Tree Farm Licence 46

Timber Supply Analysis Report

Management Plan #5

Timber Supply Analysis

March 2010

The Teal-Jones Group

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Executive Summary

Timber supply reviews are conducted every five years and an allowable annual cut (AAC) determination is made by the B.C. Forest Service's Chief Forester. The key documents supporting AAC determination are an *Information Package* describing the inputs to the timber supply analysis and an *Analysis Report* describing the results. The *Information Package*, which was approved by the Ministry of Forests and Range (MFR) in August, 2009, is included as Appendix I to this *Analysis Report*, which presents the timber supply analysis results.

The allowable annual cut for TFL 46 was set at 499,000 m^3/year at the last determination in 2003. At that time the TFL was held by TimberWest Forest Ltd., and they completed the timber supply analysis and submitted the required documents. Since then the tenure has been transferred to Teal Cedar Products Ltd. (Teal Cedar), the area of the TFL has decreased, and the AAC has been modified through administrative adjustments to its current level of 367,363 m^3/year. Teal Cedar has prepared this timber supply analysis to support a new determination of the (AAC) for TFL 46.

A base case timber supply analysis has been prepared using the most current data sources and management assumptions and is based on current operational practice. The inputs to this analysis are documented in the *Information Package*. The base case initial harvest level was set at the currently approved AAC (367,363 m^3/year). This level can be sustained for five decades, at which point it must be reduced to the maximum long-term sustainable harvest level of 332,500 m^3/year for the remainder of the planning horizon. The resulting harvest flow pattern differs markedly from that observed in base case for the last analysis, where the harvest level was constant for the entire planning horizon. This change in timber flow pattern is due primarily to the use of inventory site index (as opposed to ecosystem-based site index) to develop yield forecasts for managed stands.

Estimates of site productivity are the main determinant of future stand yields and are consequently a primary driver of timber supply forecasts. For this base case, the inventory site index from the recently-completed VRI has been used to develop yield tables for all existing and future stands. Managed stand yield curves for the base case scenario in the last timber supply analysis for TFL 46 were based on second growth site index (SGSI) derived from Terrestrial Ecosystem Mapping (TEM) and a field data collection program. These ecologically-based site index estimates were used for stands that regenerated after 1955. The derivation of these site indices is described in the report *Second Growth Site Index Estimates for Douglas-fir, Western Hemlock, Pacific Silver Fir and Western Redcedar on TFL 46.*[1]

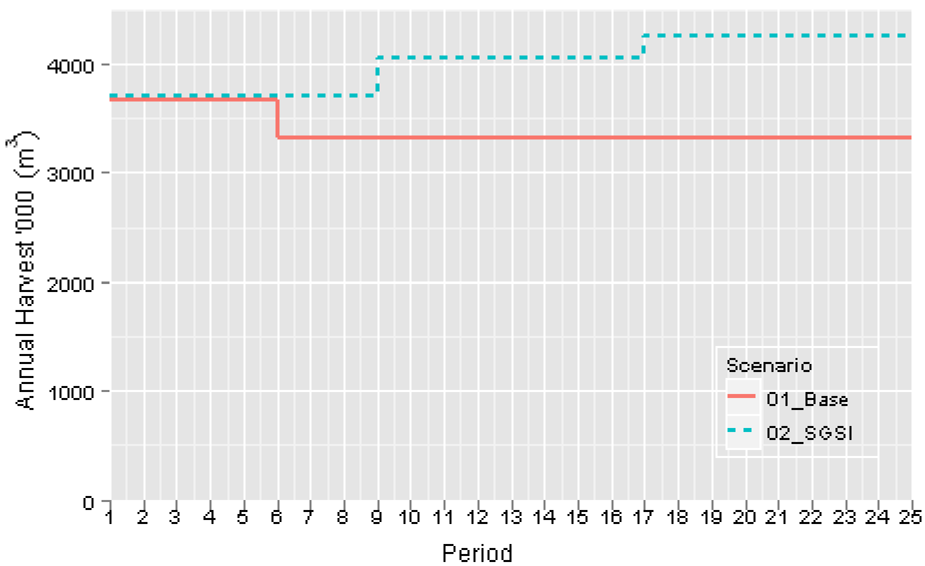
A change in government policy precludes the use of these TEM-based SGSI's for the base case scenario for this analysis. The MFR has insisted that this analysis use inventory site index to construct all yield curves for the base case. The TEM upon which the second growth site index estimates were based has not yet been independently assessed for accuracy. A new MFR policy requires that this assessment be completed before ecologically-based site index estimates can be used for a base case analysis. To gauge the impact on timber supply of this change, this sensitivity analysis using SGSI-based yield curves has been completed. SGSI estimates have been input to TIPSY to generate future managed stand yield tables for this sensitivity analysis.

These yield curves resulted in higher volumes for second growth stands. Due to the increased growth rates, these stands reached a harvestable condition at a younger age than that forecast by the base case yield curves. Minimum harvest ages were recalculated for this sensitivity analysis. The forest estate model was rerun with these amended inputs.

The sustainable long-term harvest level is 28% higher than for the base case, increasing from 332,500 m^3/year to 425,000 m^3/year. This increase occurs in two steps, from an initial harvest level of 370,000 m^3/year. This initial harvest level is less than one percent higher than the base case starting level of 367,363 m^3/year.

The chart on the next page shows how sustainable harvest levels change if SGSI is used to forecast the yield from future managed stands.

[1] J. S. Thrower & Associates Consulting Foresters Ltd. 2000. *Second-Growth Site Index Estimates for Douglas-fir, Western Hemlock, Pacific Silver Fir, and Western Redcedar on TFL 46.*



A strong case can be made for basing yield estimates for future stands on ecosystem based site index. It is widely accepted that SI values based on the height/age measurements of existing stands underestimate the productivity that those sites will exhibit when they support intensively managed plantations. Ecologically-based estimates of SI have been accepted for use in the base case on other tenures, including the adjacent Arrowsmith TSA (for which no TEM mapping exists).

Additional sensitivity analyses were conducted to explore the risk associated with various sources of uncertainty in the modelling assumptions and data. The table below summarizes the results of each sensitivity analysis with comparison to the base case. In comparing the sensitivity results to the base case, both short term and long term harvest level differences are stated. For most scenarios, 'short term' refers to the period up to the end of the sixth decade, and 'long term' refers to the remainder of the planning horizon.

Summary of Timber Supply Analysis Results

	Short Term Harvest Level		**Long Term Harvest Level**	
Scenario	**m^3/year**	**% of Base Case**	**m^3/year**	**% of Base Case**
Base Case	367,363	100.0%	332,500	100.0%
Post-Harvest SI Uncertainty				
Second Growth Site Index	370,000	100.7%	425,000	127.8%

	Short Term Harvest Level		Long Term Harvest Level	
Scenario	**m^3/year**	**% of Base Case**	**m^3/year**	**% of Base Case**
Alternate Harvest Rules				
Minimize Volume Lost	367,363	100.0%	315,000	94.7%
Highest Volume First	367,363	100.0%	325,000	97.7%
Landbase Uncertainty				
THLB Minus 10%	338,000	92.0%	297,500	89.5%
THLB Plus 10%	411,000	111.9%	364,000	109.5%
Stand G/Y Uncertainty				
Existing Volume Plus 10%	412,000	112.2%	332,500	100.0%
Existing Volume Minus 10%	330,000	89.8%	332,500	100.0%
Future Volume Plus 10%	367,363	100.0%	365,000	109.8%
Future Volume Minus 10%	367,363	100.0%	307,000	92.3%
Minimum Harvest Age Uncertainty				
MHA Minus 10 Years	372,000	101.3%	332,500	100.0%
MHA Plus 10 Years	338,000	92.0%	340,000	102.3%
MHA Plus 20 Years	292,000	79.5%	353,000	106.2%
Disturbance Limit Uncertainty				
VQO Greenup Plus 1m	367,363	100.0%	332,500	100.0%
VQO Greenup Minus 1m	374,000	101.8%	332,500	100.0%
IRM Disturbance Minus 5%	367,363	100.0%	332,500	100.0%
IRM Disturbance Plus 5%	373,500	101.7%	332,500	100.0%
IRM Greenup Plus 1m	367,363	100.0%	332,500	100.0%
IRM Greenup Minus 1m	372,500	101.4%	332,500	100.0%

Most of the rows in this table show deviations from the base case that are minor and/or entirely intuitive. The exception is the use of second growth site index when forecasting the yield of future stands. In that case, a small increase in short-term harvest level and a large increase in long-term harvest level are possible.

The next AAC determination for TFL 46 will be in force for between five and ten years, barring any significant alterations to landbase or changes in management practices. An AAC of 370,000 cubic metres per year is quite defensible based on the information presented in this document. This is the initial harvest level that could be sustained using the yield curves based on SGSI. It represents a slight increase from the current administratively-adjusted AAC that was used as the starting level in the base case. The risk of establishing the AAC at this level is small; if the VRI site index estimates are in fact accurate, harvest shortfalls will not occur for fifty years. In the meantime, further work can be done to verify site index estimates for the timber harvesting landbase.

Timberline
Natural Resource Group

1 Introduction

This Timber Supply *Analysis Report* has been prepared in order to provide the Chief Forester with information to assist in his determination of an AAC for the TFL. At the outset of this project, it was intended that the timber supply analysis would be carried out in concert with the completion of a new Management Plan, and would provide input to that process. Due to changes that have occurred subsequently in the legislation related to Management Plans, the current Plan will continue in force. The requirement for a new AAC determination remains in force, and this document is submitted to inform that decision.

Timber supply is the rate of timber availability for harvest over time. The methodology used to forecast this includes use of a forest-level simulation model, which predicts the development of a forest over a 250-year planning horizon. The model uses 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 allowable annual cut for TFL 46 was last determined in 2003. At that time the TFL was held by TimberWest Forest Ltd., and they completed the timber supply analysis and submitted the required documents. The Chief Forester reviewed this material and other information, and set the AAC at 499,000 m^3/year. The 'Implementation' section of the AAC Rationale document made a number of recommendations for monitoring (deciduous harvest, retention levels), strategy development (elk and deer conservation, old growth cedar), and landscape unit planning. Progress has been made in most of these areas.

Since the last AAC determination, the tenure has been transferred to Teal Cedar Products Ltd. (Teal Cedar), the area of the TFL has decreased, and the AAC has been modified through administrative adjustments to its current level of 367,363 m^3/year. Teal Cedar has prepared this timber supply analysis to support a new determination of the (AAC) for TFL 46.

Timber supply analysis involves three main steps:

1. Assembling data and preparing information about the landbase;
2. Using the data in a forest estate model to develop harvest forecasts and test the sensitivity of those forecasts to small changes in the input data and assumptions; and
3. Interpreting and reporting the results.

The *Information Package* was the first document published in support of the current TSR process. It was submitted to the MFR and was also made available for a public and First Nations review over a period of two months, and was accepted by Ministry of Forests and Range (MFR) Forest Analysis Branch, August 6, 2009. The information provided there has been used to define and model several timber supply scenarios. Those results are presented in this report. A base case scenario is described and the results are presented. The results of several sensitivity model runs are also summarized; these provide an indication of the stability of the base case harvest level forecast relative to the uncertainty inherent in the data and assumptions upon which it is based.

The Chief Forester will consider the timber supply *Analysis Report* and other sources of information in order to make a new AAC determination. This determination will be published by the MFR in a report entitled '*Tree Farm Licence 46 – Rationale for AAC Determination*'.

2 Description of the Licence Area

Tree Farm Licence (TFL) 46 is located on Vancouver Island between Cowichan Lake, Nitinat Lake and Port Renfrew on southern Vancouver Island. It is roughly bounded by the San Juan River in the South and the E&N Land Grant boundary to the northeast. Figure 1 shows the location of the TFL.

