TIMBER SUPPLY ANALYSIS REPORT
FOR TREE FARM LICENCE 45

FOR INTERNATIONAL FOREST PRODUCTS LIMITED
MANAGEMENT PLAN NO. 4

International Forest Products Limited
Campbell River Division

Prepared by:

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EXECUTIVE SUMMARY

A timber supply analysis has been completed as a component of Management Plan No. 4 for International Forest Products Limited (Interfor) Tree Farm Licence (TFL) 45. The analysis evaluates how current management, including allowance for management of non-timber resources, affects the supply of harvestable timber over a 250-year period. In addition, the analysis includes a 20-year spatial feasibility on proposed harvest levels and quantifies the sensitivity of the results to uncertainty associated with modelling inputs.

A timber supply model was employed to forecast long-term timber availability under a variety of scenarios. The timber supply analysis provides the technical basis for the Chief Forester of British Columbia to determine an allowable annual cut (AAC) for TFL 45 for the next five years.

The current AAC for TFL 45 is estimated at 220 000 cubic meters, based on the Base Case analysis from Management Plan No. 3. While this AAC represents the harvest level in the short term, there is an associated harvest flow that represents the expected timber availability over the next 250 years. Four concurrent harvest flow objectives have been established for the TFL:

- Maintain an initial harvest level of 220 000 cubic meters per year;
- Decrease the periodic harvest rate in acceptable steps (<=10%) when declines are required to meet all objectives associated with the various resources on the land base;
- Do not permit the mid-term harvest to fall below a level reflecting basic maintenance of the productive capacity of the TFL (based on VDYP yield estimates); and
- Achieve an even-flow long-term supply over a 250-year time horizon.

The inventory information used to define the resource characteristics for TFL 45 incorporates a number of recent updates to account for past disturbances, and updated definitions of non-timber resources such as recreation, wildlife and visual quality values.

While approximately 64 920 hectares were determined to be productive forest, only 26 800 hectares (41%) of this area was considered as part of the net timber harvesting land base, the balance having been classified as inoperable, or reserved for other purposes.

The productive forest was subdivided into a number of overlapping management zones. Specific forest cover objectives were set for each zone, based on its management objectives. Management zone forest cover objectives were incorporated into the timber supply analysis procedure.

Three analysis scenarios were completed for this timber supply analysis in support of Management Plan No. 4, specifically:

- Current Management Performance (Base Case) – based on the date of commencement for the preparation of Management Plan No. 4 employing current management assumptions;
- Alternative Management Scenarios – options considered operationally feasible by the Licensee; and
- 20-Year Spatial Feasibility – models the Base Case assumptions spatially, including cutblock adjacency and harvest blocks from Interfor's 5-year plan.

All analyses employed growth and yield estimates developed by J.S. Thrower and Associates. All employed the same land base classification. Using the new growth and yield inputs a timber flow pattern was developed, taking into consideration the timber flow policy stated above.

The Base Case option results in a starting harvest of 220 000 cubic meters for a period of 30 years. The long-term harvest level was determined to be 210 000 cubic meters. Forecasted long-term levels are approximately 9% below the theoretical long run sustainable yield (LRSY), after allowance for non-recoverable losses and wildlife tree retention. LRSY is calculated based on harvesting all stands at culmination of mean annual increment (MAI). Given the imposition of conflicting forest cover and harvest scheduling objectives, the realized long-term level will always be less than the calculated LRSY.

Based on this outcome, a series of sensitivity analyses were completed to test the impact of changing specific input assumptions. In the short-term, the supply of available timber above minimum harvest age reaches critical levels at decades 5, 16 and 23. Unforeseen delays in the availability of timber from second growth stands will have a negative impact on timber supply, as the supply from existing mature volumes must be stretched over a longer time horizon. In addition to this analysis, a number of alternative options have also been completed to assess the impacts of different TFL programs.

The 20-Year Spatial Feasibility option indicates that the short-term harvest can be placed on the ground with all of the Base Case assumptions and cutblock adjacency in place. It was not designed to be an operational plan, but a test of timber availability given the current structural characteristics and spatial distribution of components of the resource, as well as the structural and spatial management objectives associated with the Forest Practices Code.

Based on the outcome of these analyses, it is proposed that the AAC for TFL 45 be set at 220 000 cubic meters. This harvest is maintainable for a period of 30 years. It is then reduced by approximately 8% in decades 4 and 5, to a mid-term level of 186 200 cubic meters. A long-term level of 210 000 cubic meters is achieved in decade 11.

The proposed AAC is supported by four (4) critical factors:

1. The Base Case analysis demonstrates that this level is sustainable for three decades;
2. Mid-term reductions are reasonable given the productivity of the land base;
3. Long-term harvest is maintained within 9% of the productivity of the land base; and
4. The 20-Year Spatial Feasibility analysis has demonstrated that the proposed AAC is spatially attainable for 20 years.

1.0 Introduction

An analysis of timber supply has been completed as a component of Management Plan (MP) No. 4 for International Forest Products Limited (Interfor) Tree Farm Licence (TFL) 45. The analysis evaluates how current management, including allowance for management of non-timber resources, affects the supply of harvestable timber over a 250-year period. In addition, the analysis includes a 20-year spatial feasibility on proposed harvest levels and quantifies the sensitivity of the results to uncertainty associated with modelling inputs. The analytical methodology employs a forest level simulation model, which is used to forecast the long-term development of the forest given:

- A description of the initial forest conditions;
- Expected patterns of stand growth;
- A specified set of rules for harvesting and regenerating the forest;
- A specified set of forest structural characteristics; and
- Consideration of non-timber values.

The process enables forest managers to evaluate timber availability under a range of alternative scenarios. Furthermore, the timber supply analysis provides the technical basis for the Chief Forester of British Columbia to determine an allowable annual cut (AAC) for TFL 45 for the next five years.

Because of the changing nature of resource management objectives, as well as the dynamic nature of forest inventories, the timber supply predictions generated by these analyses are not viewed as static. For this reason, it is necessary to re-evaluate timber supply periodically, incorporating new sources of information and any changes to management objectives. This adaptive management process ensures that harvest strategies remain sustainable in the long term, even in the face of changing circumstances.

A number of options have been identified for analysis. These options represent different growth and yield and management scenarios. Once all options have been reviewed and evaluated, an AAC will be selected and submitted to the Chief Forester for acceptance.

2.0 General Description of the Land Base and Tenure

TFL 45, held by Interfor, consists of 7 separate areas located north of the community of Campbell River, in the Knight Inlet and Phillips Arm areas and was transferred to Interfor at the end of 1991. The licence was obtained by an assignment from Fletcher Challenge Canada Limited that was approved by the Minister of Forests. The current TFL 45 resulted from the amalgamation of TFL 17 (Knight Inlet portion) and TFL 36 (Douglas Arm portion). It is located within the Vancouver Forest Region, and is administered from the Port McNeill and Campbell River Forest District offices.

The total area of TFL 45 is approximately 231 900 hectares, of which 72% is non-productive / non-forested. Included in this is approximately 700 hectares of Schedule A land. Approximately 50% of the net timber harvesting land base (THLB) is mature forest dominated by Western Hemlock (Hw).

Continuous harvesting and forest management activities have occurred on the TFL since the 1950s. Since that time, approximately 9 800 hectares of second growth forest have been established and intensively managed. The current AAC is set at 220 000 cubic meters per year. The Small Business Forest Enterprise Program (SBFEP) cut is 10 080 cubic meters attributed to Schedule B lands.

Figure 2.1 provides an overview map of TFL 45.

