managed stands (1 – 35 years old) and all future managed stand yields were estimated with the MoF model Table Interpolation Program for Stand Yields (TIPSY batch Version 1.3). A number of TIPSY yield tables were developed to address various levels of management of TFL 37.

Canfor is conducting a TEM project that includes an intensive review of site productivity for managed stands on the TFL. An associated study included field verification of ecosystem attributes and assigned SI50 based on leading species and ecological map units. This information has provided a much improved estimate of productivity in managed stands on TFL 37.

4.4 Management Practices

Timber supply is directly linked to forest management activities. In the MoF Base Case option the timber supply is investigated using many current management practices. Code requirements including riparian management zones and stand-level biodiversity, exclusions for deer and elk habitat, visual sensitivity requirements and landscape level biodiversity objectives were all included in the MoF Base Case.

Ecologically based silviculture strategies are incorporated into the Managed Stand Yield Tables (MSYT). Forest health and non-recoverable losses (NRLs - expected timber losses due to fire, pest, and wind damage) were included in all harvest simulations. These expected losses are added to the target harvest level during modelling.

Utilisation levels reflect close utilisation standards for coastal B.C. Minimum harvest age for the AVLs is 100 years. Natural and managed stand yield tables typically use the approximate age of culmination of mean annual increment (MAI) to establish minimum harvest age. In some cases however, minimum harvest age is based on the stand reaching a minimum volume or diameter.

Cutblock adjacency (in non-spatial analysis) and green-up objectives are addressed by including maximum disturbance limits and minimum green-up heights within each REA. Goshawk areas also include mature and mature plus old cover constraints in some of the analysis scenarios.

Including an old growth requirement (weighted 10% high-45% intermediate-45% low) from the Code's Biodiversity Guidebook ensures that landscape level biodiversity requirements are accounted for in the analysis. This methodology of using an average old growth requirement is based on MoF direction as outlined in the 97.12.01 memo from Timber Supply Branch. Alternative landscape level biodiversity strategies are evaluated in other options and sensitivity analyses. Full landscape level biodiversity objectives have been included in all analysis simulations. "Ramping up" of low emphasis old growth constraints was not included.

Harvest profile and other rules included in the MoF Base Case differ from the information package as follows:
Maintain the harvest profile of winter and summer areas for 40 years (20 years was stated in the information package).
Harvest oldest stands first as the first rule.
Harvest stands that maximises the increment of the regeneration as the second rule.

Recent inventory information was collected on TFL 37 for both timber and non-timber resources. Coupled with updated management guidelines, these non-timber resources can be more thoroughly addressed in timber supply analysis compared to previous analyses. Management concepts and guidelines will continue to evolve. Changes in these guidelines will be implemented in future analyses as they are introduced.

5.0 ANALYSIS METHODS

Timberline's timber supply simulation model CASH6 (Critical Analysis by Simulation of Harvesting) has been used to assess the long-term timber supply for TFL 37. A forest projection model such as CASH6 allows a harvest level to be imposed on a forest. The forest is grown according to a set of rules and age-based relationships. An analyst can determine if a chosen harvest level can be sustained or, by modifying some of the inputs, determine the timing, duration and nature of management programs required to sustain a given level of harvest.

The Timberline model has the ability to impose forest cover constraints on harvesting. There are up to three forest cover constraint classes:

Disturbance - the maximum area that can be younger than a specified age or below a specified minimum height. This is intended to model cutblock adjacency and green-up requirements at the management zone level and early seral requirements at the watershed level.
Mature Retention - the minimum area that must be as old, or older than a specified age. This class is an auxiliary to the Old growth Retention class is intended to model thermal cover for wildlife of mature seral stage requirements.
Old growth Retention - the minimum area that must be as old, or older than a specified age. This is intended to model both retention of cover and retention of old growth.

A variable degree of spatial resolution is available depending on inventory formulation and resource emphasis area definitions. Forest stands in refuges such as environmentally sensitive and inoperable areas that do not contribute to harvest can be included to better model forest structure and disturbance levels.

The model forecasts timber availability in periodic increments or periods (5 or 10 years). The main result of each analysis is a projection of the amount of future growing stock given a set of growth and yield assumptions, and a planned level of harvest and silviculture activities. Growing stock is characterised in terms of total merchantable volume, total mature volume (above minimum harvest age), and total available volume, which is the portion of growing stock which is above minimum harvest age and could be harvested without violating specified forest cover constraints. It is this latter stock level which determines the maximum volume which can be harvested during any period.

In CASH6 the existing state of the forest is assessed on input to the model. This initial state

impacts on all future activities and available timber. The existing forest may contain areas to which access is limited from the beginning of the planning horizon by virtue of the forest cover constraints assigned in the modelling process. This may be the outcome of assigning a set of cover constraints on a forest that has never been modelled under specific cover constraints in the past. In this situation, parts of the forest remain unavailable for harvest until such time that sufficient growth has taken place to achieve acceptable levels of green-up, disturbance, or retention. This is somewhat of a dilemma in landscape management, because it may involve the creation of a landscape condition that does not exist. Even if past management guidelines have been followed, the forest may be in violation of the new set of forest cover requirements.

The following objectives were used in developing harvest schedules during the modelling simulations:

- To sustain a harvest level as high as the current AAC of 1,068,000m3/year, which includes 43,184m3/year for SBFEP, plus 3,165m3/year of net non-recoverable losses.
- Decrease the periodic harvest rate in acceptable steps during the periods when declines are required to meet all objectives associated with the various resources on TFL 37.
- Achieve an essentially even-flow of timber that approaches the long-term sustainable level that considers forest cover requirements.
- Explore opportunities to increase the harvest rate by implementing management programmes while maintaining the requirements of non-timber resources.

In addition, forest cover requirements must be met within each of the LU-BEC/NDTs and REAs during each period of the 250 year planning horizon. If forest cover requirements are not satisfied, the harvest level may be forced to decline. This ensures that integrated resource management issues are properly addressed.

In previous timber supply analyses for TFL 37, forest cover constraints were not modelled explicitly with respect to disturbance, mature and old growth retention. Many of the non-timber resources were excluded in whole or in part from the working forest as either landbase exclusions, or as reductions to the harvest level developed *i.e.* non-recoverable losses. Changes in approaches to planning for integrated resource management and the modelling tools available have improved our understanding of analysis results, and the implications of input decisions.

6.0 ANALYSIS RESULTS

Results of the various analyses are presented in graphic and tabular form. Graphic results display trends in timber inventory (stock) and harvest levels. Tables provide the actual harvest levels achieved during each period of the simulation. All harvest levels reported are net of non-recoverable losses, estimated at 3,165m3/year.

6.1 MoF Base Case

Inputs for the MoF Base Case have been described briefly in the previous sections and in more detail in the information package. The results of this option are used as a benchmark for comparison to other options and sensitivity analyses.

Forest-level modelling can offer many possible solutions given various harvest flow strategies. A number of alternatives to harvest flow were developed in the MoF Base Case option for TFL 37,

as described below:

- Even-flow – establish the maximum harvest level that does not change over time regardless of timber availability.
- Non-declining – the harvest rate is set such that there are no declines in the annual rate, but there may be increases if additional volume becomes available.
- Maximum initial – increase the short-term harvest rate above the current AAC for the Licence and then follow a similar harvest flow to the Base Case.
- 3 Decades at Current – maintain the current AAC for three decades and then adjust the harvest rate as required for the remainder of the planning horizon.

Harvest Schedule

The MoF Base Case harvest schedule was chosen after reviewing the various harvest flow alternatives listed above. It was selected because of the smooth transition between periodic harvest levels and because of its ability to meet Canfor's management objectives in addition to addressing non-timber concerns in an acceptable manner. All harvest schedules developed for the MoF Base Case are summarised in Table 6.1.

Table 6.1 – MoF Base Case Harvest Schedules

Simulation Year	Annual Harvest by Scenario (m3/year)				
	MoF Base Case	Even-flow	Non-declining	Maximum Initial	Current AAC 30 years
1-10	1,068,000	1,039,400	1,039,200	1,179,800	1,068,000
11-20	1,048,900	1,039,400	1,039,200	1,179,800	1,068,000
21-30	1,034,200	1,039,400	1,039,200	1,065,300	1,068,000
31-40	1,034,200	1,039,400	1,039,200	963,600	1,041,300
41-50	1,034,200	1,039,400	1,039,200	963,600	1,041,300
51-60	1,034,200	1,039,400	1,039,200	963,600	1,041,300
61-70	1,034,200	1,039,400	1,039,200	963,600	1,013,900
71-80	1,034,200	1,039,400	1,039,200	963,600	1,013,900
81-90	1,034,200	1,039,400	1,039,200	1,075,300	1,013,900
91-100	1,034,200	1,039,400	1,039,200	1,075,300	1,013,900
101-110	1,034,200	1,039,400	1,039,200	1,075,300	1,013,900
111-120	1,091,700	1,039,400	1,143,200	1,075,300	1,093,700
121-250	1,172,100	1,039,400	1,162,900	1,175,300	1,174,100
Total	27,753,700	25,985,000	27,692,100	27,823,000	27,754,400

The harvest flows are also illustrated in Figures 6.1 and 6.2. In the MoF Base Case the current AAC is maintained for one decade with minor declines of 1.8% in year 11 and 1.4% in year 21. After year 110 the harvest rate rises considerably for the remainder of the 250-year planning horizon.