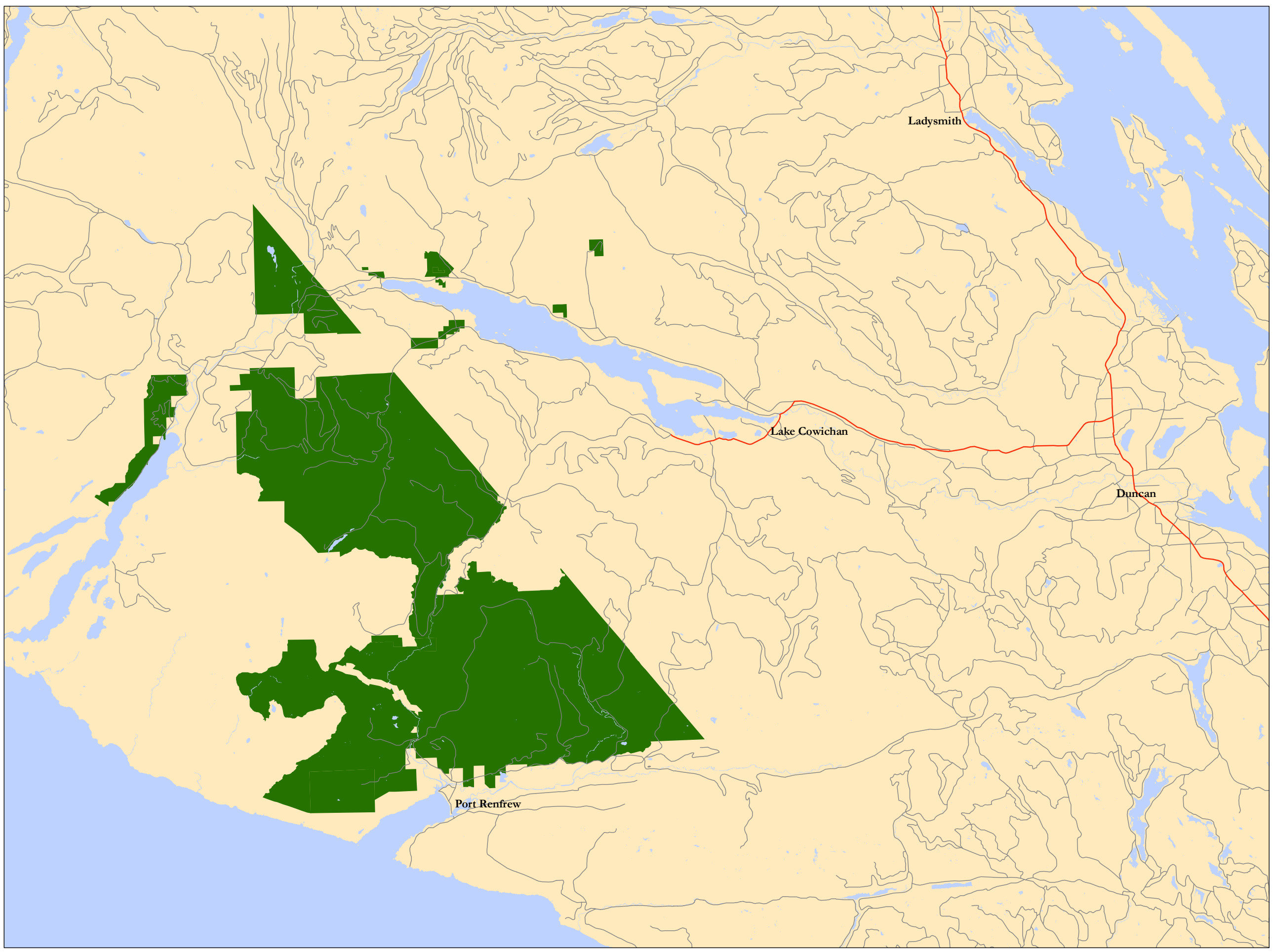


Figure 1. Location of TFL 46

Most areas of the TFL are located in watersheds with rivers running westward towards the west coast of the Island. Slopes vary from flat, alluvial river valleys to steep and rugged terrain. The portions of the TFL in the Cowichan Valley have more gentle topographic features. The terrain varies from lowland to mountainous.

Most of the productive forest land falls within the Coastal Western Hemlock (CWH) biogeoclimatic zone. Cool wet summers and mild winters support stands with a significant hemlock component. Douglas-fir is the other major tree species; true fir and western red cedar occur in lesser amounts. Less than three percent of the TFL area falls into the Mountain Hemlock zone, which occurs at higher elevations.

A significant portion of the TFL has been previously logged and now supports second growth stands ranging up to 80 years in age.

3 Information Preparation

3.1 Land Base

This section describes the steps taken to determine the THLB for TFL 46. The THLB for Management Plan #4 was 63,777 hectares, out of a total TFL area of 83,545 hectares. It is smaller now due to the various take-backs that have occurred over the past five years. Table 1 lists the changes that have taken place since the last MP.

Table 1. Summary of Land Base Changes Since MP #4

	Area(Ha)
TFL 46 Area at MP 4 (net of 7,325 ha Parks)	***83,545***
less:	
Forest Revitalization Act Orders (Instruments 22, 24, 25)	7,167
3(4)21-1 (PFN woodlot (Pixie Lake))	398
3(4)21-2 (Muir Creek)	259
3(4)21-3 (Shawnigan)	974
Bill 28 Dispositions (Instruments 28, 29 30)	
Rossander (remaining area except 33.3ha of CP41A)	2,291
San Juan BCTS (estimated)	10,479
San Juan Woodlot	600
Hill 60 (remaining area)	3,501
Mapping Error / Boundary Adjustments	(179)
TFL46 Area at MP 5	***58,055***
TO057 Area	1,536
A07065 Area	293
Total Area - Timber Supply Analysis	***59,884***

Boundaries for areas impacted by Forest Revitalization Act Orders (Instruments 22, 24, 25) were available at the start of the analysis and were incorporated into the spatial resultant. Boundaries for disposition under later Instruments were not available at that time. However, negotiations were well advance and the areas in question were known and agreed upon. These provisional boundaries were used to update the TFL boundary for this analysis. When Instruments 28, 29 and 60 came into force, the legal boundaries were compared to those that had been used in constructing the spatial dataset, and they were found to be in agreement.

The Hill 60 parcel has not yet been alienated from the TFL under Bill 28, though it is expected that this will happen in the near future. In the meantime, Teal Cedar is precluded from operating in this area, and it has been excluded from the landbase for the purpose of this analysis.

TFL boundary updates related to Instrument 26 have not been applied to the dataset used for this analysis. This is a 50-metre wide right of way along an existing mainline road that was taken for the Pacific Marine Circle Route Highway. This would have only a minor impact on the THLB, as most of the excluded area would overlay the existing road surface, ditch lines and clear portions of the R/W.

The starting landbase for the analysis is all land within the TFL 46 boundary, and all lands in Timber Licence TO057 and Timber Sale Licence A07065. All scheduled take-back areas will be excluded. These take-back lands will not be included in the base case, or in any sensitivity analyses. Timber License TO910, which is surrounded by TFL 46, has not been included in this analysis. The total TFL area for this analysis is 59,844 hectares.

Table 2 shows the netdown process by which the timber harvesting landbase has been determined. The order of the entries in the table corresponds to the sequence in which the land base classifications were applied. In some cases individual areas may have several classification attributes. For example, stands within riparian reserve boundaries might also be classified as non-commercial. These areas would have been classified on the basis of this latter attribute, prior to the riparian classification. Therefore, in most cases the net reduction will be less than the total area in the classification.

Table 2. Timber Harvesting Land Base Determination

	Total Area (Ha)	Productive Area (Ha)	Net Area Removed (Ha)
Total Area	***59,884***	***56,600***	
less:			
Non-Forest	1,538	-	1,538
Roads	1,785	-	1,746
Total Non-Forest Removed			***3,285***
Productive Forest Land			***56,600***
less:			
Inoperable	2,293	1,683	1,683
Unstable Terrain	6,722	6,284	5,802
Non-Commercial	80	71	71
Low Site	1,392	1,159	743
Community Watersheds	2	2	2
Riparian Reserve Zones	970	847	593
Riparian Management Zones	7,654	7,166	1,345
Environmentally Sensitive Areas	951	588	90
Old Growth Management Areas	6,751	6,211	3,109
Habitat	3,341	3,029	467
Recreation	464	362	186
Total Productive Removed			***14,092***
Timber Harvesting Land Base			***42,508***
Future Roads[2]			***498***
Long-term Landbase			***42,010***

3.2 Timber Growth and Yield

Forest growth and yield refers to the prediction of the growth and development of individual stands over time. Stand growth in terms of height, diameter, and volume is

[2] The area of road required to access undeveloped parts of the TFL has been estimated, and an appropriate reduction has been applied to future yield curves to account for this loss of productive landbase.

projected over time through the use of yield models. Yield tables are categorized into either natural stands or managed stands because of distinct growth pattern differences between the two types of stands. Existing natural and managed stands are differentiated based on stand age. The parameters used to define the yield table inputs were identified in the approved TFL 46 Timber Supply Analysis *Information Package*.

3.2.1 Natural Stands

Natural stand yield tables were developed for 30 analysis units as described in the *Information Package*. Inputs into the yield tables included inventory site index, species composition, stocking class, and crown closure. The yield tables were developed using the batch version of the MFR model Variable Density Yield Prediction (VDYP), version 6.6d. Yield curves were generated for each stand in the inventory, and these curves were used to create a single yield curve for each analysis unit.

For stands older than 120 years of age, previously developed Average Volume Lines (AVL) were used to assign volumes. These volumes are considered to be unchanging.

3.2.2 Managed Stands

Managed stand yield tables were developed for 30 analysis units identified in the *Information Package*. Inputs included species composition from the inventory (compiled by analysis unit), silviculture regimes by analysis unit, and Phase 2-adjusted site index estimates from the inventory. The yield tables were developed using the MFR BatchTIPSY (version 4.1c) program for managed stands. As for the natural stand yield tables, a yield curve was generated for each managed stand in the inventory, and these curves were used to create a single yield curve for each analysis unit.

Copies of the yield tables for natural and managed stands can be found in the Appendices of the *Information Package*.

3.2.3 Harvest System

Clearcutting was assumed to be the predominant harvesting system. Reductions were applied to yield curves to account for retention left to meet wildlife tree requirements.

3.2.4 Minimum Harvest Ages

MHA is established for each analysis unit. An AU is first harvestable when it meets all three of the following criteria:

- Minimum volume per hectare of 300 m^3/hectare;
- Minimum quadratic mean diameter (QMD) of 25 centimetres; and
- Within 90% of maximum mean annual increment (MAI).

The MHA’s that result from the application of these rules can be found in the *Information Package*.

3.2.5 Site Productivity

The rate at which a stand grows is determined by the underlying site productivity, and the chosen stand management regime. The productivity of a stand is measured using a site index. Three separate estimates of site index exist for TFL 46. These are:

1. a site index attribute on the old forest cover data that was inherited from TimberWest;
2. an estimate of site index for each VRI polygon based on its Phase 2-adjusted height and age, assigned using MFR-standard SI tables; and
3. a TEM-based estimate that was developed by sampling second-growth site index in the field.

Table 3 shows these estimates. The area-weighted average SI (using stands in the timber harvesting landbase only) has been calculated using each of the three stand-level SI estimates.

Table 3. SI Estimates for TFL 46

Area-weighted Average Site Index		
Old Forest Cover	VRI – Phase 2 Adjusted	TEM-based
26.7	25.0	30.3

An inventory audit conducted prior to the completion of the VRI found that "site indices for stands between free growing and 60 years of age are underestimated using the inventory data."[3] However, when the VRI Phase 2-adjusted site indices are compared to the site indices in the original forest inventory for the subset of stands that were 60 years or less in age at the time of the VRI photography, an opposite conclusion is reached. Table 4 shows that all three SI estimates are higher for second growth stands, but that the VRI estimate is still the most conservative of the three.

[3] from the VSIP

Table 4. SI Estimates for TFL 46 – Stands Less than 61 Years Old

Area-weighted Average Site Index		
Old Forest Cover	VRI – Phase 2 Adjusted	TEM-based
27.3	26.9	31.4

In spite of the fact that the VRI appears to underestimate the productivity of the TFL, it has been used to generate base case harvest forecasts. The inventory site index from the VRI forest cover database was used to develop yield tables for all existing stands, and for future managed stands as well.