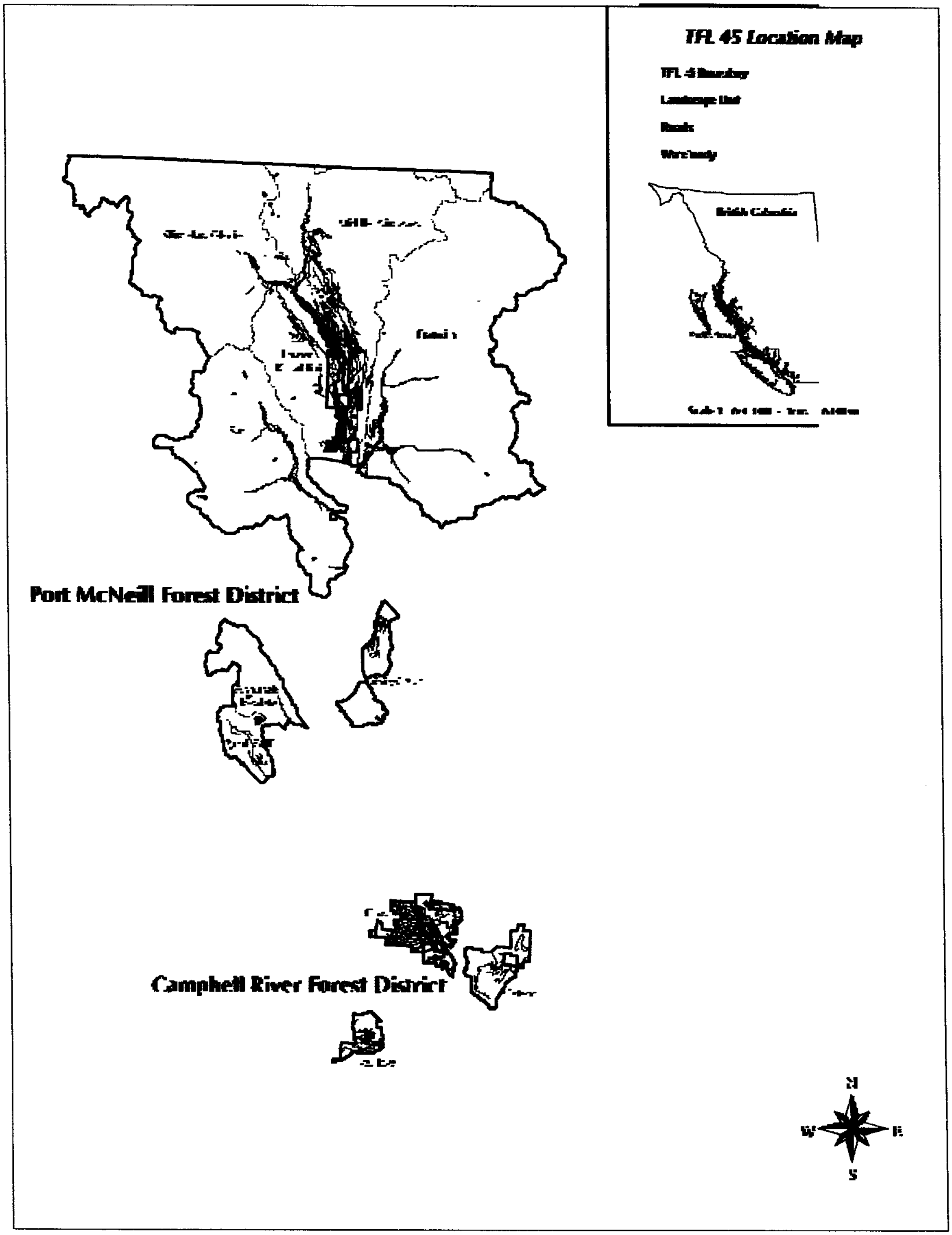

Figure 2.1 Location of TFL 45

3.0 Timber Flow Objectives

Forest cover objectives and the biological capacity of the net timber harvesting land base will dictate the harvest level. However, there are a number of alternative harvest flows possible. In this analysis, the proposed harvest flow reflects a balance of the following objectives:

- Maintain an initial harvest level of 220 000 cubic meters per year;
- Decrease the periodic harvest rate in acceptable steps (<=10%) when declines are required to meet all objectives associated with the various resources on the land base;
- Do not permit the mid-term harvest to fall below a level reflecting basic maintenance of the productive capacity of the IFPA (based on VDYP yield estimates); and
- Achieve an even-flow long-term supply over a 250-year time horizon.

4.0 Forest Information

A complete description of the information used in the Interfor TFL 45 MP No. 4 timber supply analysis is contained in the document "Timber Supply Analysis Information Package for TFL 45, Version 4", dated April 2001. This document has been included as part of the TFL 45 MP No. 4 submission, for review and acceptance by Ministry of Forests (MoF) staff.

4.1 Growth and Yield

For the analysis of TFL 45, the development of growth and yield relationships was undertaken by J. S. Thrower and Associates. A report documenting this work and the results is being submitted under separate cover. The following is a brief summary of the contents of that report.

4.1.1 Natural stands (age > 40)

Natural stand yield tables (NSYTs) for the timber supply analysis were developed using the batch version of the Ministry of Forests (MoF) program *BatchVDYP* (Version 6.6d) and the recently completed Vegetation Resources Inventory (VRI) Phase I database.

4.1.2 Managed stands (age < 41)

Managed stand yield tables (MSYTs) were modelled using *BatchTIPSY* (Version 3.0a). These stands have been managed since establishment and include both natural and artificially regenerated sites. Separate tables were developed for all future managed stands established following the harvest of existing stands.

Yield tables were generated independently for the northern part of the TFL (Knight Inlet, Forest Inventory Zone [FIZ] A) and the southern part of the TFL (Phillips Arm, FIZ B).

Figure 4.1 provides an example of VDYP and TIPSY curves for Western Hemlock (Hw) types. The VDYP curve is applied to existing stands, while the TIPSY curve is used to model the post-harvest managed yield. The mean annual increment (MAI) over time for both the VDYP and TIPSY curve is also depicted.

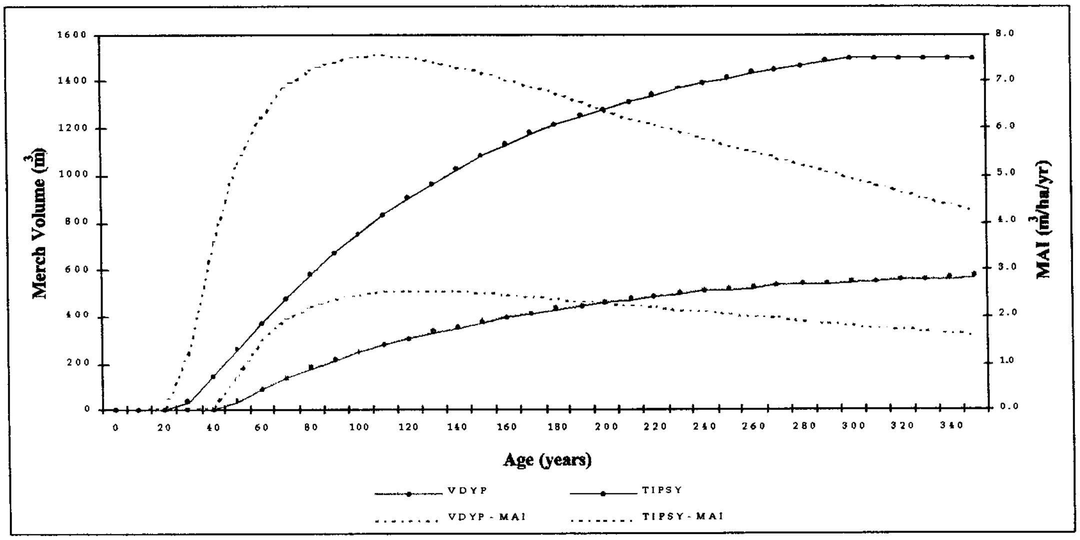

Figure 4.1. Natural and future managed Western Hemlock (Hw) yield curves

4.2 Land Base Classification

Land is classified based on four broad criteria:

1. It is unproductive for forest management purposes;
2. It is or will become inoperable under the assumptions of the analysis;
3. It is unavailable for harvest for other reasons (ex. wildlife habitat or recreation); or
4. It is available for integrated use (including harvesting).

The area classification is presented in Figures 4.2 and 4.3. The total net harvestable land base of 27 128 hectares includes 325 hectares of NSR lands, scheduled to be restocked. It represents harvestable area in conventional and aerial operability classes.

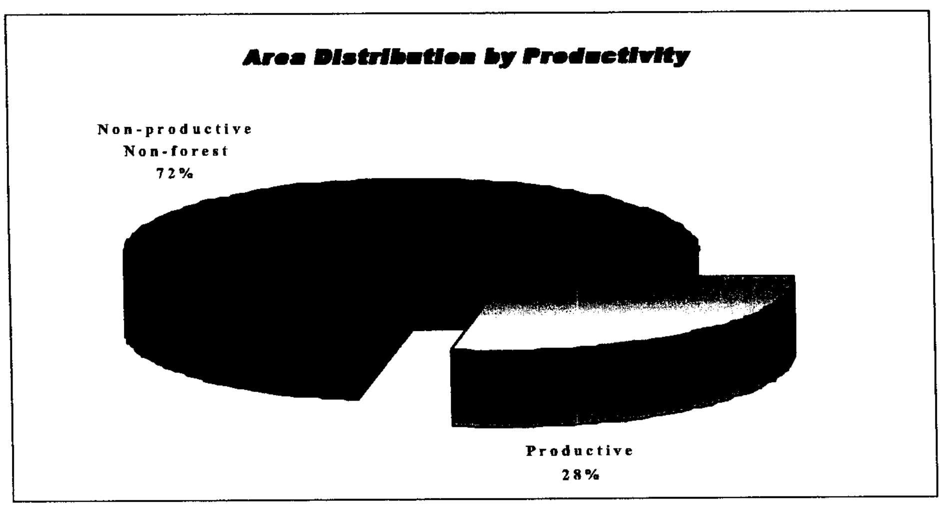

Figure 4.2. Distribution of total area (231 866 hectares)

The timber harvesting land base consists of all of the productive land expected to be available for harvest over the long-term. This land base is determined by reclassifying the total land base according to specified land base classification criteria. The unharvestable component includes exclusions such as low site removals and deciduous leading types. Figure 4.3 provides a graphic representation of the land base reductions for TFL 45.