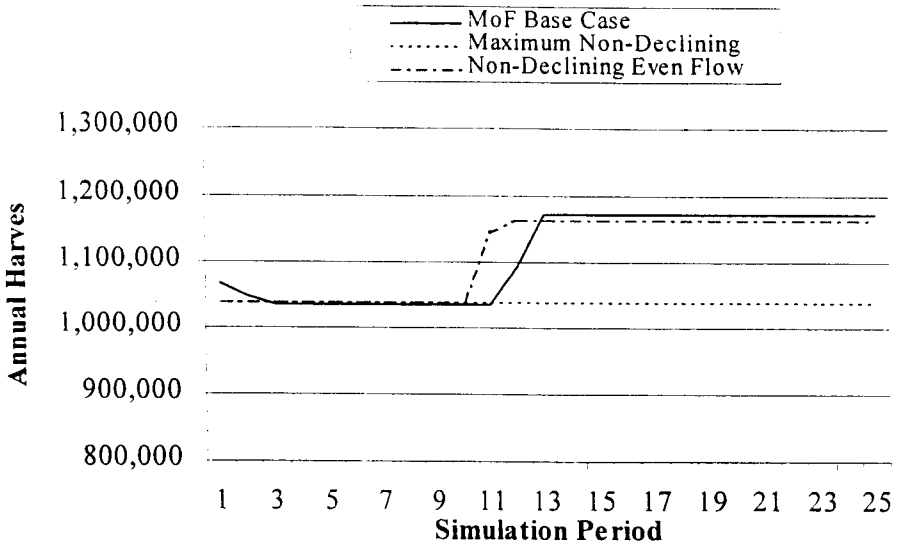

Figure 6.1 – MoF Base Case Even Flow Harvest Levels

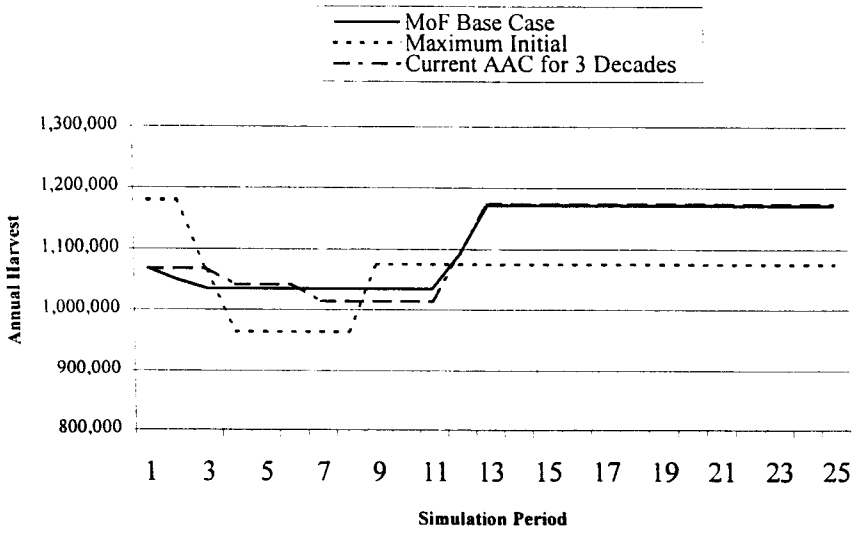

Figure 6.2 – Short Term Alternatives to MoF Base Case Harvest Flow

The annual harvest and inventory levels for the MoF Base Case are presented graphically in Figure 6.3. Inventory levels are associated with the net operable landbase only.

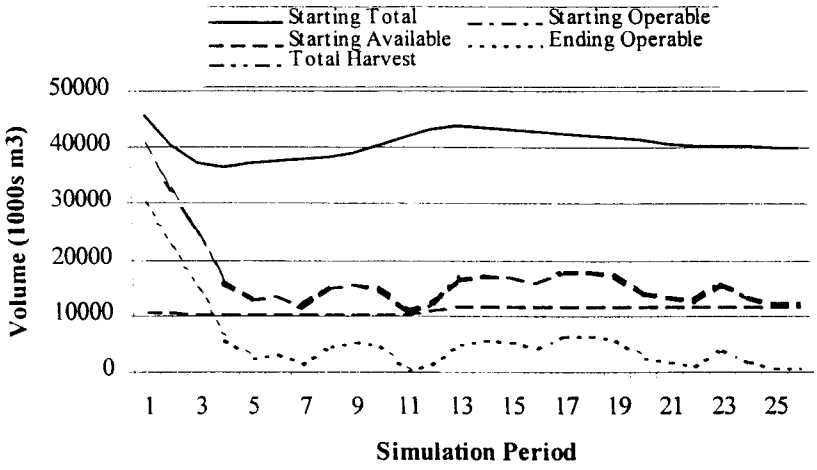

Figure 6.3 – MoF Base Case Inventory and Harvest Levels

Timber Availability

The existing inventory of mature timber on TFL 37 is approximately 40 million cubic metres. Short term harvesting utilises this inventory until existing and future managed stands become available. The key factors influencing the short-term harvest rate are:

1. The amount of mature timber on the TFL.
2. The timing of the availability of managed stands for harvest.

There is a fixed volume of existing mature and unmanaged second growth on the TFL. Most of the available component of this inventory is harvested during the first 60 years of the simulation. Unmanaged second growth stands were established naturally after harvest 40 to 90 years ago and may not have the same high volumes as managed stands. In decades 4 and 5 the average volume of harvested stands declines, as these second growth stands comprise more of the annual harvest as shown in Figure 6.4.

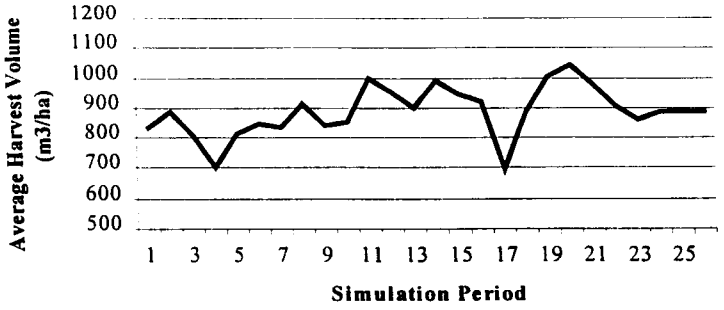

Figure 6.4 – MoF Base Case Average Harvest Volume/ha

Any increases in the short-term harvest need to be followed by at least an equivalent harvest reduction at some other time during the first 110 years of the simulation. The Maximum Initial and Current AAC for 30 Years scenarios demonstrate this condition. Alternatively, if the early

harvest rate is reduced, any further reductions are less significant as noted in the Even-Flow and Non-Declining scenarios.
The critical period for determining the short-term harvest level occurs 50 to 70 years into the future at which time managed stands are required to make up a significant portion of the annual harvest. Figure 6.5 presents the percent of area in managed over time and percent of merchantable area over the minimum harvest age.

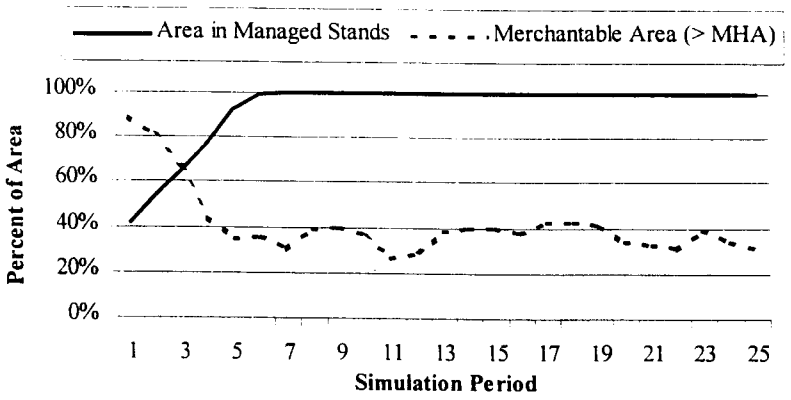

Figure 6.5 – Percent Area in Stands Over Time

The timing of managed stands contributing to the periodic harvest is verified by the significant reduction in the average age of harvested stands between the first and sixth decades as summarised in Table 6.2.

Table 6.2 – MoF Base Case Average Age of Harvested Stands

Decade	Average Age of Harvested Stands (years)
1	295
2	283
3	231
4	232
5	128
6 - 25	72 - 88

Even though the average age of stands harvested in the first three decades is approximately three times older than the stands harvested from decade six onwards, the average volume per hectare generally increases over time with the exception of decade 17 (see Figure 6.4). This demonstrates the productive capability of the TFL 37 landbase when silviculture programmes are carried out and improved estimates of site productivity are included. In addition, managed stands typically have much less decay and waste compared with mature natural stands.

The mid-term harvest rate of 1,034,200m3/year is maintained between years 21 and 110 of the simulation. Between years 50 and 120, managed stands comprise the majority of the annual harvest and second growth stands are harvested very soon after reaching minimum harvest age.

At year 120 the available inventory reaches another low point (see Figure 6.3). Between years 100 and 120 managed stands provide lower per hectare volumes to the annual harvest which

prevents the annual harvest rate from increasing above the demonstrated level. In addition, the next generation of managed stands has not quite reached minimum harvest age and cannot yet contribute to the mid-term harvest. Similar low points in the available inventory occur approximately every 40 to 50 years throughout the planning horizon.

Beyond year 120 the inventory of managed stands improves and the harvest rate increases to the long-term level of 1,172,100m3/year. This increase of approximately 10% over the current AAC is primarily due to reduced managed stand harvest ages. This increase is also a result of an improved understanding of the productivity from those managed stands which was not recognised in previous timber supply analyses for TFL 37.

Forest Cover Requirements

Forest cover requirements related to REA disturbance and green-up do not significantly constrain the harvest schedule at any time during the planning horizon. Only in a few cases does the disturbance level reach the maximum permitted. The Woss-Zeballos LIA (REA 54) and Tsitika GFA (REA 61) reach maximum disturbance limits during periods 3 and 4. Other smaller REAs reach maximum disturbance limits on a very infrequent basis, but these areas only make up a very small component of the timber harvesting landbase.

Generally, old growth requirements are met with old stands from outside the timber harvesting landbase, except for the Nimpkish CWHxm/NDT2 unit. This unit reserves up to 25% of the old growth requirement (approximately 486 ha) from within the timber harvesting landbase during the first 70 years of the analysis simulation. Beyond year 71 sufficient area greater than 250 years old from outside of the timber harvesting landbase satisfies the old growth requirement. Consequently, there are no further restrictions on harvesting due to old growth requirements in this or any other LU-BEC/NDT beyond year 71. This demonstrates that the considerable netdowns to the productive forest landbase to address management for non-timber interests (33% of the productive forest) play a significant role in developing the harvest schedule.

Table 6.3 summarises the state of the forest with respect to seral stage distributions. Biodiversity emphasis is based on seral stage distributions weighted 45% low, 45% intermediate and 10% high for each LU-BEC/NDT. The early and mature+old seral stages were monitored rather than enforced in the MoF Base Case analysis. Old growth requirements were enforced.

Table 6.3 – MoF Base Case Seral Stage Compliance

LU-BEC/NDT	Seral Stage & Biodiversity Guidebook Requirement & Compliance		
	Code Guidebook Requirement (45-45-10)	Number of Decades Meeting or Exceeding Requirement	Number of Decades Not Meeting Requirement & Lowest Non-Compliance
Early (% < 40 years)			
1 Nimpkish–CWHvm/NDT1	61	25	0
2 Nimpkish – CWHxm/NDT2	64	25	0
3 Nimpkish – MH/NDT1	57	25	0
4 Tsitika-CWHvm/NDT1	61	25	0
5 Tsitika-MH/NDT1	57	25	0
6 Woss Vernon–CWHvm/NDT1	61	25	0
7 Woss Vernon–CWHxm/NDT2	64	24	1 74%
8 Woss Vernon–MH/NDT1	57	25	0

LU-BEC/NDT	Seral Stage & Biodiversity Guidebook Requirement & Compliance		
	Code Guidebook Requirement (45-45-10)	Number of Decades Meeting or Exceeding Requirement	Number of Decades Not Meeting Requirement & Lowest Non-Compliance
Mature+Old (% > 80/120years)			
1 Nimpkish–CWHvm/NDT1	30	25	0
2 Nimpkish – CWHxm/NDT2	28	7	18 27%
3 Nimpkish – MH/NDT1	30	25	0
4 Tsitika-CWHvm/NDT1	30	25	0
5 Tsitika-MH/NDT1	30	25	0
6 Woss Vernon–CWHvm/NDT1	30	25	0
7 Woss Vernon–CWHxm/NDT2	28	2	23 16%
8 Woss Vernon–MH/NDT1	30	25	0
Old growth (% > 250 years)			
1 Nimpkish–CWHvm/NDT1	14	25	0
2 Nimpkish – CWHxm/NDT2	9	25	0
3 Nimpkish – MH/NDT1	20	25	0
4 Tsitika-CWHvm/NDT1	14	25	0
5 Tsitika-MH/NDT1	20	25	0
6 Woss Vernon–CWHvm/NDT1	14	25	0
7 Woss Vernon–CWHxm/NDT2	9	25	0
8 Woss Vernon–MH/NDT1	20	25	0

As noted in Table 6.3, 21 of the 24 seral stages evaluated in the analysis meet Biodiversity Guidebook seral stage recommendations during the planning horizon. Only the mature plus old, CWHxm/NDT2 units exhibited any noticeable deficiency in seral stage requirements. This is mainly due to the history of harvesting activity in this unit and the fact that over 75% of the productive forest within the unit is available for harvest.