3.3 Management Practices

The productive land base was assigned to resource emphasis areas (REA's) to facilitate the modelling of management requirements. These REA's were set up to model management practices that protect:

- visual quality objectives
- fisheries sensitive watersheds
- goshawk habitat
- old seral forest[4]

Polygon-based visual quality objective (VQO) zones are incorporated into the analysis as REA's. A total of 92 VQO polygons were contained in the source data sets. VQO's comprise 10,750 productive hectares, of which 7,512 hectares fall within the THLB. Both THLB and productive non-contributing land contributes to the management requirements within the VQO polygon.

Any area within the THLB that is not classified as visually sensitive was assigned to the integrated resource management (IRM) REA. These areas may be non-visible or visible but are not considered to be visually significant, and therefore have fewer restrictions on harvesting. For modelling purposes the IRM areas were aggregated within each landscape unit, resulting in six discreet units. Within these areas a 3-metre green-up requirement was applied.

[4] in the Cowichan landscape unit only – OGMA's have been established in all other LU's

The rate of harvesting has been controlled in the three fisheries sensitive watersheds that overlap the TFL. These watersheds cover a productive area of 22,952 hectares and 16,559 hectares of THLB. The modelling objective for these areas was to limit the ECA impact of harvesting to 20%, where ECA decreases based on stand height from 100% at zero metres to zero percent and nine metre in height. This was translated into a rate of cut restriction of 20% under three metres in height for modelling purposes. This limit was arrived at be using managed stand height growth for a stand of average site index. The maximum constant rate of harvest at this limit also leads to an ECA level of 20%.

Two modelling measures were taken to account for the management of goshawk foraging habitat:

1. at least 20% of the area had to be greater than 80 years of age
2. no more than 20% of the area could be less than 20 years of age

These constraints were applied to the 1627 hectares of productive forest classified as foraging habitat. However, only 788 hectares fall with the THLB. Nesting and fledging habitat were netted out of the THLB entirely.

Old seral constraints were applied in the Cowichan LU. These are normally applied at the BEC variant level, but because of the small areas involved, variants were combined by natural disturbance type. This resulted in one constraint being applied to the CWHvm1/vm2 variants and another to the CWHxm. It total, 738 hectares of productive area and 451 hectares of THLB area were affected by this constraint.

A more detailed description of the REA's modelled in this analysis is provided in the *Information Package*.

4 Analysis Methods

4.1 Forest Estate Model

Timberline's simulation model CASH6 (*Critical Analysis by Simulation of Harvesting*) was used to develop harvest schedules integrating all resource management considerations. The model uses a geographic approach to land base and inventory organization in order to adhere as closely as possible to the intent of forest cover requirements. Maximum disturbance and minimum thermal and old growth retention forest cover requirements, as well as biodiversity seral stage requirements, can be explicitly implemented if required. For this analysis disturbance constraints have been applied to control the rate of harvest in visually important areas and in fisheries sensitive watersheds. Retention constraints have been less widely employed – to retain old seral forests and protect goshawk habitat.

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 the periodic harvest can be included to better model forest structure at the landscape level.

Forest cover objectives are applied to specific areas or zones, so they require an explicit control area over which to operate. The control area for a constraint should correspond to a realistic element in the landscape. For example, the requirements associated with visual quality objectives (VQO) are designed to operate on the scene visible from discrete sets of viewpoints. The objective is to identify the "natural" constituency for forest cover constraints. CASH6 contains a hierarchical land base organisation to assist in implementing control areas. Numerous levels of land aggregation are used to define both geographically separate areas and areas of similar management regime. Forest cover constraints can be applied at up to five overlapping levels.

4.2 Timber Flow Objectives

The objective of the analysis is to determine the capacity of the TFL 46 land base to sustain a timber flow, and any risks to this flow resulting from uncertainty in the underlying assumptions. The analysis goes beyond a simple calculation of capturing the growth potential of the land base. Many management objectives with overlapping and potentially conflicting goals must be met. The maximum sustainable timber flow must ensure that these objectives are met while capitalizing on the growth potential of the land base.

A number of alternative harvest flows are possible. For this analysis, the objective was to achieve a balance of the following timber flow objectives:

- Maintain the existing AAC of 367,363 cubic metres per year for as many decades as possible;
- Decrease the periodic harvest rate in acceptable steps (no more than ten percent per decade) when declines are required to meet all objectives associated with the various resources on the land base;
- Ensure that over the next ten years 180,000 cubic metres per year is harvested from second growth stands on the TFL; and
- Achieve a maximum even-flow long-term supply where the total forest growing is stable.

4.3 Presentation of Results

Analysis results are provided in both tabular and graphic format for all scenarios modelled. The base case is presented in Section 5) and is described in detail. Harvest level and profiles, and growing stock forecasts are included. The relationship between the base case harvest level and other resource values is discussed.

The use of SGSI to generate future managed stand yield tables is the first of the sensitivity analyses presented. It is described (in Section 6) to the same level of detail as the base case, with the intention that it will be seriously considered as an alternative to the base case as the foundation for the AAC determination. As noted previously, SGSI was included for the base case for the last timber supply analysis.

For the remaining sensitivity analysis scenarios, the annual harvest levels are provided with comparison to the base case Harvest Level results. The report finishes with ‘Discussion and Conclusions’ in Section 7.

5 Base Case Results

The base case scenario is designed to find the harvest level that can be achieved under the assumption that current management practices are continued into the future. It is based on current performance and so provides a reference timber supply forecast against which timber supply implications of different management assumptions may be measured. The base case is used as the baseline to assess risk associated with any of the assumptions in the sensitivity analysis.

The harvesting rule employed was 'relative oldest first'. Stands that had aged the greatest number of years past their minimum harvest age were scheduled for harvest first. Alternative harvest rules are considered below.

If harvest scheduling had been based only on 'relative oldest first', most of the harvest in the early years of the planning timeframe would have occurred in old growth stands. In reality, a significant amount of harvesting is planned for second growth stands, due to market conditions and operational issues. For the base case model run, an annual quota for second growth logging of 180,000 m^3 was established. This was applied for the first planning period – ten years in total.

5.1 Harvest Level and Growing Stock

The initial harvest rate has been set at 367,363 m^3/year. This represents the AAC level set at the last AAC determination, administratively adjusted for area that has since been removed from the TFL. This harvest level is sustainable for fifty years, at which point it must fall to the long term sustainable level of 332,500 m^3/year. This represents a drop in harvest level of 9.9%, the maximum single-period decline permitted. Figure 2 shows this harvest level pattern.

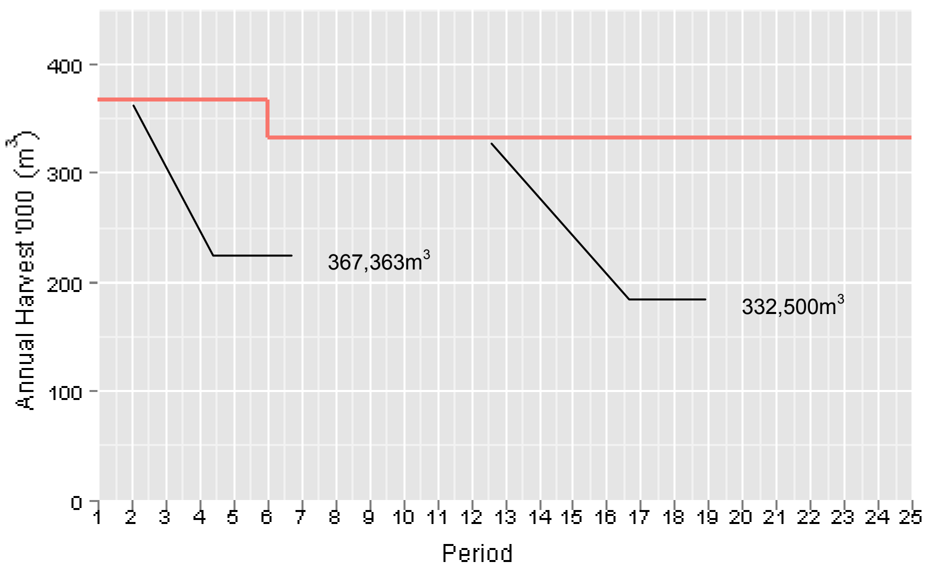


Figure 2. Base Case Harvest Level

In order to ensure that proposed harvest levels are sustainable, several metrics in addition to harvest volume need to be assessed. The first of these metrics is growing stock level. Figure 3 shows how total, operable and available growing stock levels vary over the planning horizon as a result of the base case harvesting regime.

Total growing stock represents the sum of the net merchantable volumes of all stands in the THLB. Operable volume, which is lower, only includes the volume from stands that are above their minimum harvest age. Available growing stock excludes stands that cannot be harvested without violating a cover constraint. This is assessed at the beginning of each period; additional stands may also become unavailable are a result of harvesting that occurs during the period.

This graph shows that the pinch-point in timber supply occurs in period five. After that, growing stock levels rebound. This is also the point at which the harvest level is decreased to the sustainable level. Long term growing stock levels are stable, with operable and available volumes rising slightly at the end of the planning horizon. The harvest level could not be increased any further at period nine without generating a harvest shortfall, but a small increase might be possible later in the planning horizon.

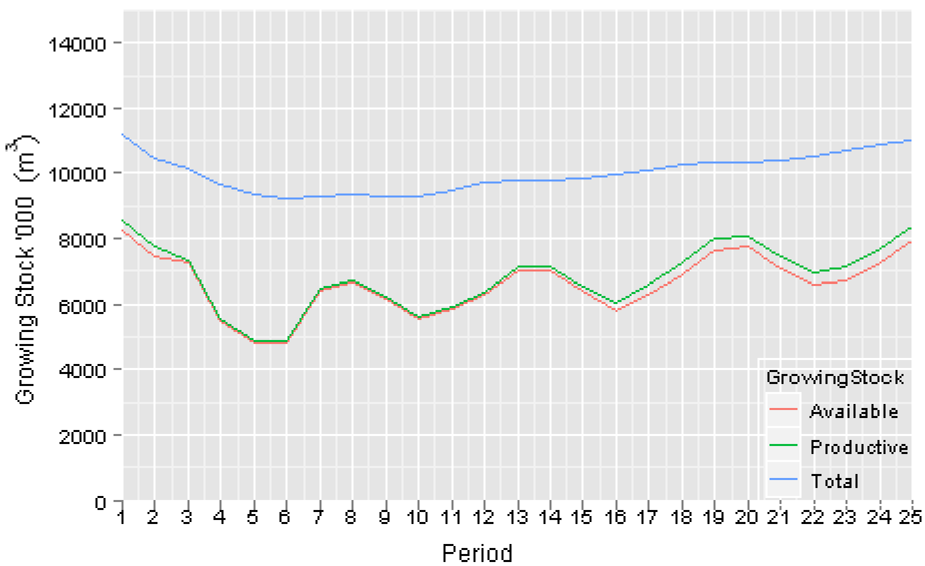


Figure 3. Base Case Growing Stock Levels

Figure 4 shows the progression of harvesting through the three types of stands – Existing Natural, Existing Managed and Future Managed. Existing Natural stands are comprised of old growth and second growth stands established prior to 1955. Some existing stands – both natural and managed – are not harvested until late in the planning period either because they are needed to meet old seral requirements, or because they fall within very restrictive VQO constraints.