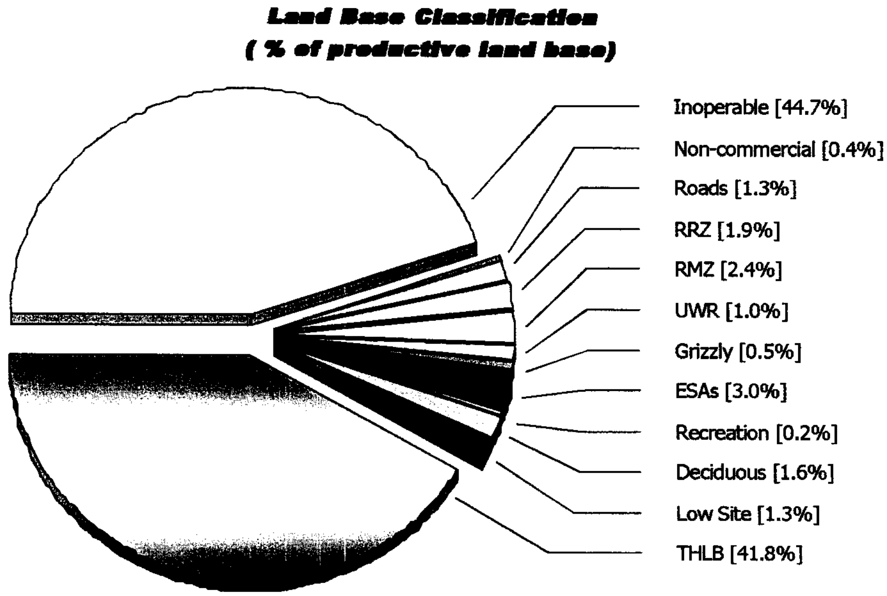

Figure 4.3. Distribution of productive area (64 918 hectares)

4.2.1 Inventory aggregation

In order to reduce the complexity of the forest description for the purposes of timber supply simulation, considerable aggregation of individual stands is necessary. However, it is critical that these aggregations not obscure either biological differences in forest stand productivity, or differences in management objectives and prescriptions. Management differences are recognized by grouping stands into landscape units and resource emphasis zones on the basis of similarity of management objectives. Grouping stands into analysis units (or clusters) on the basis of similar species and site productivity captures biological similarity.

4.2.2 Landscape units

For planning purposes, TFL 45 has been subdivided into 11 landscape units. In the timber supply analysis, all forest cover requirements must be met within the boundaries of these landscape units. Figure 4.4 summarizes the distribution of productive area by landscape unit.

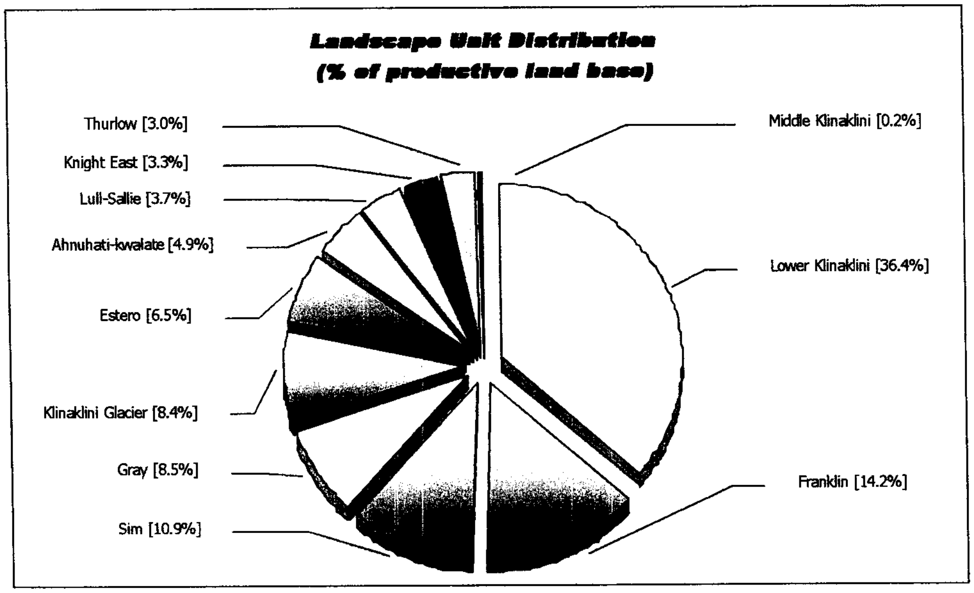

Figure 4.4. Distribution of productive area by landscape unit

Figure 4.5 summaries the distribution of productive area by biogeoclimatic zone (BEC) / natural disturbance type (NDT) zone.

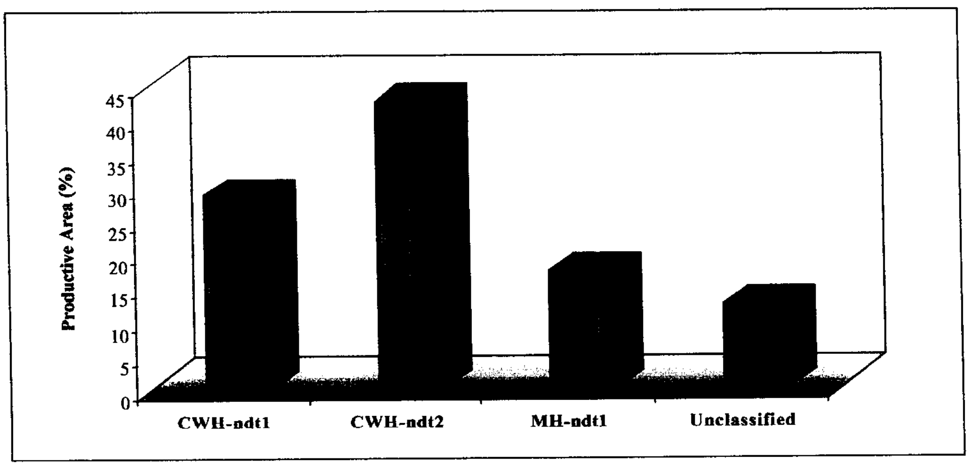

Figure 4.5. Distribution of productive area by BEC/NDT

4.2.3 Resource management zones

The land base has also been segregated into Resource Emphasis Areas (REAs) to facilitate the application of management criteria. These include:

- Polygonal-based visual quality objective (VQO) zones;
- Polygonal-based deer management areas;
- Polygonal-based mountain goat management areas; and
- An integrated resource management (IRM) zone.

4.2.4 *Analysis units / clusters*

To capture biological similarity, the inventory has been assembled and aggregated into analysis units (or clusters) on the basis of:

- Site index;
- Species composition;
- Stocking class; and
- Crown closure.

The distribution of area in the timber harvesting land base by leading species is shown Figure 4.6.

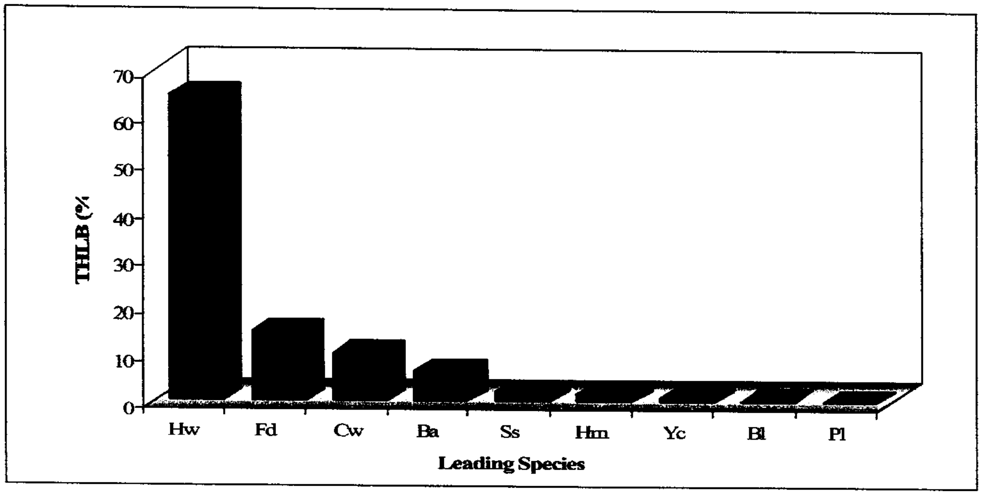

Figure 4.6. Distribution of net operable area by leading species

Site index stratification is independent of any subsequent site index modifications. Figure 4.7 shows the distribution of productive area by broad site productivity classification.

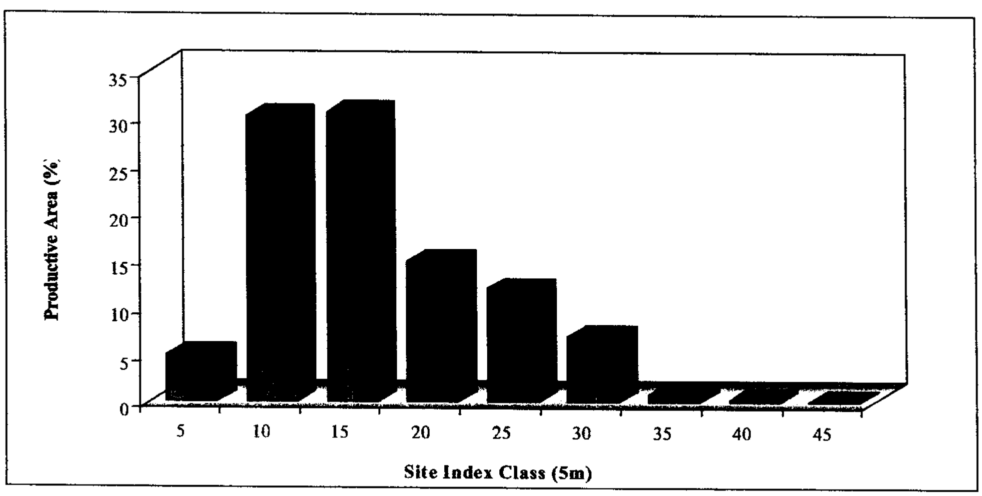

Figure 4.7. Distribution of productive area by 5-meter site index class

5.0 Timber Supply Analysis Methods

Timberline's proprietary simulation model CASH6 (Critical Analysis by Simulation of Harvesting), Version 6.2g was used to develop harvest schedules for all options and sensitivity analyses included in the TFL 45 timber supply analysis.