Age Class Distributions

Figures 6.6 (i – vi) display the age class distribution for both the net operable forest and non-contributing forest at various times during the 250 year planning horizon. Productive forest areas from outside TFL 37 are included in these age class distributions. These outside areas are within the boundaries of TFL 39 and Schoen Lake Park.

The initial age class distribution shows a large gap between age classes 5 and 25. This represents the area of stands between 50 and 250 years of age (note that age class 27 includes all stands 271 years+). The absence of available timber in these age classes limits the short-term harvest to that demonstrated for the MoF Base Case.

Approximately 57% of the total productive forest is at least 251 years old at year 0 of the simulation. This contributes significantly towards satisfying landscape level biodiversity objectives. The component of old growth associated with non-contributing forest is maintained throughout the planning horizon.

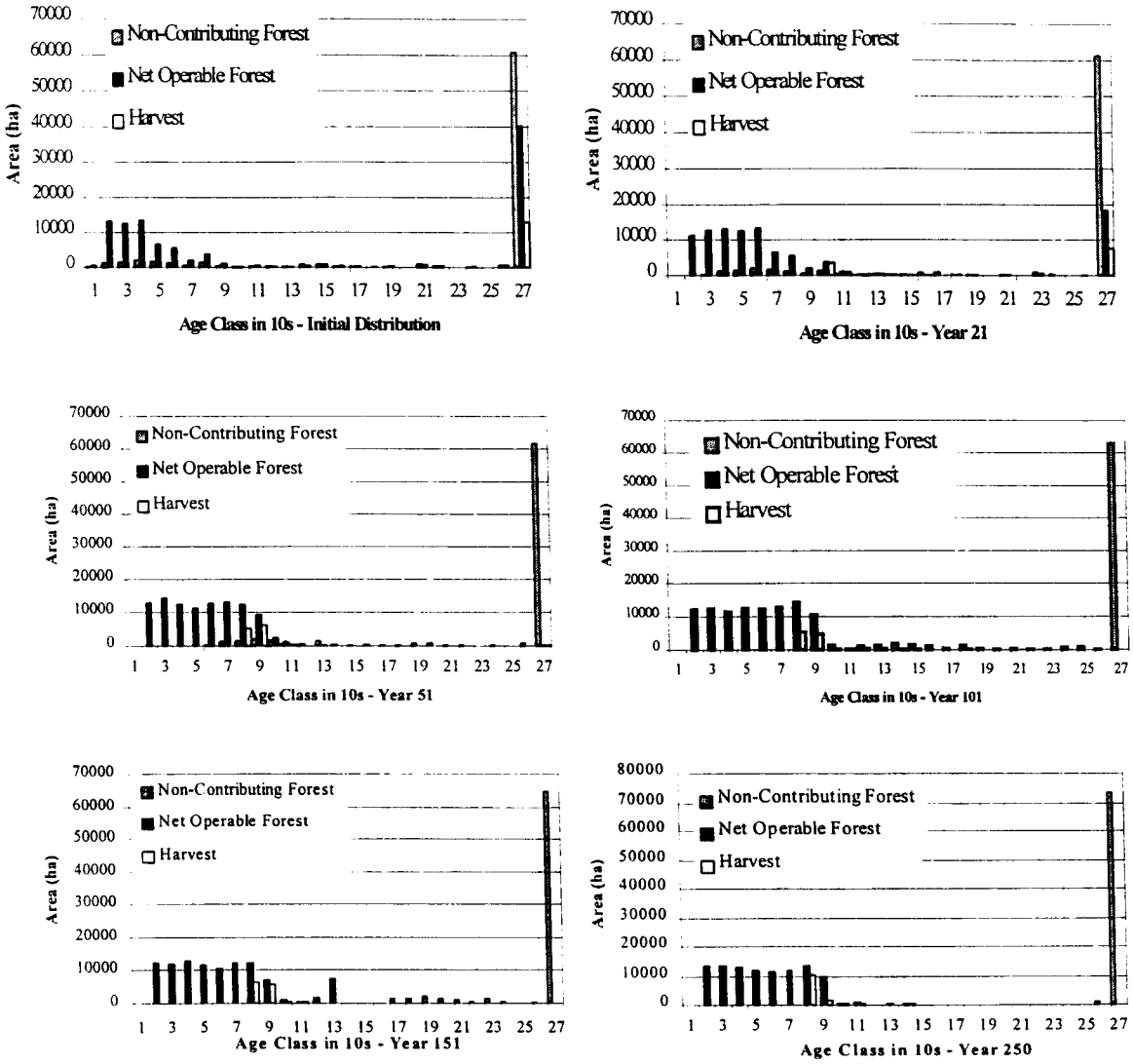

Figure 6.6 (iii – vi) – Age Class Distributions over Time

Most of the early harvest is drawn from stands at least 250 years of age. As discussed earlier, the availability of young stands, currently between 1 and 40 years of age, is critical to the short and mid-term timber supply.

The MoF Base Case results indicate that the inventory of older stands is harvested prior to the immature natural and managed stands reaching minimum harvest age. There is always a surplus of old growth however, due to the large area of old timber in permanent reserve.

By simulation year 51 the net operable forest approaches a balanced age class distribution among stands less than 100 years old. Because the harvest level is mostly dictated by the timing of young stands becoming merchantable rather than by forest cover objectives, there is very little net operable forest retained in ages 110 to 250 years of age. At year 151 an accumulation of timber

between 90 and 130 years of age representing slower growing managed stands that have the oldest minimum harvest ages is present. This timber is required to support the harvest during the later decades as the low point in the total inventory is repeated.

At the end of the modelling simulation all of the non-contributing areas have reached old growth status. The harvest is drawn almost exclusively from stands less than 100 years of age as there is an insignificant amount of area between ages 120 and 250 years. This is common of coastal forests that have predominantly very old and younger stands.

6.1.1 MoF Base Sensitivity Analysis

The following section summarises the results of the various sensitivity analyses completed for the MoF Base Case option. The sensitivity analyses are grouped into three categories:

- Landbase revisions.
- Growth and yield adjustments.
- Management considerations and forest cover constraints.

6.1.1.1 Landbase Sensitivity Analyses

Table 6.4 summarises the results of the modelling simulations for landbase revision sensitivity analyses.

Table 6.4 – Landbase Sensitivity Analysis Harvest Schedules

Simulation Year	Annual Harvest by Scenario (m3/year)			
	MoF Base Case	Add Uneconomic	Remove Marginally Economic	Remove Technically Unconventional
1-10	1,068,000	1,068,000	1,068,000	1,052,400
11-20	1,048,900	1,068,000	954,200	944,200
21-30	1,034,200	1,051,000	954,200	944,200
31-40	1,034,200	1,051,000	954,200	944,200
41-50	1,034,200	1,051,000	954,200	944,200
51-60	1,034,200	1,051,000	954,200	944,200
61-70	1,034,200	1,051,000	954,200	944,200
71-80	1,034,200	1,051,000	954,200	944,200
81-90	1,034,200	1,051,000	954,200	944,200
91-100	1,034,200	1,051,000	954,200	944,200
101-110	1,034,200	1,051,000	954,200	944,200
111-120	1,091,700	1,115,800	1,063,300	1,041,900
121-250	1,172,100	1,199,200	1,125,100	1,117,500
Total	27,753,700	28,300,400	26,299,600	26,063,800

Changes to the amount of available mature timber impacts on the short-term supply. If mature timber reductions are introduced there is less volume available for the first 40 years prior to any managed stands becoming available for harvest and a reduction in harvest level is necessary. Alternatively, increasing the available mature timber results in an improvement to the short-term harvest rate. Long-term harvest levels are typically proportional to the average productivity of the area loss or gain. Canfor intends to continue harvesting in the marginally economic and technically unconventional areas. As markets permit they will also consider harvesting in stands currently designated uneconomic.

Sensitivity to Adding Uneconomic Stands

Adding 3,169ha of stands classified as uneconomic allows the current AAC to be maintained for 10 years longer than in the MoF Base Case. There is still a required drop of approximately 1.5% during the same mid-term period until year 110. These stands have lower volumes than other mature stands, only 289m^3/ha on average, so they contribute less than the average stand within the MoF Base Case mature inventory. In the long-term the increase over the MoF Base Case harvest level is in proportion to the product of the average productivity of the uneconomic areas and the area in hectares that they occupy.

Sensitivity to Removing Technically Inoperable Areas

Technically inoperable areas require unconventional harvesting systems such as helicopter or similar aerial systems. Excluding these areas, 6,998ha (7%) of the net operable forest, results in declines throughout the planning horizon. In this sensitivity a 10% drop in harvest rate is required after maintaining the current AAC for 10 years. This harvest flow is consistent with the stated objectives of limiting changes to approximately 10% between decades. The long-term rate is approximately 4% lower than in the MoF Base Case. This indicates that the sites occupied by technically unconventional areas are of lower productivity on average than the stands remaining in the net operable landbase.

Sensitivity to Removing Marginally Economic Areas

In this simulation 8,493ha of mature timber designated as marginally economic are removed from the timber harvest landbase. The current AAC cannot be maintained in this sensitivity without having a more noticeable reduction in the mid-term harvest level. Therefore a drop of approximately 1.5% is required in the first decade of the simulation with a further drop of 10% to the mid-term level. As noted with the Remove Technically Unconventional sensitivity the long-term harvest rate is reduced by only 5% even though the area lost represents approximately 8% of the net operable landbase. Again this is the result of stands of lower productivity being lost from the net operable landbase in this scenario. Figure 6.7 presents the harvest over time for the landbase sensitivity analyses.