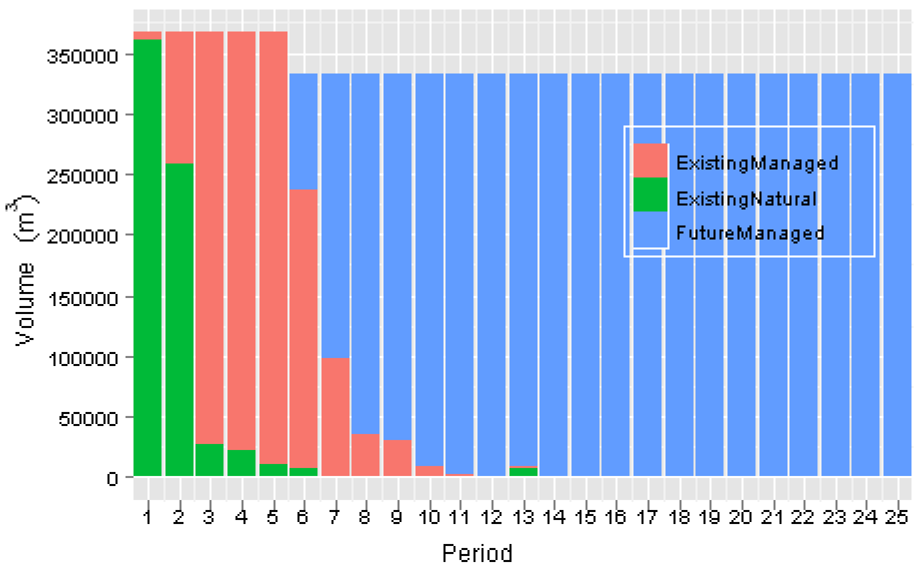


Figure 4. Harvest Contribution from Existing and Future Stands

Trends in annual area harvested, average harvest age, and average harvested volume are also useful in attempting to understand the dynamics of the forest under the base case scenario. The average annual area harvested is shown in Figure 5. This graph shows a stable trend, with area harvest falling between 600 and 800 hectares per year for most of the planning horizon. Over the entire planning horizon, an average of 671 hectares is harvested each year.

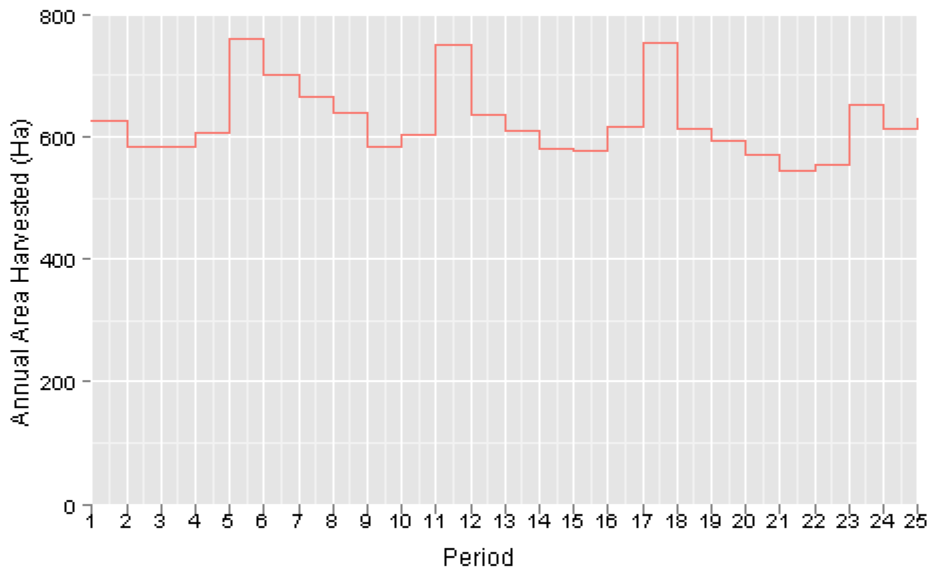


Figure 5. Average Annual Area Harvested

The average age of harvested stands is high in the early portion of the planning horizon – it averages 170 years for the first two ten-year periods. The harvest for each of these periods is made up of a mixture of old growth and second growth stands. In the first period this is driven by the quota of 50% that was applied to harvest in second growth. In the second period no quota was applied, but the remaining stock of available old growth is depleted and harvesting necessarily moves to second growth. The average harvest age falls sharply at this point. Figure 6 shows this trend. The average harvest age after the second period is 62 years, and is very stable. This average age is slightly lower than the average found in the base case from the previous timber supply analysis.

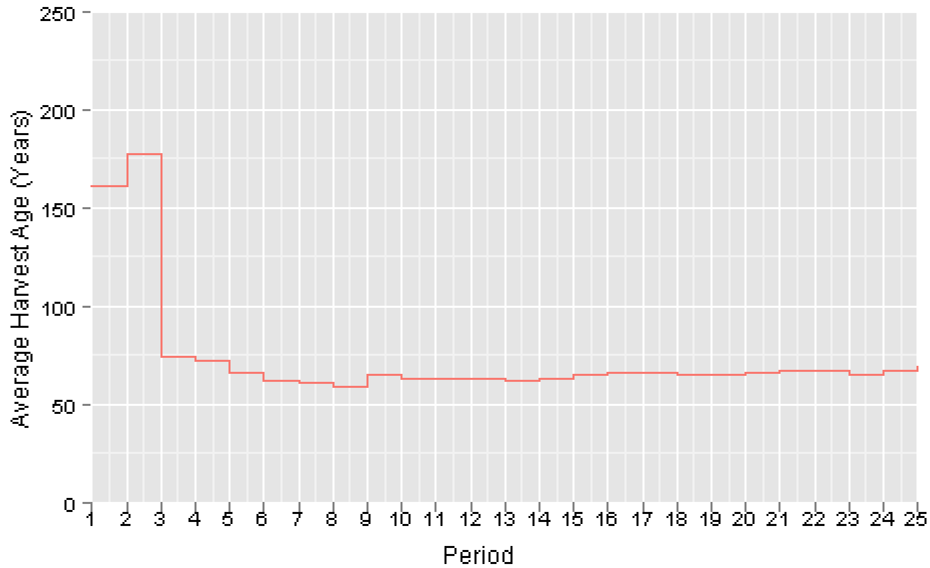


Figure 6. Average Age of Harvested Stands

The average volume of harvested stands (Figure 7) exhibits a fairly steady trend, with only a slight decline during the transition from old growth to second growth logging. The average for the entire planning horizon is 542 m^3/hectare. The average for the first five decades is higher (542 m^3/hectare) as old growth and older second growth stands are harvested, subject to cover constraints. After this point, harvest consists of second growth stands near their rotation age. The average harvest volume after this point is 532 m^3/hectare. This is lower than the results for the previous timber supply analysis – in that case the average harvest volume per hectare varied between 700 m^3/hectare and 800 m^3/hectare for most of the planning horizon.

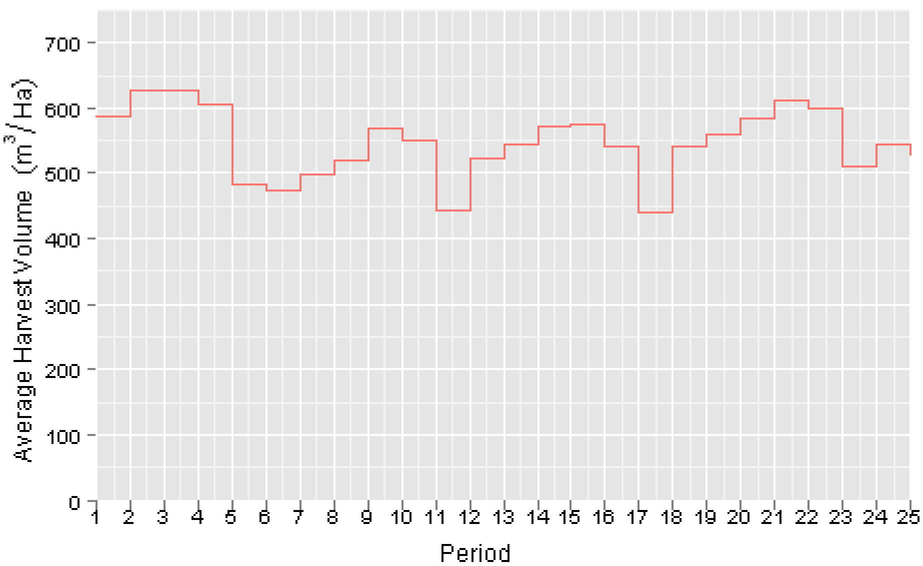


Figure 7. Average Volume of Harvested Stands

A final assessment of the base case scenario can be made by reviewing how the age class distribution of the forest changes over the planning horizon. The six charts that begin on the following page show these changes. The current distribution (Period 1) has a large component of old growth, but over half of that is outside of the THLB – reserved for habitat and biodiversity purposes. Half of the harvesting in the first period is in the oldest age class. The 180,000 cubic metre annual quota that was applied to second growth stands forces harvest in some younger stands as well. This is concentrated in the 60-year age class, with smaller volumes being harvested from the 50 and 70-year age classes.

By period five, all of the old growth in the THLB has been harvested. In fact, most of the old growth is harvested by the end of period two. Since no effort has been made to model disturbance in the productive non-contributing land base, the first four age classes contain only THLB land.

Most of the THLB is less than 60 years of age by period ten, though some THLB remains in old age classes to satisfy old-seral, habitat and visual constraints. Some stands are being harvested at 50 years of age, reflecting the rapid growth of future managed stands. Most harvesting occurs at ages less than 80 years, though some stands – those on poor sites or constrained – are harvested at older ages.

The remaining three distributions – for periods fifteen, twenty and twenty five show a consistent pattern: the THLB uniformly distributed in the first seven age classes; harvesting occurs at between 50 and 80 years of age; and the non-contributing landbase ages steadily rightward on the chart.

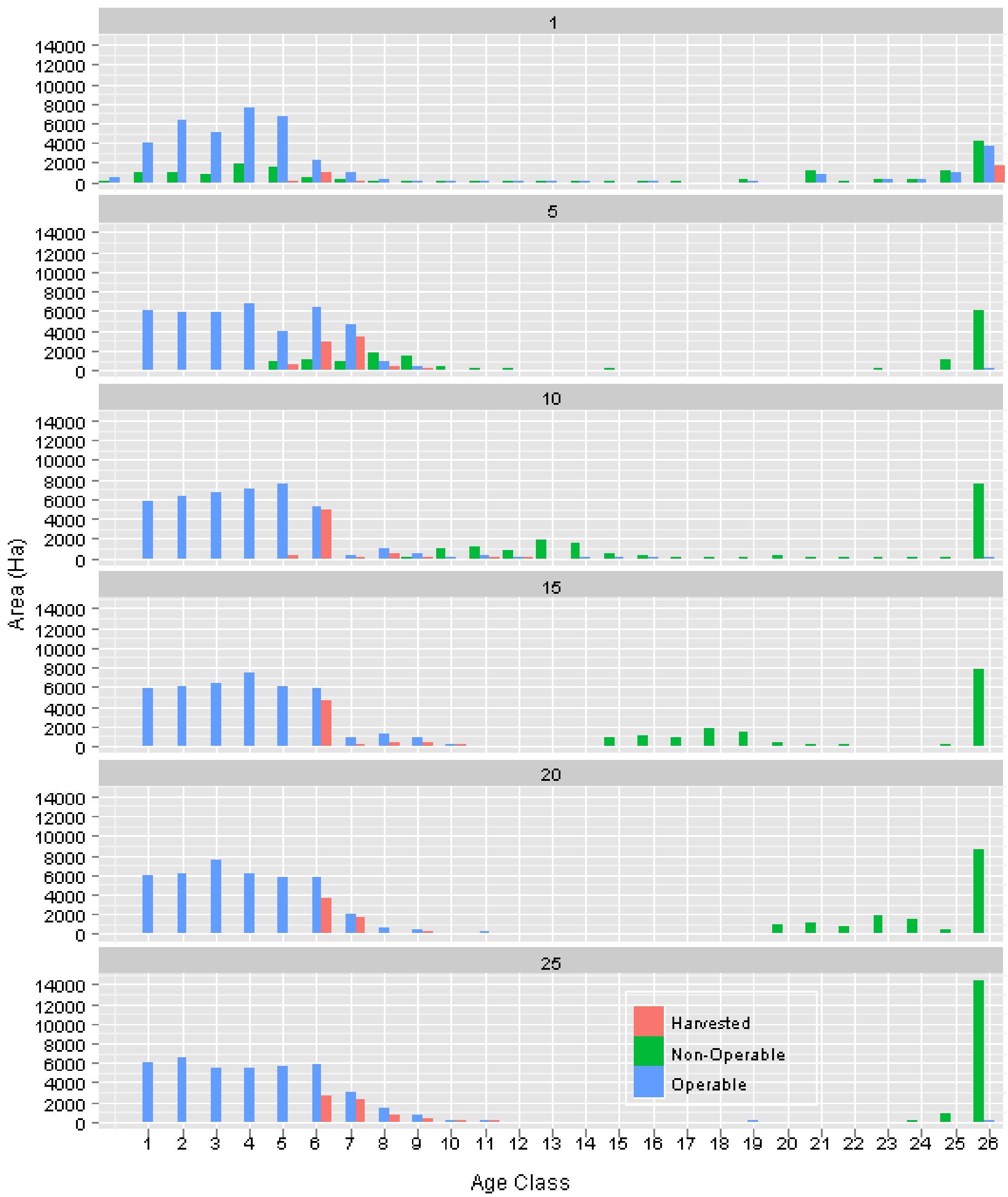


Figure 8. Age Class Distribution Throughout the Planning Horizon

5.2 Alternative Harvest Flows

The base case used a ‘Relative Oldest First’ harvest rule, subject to a quota on second growth to ensure that the resulting harvest schedule is consistent with current practice. In order to evaluate the stability of the timber supply to departures from this queuing rule, two additional harvest rules were tried.