This model uses an aspatial and spatial geographic approach to land base and inventory definition in order to adhere as closely as possible to the intent of forest cover requirements on harvesting. CASH6 can simulate the imposition of overlapping forest cover objectives on timber harvesting and resultant forest development. These objectives are addressed by placing restrictions on the distribution of age classes, defining maximum or minimum limits on the amount of area in young and old age classes found in specified components of the forest. For the purposes of this analysis objectives are of two types:

1. Disturbance (green-up)
The disturbance category is defined as the total area below a specified green-up height or age. This disturbed area is to be maintained below a specified maximum percent. The effect is to ensure that at no time will harvesting cause the disturbed area to exceed this maximum percent. This category is typically used to model adjacency, visual, wildlife or hydrological green-up requirements in resource emphasis areas, and early seral stage requirements at the landscape unit level.

2. Retention (old growth)
The retention category is defined as the total area above a specified age. This retention area is to be maintained above a specified minimum percent. The effect is to ensure that at no time will harvesting cause the retention area to drop below this minimum percent. This category is typically used to model thermal cover and/or old growth requirements in wildlife management resource emphasis areas, and mature and old growth seral stage requirements at the landscape unit level.

The model projects the development of a forest, allowing the analyst to impose different harvesting/silviculture strategies on its development, in order to determine the impact of each strategy on long-term resource management objectives. CASH6 was used to determine harvest schedules that incorporate all integrated resource management considerations including spatial feasibility factors, for example, silviculture block green-up.

In these analyses, timber availability is forecasted in decadal time steps (periods). The main output from each analysis is a projection of the amount of future growing stock, given a set of growth and yield assumptions, and planned levels of harvest and silviculture activities. Growing stock is characterized in terms of operable volume *(total volume on the timber harvesting land base)*, merchantable volume (*operable volume above minimum harvest age*), and available volume (*maximum merchantable volume that could be harvested in a given decade without violating forest cover constraints*).

A 250-year time horizon was employed in these analyses, to ensure that short and medium term harvest targets do not compromise long-term growing stock stability. Also, modelled harvest levels included allowances for non-recoverable losses. Harvest figures reported here exclude this amount unless otherwise stated.

Over the next rotation it may be necessary to reduce harvest levels prior to achieving the long-term level. Unless otherwise stated in the timber supply forecasts that follow, the decadal rate of decline was limited to 10%, and the mid-term harvest level was not permitted to drop below a level reflecting the basic productive capacity of the land base. The long-term steady harvest level will always be slightly below the theoretical long-term level, attainable only if all stands are harvested at the age when mean annual increment (MAI) maximizes. This is due to the imposition of minimum harvest ages and forest cover requirements, which alter time of harvest.

6.0 Base Case

6.1 Introduction

This option reflects current management performance based on the date of commencement for the preparation of MP No. 4. The analysis will incorporate:

- New Vegetation Resource Inventory (VRI) inventory database;
- Current management regimes;
- Current definition of operability, updated to new VRI inventory and TRIM NAD 83 map base;
- Updated definitions of Management Zones (MZs) formerly Environmentally Sensitive Areas (ESAs);
- Updated recreation features inventory;
- Visual Quality Classes as per the original VQO Buyback Strategy;
- Definition of biodiversity in accordance with Landscape Unit Planning Guide (LUPG);
- Definition of riparian buffers consistent with Riparian Management Area Guidebook;
- Updated wildlife habitat inventory;
- Updated Stream / Riparian Classifications;
- Updated Slope Stability Review for Es2 polygons originally mapped and classified in 1993;
- Expanded Slope Stability Mapping for areas previously unmapped and unclassified;
- New Terrestrial Ecosystem Mapping (TEM) of International Forest Product's Tree Farm Licence 45, B.A. Blackwell and Associates Ltd.;
- New Potential Site Index Estimates for the Main Commercial Species on TFL 45, J.S. Thrower & Associates Ltd.;
- Variable Retention Harvesting;
- Definition of merchantable stands and utilization standards;
- Definition of non-recoverable losses (NRLs);
- Minimum harvest ages;
- New information regarding stands with reduced regeneration stocking standards;
- Silvicultural standards; and
- Forest health.

Two Base Case scenarios have been developed, specifically:

BASE CASE A: Maintain an initial harvest level of 220 000 cubic meters per year for as long as possible, subject to a mid-term minimum harvest objective; and

BASE CASE B: Maintain an initial harvest level of 200 000 cubic meters per year for as long as possible.

The results of the Base Case options and its respective attendant timber flows are presented in Table 6.1 and Figure 6.1.

Table 6.1. Net harvest levels – Base Case

Decade	Annual Harvest Level (m^3 / year)	
	Base Case A	Base Case B
1	220 000	200 000
2	220 000	200 000
3	220 000	200 000
4	202 400	200 000
5 - 10	186 200	200 000
11 +	210 000	207 000

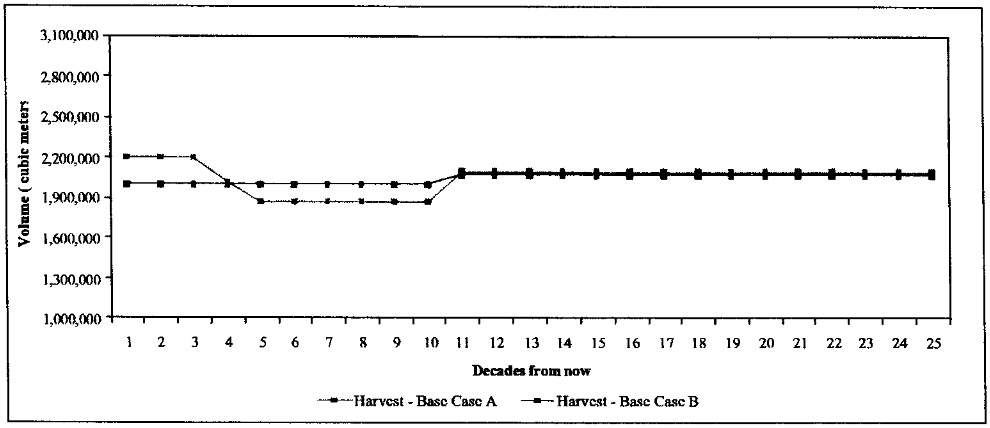

Figure 6.1. Net harvest levels – Base Case options

As shown in Table 6.1 and Figure 6.1, a number of alternative harvest flows were evaluated for the Base Case. They explore opportunities to alter the short and mid-term harvest without compromising long-term objectives. The results of Base Case B indicate that the 200 000 cubic meters per year could by maintained in the short and mid-term. However, Base Case A was selected as the basis for sensitivity analysis, as it adheres specifically to the harvest flow policy adopted by Interfor (Section 3.0).

In Base Case A the initial harvest level is set at 220 000 cubic meters per year, and maintained for 3 decades. Decadal drops of 8% are necessary to avoid unacceptably low mid-term levels. The net long-term steady level is 210 000 cubic meters, which is approximately 9% below the theoretical long-term LRSY (250 685 cubic meters) based on maximizing MAI.

This difference results from two factors:

- Allowance for wildlife tree patches and variable retention harvesting; and
- Conflicting forest cover and harvest scheduling objectives.

Figure 6.2 displays the 250-year growing stock (inventory) profile associated with Base Case A. Operable inventory within the harvestable land base declines steadily for 5 decades at which point harvesting emphasis has shifted from existing mature types to second growth. Beyond this point, growth and harvest rates equalize, and inventory remains relatively stable to the end of the simulation period. Merchantable inventory (operable volume above minimum harvest age) stabilizes at decade 9. ***Available growing stock represents the maximum merchantable volume that could be harvested in a given decade without violating forest cover constraints***. Availability reaches minimum's in decades 5, 16 and 23. The harvest flow is largely controlled by these minimum's. Further increases prior to decade 5 could result in the medium term harvest falling below the mid-term minimum, which is contrary to the harvest flow policy adopted in these analyses.

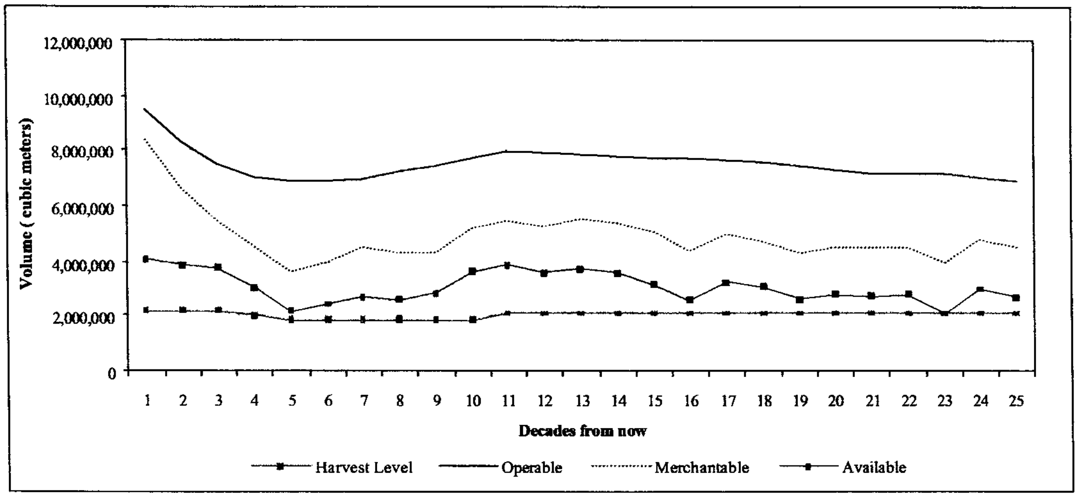

Figure 6.2. Growing stock profile – Base Case A

Figure 6.3 shows the sources of timber for the harvest over the entire 250-year time horizon. For the first 40 years most of the harvest comes from the existing mature forest. This reflects the management strategy, which is to maximize harvest by capturing volume in the mature forest first. At year 40, the harvest from the current existing mature harvesting land base begins to shift to the managed, or second growth forest.