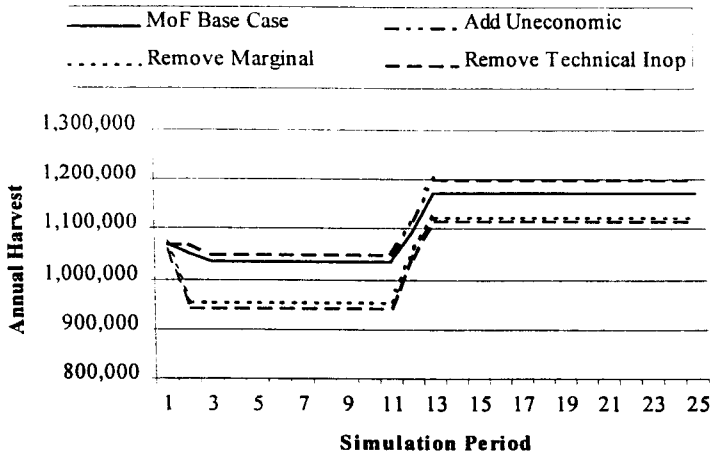

Figure 6.7 – Landbase Sensitivity Harvest Flow

6.1.1.2 Growth & Yield Sensitivity Analyses

A number of sensitivity analyses were completed in which modifications were made to growth and yield inputs including:

- Regeneration delay.
- Managed stand yield table (MSYT) minimum harvest age.
- MSYT volume.

The existing mature component of the inventory was not adjusted in these sensitivity analyses because the majority of these stands are assigned to Canfor AVLs which are based on a significant number of local plots for each stratum identified. In addition, the small component assigned to VDYP natural stand yield tables accounts for only about 15% of the net operable landbase and changes to these stands would not significantly alter the harvest schedules developed in the MoF Base Case. Table 6.5 summarises the results of the modelling simulations for growth and yield adjustment sensitivity analyses.

Table 6.5 – Growth & Yield Sensitivity Analysis Harvest Schedules

Simulation Year	Annual Harvest by Scenario (m3/year)						
	MoF Base Case	Regeneration Delay		MSYT Min Harvest Age		MSYT Volume	
		0 Years	2 Years	+10 Years	-10 Years	-10%	+10%
1-10	1,068,000	1,068,000	1,068,000	928,900	1,090,600	1,068,000	1,068,000
11-20	1,048,900	1,048,900	1,048,900	928,900	1,090,600	1,014,600	1,068,000
21-30	1,034,200	1,038,500	1,017,200	928,900	1,090,600	965,800	1,068,000
31-40	1,034,200	1,038,500	1,017,200	928,900	1,090,600	965,800	1,068,000
41-50	1,034,200	1,038,500	1,017,200	928,900	1,090,600	965,800	1,068,000
51-60	1,034,200	1,038,500	1,017,200	928,900	1,090,600	965,800	1,068,000
61-70	1,034,200	1,038,500	1,017,200	999,500	1,090,600	965,800	1,068,000
71-80	1,034,200	1,038,500	1,017,200	999,500	1,090,600	965,800	1,068,000
81-90	1,034,200	1,038,500	1,017,200	999,500	1,090,600	965,800	1,196,200
91-100	1,034,200	1,038,500	1,017,200	1,013,700	1,090,600	965,800	1,196,200
101-110	1,034,200	1,038,500	1,017,200	1,013,700	1,150,100	965,800	1,196,200
111-120	1,091,700	1,118,400	1,085,800	1,013,700	1,150,100	965,800	1,196,200
121-130	1,172,100	1,189,500	1,165,000	1,124,100	1,150,100	1,049,100	1,289,400
131-140	1,172,100	1,189,500	1,165,000	1,168,300	1,150,100	1,049,100	1,289,400
141-250	1,172,100	1,189,500	1,165,000	1,168,300	1,150,100	1,049,100	1,289,400
Total	27,753,700	28,045,300	27,502,500	26,756,700	28,157,500	25,378,900	30,091,000

As demonstrated by this set of analysis runs, the availability of managed stands for harvest is critical to the timber supply on TFL 37. Any change in the time required for managed stands to reach minimum harvest age results in a modified harvest schedule. Similarly, adjusting managed stand volumes changes the harvest level developed in the MoF Base Case.

Sensitivity to Changes in Regeneration Delay

Reducing regeneration delay to zero makes a minor improvement in the harvest schedule. However, for such a small adjustment to analysis inputs to make any difference to the harvest schedule indicates the importance of the input to timber supply. The long-term harvest rate is 1.5% higher than in the MoF Base Case.

Alternatively, increases to regeneration delay result in decreased harvest rates. An increase to two years causes a mid-term reduction of approximately 1.5% compared to the MoF Base Case. There is less than a 1% difference in the long-term harvest rate. Increasing regeneration delay

impacts negatively on the harvest for two reasons:

- Areas take longer to reach minimum harvest age.
- Harvested areas take longer to reach minimum green-up height.

Therefore increasing regeneration delay has a more significant impact than increasing minimum harvest age for a given area.. Canfor's success in establishing regeneration after harvest indicates that regeneration delay will not likely exceed the MoF Base Case and might reach an average of 0 years in the future.

Sensitivity to Changes in MSYT Minimum Harvest Age

Increasing MSYT minimum harvest age by 10 years has a more significant impact on the harvest schedule compared with increased regeneration delays. The MoF Base Case initial harvest rate of 1,068,000m^3/year cannot be sustained in this scenario without having a significant drop in harvest after year 10. The short and mid-term harvest is 3 – 13% below that of the MoF Base Case. There is virtually no difference in the long-term harvest between this scenario and the MoF Base Case. This is because not all stands are harvested as soon as they reach minimum harvest age in the later decades of the simulation. In the short and mid-term, managed stands are harvested as soon as they become merchantable in both simulations.

Reducing MSYT minimum harvest age by 10 years improves the short and mid-term harvest levels by as much as 5%. It is important to note that there is no mid-term decline in this scenario compared with the MoF Base Case. In addition, the rise to the long-term harvest level occurs 20 years earlier in this scenario. The long-term harvest rate is slightly lower than in the MoF Base Case because the harvested stands are providing less volume at minimum harvest age. Harvesting of managed stands begins in year 51, as in the MoF Base Case. However, 7,130,000m3 of managed stand volume are harvested between years 51 and 60 in this sensitivity compared to 4,768,000m3 in the MoF Base Case during the same decade. The Products-Based Silviculture option examines MSYT minimum harvest ages that are likely to be reduced in future to meet log product objectives.

Sensitivity to Changes in MSYT Volume

Reducing managed stand volumes by 10% does not significantly impact the short-term harvest rate until year 21. At that point the harvest is approximately 7% below that of the MoF Base Case. Although volumes are reduced the minimum harvest ages were not changed from the MoF Base Case. Therefore the harvest reduction is not as immediate or significant as increasing minimum harvest age for these stands. The long-term harvest rate is 10% below that of the MoF Base Case, equivalent to the drop in volume for long-term stands.

Increasing managed stands volumes by 10% improves the harvest rate by 3% in the mid-term and 10% in the long-term. The full impact of improving the yields from these stands is realised in this scenario. Figure 6.8 illustrates the harvest rate over time for some of the growth and yield sensitivity runs.

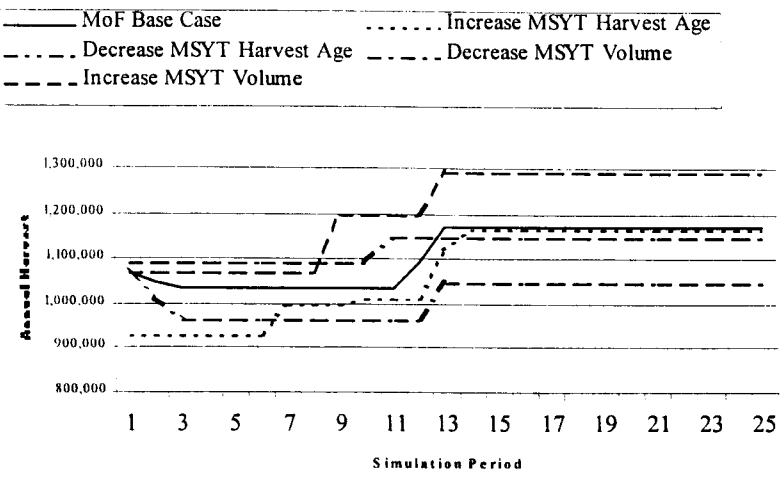

Figure 6.8 – Growth & Yield Sensitivity Harvest Flow

6.1.1.3 Management Considerations Sensitivity Analysis

Management considerations include landscape level biodiversity, wildlife management and inclusion of the 20-Year Plan. The information package indicated that old growth requirements would be modified to Biodiversity Guidebook "low emphasis biodiversity" levels. This scenario was not completed, as there is minimal difference compared to the MoF Base Case old growth requirements. The VILUP-recommended old growth requirements are considered in the VILUP option. Table 6.6 summarises the harvest schedule results for variations in Goshawk management intensities.

Table 6.6 – Management Considerations Sensitivity Analysis Harvest Schedules

Simulation Year	Annual Harvest by Scenario (m3/year)		
	MoF Base Case	Goshawk Mgmt – 2 Nest Sites	Goshawk Mgmt – 8 Nest Sites
1-10	1,068,000	1,068,000	1,002,400
11-20	1,048,900	1,005,600	953,300
21-30	1,034,200	1,005,600	953,300
31-40	1,034,200	1,005,600	953,300
41-50	1,034,200	1,005,600	953,300
51-60	1,034,200	1,005,600	953,300
61-70	1,034,200	1,005,600	953,300
71-80	1,034,200	1,005,600	953,300
81-90	1,034,200	1,005,600	953,300
91-100	1,034,200	1,005,600	953,300
101-110	1,034,200	1,005,600	953,300
111-120	1,091,700	1,065,800	953,300
121-130	1,172,100	1,143,200	1,056,700
131-250	1,172,100	1,143,200	1,114,300
Total	27,753,700	27,051,400	25,917,000

Sensitivity to Changes in Management Considerations for Goshawk

The forest management requirements for Queen Charlotte Goshawk habitat are still being developed. A set of habitat objectives is defined for each nest site as summarised in the information package.

There is a reduction in the availability of mature timber when additional forest cover constraints are assigned to Goshawk foraging areas and post-fledgling areas. These additional constraints affect mature plus old and old growth components of the forest. Therefore the short-term harvest level is negatively impacted.

Imposing Goshawk forest cover requirements on two nest sites reduces the harvest rate by approximately 2.5% after the first decade, compared to the MoF Base Case. Unlike the MoF Base Case harvest schedule, which is driven mainly by the availability of managed stands reaching minimum harvest age, this scenario is limited by the requirement to reserve additional mature and old growth stands to satisfy Goshawk habitat needs.

When all eight nest sites are assigned the additional forest cover constraints the harvest level declines by 6% to 8% in the short-term and 5% in the long-term, compared to the MoF Base Case. The current AAC of 1,068,000m3/year cannot be achieved in the first decade without more substantial declines in years 11 to 110.