The first of these was ‘maximize replacement increment’. Harvest was directed to those stands that would regenerate to the fast growing stands. The base case harvest levels can be achieved in the short term, but a small harvest volume deficit occurs in period 17 and recurs in period 22. The long term harvest level must be reduced by 16,000 cubic metres annually to 315,000 m3/year.

The second alternative harvest rule tried was ‘maximize volume per hectare’. Stands with the highest volume per hectare were selected first for harvesting. Using the base case harvest request, a significant shortfall occurs at period 18 and is an issue for most subsequent periods until the end of the planning horizon. The long-term harvest level must be reduced by 6000 cubic metres annually in order to be sustainable.

Figure 9 shows the harvest levels that are sustainable under the base case and two alternative harvest queuing rules.

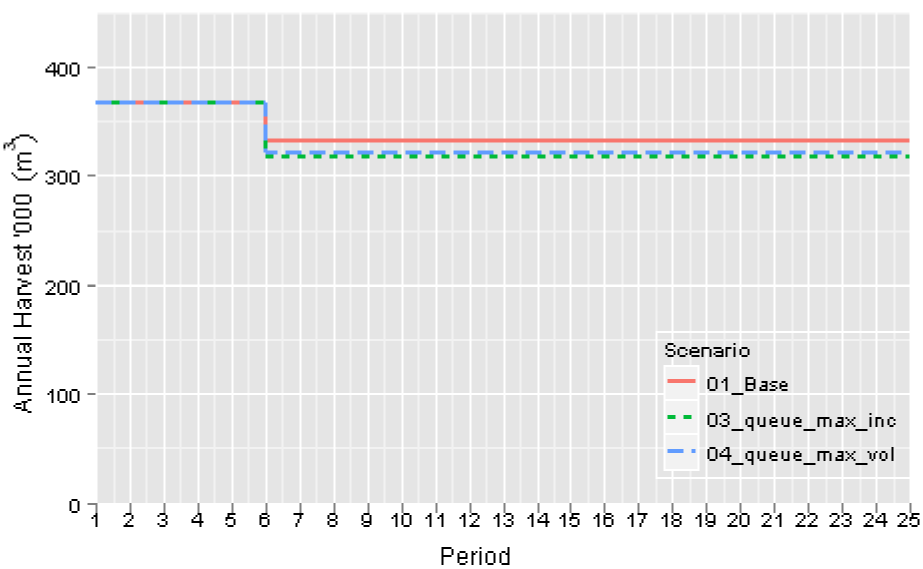


Figure 9. Alternative Harvest Scheduling Rules

6 Sensitivity Analysis Results

Sensitivity analysis provides a measure of the upper and lower bounds of the base case harvest forecast that reflects the uncertainty in the data and/or the management assumptions made in the base case. The magnitude of the increase and decrease in the sensitivity variable reflects the degree of uncertainty surrounding the assumption associated with that specific variable. Table 5 summarizes the sensitivity analyses that have been performed for this analysis.

Table 5. List of Sensitivity Analyses

Issue	**Sensitivity Analysis**	**Level to be Tested**
Post-Harvest SI Uncertainty		
VRI does not accurately reflect future site productivity	Use SGSI to build yield curves	n/a
Landbase Uncertainty		
Impact of changes in area available for harvest	Area of THLB	+/- 10%
Stand G/Y Uncertainty		
Inventory volumes not realized at harvest	Existing Stand Volume	+/- 10%
Future stands do not perform as forecast	Future Stand Volume	+/- 10%
Stands become economical to harvest sooner or later than predicted	Minimum Harvest Age	-10 years, +10, +20 years,
Disturbance Limit Uncertainty		
Visual Constraints	Green-up Height	+/- 1 metre
Integrated Resource Management (IRM)	Disturbance Limit	- 5% (20%) + 5% (30%)
Integrated Resource Management (IRM)	Green-up Height	+/- 1 metre

6.1 Site Index – Post Harvest

Estimates of site productivity are the main determinant of future stand yields and are consequently a primary driver of timber supply forecasts. The timber supply analysis completed for the last Management Plan and AAC determination was based on different estimates of site productivity than have been used for this analysis. For this base case, the inventory site index from the VRI has been used to develop yield tables for all existing and future stands. Managed stand yield curves for the base case scenario in the last timber supply analysis for TFL 46 were based on second growth site index derived from Terrestrial Ecosystem Mapping (TEM) and a field data collection program. These ecologically-based site index estimates were used for stands that regenerated after 1955. The derivation of these site indices is described in the report *Second Growth Site Index Estimates for Douglas-fir, Western Hemlock, Pacific Silver Fir and Western Redcedar on TFL 46*.[5] This is referred to as second-growth site index (SGSI).

A change in government policy precludes the use of these TEM-based SI's for the base case scenario for this analysis. The MFR has insisted that this analysis use inventory site index to construct all yield curves for the base case. The TEM upon which the second growth site index estimates were based has not yet been independently assessed for accuracy. A new MFR policy requires that this assessment be completed before ecologically-based site index estimates can be used for a base case analysis. To gauge the impact on timber supply of this change, this sensitivity analysis using SGSI-based yield curves has been completed. TEM-based estimates have been input to TIPSY to generate future managed stand yield tables for this sensitivity analysis.

These yield curves resulted in higher volumes for second growth stands. Due to the increased growth rates, these stands reached a harvestable condition at a younger age than that forecast by the base case yield curves. Minimum harvest ages were recalculated for this sensitivity analysis. The forest estate model was rerun with these amended inputs.

The sustainable long-term harvest level is 28% higher than for the base case, increasing from 332,500 m^3/year to 425,000 m^3/year. This increase occurs in two steps, from an initial harvest level of 370,000 m^3/year. This initial harvest level is less than one percent higher than the base case starting level of 367,363 m^3/year. Figure 10 compares the harvest level for this sensitivity analysis to the base case harvest flow.

[5] J. S. Thrower & Associates Consulting Foresters Ltd. 2000. *Second-Growth Site Index Estimates for Douglas-fir, Western Hemlock, Pacific Silver Fir, and Western Redcedar on TFL 46.*

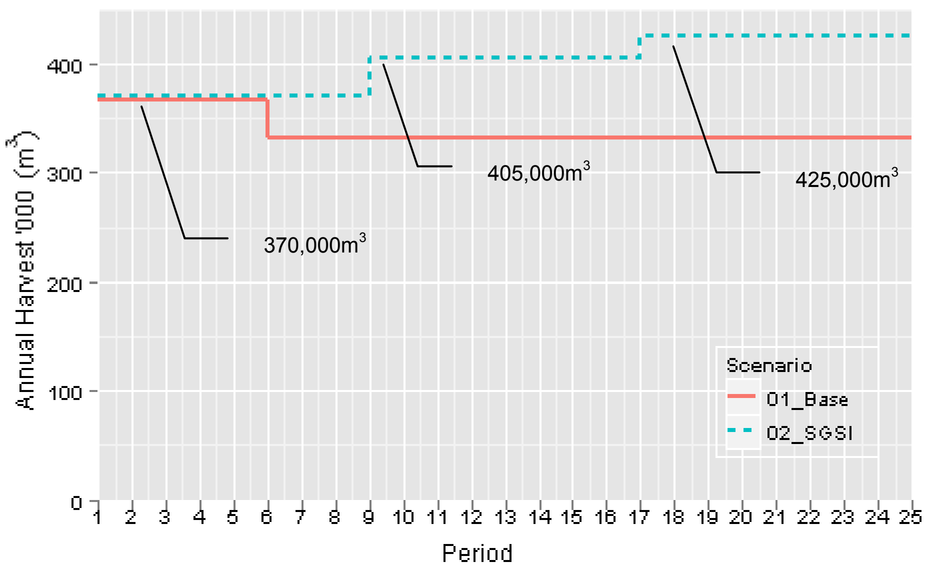


Figure 10. SGSI Harvest Level

Initial growing stock levels are identical to the base case. Once stands regenerate to the new managed stand yield curves, growing stock levels begin to increase, relative to base case levels. Figure 11 show these growing stock trends. Levels still decrease for the first 60 years however; the trough at this point is almost as deep as for the base case. The increase growth is offset somewhat by the higher harvest levels. In the long term, growing stock levels are significantly higher. The increased volume cannot be harvested due to IRM, watershed and visual quality disturbance constraints.

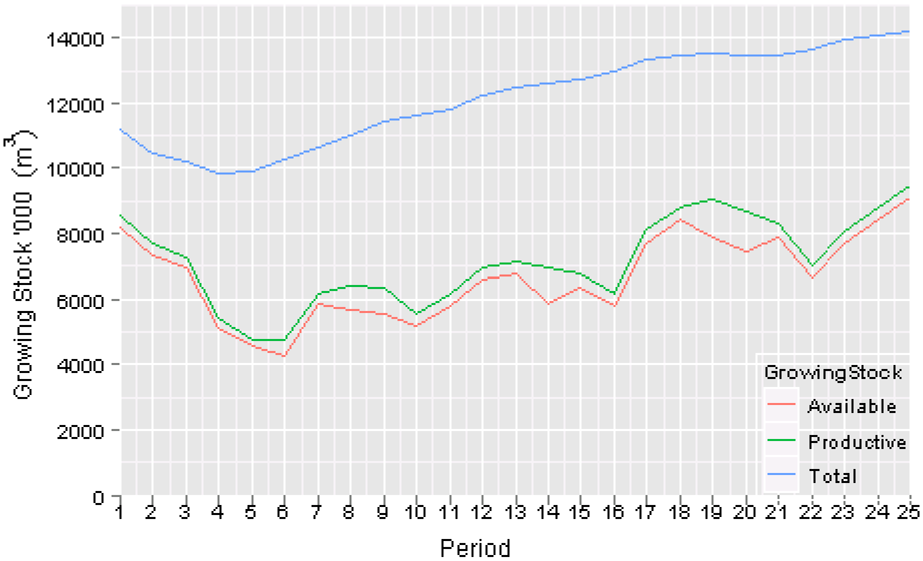


Figure 11. SGSI Growing Stock Levels

The transition from harvesting in existing to harvesting in future managed stands is similar to the pattern seen in the base case, and is shown in Figure 12.

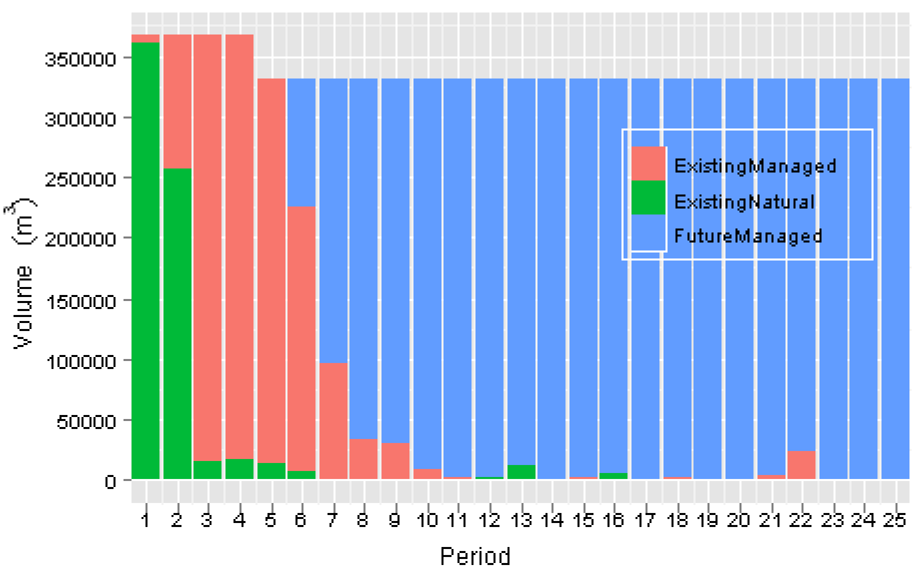


Figure 12. Harvest Contribution from Existing and Future Stands

Compared to the base case, average annual area harvested is greater in the midterm (50-80 years) as the higher initial harvest level forces harvest into younger stands. In the long term, however, annual area harvested is lower because the managed stands being harvested are generating a higher volume per hectare. Figure 13 shows this pattern.