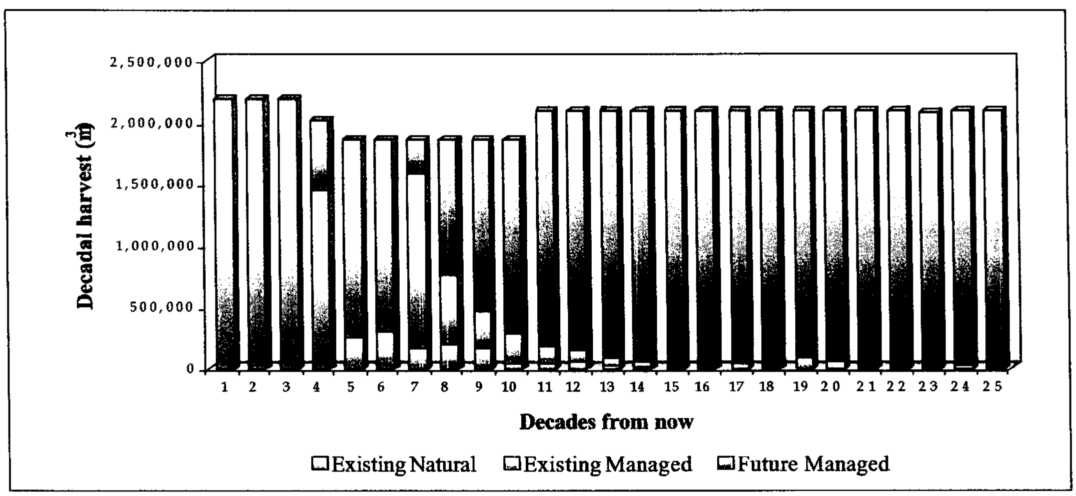

Figure 6.3. Timber supply sources – Base Case A

Figures 6.4 through 6.6 show average harvested age, volume per hectare and area harvested per year. The shift in average harvest age declines sharply as harvesting shifts from mature types to second growth.

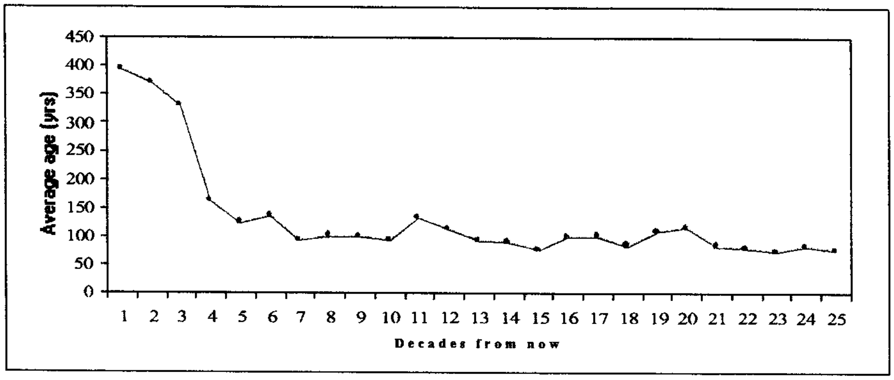

Figure 6.4. Average harvested age – Base Case A

As seen in Figure 6.5, the average volume per hectare gradually increases over the planning horizon. Although the average harvested age drops sharply during the shift to second growth forest, the volume per hectare increases due to managed stand yield expectations.

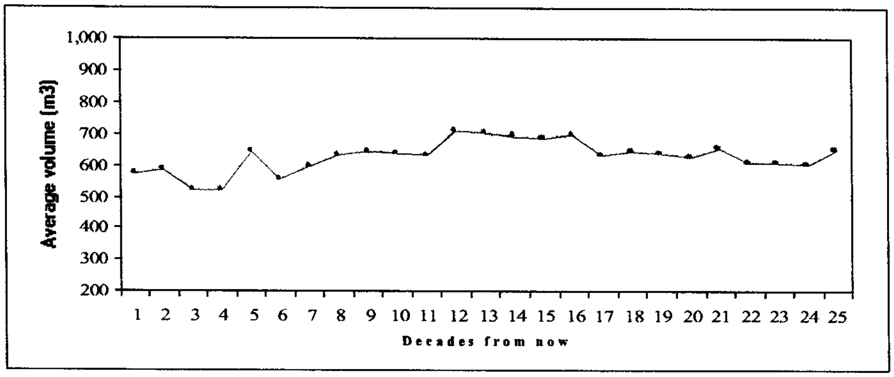

Figure 6.5. Average harvested volume per hectare – Base Case A

The average area harvested remains relatively constant over the planning horizon at approximately 337 hectares per year (Figure 6.6).

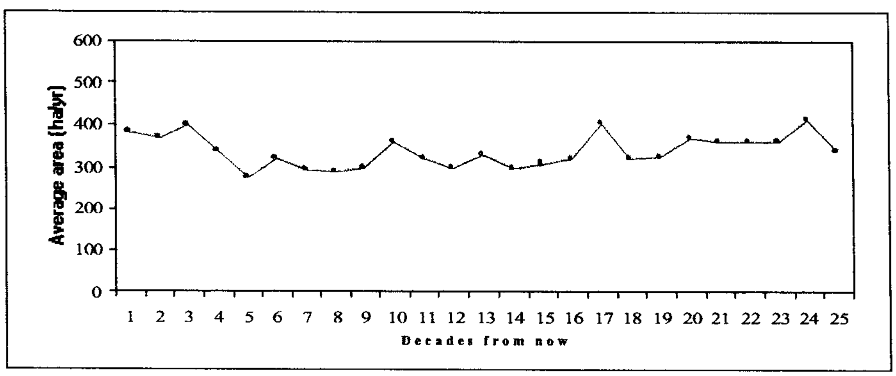

Figure 6.6. Average area harvested – Base Case A

6.1.1 Ageclass distribution

Figure 6.7 show the changes in forest structure over time. Each figure indicates the residual structure of the total productive forest, including the unharvestable (non-contributing) components.

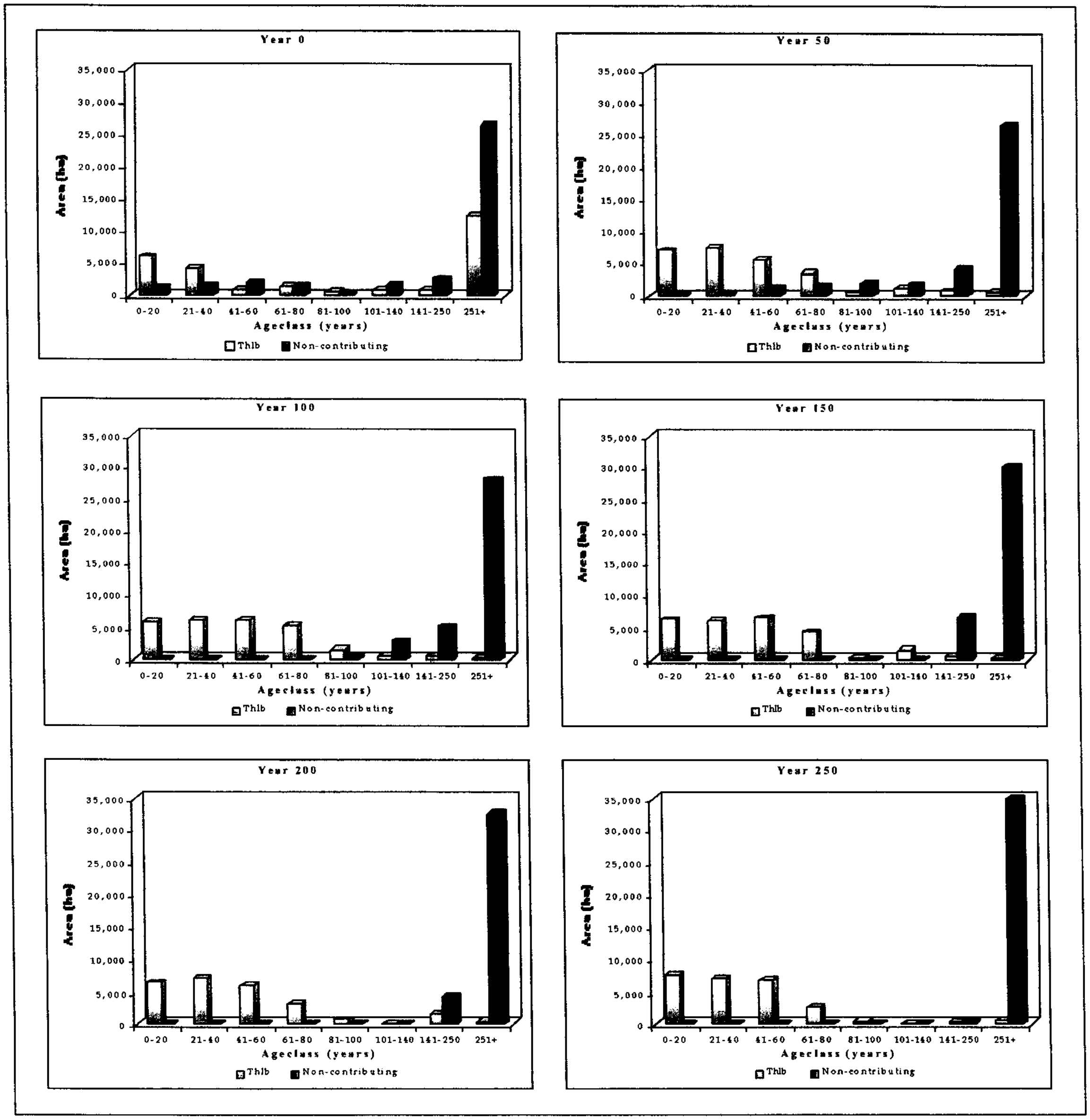

Figure 6.7. Age class distribution over time – Base Case A

While the harvestable old growth inevitably declines in the future, the total productive area greater than age 250 increases steadily over time, reaching approximately 28 300 hectares by the end of decade 10 and 36 400 hectares by the end of decade 25. In other words, 43% of the productive forest is above age 250 by the end of the first rotation, and 56% by the end of the second rotation.