The Goshawk nest sites are surrounded by stands within the net operable forest that play a significant role in meeting forest cover objectives. On average, 75% of the forest area associated with Goshawk nest sites falls within the net operable landbase.

Many of the REAs associated with Goshawk nest sites do not meet the prescribed forest cover objectives at the beginning of the harvest simulation. These areas must therefore recruit mature and old growth areas from within the net operable landbase to ensure that forest cover requirements for Goshawk are satisfied later in the planning horizon. As a result of this recruiting, harvesting of some stands within Goshawk habitat is delayed until late in the planning horizon, in some cases until year 211. In the MoF Base Case all of the Goshawk REAs contribute to the harvest during the first period of the simulation. Goshawk management guidelines are not yet available for the area and therefore the specific impact on timber supply is not known at this time. Figure 6.9 provides the harvest rate for the Goshawk sensitivity runs.

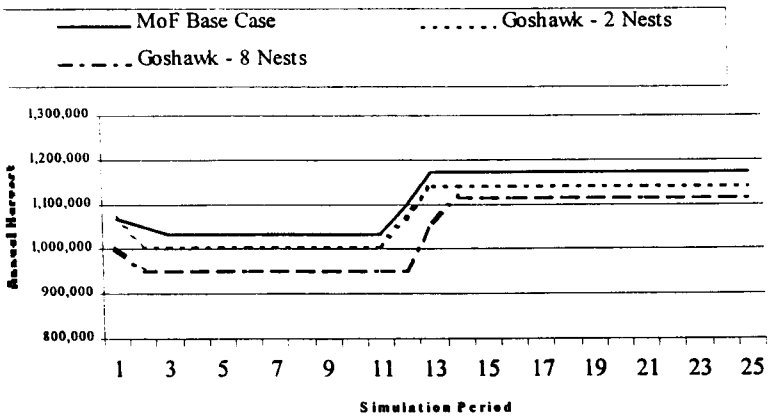

Figure 6.9 – Goshawk Management Harvest Flow

Sensitivity to Changes in Disturbance and Green-up

Several alternative disturbance and green-up forest cover constraints were evaluated in this group of sensitivity analyses. Table 6.7 summarises the harvest schedule results for these sensitivity analyses.

Table 6.7 – Forest Cover Constraint Sensitivity Analysis Harvest Schedules

Simulation Year	Annual Harvest by Scenario (m3/year)					
	MoF Base Case	Maximum Disturbance		REA Green-up Ht (non Visual 1 & 2 REAs)		
		Increase	Decrease	HIA 1m GFA 3m	HIA 1m GFA 2m	HIA 1m GFA 1m
1-10	1,068,000	1,068,000	1,068,000	1,068,000	1,068,000	1,068,000
11-20	1,048,900	1,051,900	1,039,000	1,049,900	1,049,900	1,049,900
21-30	1,034,200	1,036,500	1,024,300	1,035,000	1,035,000	1,035,000
31-40	1,034,200	1,036,500	1,024,300	1,035,000	1,035,000	1,035,000
41-50	1,034,200	1,036,500	1,024,300	1,035,000	1,035,000	1,035,000
51-60	1,034,200	1,036,500	1,024,300	1,035,000	1,035,000	1,035,000
61-70	1,034,200	1,036,500	1,024,300	1,035,000	1,035,000	1,035,000
71-80	1,034,200	1,036,500	1,024,300	1,035,000	1,035,000	1,035,000
81-90	1,034,200	1,036,500	1,024,300	1,035,000	1,035,000	1,035,000
91-100	1,034,200	1,036,500	1,024,300	1,035,000	1,035,000	1,035,000
101-110	1,034,200	1,036,500	1,024,300	1,035,000	1,035,000	1,035,000
111-120	1,091,700	1,094,700	1,083,500	1,092,700	1,092,700	1,092,800
121-250	1,172,100	1,175,100	1,156,800	1,172,800	1,172,800	1,172,900
Total	27,753,700	27,819,400	27,447,600	27,772,000	27,772,000	27,773,400

Sensitivity to Changes in Maximum Disturbance

In the Increase Maximum Disturbance scenario, REA disturbance was increased to a "3-pass" approach for most areas (maximum 33% < 3 metres) or up one level for visually sensitive areas (visual 1 to visual 2, *etc.*). There was virtually no difference in the periodic harvest rate (< 0.5%) compared with the MoF Base Case at any time. Similarly, decreasing the maximum disturbance limit to simulate a "5-pass" system (maximum 20% < 3 metres) or increasing visually sensitive areas (visual 2 to visual 1 *etc.*) there was less than 1% difference in the harvest rate developed for the MoF Base Case. These results confirm that maximum disturbance is not a crucial element in determining the harvest potential from TFL 37.

Sensitivity to Changes in REA Green-Up Height

A number of alternative green-up height requirements were assigned to the Nimpkish HIA and the Tsitika and Woss-Vernon GFAs for this series of analyses. As noted for the maximum disturbance adjustments, these changes to green-up height had no impact on the harvest rate at any time during the planning horizon compared to the MoF Base Case. This is because managed stands achieve green-up in a short time (*i.e.* many in less than 10 years) because of the high productivity of the landbase. More important is the timing of managed stands reaching minimum harvest age. It is expected that green-up on the Nimpkish HIA will be lower than 3.0m and this will provide and improved harvest potential for the TFL. This is also noted in the 20-Year Spatial Analysis scenario.

Sensitivity to Incorporating the 20 Year Plan

As an alternative to the typical 20-year plans included in management plan submissions a spatial timber supply analysis was conducted for TFL 37. In addition to the landbase netdowns, growth and yield assumptions and management considerations included for the MoF Base Case option,

cutblocks were identified and included in the landbase. The majority of the cutblocks were designed by Canfor engineers and covered the mature and older immature stands. Additional cutblocks were designed in the GIS environment based on similar age categories. These cutblocks were then added to the analysis database and allowed cutblock adjacency and silviculture green-up rules to be included in analysis simulation.

The spatial analysis is not intended to represent an operational plan but it does provide one possible solution to locating the harvest on the ground. A full report of results of the spatial analysis is provided in the *20-Year Spatial Feasibility Analysis Report*[2]. The results provide an important link between the harvest schedule developed in the non-spatial analyses and operational planning which requires specific harvest locations on an annual basis. Results of the 20-Year Spatial Analysis are then mapped to identify which cutblocks are harvested during each 5-year period of the simulation. Table 6.8 summarises the results of the 20-Year Spatial Analysis scenarios. Note that 5-year simulation periods were used in the 20-Year Spatial Analysis. The total planning horizon was 20 years.

Table 6.8 – 20-Year Spatial Analysis Harvest Schedules

Simulation Year	Annual Harvest by Scenario (m3/year)			
	MoF Base Case (non-spatial)	MoF Base Case Spatial	HIA 2.25m Green-up	Enhanced Silviculture 3.0m Green-up
1-5	1,068,000	1,068,000	1,068,000	1,068,000
6-10	1,068,000	1,068,000	1,068,000	1,068,000
11-15	1,048,900	1,020,200	1,048,900	1,048,900
16-20	1,048,900	1,020,200	1,048,900	1,048,900

The results indicate that the initial harvest level of 1,068,000m^3/year (the current TFL 37 AAC) developed for the MoF Base Case non-spatial analysis option can be carried for at least 5 years in all of the 20-Year Analysis scenarios. A reduction of 4.5% between the first and second periods in the MoF Base Case spatial analysis is required to meet the 3.0m silviculture green-up requirements. All other forest cover requirements are met during all periods of the spatial analyses as they were in the non-spatial analysis.

The mapped result, provided in Appendix I of the *20-Year Spatial Feasibility Analysis Report,* shows the location of the blocks selected for harvest by the model in each of the 5-year periods. Additionally, recent harvesting and the remaining forest landbase are identified on the map. Again, some of the cutblocks may not have boundaries, shapes or sizes of true operational blocks but this analysis is not expected to meet the same level of operational scrutiny as a forest development plan. It does indicate that the current AAC of 1,068,000m^3/year can be located on the ground with silviculture green-up requirements in place.

Silviculture green-up is a key issue in developing the short-term harvest rate on TFL 37. This was not clearly identified in the non-spatial analysis because of the model's ability to harvest small forest stands (as small as 0.25ha) compared with the larger units selected for harvest in the spatial analysis.

Reducing silviculture green-up in the Nimpkish HIA to 2.25m allows the non-spatial MoF Base Case harvest schedule to be carried for the entire 20 years of the planning horizon. Similarly, reducing silviculture green-up by approximately one year in the Enhanced Green-up scenario

[2] Appendix VIII of TFL 37 MP 8

allows the harvest schedule to match that of the MoF Base Case non-spatial analysis.

6.2 Products-Based Silviculture Option

For this option Canfor staff completed a review of MSYT minimum harvest ages requirements based on future product objectives. Adjusted minimum harvest ages were then included in the analysis inputs for the Products-Base Silviculture option. The MSYTs for both the MoF Base Case and Enhanced Silviculture options were reviewed and possibly adjusted for the Products-Based Silviculture option. Table 6.9 summarises the new minimum harvest ages for the MoF Base Case MSYTs for existing stands.

Table 6.9 –Adjusted MSYT Minimum Harvest Ages (MoF Base Case Existing MSYTs)

Existing MSYT AU	Aggregated MSYT ID	Net Area (ha)	Minimum Harvest Age Attributes				
			Age	Volume	MAI	Diameter	Height
201	C01	0	200	54	0.27	12.7	11.9
202	C02	9,402	90	626	6.96	31.0	31.0
203	C03	867	130	362	2.78	25.5	23.6
204	C04	277	140	361	2.58	27.1	25.0
205	C05	19	60	615	10.25	30.0	31.9
206	C06	23,516	65	794	12.20	35.1	36.0
207	C07	6,071	70	821	11.73	41.9	40.1
208	C08	2,232	85	763	8.96	39.0	36.8
Total		42,384					

Table 6.10 summarises the new MSYT minimum harvest ages for the MoF Base Case future MSYTs.

Table 6.10 –Adjusted MSYT Minimum Harvest Ages (MoF Base Case Future MSYTs)

Future MSYT AU	Aggregated MSYT ID	Net Area (ha)	Minimum Harvest Age Attributes				
			Age	Volume	MAI	Diameter	Height
301	R01	0	180	102	0.57	21.9	16.4
302	R02	0	140	392	2.80	37.9	25.8
303	R03	156	130	405	3.12	32.6	25.1
304	R04	55	90	495	5.50	27.1	28.5
305	R05	11,318	129	393	3.05	25.9	24.1
306	R06	394	75	751	10.00	39.8	32.1
307	R07	312	80	643	8.04	40.6	30.2
308	R08	39,214	61	899	14.74	35.8	38.3
309	R09	363	100	608	6.08	37.2	29.2
310	R10	9,968	91	723	7.95	31.7	31.9
311	R11	2,362	77	793	10.29	33.8	33.9
312	R12	39,107	69	8.08	11.72	33.0	35.8
Total		103,248					

Table 6.11 summarises the new MSYT minimum harvest ages for the Enhanced Silviculture option future MSYTs.