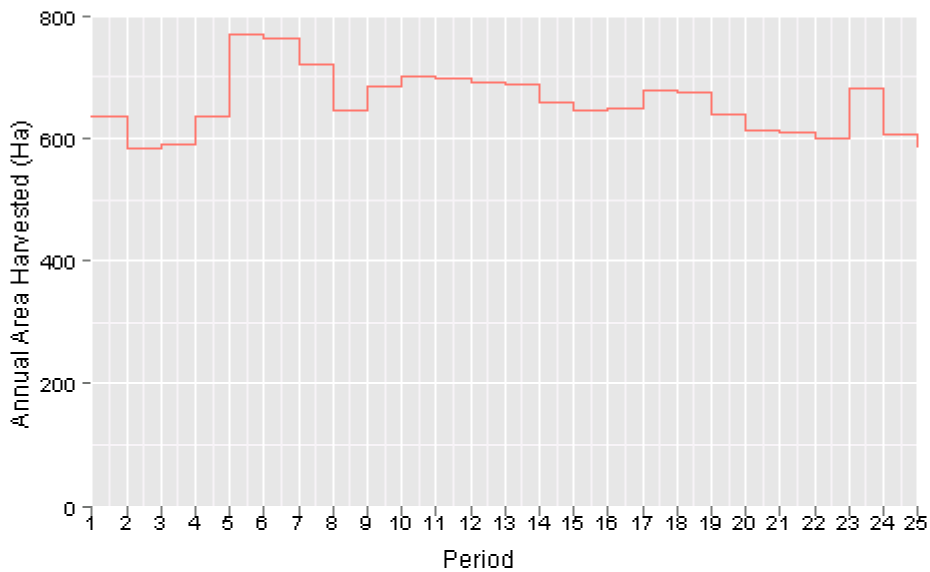


Figure 13. Average Annual Area Harvested

The average harvest age pattern (Figure 14) is very similar to the base case. However, the age is slightly higher in the long term. Over the last five periods, the average harvest age is 67 year, as opposed to 62 years in the base case.

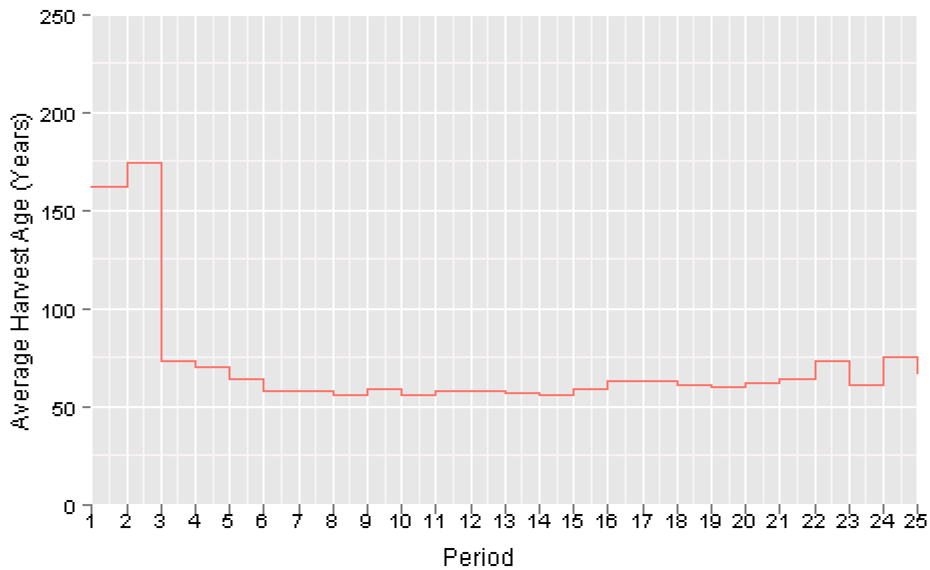


Figure 14. Average Age of Harvested Stands

The average harvest volume achieve is similar to that seen in the base case in the short term. However, whereas harvest volumes fall and stabilize at just below 500 m^3/ha in the base case, long term harvest level in this case approach 650 m^3/ha as higher yielding managed stands come on line. Figure 15 shows this pattern.

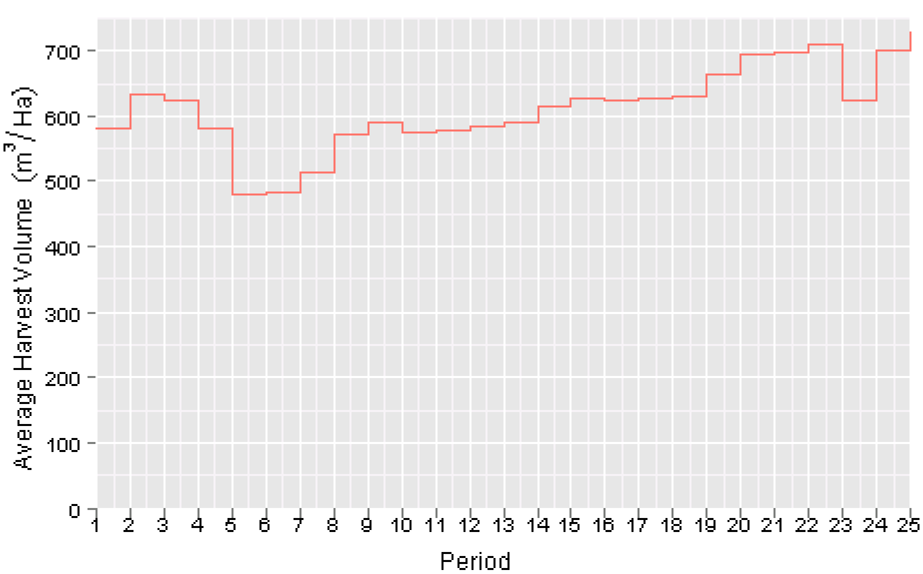


Figure 15. Average Volume of Harvested Stands

The age class distribution of the forest over time is similar to that seen in the base case. However, because the long-term average harvest age is slightly higher, more area accumulates in the 60-70 year age class. As with the base case, no allowance has been made for natural disturbance in areas outside of the THLB, so by the end of the planning horizon all of the non-contributing landbase is over 250 years of age.

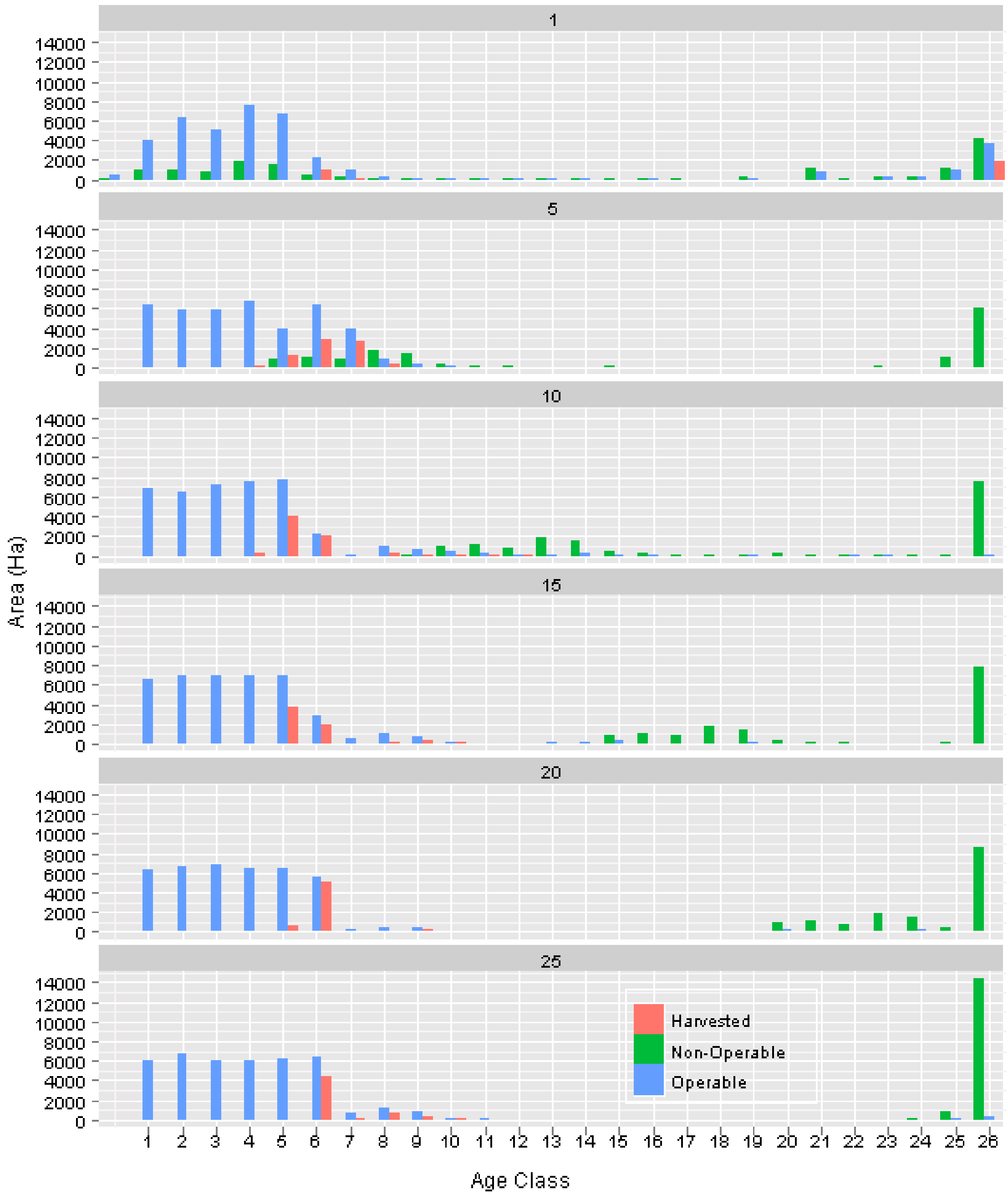


Figure 16. Age Class Distribution Throughout the Planning Horizon

6.2 Landbase Uncertainty

The actual size of the timber harvesting landbase is generally a source of uncertainty. The size of the landbase that could be harvested at any point it time varies with market conditions and with evolving objectives for non-timber resource values. The THLB determination completed in the *Information Package* was based on the best available resource information; if underlying inventories, management assumptions or log prices change, the size of the THLB will be affected. To gauge the potential impact of landbase changes on timber supply, the THLB has been increased and decreased by 10%. The area in productive non-contributing land was increased 30.2% - the amount needed so that the total size of the productive landbase remained the same as for the base case.

If the size of the THLB is decreased by 10% (and the productive, non-contributing area is increased by a corresponding amount), timber supply is significantly affected in both the short and long term. The initial harvest level falls by 8.0% to 338,000 m^3 annually. The sustainable long-term level is 297,500 m^3 – a decrease of 10.5% from the base case.

If the size of the THLB is increased by 10%, the short-term harvest level increases by 11.9% to 411,000 m^3/year. The long-term level rises to 364,000 m^3/year – an increase of 9.5%. The long-term increase is slightly less than the increase in the size of the THLB because less non-contributing area is available to meet biodiversity constraints (since the size of the productive landbase is fixed).

The results of all landbase uncertainty runs are summarized in Figure 17 below.