This has very positive implications with respect to retention objectives on the TFL. It should be noted that harvestable area in the 251+ age class (631 ha) remains at the end of the simulation as a result of recruitment to meet forest cover requirements.

Seral stage objectives are modeled at the Landscape Unit (LU) / BEC variant level, and forest cover objectives are modelled at the REA or LU / REA level. In the case of VQO disturbance constraints (Figure 6.8), a maximum of 25% of the THLB can be below green-up (5 meters) at any point in time. Timber availability is impacted if the disturbed area reaches this maximum at the same point in time, as is the case in decades 5, 16 and 23. As was shown in Figure 6.2, this coincides with the point when timber availability minimizes.

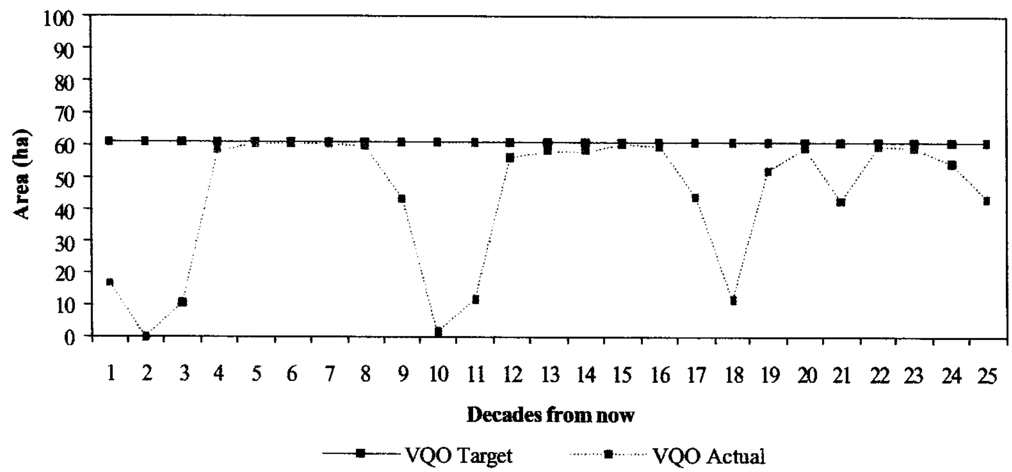

Figure 6.8. IRM post-harvest disturbance constraint status – Base Case A

Old-growth seral constraints represent minimum retention levels of the productive forest which must be maintained above age 250. As seen in Table 6.2, old-growth levels substantially exceed the minimum thresholds.

Table 6.2. Periodic old-growth compliance

Landscape Unit	BEC Variant	Area (ha)	Old -growth (% > years)	Status at Year of Simulation					
				0	50	100	150	200	250
Ahnuhati-kwalate	CWHvm1	1,744	9.7 > 250	49.8	49.8	50.2	56.7	61.3	65.5
	CWHvm2	808	9.7 > 250	87.9	87.9	88.2	90.7	91.2	92.6
	MHmm1	193	14.2 > 250	99.9	99.9	99.9	99.9	99.9	99.9
Estero	CWHvm1	1,378	9.7 > 250	25.1	10.6	9.7	12.1	25.1	27.5
	CWHvm2	1,362	9.7 > 250	54.6	28.4	32.1	33.0	35.7	36.7
	CWHdm	887	6.7 > 250	7.3	6.7	6.7	6.7	24.5	28.2
	MHmm1	513	14.2 > 250	71.6	50.3	57.7	62.4	68.7	71.4
Franklin	CWHvm1	19	9.7 > 250	15.5	15.5	15.5	15.5	81.9	81.9
	CWHvm2	79	9.7 > 250	90.3	76.1	76.1	76.1	83.6	83.6
	CWHms2	2,061	6.7 > 250	30.0	17.3	18.9	20.0	24.4	38.2
	CWHws2	3,093	6.7 > 250	77.1	45.4	47.2	48.3	49.5	50.2
	MHmm1	230	14.2 > 250	85.6	85.0	85.0	85.0	87.3	89.1
	MHmm2	2,427	14.2 > 250	82.0	74.4	83.1	85.7	86.7	86.9

Table 6.3 (continued). Periodic old-growth compliance

Landscape Unit	BEC Variant	Area (ha)	Old -growth (% > years)	Status at Year of Simulation 0	50	100	150	200	250
Gray	CWHvm1	3,248	9.7 > 250	8.8	8.8	9.6	9.4	10.1	26.1
	CWHvm2	1,329	9.7 > 250	36.0	25.8	27.4	29.8	32.2	39.4
	CWHdm	529	6.7 > 250	15.4	6.7	6.7	7.5	14.4	34.9
	MHmm1	198	14.2 > 250	73.9	63.7	76.7	77.5	78.9	81.1
Klinaklini Glacier	CWHms2	337	6.7 > 250	32.7	19.4	27.9	38.0	45.4	45.6
	CWHws2	1,065	6.7 > 250	87.1	47.1	48.2	50.9	51.6	52.4
	MHmm2	1,611	14.2 > 250	91.2	81.9	82.3	83.4	83.7	84.3
Knight East	CWHvm1	1,157	9.7 > 250	23.6	22.3	24.5	25.4	29.4	38.0
	CWHvm2	506	9.7 > 250	57.2	57.1	60.3	62.1	66.0	68.6
	MHmm1	159	14.2 > 250	90.9	90.9	91.1	91.1	91.3	91.3
Lower Klinaklini	CWHms2	10,747	6.7 > 250	32.9	19.1	20.9	26.1	29.4	39.7
	CWHws2	6,143	6.7 > 250	83.1	41.6	42.1	42.6	43.1	44.8
	MHmm2	4,861	14.2 > 250	87.0	74.8	78.6	79.2	80.0	80.7
Lull-Sallie	CWHvm1	1,293	9.7 > 250	37.1	33.3	32.7	34.7	35.6	55.2
	CWHvm2	558	9.7 > 250	67.1	62.9	61.4	63.6	65.0	70.2
	MHmm1	213	14.2 > 250	88.4	88.4	88.4	89.4	91.7	99.9
Middle Klinaklini	CWHms2	70	6.7 > 250	78.3	41.5	41.5	41.5	41.5	41.5
	CWHws2	73	6.7 > 250	80.6	70.6	73.8	73.8	73.8	73.8
	MHmm2	2	14.2 > 250	100.0	100.0	100.0	100.0	100.0	100.0
Sim	CWHvm1	3,481	9.7 > 250	51.7	41.2	42.5	46.4	52.9	63.0
	CWHvm2	1,086	9.7 > 250	82.8	79.5	81.2	85.8	91.0	91.1
	CWHws2	218	6.7 > 250	63.3	60.8	64.2	70.4	71.9	73.9
	MHmm1	579	14.2 > 250	90.8	95.2	96.4	98.2	99.2	99.2
	MHmm2	13	14.2 > 250	100.0	100.0	100.0	100.0	100.0	100.0
Thurlow	CWHmm1	1,299	6.7 > 250	5.1	5.1	5.8	5.8	8.1	17.2
	CWHxm	598	6.7 > 250	5.1	5.1	5.8	16.4	36.5	48.3
Unclassified		7,671	14.2 > 250	65.1	65.6	71.5	80.9	90.9	99.1

6.2 Summary – Base Case A

Base Case A provides for an initial harvest level of 220 000 cubic meters. However, the timber flow policy adopted for TFL 45 necessitates reductions of 8% until a mid-term harvest level of 186 200 cubic meters is obtained. A long-term level of 210 000 cubic meters is achieved in decade 11.

Short and medium term harvest levels are largely dictated by the availability of harvestable regenerating stands. Timber availability is particularly constrained in decades 5, 16 and 23. Any changes to inventory information, growth and yield expectations, silviculture treatment scenarios or forest cover requirements that affect the timber availability at these points can have a significant impact on short and medium term timber supplies.

The long-term harvest level is driven by the productive capacity of the harvestable land base. The theoretical capacity is measured by the average MAI for second growth managed stands. The calculations (rounded) for the Base Case are shown in Table 6.3.