Table 6.11 –Adjusted MSYT Minimum Harvest Ages (Enhanced Silviculture MSYTs)

Future MSYT AU	Aggregated MSYT ID	Net Area (ha)	Minimum Harvest Age Attributes				
			Age	Volume	MAI	Diameter	Height
Tree Improvement							
401	E01	3,519	70	806	11.51	30.00	34.40
402	E02	0	150	109	0.73	25.74	18.30
403	E03	0	150	33	0.22	15.89	13.10
404	E04	0	120	52	0.43	17.03	14.40
405	E05	931	65	765	11.77	31.00	36.30
406	E06	813	120	374	3.12	26.00	24.10
407	E07	148	110	352	3.20	23.00	23.00
408	E08	146	85	719	8.46	29.00	31.60
409	E09	754	65	709	10.91	31.00	31.60
410	E10	1,029	65	969	14.91	33.00	36.50
411	E11	55	80	494	6.18	26.00	28.40
412	E12	18	75	712	9.49	35.00	34.70
413	E13	1,854	60	637	10.62	29.00	32.20
414	E14	7,381	55	772	14.04	31.00	35.30
415	E15	15,234	55	851	15.47	32.00	37.10
416	E16	17,914	65	1067	16.42	38.00	42.70
417	E17	712	55	1013	18.42	36.00	41.40
418	E18	6,812	65	810	12.46	32.00	37.50
419	E19	410	90	655	7.28	29.00	30.20
420	E20	202	85	682	8.02	30.00	30.80
421	E21	20	75	704	9.39	33.00	31.60
422	E22	17,181	70	726	10.37	30.00	31.60
423	E23	0	200	200	1.00	30.00	21.40
424	E24	526	130	404	3.11	25.00	24.40
425	E25	9,108	130	404	3.11	25.00	24.40
426	E26	286	95	833	8.77	30.00	33.90
427	E27	590	95	769	8.09	31.00	32.60
428	E28	500	85	755	8.88	31.00	32.20
429	E29	363	65	778	11.97	29.00	32.40
430	E30	2,161	55	952	17.31	33.00	39.10
431	E31	2,905	50	923	18.46	34.00	38.60
432	E32	288	50	996	19.92	34.00	40.70
433	E33	215	120	478	3.98	27.00	26.10
434	E34	1,219	90	760	8.44	31.00	32.30
435	E35	1,570	75	904	12.05	32.00	34.90
436	E36	35	65	878	13.51	32.00	34.40
437	E37	14	165	221	1.34	22.00	19.20
438	E38	299	105	400	3.81	26.00	24.10
439	E39	6,616	85	710	8.35	31.00	31.80
440	E40	73	130	399	3.07	32.00	25.00
441	E41	0	250	2	0.01	9.28	8.70
442	E42	0	250	140	0.56	25.36	18.00
443	E43	209	130	294	2.26	28.00	21.40
444	E44	0	140	383	2.74	37.51	25.70
445	E45	68	120	411	3.43	33.00	25.10
446	E46	363	90	585	6.50	37.00	28.70
447	E47	312	80	635	7.94	40.00	30.10
448	E48	394	70	746	10.66	39.00	32.10
Tree Improvement total		103,248					
Tree Imp+Spacing total							
449	E49	3,519	65	708	10.89	32.00	32.80
450	E50	931	60	912	15.20	35.00	35.60
451	E51	1,029	60	859	14.32	34.00	34.60
452	E52	15,234	55	841	15.29	35.00	37.10
453	E53	17,914	65	1068	16.43	41.00	42.70
454	E54	712	50	905	18.10	37.00	38.80
455	E55	363	60	674	11.23	32.00	30.60
456	E56	2,161	55	948	17.24	38.00	39.10
457	E57	2,905	50	919	18.38	37.00	38.60
458	E58	288	45	861	19.13	36.00	37.60
Tree Imp+Spacing total		45,056					
Tree Imp+Fertilisation							
462	E62	6,812	65	810	12.46	32.00	37.50

Future MSYT AU	Aggregated MSYT ID	Net Area (ha)	Minimum Harvest Age Attributes				
			Age	Volume	MAI	Diameter	Height
Tree Imp+Fertilisation total		6,812					
Tree Imp+Fert+Spacing							
463	E63	15,234	50	734	14.68	33.00	34.70
464	E64	17,914	65	1068	16.43	41.00	42.70
Tree Imp+Fert+Spacing total		33,148					

Table 6.12 summarises the results of the simulation runs for the Products-Based Silviculture option.

Table 6.12 – Products-Based Silviculture Option Harvest Schedules

Simulation Year	Annual Harvest by Scenario (m3/year)		
	MoF Base Case	Products-Based (MoF Base Case MSYTs)	Products-Based (Enhanced Silviculture MSYTs)
1-10	1,068,000	1,086,100	1,089,400
11-20	1,048,900	1,086,100	1,089,400
21-30	1,034,200	1,086,100	1,089,400
31-40	1,034,200	1,086,100	1,089,400
41-50	1,034,200	1,086,100	1,089,400
51-60	1,034,200	1,086,100	1,089,400
61-70	1,034,200	1,086,100	1,089,400
71-80	1,034,200	1,086,100	1,089,400
81-90	1,034,200	1,086,100	1,089,400
91-100	1,034,200	1,086,100	1,089,400
101-110	1,034,200	1,086,100	1,089,400
111-120	1,091,700	1,086,100	1,198,600
121-130	1,172,100	1,086,100	1,238,900
131-140	1,172,100	1,086,100	1,238,900
141-150	1,172,100	1,086,100	1,238,900
151-250	1,172,100	1,182,500	1,238,900
Total	27,753,700	28,116,500	29,287,700

MoF Base Case MSYTs

The positive results of adjusting minimum harvest ages are clearly demonstrated in the two Products-Based Silviculture option scenarios. Future MSYT minimum harvest ages were reduced between 5 and 10 years for many of the MSYTs. The additional volume available in the short-term is due to managed stands becoming available for harvest earlier during the critical period when the existing mature inventory is at a low point. Long-term harvest levels are also improved because stands reach merchantable age in less time.

Enhanced Silviculture (Tree Improvement) MSYTs

The Enhanced Silviculture (tree improvement) MSYTs provide higher volumes for future MSYTs and therefore the overall harvest rate is higher in this scenario. In some situations reduced MSYT minimum harvest ages can result in decreased long-term harvest rates because the volumes provided at younger ages are insufficient to support the harvest target. The productive capacity of the landbase is therefore not achieving its potential. This is not the case for the Products-Based Silviculture scenarios as revisions to the minimum harvest ages were not great and forest cover disturbance is not constraining.

As Canfor adjusts future minimum harvest ages based on product objectives, the Products-Based Silviculture becomes a realistic alternative to the MoF Base Case for future management of TFL 37. Figure 6.10 provides a graphic comparison of the Products-Base Silviculture option harvest results.

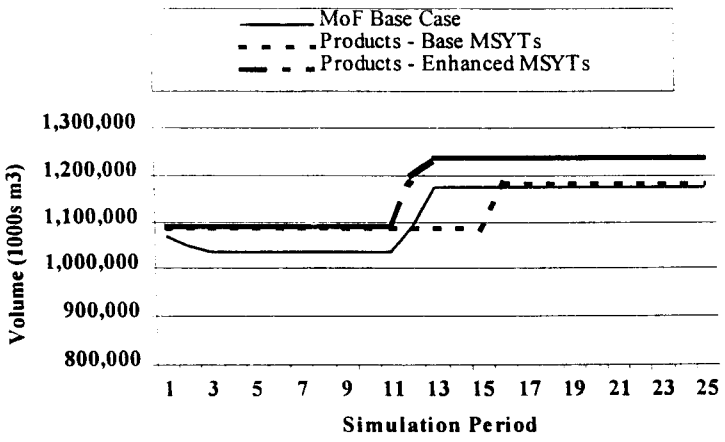

Figure 6.10 – Products-Based Silviculture Harvest Flow

6.3 Enhanced Silviculture Option

The timber supply impacts of enhancing the level of incremental silviculture on managed stands were reviewed in this option. This option is referred to as the Additional Incremental Silviculture option in the information package. Canfor currently has an extensive programme of spacing, fertilisation, first generation seed orchards and commercial thinning. Gains from second-generation tree improvement, spacing and fertilisation were evaluated in this set of analyses. A new set of managed stand yield tables incorporating gains related to these silviculture programmes was developed for this option.

Table 6.13 summarises the results of the Enhanced Silviculture analysis scenarios.

Table 6.13 – Enhanced Silviculture Harvest Schedules

Simulation Period	Annual Harvest by Scenario (m3/year)				
	MoF Base Case	Tree Improvement	Tree Imp. + Spacing	Tree Imp. + Fertilisation	Tree Imp. + Spacing + Fertilisation
1-10	1,068,000	1,068,000	1,068,000	1,068,000	1,068,000
11-20	1,048,900	1,052,700	1,048,900	1,053,800	1,048,900
21-30	1,034,200	1,052,700	1,022,500	1,053,800	1,033,200
31-40	1,034,200	1,052,700	1,022,500	1,053,800	1,033,200
41-50	1,034,200	1,052,700	1,022,500	1,053,800	1,033,200
51-60	1,034,200	1,052,700	1,022,500	1,053,800	1,033,200
61-70	1,034,200	1,052,700	1,022,500	1,053,800	1,033,200
71-80	1,034,200	1,052,700	1,022,500	1,053,800	1,033,200
81-90	1,034,200	1,052,700	1,022,500	1,053,800	1,033,200
91-100	1,034,200	1,052,700	1,022,500	1,053,800	1,033,200
101-110	1,034,200	1,166,400	1,145,200	1,169,100	1,166,400
111-120	1,091,700	1,264,200	1,261,800	1,269,500	1,258,400
121-250	1,172,100	1,264,200	1,261,800	1,269,500	1,258,400
Total	27,753,700	29,407,500	29,107,300	29,494,300	29,166,500

6.3.1 Additional Tree Improvement

Estimates associated with improvements from second-generation seed orchard planting stock are included in this scenario. The analysis results show that short-term gains of about 2% are possible, while the long-term harvest level is increased approximately 8% over the MoF Base Case. The increase to the long-term harvest rate occurs in year 101 in this scenario compared to year 111 in the MoF Base Case. Minimum harvest ages for the revised MSYT are only about three years less in this scenario compared with the MoF Base Case. In the long-term as the inventory of mature managed stands rises, the harvest increases to take full advantage of the enhanced productivity associated with tree improvement.

6.3.2 Tree Improvement plus Spacing

Similar gains are noted in the long-term for this scenario as were described for the Additional Tree Improvement scenario, approximately 8% above the MoF Base Case. However in the short-term the harvest level is slightly lower (1%) compared with the MoF Base Case. This is a result of older minimum harvest ages for the managed stands that include spacing programmes. Minimum harvest ages were based on culmination of MAI for this scenario.