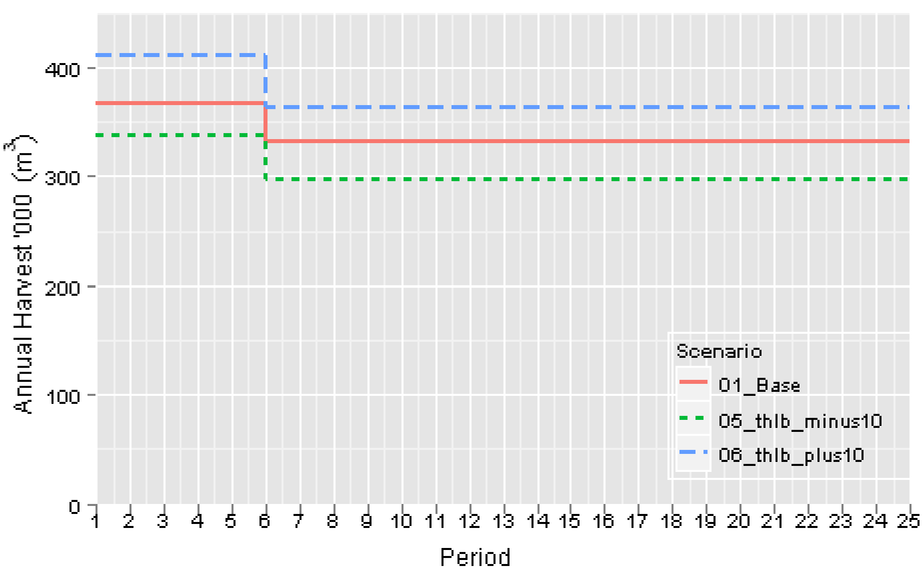


Figure 17. Harvest Level Sensitivity to Landbase Uncertainty

6.3 Growth and Yield Uncertainty

Estimates of stand yield form the core of a timber supply analysis. Stand yield forecasts for this analysis were developed using VDPY and TIPSY. These yields, for existing and future stands, are subject to uncertainties that arise from inventory inputs, changing silvicultural practices, uncertain site productivity and the limitations of the individual models. Two pairs of sensitivity analyses were run in an effort to present the potential impacts on timber supply of the uncertainty attached to estimates of individual stand yield.

6.3.1 Existing Stand Volume

Existing natural stand yields were estimated using VDYP; existing managed stands were modeled with TIPSY. The impact on timber supply of increasing or reducing these estimates by 10% has been examined.

When existing stand volumes are increased by 10%, short term harvest levels climb by 12.2% from the base case harvest level of 367,363 m^3 to 412,000 m^3/year.

When existing stand volumes are reduced by 10%, the harvest level falls by 10.2%; the base case harvest level of 367,363 is reduced to 330,000 m^3/year. In both cases, long term harvest levels are essentially unchanged; a 500 m^3/year reduction is needed in the latter case so that long-term growing stock levels stabilize. The results are summarized in Figure 18.

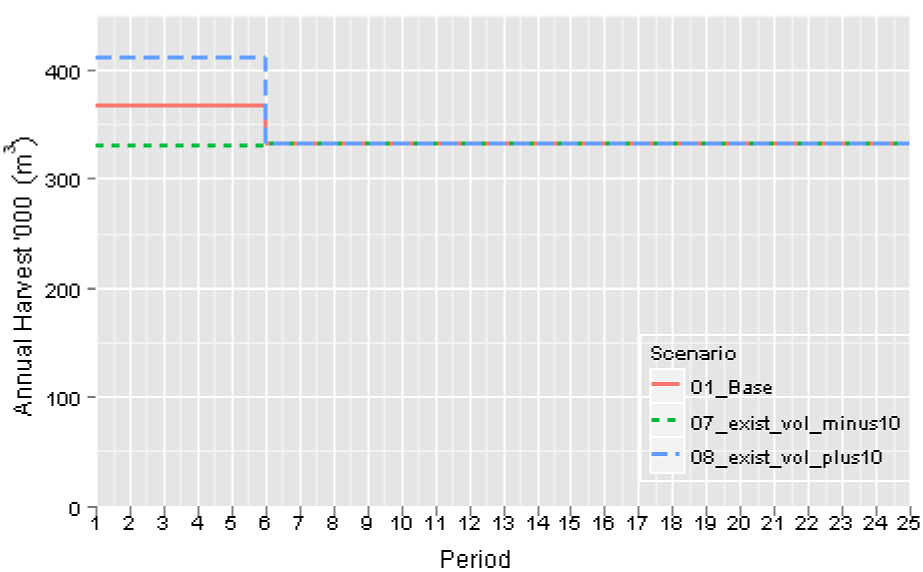


Figure 18. Harvest Level Sensitivity to Existing Stand Yield Uncertainty

6.3.2 Future Stand Volumes

In a similar fashion, uncertainty in future stand yields has been considered. They were increased by 10% for the first sensitivity analysis, and reduced by 10% for the second. Neither change had any impact on short term harvest levels.

When future stand volumes are increased by 10%, the long-term harvest level increases by 9.8% to 365,000 cubic metres annually. When they are reduced by 10%, the harvest level falls by 7.7% to 307,000 m^3/year. The results are summarized in Figure 19.

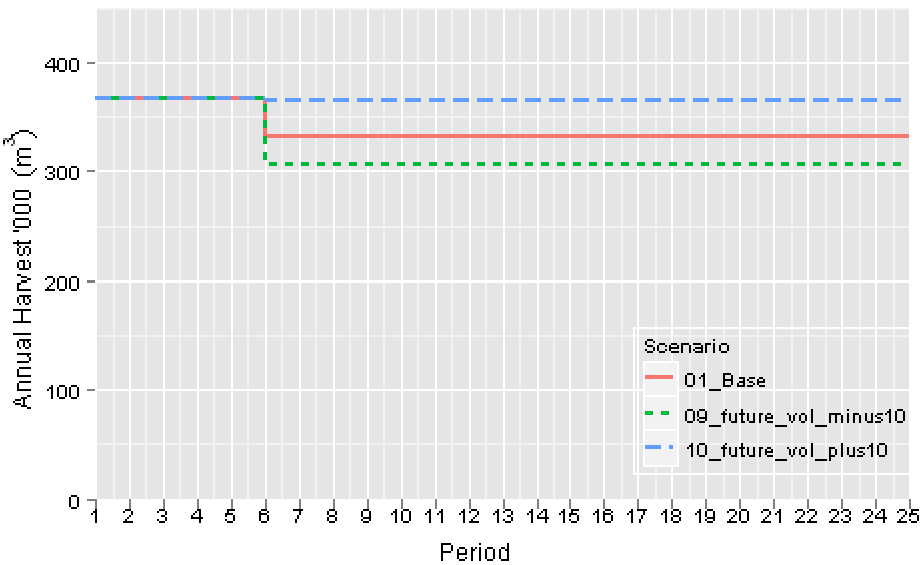


Figure 19. Harvest Level Sensitivity to Future Stand Yield Uncertainty

6.3.3 Minimum Harvest Age

The minimum harvest age was established for each yield curve as the youngest age at which it meets all three of the following criteria:

- Minimum volume per hectare of 300 m^3/hectare;
- Minimum QMD of 25 centimetres; and
- Within 90% of maximum MAI.

This is not a ‘rotation’ age, but rather the earliest age at which the stand would be available for harvest. Three sensitivity analyses have been run to test the impact on timber supply of varying MHA. When MHA is decreased by 10 years, short term harvest rises by 1.3% to 372,000 m^3/year. Any increase in harvest above this level results in a shortfall at the end of the planning horizon. The long term harvest level remains unchanged at 332,500 m^3/year.

In a second sensitivity analysis, MHA was increased by 10 years. This resulted in a short term decrease in harvest of 8.0%, to a level of 338,000 cubic metres per year. The long term harvest level actually increases slightly – by 2.3% to 340,000 m^3/year.

In the final sensitivity analysis of this set, MHA was increased by 20 years. This resulted in a short-term decrease in harvest level of 20.5% to 292,000 m^3/year and a long-term increase of 6.2% to 353,000 m^3/year. Figure 20 shows these trends.

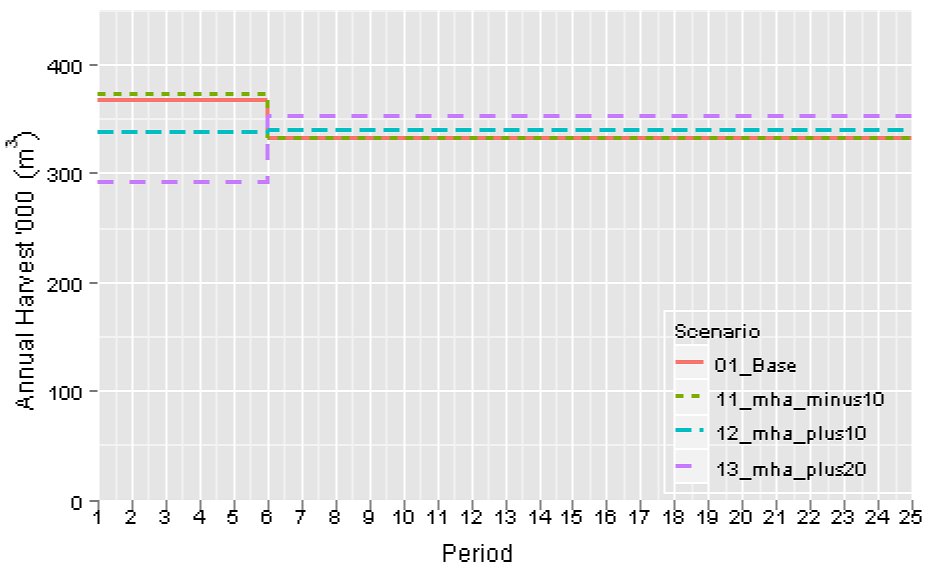


Figure 20. Harvest Level Sensitivity to MHA Uncertainty

6.4 Disturbance Limit Uncertainty

6.4.1 Visual Green-up

The rate of harvesting in visually sensitive areas is controlled so that viewscapes are not excessively impacted. For each visually sensitive polygon, no more than a certain proportion of the area can be below a specified height (the visually effective green-up height). The height limits and proportions allowed are described in the information package.

The first sensitivity analyses examined the impact of increasing green-up height by one metre. This had no impact on harvest levels in either the short or long term. Decreasing green-up requirements led to slightly increased harvest levels (1.8% to 374,000 cubic metres annually) in the short term. The long-term harvest level remained unchanged. Figure 21 shows these results.

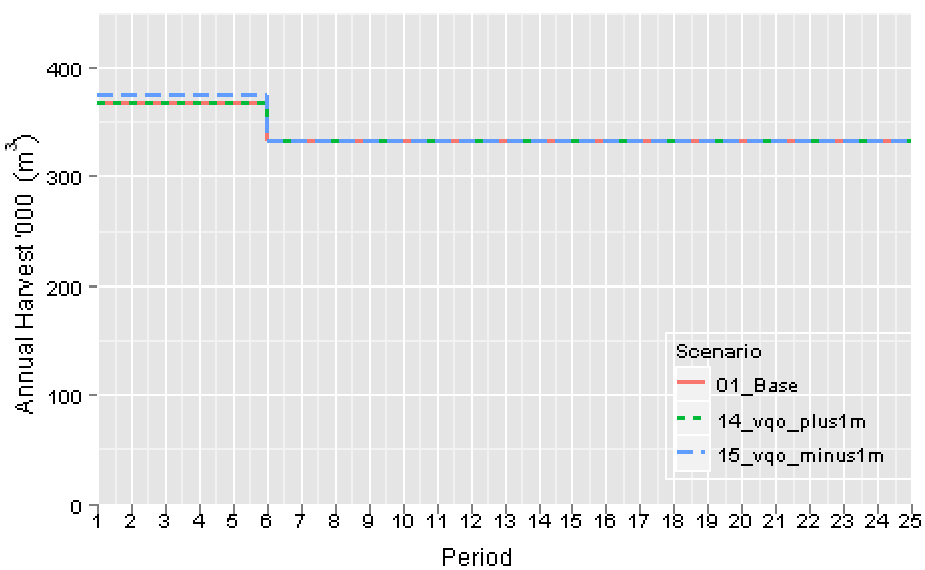


Figure 21. Harvest Level Sensitivity to Visual Green-up Uncertainty

6.4.2 Integrated Resource Management

In areas that are not subject to visual quality management, disturbance constraints have been applied as a proxy for adjacency. No more than 25% of a landscape unit can be less than three metres in height. This constraint is applied to the THLB only. Sensitivity runs were conducted on both parts of this constraint – the proportion and the height. The results are summarized in Figure 22 below.