Table 6.3. Natural and managed forest LRSYs

Description	Natural	Managed
THLB (including NSR) (ha)	27 128	27 128
- future roads (ha)	- 0	- 1 015
= net long-term land base (ha)	= 27 128	= 26 113
* average MAI (m^3/ha) at culmination age	* 6.2	* 9.6
= theoretical GROSS long-term (m^3)	***= 168 194***	***= 250 685***
- WTP and variable retention (8%) (m^3)	*- 13 455*	*- 20 055*
- non-recoverable losses (NRLs) (m^3)	*- 0*	*- 0*
= theoretical NET long-term (m^3)	***= 154 738***	***= 230 630***

In the Base Case, the theoretical long-term harvest level of 230 630 cubic meters (net of WTP, variable retention and NRL volumes) could be attained if all stands were harvested at MAI culmination age. The realized long term net level of 210 000 cubic meters is approximately 9% lower, as stands cannot always be harvested at this age due to harvest scheduling requirements conflicting with forest cover objectives. Sensitivity issues that can affect the Base Case harvest flow are explored in the next section.

7.0 Sensitivity Analysis

Sensitivity analysis provides a measure of the upper and lower bounds of the Base Case harvest forecast, reflecting the uncertainty of assumptions made in the Base Case. The magnitude of the change in the sensitivity variable(s) reflects the degree of uncertainty surrounding the assumption associated with that variable. By developing and testing a number of sensitivity issues, it is possible to determine which variables most affect results. This in turn facilitates the management decisions that must be made in the face of uncertainty.

To allow meaningful comparison of sensitivity analyses, they are performed using the Base Case A option and varying only the assumption being evaluated. All other assumptions remain unchanged. In each analysis, the changes in availability were first assessed, using the Base Case harvest level, and imposing the alternative assumption to be tested. Available growing stock was determined for a given decade, by setting an infinite harvest target for that period, and imposing the Base Case level for all other periods. In this way, the impact on availability of the alternative assumption was determined. Based on the changes in availability, a new harvest level was sought, adhering to the flow policy described earlier.

In adjusting the flow to reflect the alternate assumption, short-term harvest levels were altered first, followed by mid-term and finally long-term levels. The exception to this rule occurred when land base changes were employed. In these latter cases, the impacts were distributed proportionately across the total planning horizon.

Sensitivity issues are summarized in Table 7.1. The timber supply impacts are illustrated in Sections 7.1 through 7.12.

Table 7.1. Current management sensitivity analyses

Issue	Sensitivity Levels to be Tested	Section
Land base	• adjust timber harvesting land base by +/- 10	7.1
	• include marginal operability stands	7.2
Growth and yield	• adjust existing (VDYP) stand yields by +/- 10%	7.3
	• adjust future (TIPSY) managed stand yields by +/- 10%	7.4
	• adjust managed minimum harvest ages by +/- 10 years	7.5
	• adjust regeneration delay by +/- 1 year	7.6
Forest cover	• alter maximum area below green-up by +/- 5 years in IRM zone	7.7
	• alter constraints in UWR zone by +/- 5%	7.8
	• alter VQO denudation to minimum requirement	7.9
	• alter old-growth biodiversity constraints by +/- 5%	7.10
	• apply mature + old seral stage requirements	7.11
Summary	• summary of sensitivity issues / impacts	7.12

7.1 Adjust THLB

In order to assess the sensitivity of the timber supply to changes in the harvestable land base, the THLB was adjusted by +/-10% (+/- 2 689 ha). The intent was to model the effect of a change in the THLB, not a change in the overall productive area. In the –10% scenario, 10% of each harvestable type was reclassified as unharvestable. In this case, it was necessary to reduce the harvest profile proportionally by 10 %.

In the +10% scenario, a proportion of each unharvestable type was reclassified as harvestable. A 10% increase or decrease in the THLB had a proportional effect on Base Case harvest levels (Table 7.2, Figure 7.1). This confirms that availability, and consequently timber supply, is more closely tied to growth and yield issues than forest cover requirements.

Table 7.2. Net harvest levels – adjust timber harvesting land base

Decade	Annual Harvest Level (m^3 / year)		
	THLB –10%	Base Case A	THLB +10%
1	198 000	220 000	235 400
2	198 000	220 000	235 400
3	198 000	220 000	235 400
4	182 160	202 400	216 568
5 - 10	167 580	186 200	199 234
11 +	189 000	210 000	224 700

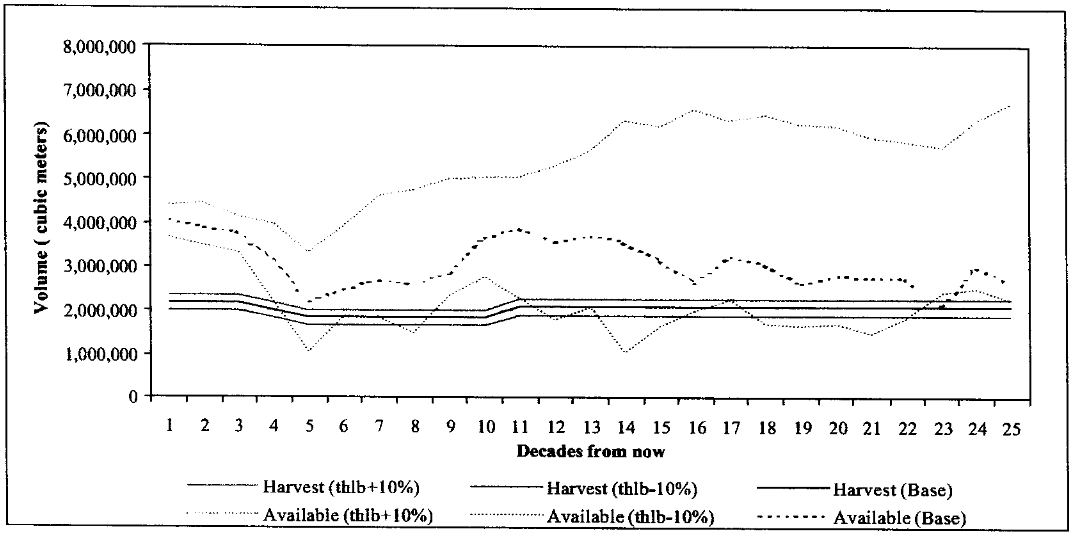

Figure 7.1. Net harvest levels – adjust THLB by +/- 10%

7.2 Include Marginal Operability

In the Base Case, marginally operable stands were excluded from the timber harvesting land base. This classification includes stands with high decay factors, averaging 350 to 450 cubic meters per hectare and is, in actual fact, considered "opportunity" wood. Accounting for an overall increase of 5% (1 352 ha) in the timber harvesting land base, this analysis will explore the timber supply impacts associated with the inclusion of these areas.

When including these types, existing short-term harvest levels were maintained for 5 decades, 2 more than under Base Case assumptions. This reflects the amount of available timber which, on average, is 12% above Base Case levels over the short-term (Table 7.3, Figure 7.2).

Table 7.3. Net harvest levels – include marginal operability

Decade	Annual Harvest Level (m^3 / year)	
	Marginal Operability	Base Case
1	220 000	220 000
2	220 000	220 000
3	220 000	220 000
4	220 000	202 400
5	220 000	186 200
6	202 400	186 200
7 - 10	186 200	186 200
11 +	210 000	210 000

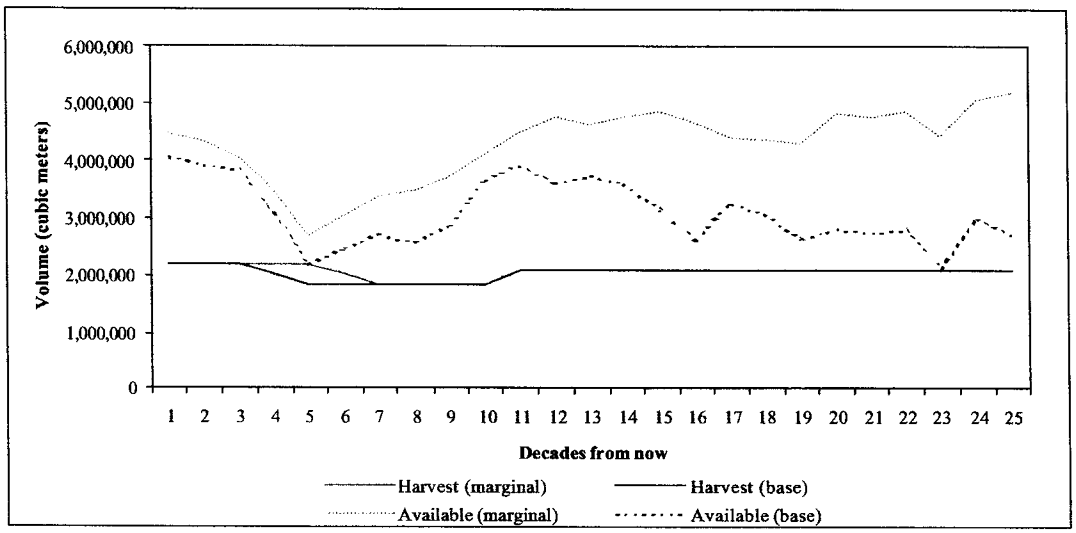

Figure 7.2. Net harvest levels – include marginal operability

7.3 Adjust Existing Stand Yields

A test of the sensitivity of the timber supply to changes in natural stand yield table (NSYT) forecasts was completed. In this case, no changes were made to yield forecasts for existing managed or future managed stands. Overall, changing NSYT expectations by +/- 10% has a significant impact on short and mid-term timber supply, as shown in Table 7.4 and Figure 7.3. Beyond this point the impact diminishes, as the managed stand yield forecasts were not adjusted.