6.3.3 Tree Improvement plus Fertilisation

Comparable short and long-term gains to those in the Additional Tree Improvement scenario are noted for this scenario, approximately 8% above the MoF Base. Very few stands were assigned to fertilisation yield tables in this scenario because of limitations within the growth and yield models used to develop the tables. Some adjusting of SI50 values was necessary to develop the yield tables, which resulted in less definitive results. In addition, areas with SI50 of 35m or more are not expected to show any additional volume gains from fertilisation.

6.3.4 Tree Improvement plus Spacing plus Fertilisation

The harvest schedule developed for this scenario was virtually the same as the MoF Base Case up to year 100 when the increase to the long-term harvest rate commences. As with the other two scenarios in this option, this increase takes place one decade earlier than in the MoF Base Case

because of the improved productivity associated with the enhanced MSYTs. The harvest rate up to year 100 is slightly lower than the MoF Base Case, as noted for the Tree Improvement plus Spacing scenario. Again, this is due to the older minimum harvest ages associated with the MSYTs that include spacing. Figure 6.11 provides a graphic summary of the harvest schedules for the Enhanced Silviculture option.

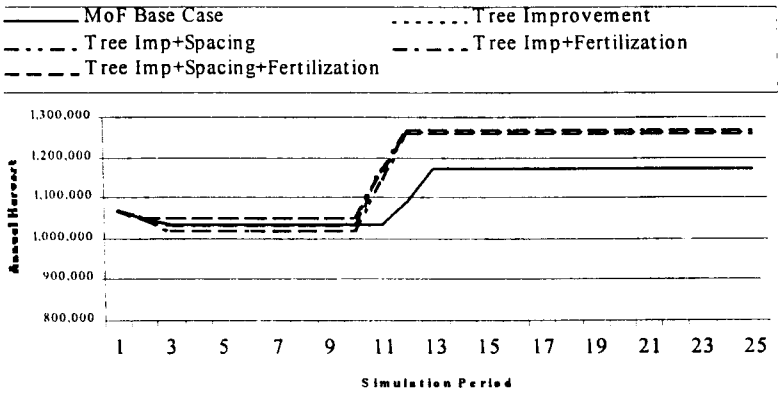

Figure 6.11 – Enhanced Silviculture Harvest Flow

6.4 Vancouver Island Land Use Plan Option

This option evaluated the impacts of the decisions made regarding the VILUP implementation. Landscape level biodiversity, old growth targets, are based on the recommended biodiversity emphasis provided for the VILUP instead of the weighted average method applied in the MoF Base Case.

Sensitivity analyses were also completed for this option, as discussed in the information package. Table 6.14 summarises the harvest schedules developed for the various analysis scenarios completed for the VILUP option.

Table 6.14 – VILUP Harvest Schedules

Simulation Period	Annual Harvest by Scenario (m3/year)						
	MoF Base Case	VILUP Base Case	REA Green-up Ht (non Visual 1 & 2)			Addition of New Parks	Add Uneconomic Stands
			HIA 1m GFA 3m	HIA 1m GFA 2m	HIA 1m GFA 1m		
1-10	1,068,000	1,068,000	1,068,000	1,068,000	1,068,000	1,089,400	1,068,000
11-20	1,048,900	1,048,900	1,049,900	1,049,900	1,049,900	1,089,400	1,064,800
21-30	1,034,200	1,034,200	1,035,000	1,035,000	1,035,000	1,089,400	1,049,900
31-40	1,034,200	1,034,200	1,035,000	1,035,000	1,035,000	1,089,400	1,049,900
41-50	1,034,200	1,034,200	1,035,000	1,035,000	1,035,000	1,089,400	1,049,900
51-60	1,034,200	1,034,200	1,035,000	1,035,000	1,035,000	1,089,400	1,049,900
61-70	1,034,200	1,034,200	1,035,000	1,035,000	1,035,000	1,089,400	1,049,900
71-80	1,034,200	1,034,200	1,035,000	1,035,000	1,035,000	1,089,400	1,049,900
81-90	1,034,200	1,034,200	1,035,000	1,035,000	1,035,000	1,089,400	1,049,900
91-100	1,034,200	1,034,200	1,035,000	1,035,000	1,035,000	1,089,400	1,049,900
101-110	1,034,200	1,034,200	1,035,000	1,035,000	1,035,000	1,089,400	1,049,900
111-120	1,091,700	1,091,700	1,092,700	1,092,700	1,092,700	1,153,400	1,122,000
121-250	1,172,100	1,172,100	1,173,100	1,173,100	1,173,100	1,216,800	1,200,000
Total	27,753,700	27,753,700	27,775,900	27,775,900	27,775,900	28,955,200	28,303,900

6.4.1 VILUP Base Case

The harvest schedule developed for the VILUP (Base Case) option is identical to that of the MoF Base Case. The only difference between these two scenarios is the old growth requirements for the LU-BEC/NDTs. Virtually all of the old growth requirement is met on areas outside the net operable landbase for both of these scenarios, therefore the harvest rate is dictated by factors associated with existing mature inventory and availability of managed stands in 50 to 100 years. The fact that there is a surplus of old growth outside the net landbase confirms that the net landbase is available mainly for harvesting.

6.4.2 VILUP Sensitivity Analyses

6.4.2.1 Sensitivity to REA Green-Up Height

Changes to the REA green-up height in HIAs and GFAs does not impact the harvest schedule developed for the VILUP Base Case. As noted in the MoF Base Case forest cover constraints sensitivity analyses, the difference in harvest rate is no more than 0.1%, which is insignificant in strategic timber supply planning. A very small number of stands became available earlier with reduced green-up but not enough to make a noticeable difference in the harvest rate.

6.4.2.2 Sensitivity to Addition of New Parks

In this scenario the new parks identified as part of the VILUP were added back to the timber harvesting landbase. These areas were subject to the same netdown reductions as the remainder of the productive forest. This addition represents 4,543 ha of net operable area (3,613,000m3 of timber), of which approximately 3,900 ha are mature available timber.

As a result of this additional area, the harvest rate has a 2% increase over the current AAC. After the first decade the harvest level is 4 – 5% higher than noted for the VILUP Base Case. The critical requirement for managed stands to contribute to the periodic harvest is less significant with this additional mature timber from the park areas. The difference between this scenario and the VILUP Base Case represents the timber supply cost of creating the new parks within TFL 37.

6.4.2.3 Sensitivity to Addition of Uneconomic Stands

This scenario followed the same assumptions used in the MoF Base Case landbase sensitivity in which stands classified as "uneconomic" were added back into the net operable landbase. Only stands that possess acceptable regeneration characteristics were added to the net landbase. Results show that the harvest rate is approximately 2% higher from year 21 onwards in this scenario compared with the VILUP Base Case. As noted for the Addition of New Parks scenario, having 3,169 ha of available mature timber improves the short-term supply prior to the requirement for managed stands to contribute to the annual supply. Figure 6.12 summarises the VILUP harvest Option schedules graphically.

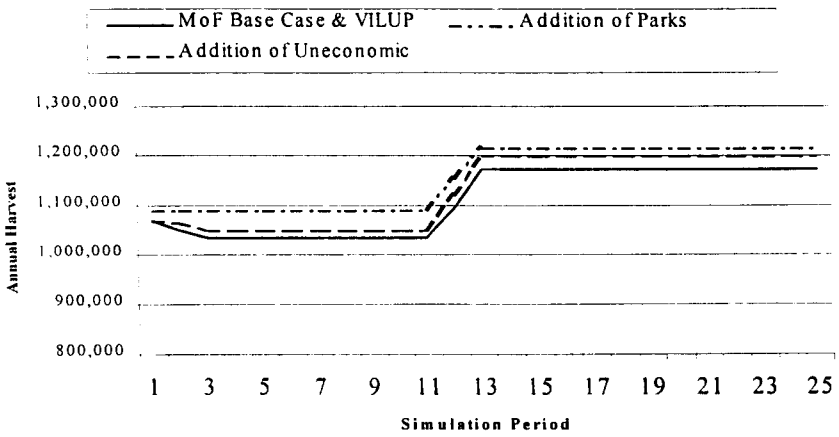

Figure 6.12 – VILUP Harvest Flow

7.0 DISCUSSION & RECOMMENDATIONS

This analysis demonstrates the stable nature of the timber supply on TFL 37. Results of the analysis indicate the sustainable long-term harvest level is considerably higher than the current AAC. Harvesting during the first 40 years is supported by an inventory of existing, predominantly mature, natural stands of timber distributed across the various LUs and REAs.

Factors affecting the timing of the availability of managed stands during the critical period, 50 to 70 years into the future, determine the harvest rate for the first 110 years of the planning horizon. During this critical period, managed stands begin to comprise the majority of the annual harvest. Beyond 110 years, improved yields associated with future managed stands support an increase in the harvest rate for the remainder of the 250-year planning horizon. By year 50 of the simulation total and mature inventory levels are relatively stable.

The timber supply is affected by the timing of availability of managed stands for harvest. Managed stand minimum harvest age and/or volume can impact on the harvest level. In addition, changing the current level of available mature inventory affects the harvest level throughout the planning horizon. Canfor maintains that minimum harvest ages can be younger than those used for the MoF Base Case. Minimum harvest ages assigned to MSYTs in the Products-Based Silviculture option are more likely to reflect future operations on the TFL. Therefore, the short-term supply has the potential to be increased compared to the MoF Base Case.

Similarly, the Enhanced Silviculture option demonstrates that additional silviculture activity – tree improvement, spacing and fertilisation will result in improved harvest rates over the entire planning horizon. These treatments are especially important to the short-term harvest rate that is dictated by the transition to managed stands. Equally important is the positive impact these treatments will have by reducing the time to achieve silviculture green-up.

Results of the adjusted managed stand volume sensitivity analyses indicate that managed stand availability and volume play a significant role in determining the harvest rate. It also points out that forest cover constraints do not play a very important role in the MoF Base Case. If forest cover constraints were significantly influencing the harvest level, a 10% increase in the long-term

harvest rate would not likely be realised.

Forest cover constraints related to REA maximum disturbance and green-up do not impact timber availability at any time during the planning horizon. Adjacency concerns have been addressed in the 20-Year Spatial Feasibility Analysis. This scenario provided a ground-based confirmation of the supply of timber on TFL 37 using the assumptions outlined in the MoF Base Case. Old growth requirements were met in all analysis simulations and, when modified, this component of the analysis did not affect supply. Seral stage objectives, based on VILUP recommended biodiversity emphasis were met in virtually all LU-BEC/NDTs over the entire planning horizon even though these objectives were not strictly enforced in the analysis.