A decrease in the maximum proportion of the area allowed to be below three metres (from 25% to 20%) stand height had no impact on harvest levels. When the limit was increased to 30% a short-term increase in harvest level was possible; it rose by 1.7% to 373,500 m^3/year.

Changes in the green-up height limit likewise had little effect on harvest levels. Increasing the green-up height to four metres had no impact on in either the short or long term. Long term harvest level did not change when the height limit was decreased to two metres, but the short-term harvest level increase slightly (by 1.4%) to 372,500 cubic metres per year.

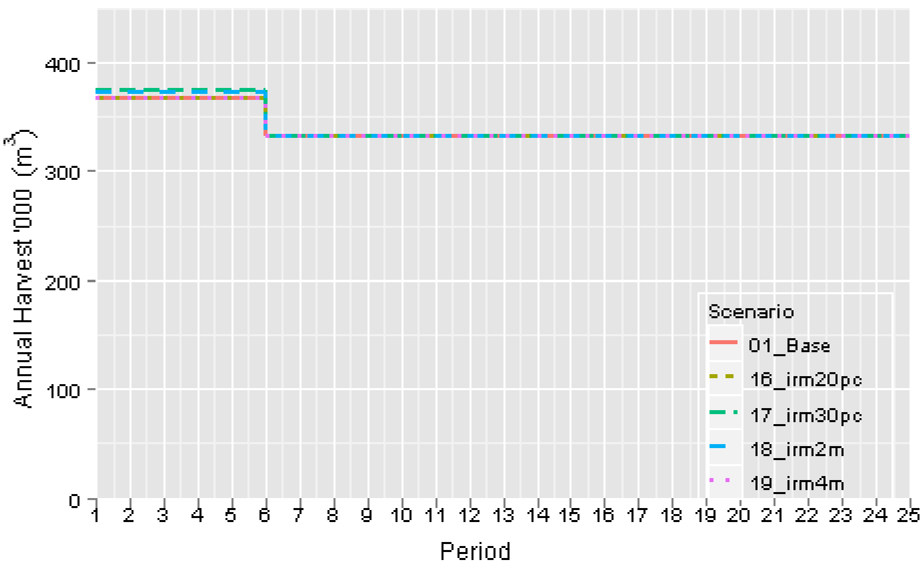


Figure 22. Harvest Level Sensitivity to IRM Uncertainty

7 Discussion and Conclusions

The analyses described in this report were developed to provide input into the process of determining the AAC for TFL 46. In doing so, a timber supply harvest rate was sought that would maintain the existing AAC for as long as possible while achieving a stable long-term supply and growing stock. Under the base case scenario, it was possible to maintain the current harvest rate for fifty years. At that point, it must fall to the long-term sustainable level of 332,500 m^3/year. Attempts to increase the short term harvest above the current level resulted in a harvestable growing stock shortfall at the end for the fifth decade.

The results of the sensitivity analyses that were completed in order to test the robustness of the base case harvest levels to changes in landbase, yield and management practice assumptions are presented in Table 6.

Table 6. Base Case and Sensitivity Harvest Level Summary

		Short Term Harvest Level		**Long Term Harvest Level**	
Scenario		**m^3/year**	**% of Base Case**	**m^3/year**	**% of Base Case**
Base Case	01	367,363	100.0%	332,500	100.0%
Post-Harvest SI Uncertainty					
Second Growth Site Index	02	370,000	100.7%	425,000	127.8%
Alternate Harvest Rules					
Minimize Volume Lost	03	367,363	100.0%	315,000	94.7%
Highest Volume First	04	367,363	100.0%	325,000	97.7%
Landbase Uncertainty					
THLB Minus 10%	05	338,000	92.0%	297,500	89.5%
THLB Plus 10%	06	411,000	111.9%	364,000	109.5%
Stand G/Y Uncertainty					
Existing Volume Plus 10%	08	412,000	112.2%	332,500	100.0%
Existing Volume Minus 10%	07	330,000	89.8%	332,500	100.0%
Future Volume Plus 10%	10	367,363	100.0%	365,000	109.8%
Future Volume Minus 10%	09	367,363	100.0%	307,000	92.3%
Minimum Harvest Age Uncertainty					

		Short Term Harvest Level		Long Term Harvest Level	
Scenario		**m³/year**	**% of Base Case**	**m³/year**	**% of Base Case**
MHA Minus 10 Years	11	372,000	101.3%	332,500	100.0%
MHA Plus 10 Years	12	338,000	92.0%	340,000	102.3%
MHA Plus 20 Years	13	292,000	79.5%	353,000	106.2%
Disturbance Limit Uncertainty					
VQO Greenup Plus 1m	14	367,363	100.0%	332,500	100.0%
VQO Greenup Minus 1m	15	374,000	101.8%	332,500	100.0%
IRM Disturbance Minus 5%	16	367,363	100.0%	332,500	100.0%
IRM Disturbance Plus 5%	17	373,500	101.7%	332,500	100.0%
IRM Greenup Plus 1m	18	367,363	100.0%	332,500	100.0%
IRM Greenup Minus 1m	19	372,500	101.4%	332,500	100.0%

7.1 Second Growth Site Index

The base case yield curves were developed using the site index from the VRI. This is lower than the site index in the old forest cover, and significantly lower than the TEM-based SI. This conservative estimate of productivity results in significant downward pressure on timber supply in the long term. When yield curves based on SGSI are used to forecast the development of future managed stands, a 27% increase in long term harvest level is possible. A small increase (slightly less than 1%) is also possible in the short term because future stands become harvestable at a younger age.

7.2 Landbase and Yield Issues

The proportion of the TFL landbase that is available for harvesting – physically accessible, economically viable and free of regulatory restrictions – is a primary driver of timber supply. The *Information Package* presented and justified a netdown of the total TFL landbase (of 59,844 hectares) to a timber harvesting landbase of 42,508 hectares. This was done using the most current information available and was based on current management practices. To the extent that the actual area available for harvesting departs from this estimate, the timber supply will be impacted. If the THLB were to increase in size by 10%, short-term timber supply would rise by 11.9% and long-term supply would increase by 9.5%. Conversely, if the area of the THLB is reduced by 10% short- and long-term timber supply fall by 8.0% and 10.5% respectively.

The short-term timber supply is moderately sensitive to changes in the yield estimates for natural mature stands. The increase or decrease in timber flow is approximately proportional to assumptions about changes in yield. Reducing the volume estimates for natural stands by 10% forces the annual harvest to drop by 10.2% from the base case level. Conversely, increasing volumes in natural stands by 10% allows the current AAC to climb by 12.2%. The long-term harvest level is unaffected by changes in the yield of existing stands.

Changing the yield of future stands has no impact on initial harvest levels. The change in long-term levels is roughly proportional to changes in future yield curves. Adjusting future yield curves up by 10% resulted in a corresponding increase of 9.8% in long-term harvest levels. A 10% reduction in future yield reduces long-term timber supply by 7.7%.

If future yield curves are unaltered, but MHA is increased by 10 years, short-term timber flow falls by 8.0% and long-term timber supply increases by 2.3%. These trends are magnified if MHA is increased by 20 years. Short-term harvest levels must fall by 20.5% and long-term timber supply increases by 6.2%. However, if MHA is decreased by 10 years, the initial harvest level increases by only 1.3% – an indication the short-term supply is also limited by disturbance and retention constraints, and not just the availability of timber above minimum harvest age. Long-term harvest level is unaffected.

7.3 Management Practices

The variations in timber supply discussed above are due to uncertainty about the data upon which the base case timber supply is founded. The other major source of uncertainty considered in the sensitivity analyses was that related to forest management practices. The complex operational decision making that occurs on a day-to-day basis in order to meet competing resource objectives in a shifting economic and social environment must be reduced to a somewhat simple set of cover constraints that can be applied during forest estate modeling. If actual management practices differ from these assumptions, changes in sustainable timber supply will result.

A cover constraint enforces a limitation on harvesting over a specified area or zone. For this analysis, zones were created to model:

- visual quality objectives;
- goshawk habitat;
- biodiversity (in the Cowichan LU only); and
- fisheries sensitive watersheds

and also at the landscape unit level as an alternative to modeling strict cutblock adjacency (an IRM constraint). Sensitivity analyses were conducted around the first and last of these issues – VQO and IRM constraints.

Changes in the constraints applied to protect VQO's have virtually no impact in harvest levels in either the short or the long-term. Five VQO polygons currently exceed the harvest limit specified for the VQO class into which they fall, but the forest estate model does not schedule future harvesting in these areas until they are sufficiently recovered.

IRM constraints are, for the most part, not limiting on timber supply. Small short-term increases in harvest level are possible (less than 2%) if the green-up height is reduced or the harvest area limit is increased, but the long-term harvest level is unchanged under all of the IRM sensitivities model. The Cowichan LU is in violation of its IRM constraint at the start of the planning horizon, but recovers within twenty years. The area of this LU that falls within TFL 46 is small, so it has a negligible impact on the overall timber supply situation. The Walbran is the only other LU that approaches the IRM limit – this occurs at 60 years and the harvested area is slightly over 90% of the available area.

No sensitivity analyses were conducted for goshawk habitat or for biodiversity in the Cowichan LU. Although these resource values are important, the area of the TFL that falls into each of these zones is too small for the sensitivities that are typically examined for these issues to show meaningful timber supply impacts.

7.4 Conclusions

Most of the sensitivity analyses completed show that the TFL 46 timber supply is relatively insensitive to small changes in the underlying data or varying assumptions about future management practices. The exception to this is belief about true site productivity of the TFL, and the significant impact that this has on the yield and MHA forecasts for second growth stands. Even in this case, the differences in projected timber supply are small in the short term. It is only in the long term that these forecasts depart from one another significantly.

The next AAC determination for TFL 46 will be in force for between five and ten years, barring any significant alterations to landbase or changes in management practices. An AAC of 370,000 cubic metres per year is quite defensible based on the information presented is this document. This is the initial harvest level that could be sustained using the yield curves based on SGSI. It represents a slight increase from the current administratively-adjusted AAC that was used as the starting level in the base case. The risk of establishing the AAC at this level is small; if the VRI site index estimates are in fact accurate, harvest shortfalls will not occur for fifty years. In the meantime, further work can be done to verify site index estimates for the timber harvesting landbase.

8 Glossary

AAC	Allowable Annual Cut
BEC	Biogeoclimatic Ecosystem Classification
CASH6	Critical Analysis by Simulation of Harvesting
ESA	Environmentally Sensitive Area
FPPR	Forest Planning and Practices Regulation
FSP	Forest Stewardship Plan
GIS	Geographic Information System
IP	Information Package
IRM	Integrated Resource Management
IRM	Integrated Resource Management
LU	Landscape Unit
MHA	Minimum Harvestable Age
MFR	Ministry of Forests and Range
MP	Management Plan
NSR	Not Satisfactory Restocked
OAF	Operational Adjustment Factor
OGMA	Old Growth management Area
PSYU	Public Sustained Yield Unit
QMD	Quadratic Mean Diameter
RFI	Recreation Features Inventory
RMZ	Riparian Management Zone
RRZ	Riparian Reserve Zone
RVQC	Recommended Visual Quality Class

SGSI	Second Growth Site Index
SI	Site Index
SRMZ	Special Resource Management Zone
TEM	Terrestrial Ecosystem Mapping
THLB	Timber Harvesting Land Base
TIPSY	Table Interpolation Program for Stand Yields
TL	Timber Licence
UWR	Ungulate Winter Range
VDYP	Variable Density Yield Prediction
VILUP	Vancouver Island Land Use Plan
VLI	Visual Landscape Inventory
VQO	Visual Quality Objective
VRI	Vegetative Resources Inventory
WHA	Wildlife Habitat Area

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Appendices

Appendix I

Information Package