The 20-Year Spatial Feasibility Analysis, which included cutblocks designed by Canfor engineering staff, supports the MoF Base Case harvest level for the period of MP 8. The results of this analysis also illustrate that the harvest can be located on the ground while considering many of the operational requirements in development planning. This includes 3.0m silviculture green-up height in adjacent blocks. Reducing this green-up requirement slightly in the Nimpkish HIA allows the MoF Base Case harvest schedule to be maintained in the spatial analysis. The results of this analysis also address the non-timber resources such as wildlife habitat, biodiversity and overall disturbance limits that are often difficult to assess in traditional 5- and 20-year plans.

The information that was collected in the various inventories and special studies on TFL 37 during the period of MWP 7 provided a strong foundation for developing the MP 8 timber supply analysis. Numerous options and scenarios have been completed that evaluate the impacts on timber supply of changes to management and biological factors. The results of this analysis and the 20-Year Spatial Feasibility Analysis clearly support a harvest level of 1,068,000m3/year for the period of MP8.

The following issues will have to be addressed to further improve the timber supply forecast for TFL 37:

- Confirm the location of any landbase withdrawals associated with non-timber concerns to allow mapping of these areas.
- Confirm the requirements for non-timber resources such as landscape level biodiversity and wildlife habitat.
- Confirm silviculture green-up requirements for the various LUs and REAs on the TFL.
- Monitor managed stand growth to confirm the productivity estimates used in the analysis.
- Continue to include enhanced silviculture treatments in practice and analysis to improve timber supply.
- Continue to use GIS to identify potential harvest sites and to identify areas that can meet the requirements of non-timber resources, especially if these areas can accommodate multiple non-timber resource needs.
- Continue to gather relevant inventory information to ensure confidence in the results of planning exercises such as timber supply analysis and 20-year planning.

Appendix VI Timber Supply Analysis Report

Facsimile Transmitted Message

CANFOR

To:	Mike Clarkson
Company:	MoF
Phone:	
Fax:	(250) 953-3838

RECEIVED
NOV 10 1998
TIMBER SUPPLY BRANCH
MINISTRY OF FORESTS

From:	Patrick Bryant
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Date:	November 10, 1998
Pages (including this):	6

REMARKS: ☐ Urgent ☒ For your review ☐ Reply ASAP ☐ Please Comment

RE: TFL 37 MP 8 – Old seral stage distribution

Hi Mike,

We liked your (Larry's) request to clarify old seral stage distribution so much, we will attach this supplement to the Timber Supply Analysis (for posterity). Please look it over.

Cheers!

If you do not receive all of the pages, please telephone us immediately

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document

CANADIAN FOREST PRODUCTS LTD.
NIMPKISH TREE FARM LICENCE 37
MANAGEMENT PLAN 8

TIMBER SUPPLY ANALYSIS SUPPLEMENT

OLD SERAL STAGE DISTRIBUTION

Prepared by:

Canadian Forest Products Ltd.
&
Timberline Forest Inventory Consultants Ltd.

98.11.10

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PAGE.03 250 281 2485

1.0 INTRODUCTION

This following discussion is supplemental to timber supply analysis completed as part of the process for submission of Management Plan 8 (MP 8) for the Nimpkish Tree Farm Licence 37 (TFL 37) held by Canadian Forest Products Ltd. (Canfor). At the request of the provincial Chief Forester, we completed a summary of the old seral stage distribution for TFL 37. Specifically, the MoF wanted to confirm that the old seral stage distribution could be met outside the timber harvesting land base (THLB) at the variant level of the biogeoclimatic ecological classification (BEC) system. Ultimately, this would provide the provincial Chief Forester with a better appreciation of how biodiversity objectives can be achieved, in determining the allowable annual cut for TFL 37.

Supporting sections for this supplement include:

- Timber Supply Analysis Information Package – Landscape Unit – BEC/NDT (page 17)
- Timber Supply Analysis Information Package – Section 10.2.1.6 Landscape Level Biodiversity (page 41)
- Timber Supply Analysis Information Package – Appendix VI (References)
- Timber Supply Analysis – Forest Cover Requirements (page 12)

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2.0 RESULTS

Landscape units for TFL 37 have been recommended by the Vancouver Island Resource Targets Team as part of the ongoing VILUP process. Three LUs are associated with the TFL. BEC/NDT is based on MoF 1:250,000 Biogeoclimatic mapping and NDT definitions provided in the FPC Biodiversity Guidebook. Constraints applied at the broad LU-BEC/NDT level are intended to address biodiversity requirements and ensure that an acceptable distribution of age classes is maintained. Table 2.1 summarises the distribution of LUs and BEC variant/NDTs on TFL 37.

Table 2.1 Distribution of Landscape Units and BEC variant/NDTs

Landscape Unit – BEC variant/NDT [1]	Productive Forest		
	TFL 37 [2] (ha)	Park and TFL 39 Reserved (ha) [3 & 4]	Total (ha)
1 Nimpkish – CWHvm1/NDT1	22,180	0	22,180
1 Nimpkish – CWHvm2/NDT1	15,074	0	15,074
2 Nimpkish – CWHxm/NDT2	20,136	0	20,136
3 Nimpkish – MHmm1/NDT1	9,283	0	9,283
Nimpkish total	66,673	0	66,673
4 Tsitika – CWHvm1/NDT1	1,441	3,996	5,437
4 Tsitika – CWHvm2/NDT1	3,210	2,410	5,620
5 Tsitika – MHmm1/NDT1	3,526	2,836	6,362
Tsitika total	8,178	9,242	17,419
6 Woss-Vernon – CWHvm1/NDT1	20,538	2,643	23,181
6 Woss-Vernon – CWHvm2/NDT1	24,388	2,213	26,601
7 Woss-Vernon – CWHxm/NDT2	24,121	0	24,121
8 Woss-Vernon – MHmm1/NDT1	17,781	2,257	20,038
Woss-Vernon total	86,829	7,113	93,942
Total	161,680	16,355	178,034

1. CWHvm1 and CWHvm2 are listed separately. In the timber supply analysis, these variants were modelled as a single LU-BEC/NDT.
2. Includes productive forest with acceptable forest cover from new parks within TFL 37.
3. Schoen Lake Park is in the Woss Vernon landscape unit. The inventory of the park area was obtained and added to the productive forest landbase as this area contributes towards meeting biodiversity objectives.
4. Reserved areas from TFL 39 in the Tsitika landscape unit was added to the productive forest land base that is permitted to contribute towards meeting biodiversity objectives.

To address landscape level biodiversity, recently designated parks were included in the assessment of old seral stage distribution within the appropriate LU-BEC variant/NDT. These areas are completely contained within TFL 37's recommended LUs.

In addition, the remainder of Schoen Lake Park (Woss-Vernon LU) established prior to VILUP and the reserved forest component of TFL 39 (Tsitika LU) will contribute to mature and old seral stage requirements. A more realistic evaluation of landscape level biodiversity targets will be possible by including these areas. Table 1 includes a breakdown of the area associated with the original Schoen Lake Park and TFL 39 that will contribute to landscape level forest cover requirements.

In the MoF Base Case, the MoF's procedure for incorporating biodiversity and landscape units

into the timber supply analysis was used according to their correspondence dated December 1, 1997. The seral stage constraints were weighted based on the target proportions of 45%-45%-10% for high, intermediate and low biodiversity emphasis respectively. This MoF procedure also allows the old seral stage constraint within low level emphasis areas to be set initially to one third of the biodiversity guidebook value and ramping up to full implementation within 140 years. Yet, this relaxed constraint was not required for TFL 37 as full implementation was applied throughout the 250 year planning horizon.

Table 2.2 reports the breakdown of the old seral stage results relative to the targets set using the MoF's weighted-average method.

Table 2.2 Old Seral Stage Analysis Results Relative to the Targets Set

Landscape Unit – BEC variant/NDT	Old Seral Stage Targets [1]		Old Seral Stage Results			
			Outside THLB		Inside THLB	
	Percent (%)	Area (ha)	Area (ha)	Percent (%)	Area (ha)	Percent (%)
1 Nimpkish – CWHvm1/NDT1	13.6	3,016	3,421	15.4	4,209	19.0
1 Nimpkish – CWHvm2/NDT1	13.6	2,050	5,094	33.8	6,774	44.9
2 Nimpkish – CWHxm/NDT2	9.4	1,893	1,482	7.4	2,031	10.1
3 Nimpkish – MHmm1/NDT1	19.9	1,847	5,781	62.3	2,801	30.2
4 Tsitika – CWHvm1/NDT1	13.6	739	4,373	80.4	422	7.8
4 Tsitika – CWHvm2/NDT1	13.6	764	3,222	57.3	1,677	29.8
5 Tsitika – MHmm1/NDT1	19.9	1,266	4,618	72.6	1,553	24.4
6 Woss-Vernon – CWHvm1/NDT1	13.6	3,153	6,721	29.0	5,041	21.7
6 Woss-Vernon – CWHvm2/NDT1	13.6	3,618	10,193	38.3	9,829	36.9
7 Woss-Vernon – CWHxm/NDT2	9.4	2,267	2,943	12.2	1,966	8.2
8 Woss-Vernon – MHmm1/NDT1	19.9	3,988	13,434	67.0	4,480	22.4

1. Based on MoF Base Case option for TFL 37 - old seral stage targets using 45%-45%-10% low, intermediate and high emphasis. Old seral stage is defined as stands greater than 250 years of age.

With the current landbase breakdown, only the Nimpkish – CWHxm/NDT2 landscape unit fails to meet the old seral stage target from outside the THLB by 411 hectares, or 2%. This is easily met in the short term, however, from area within the THLB. In fact, the timber supply analysis reserved up to 25% of the old growth requirement (approximately 486 ha) from the THLB during the first 70 years of the simulation. Beyond year 71, sufficient area greater than 250 years old from outside of the THLB satisfies the old growth requirement. Although it was not modelled, we expect that initially setting the old seral stage constraint within low level emphasis areas to one third of the biodiversity guidebook value and then ramping up would resolve this minor deviation.

The timber supply analysis table 6.3 noted that 21 of the 24 seral stages evaluated in the analysis meet Biodiversity Guidebook seral stage recommendations during the planning horizon. Only the mature plus old, CWHxm/NDT2 units exhibited any noticeable deficiency in seral stage requirements. This is mainly due to the history of harvesting activity in this unit and the fact that over 75% of the productive forest within the unit is available for harvest.

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PAGE.06 250 953 2485

3.0 DISCUSSION

This supplement confirms that the old seral stage distribution is essentially met outside the timber harvesting land base (THLB) at the variant level of the biogeoclimatic ecological classification (BEC) system. The only exception is the CWHxm variant in the Nimpkish Landscape unit, which is mitigated operationally by setting the old seral stage constraint to one third of the biodiversity guidebook value, according to the MoF procedure.

Biodiversity requirements related to disturbance do not significantly constrain the harvest schedule at any time during the planning horizon. This demonstrates that the considerable netdowns to the productive forest landbase to address management for non-timber interests (33% of the productive forest) play a significant role in developing the harvest schedule.

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