Table 7.4. Net harvest levels – adjust existing stand yields

Decade	Annual Harvest Level (m^3 / year)		
	NSYT -10%	Base Case	NSYT +10%
1	198 000	220 000	220 000
2	198 000	220 000	220 000
3	198 000	220 000	220 000
4	182 160	202 400	220 000
5 - 8	167 580	186 200	220 000
9	167 580	186 200	202 400
10	167 580	186 200	186 200
11 +	199 500	210 000	210 000

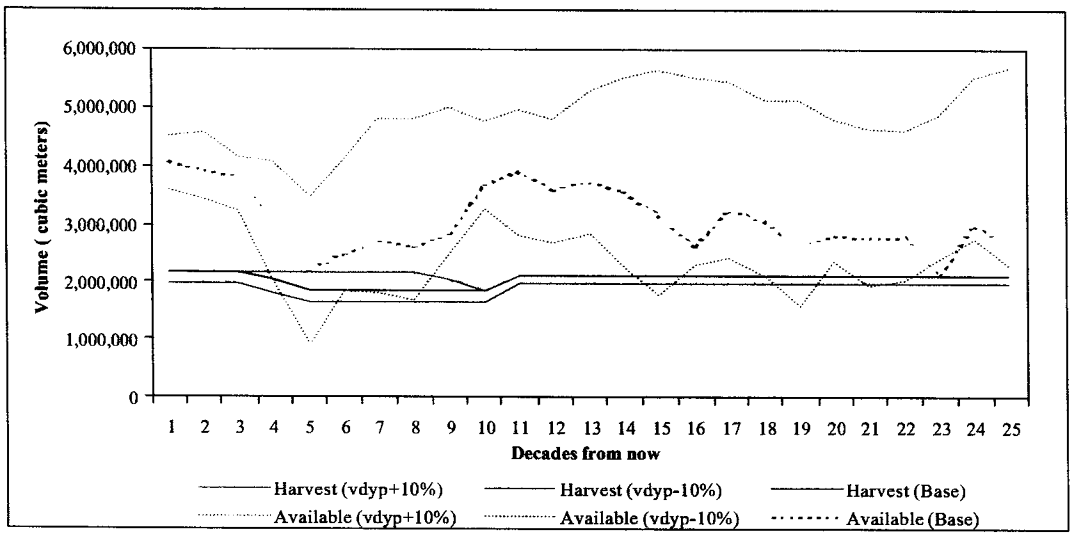

Figure 7.3. Net harvest levels – adjust existing stand yields by +/- 10%

7.4 Adjust Managed Stand Yields

A test of the sensitivity of the timber supply to changes in managed stand yield table (MSYT) forecasts was also completed. In this case, no changes were made to yield forecasts for existing natural stands. Overall, changing MSYT expectations by +/- 10% has a predictable impact on timber supply after 40 years, as shown in Table 7.5, Figure 7.4. Also, predictably the impact prior to this point is insignificant.

Table 7.5. Net harvest levels – adjust managed stand yields

Decade	Annual Harvest Level (m^3 / year)		
	MSYT -10%	Base Case	MSYT +10%
1	220 000	220 000	220 000
2	220 000	220 000	220 000
3	220 000	220 000	220 000
4	202 400	202 400	202 400
5 - 10	176 890	186 200	195 510
11 +	189 000	210 000	231 000

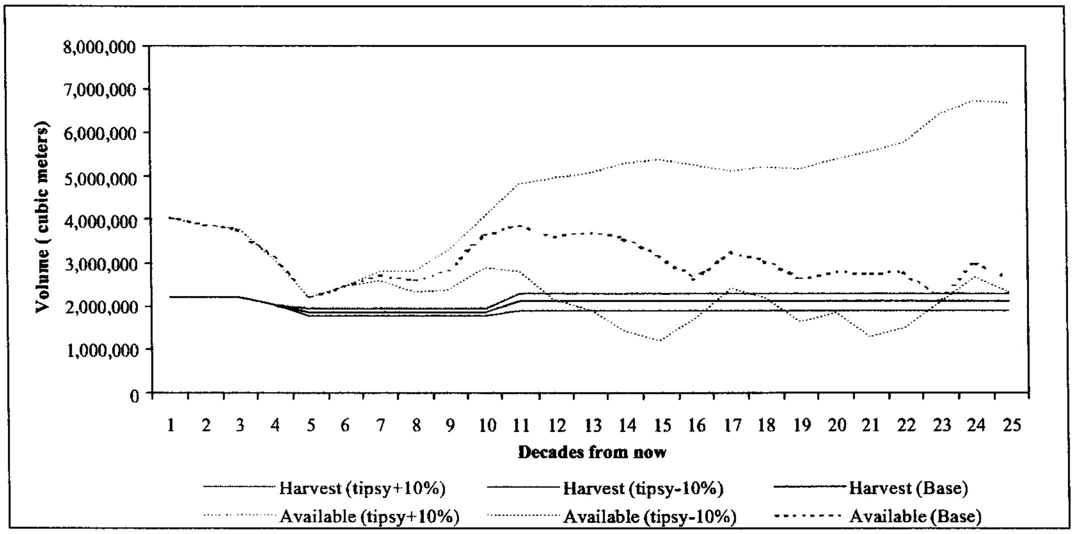

Figure 7.4. Net harvest levels – adjust managed stand yields by +/- 10%

7.5 Adjust Minimum Harvest Ages

Minimum harvest ages for future managed stands were based on the following two criteria:

- Age at which mean annual increment (MAI) in volume culminates; and
- Minimum volume requirement of 450 cubic meters per hectare.

This is an arbitrary approach, representing a conservative estimate of this age; *i.e.* in some cases it is reasonable to expect to harvest stands at an earlier age. The sensitivity to this assumption was tested by arbitrarily adjusting minimum harvest ages by +/- 10 years.

The results are presented in Table 7.6 and Figure 7.5. As the Base Case timber supply is significantly constrained by the availability of second growth timber in decades 5, 16 and 23, the timber supply is sensitive to reductions in this availability when increasing the minimum harvest age by 10 years. On the other hand, when decreasing the minimum harvest age by 10 years availability in the long-term increases, however, harvest levels are only marginally above (1%) those documented in the Base Case. Since stands are harvested further away from culmination less volume per hectare, and hence, more area must be harvested.

Table 7.6. Net harvest levels – adjust minimum harvest ages

Decade	Annual Harvest Level (m^3 / year)		
	MHA –10 years	Base Case	MHA +10 years
1	220 000	220 000	220 000
2	220 000	220 000	220 000
3	220 000	220 000	202 400
4	202 400	202 400	186 200
5 - 10	186 200	186 200	186 200
11 +	212 000	210 000	210 000

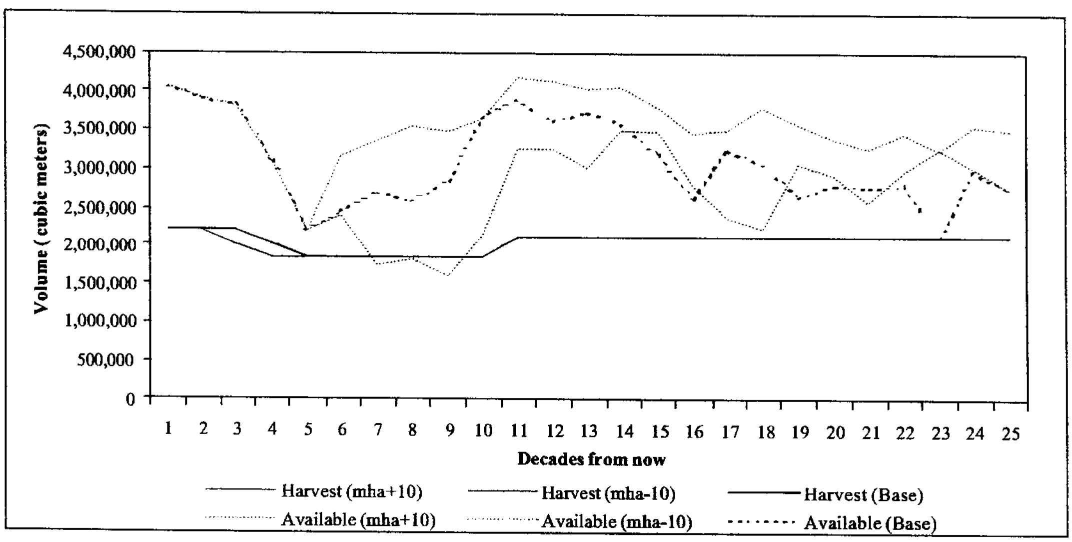

Figure 7.5. Net harvest levels – adjust minimum harvest ages by +/- 10 years

7.6 Adjust Regeneration Delay

Increased regeneration delays impose limitations on harvesting since the time required by trees to reach merchantability and green-up height is prolonged. As a result, timber availability was reduced by an average of 14% over the planning horizon and initial harvest levels could not be realized when increasing regeneration delays by one year.

Conversely, reducing regeneration delays by one year increased timber availability. Consequently, initial harvest levels could be maintained for 4 decades, one more than under Base Case assumptions. As shown in Table 7.7 and Figure 7.6, a one-year reduction in regeneration delay has a significant impact on timber availability in the short-term.

Table 7.7. Net harvest levels – alter regeneration delay

Decade	Annual Harvest Level (m^3 / year)		
	Delay -1	Base Case	Delay +1
1	220 000	220 000	220 000
2	220 000	220 000	220 000
3	220 000	220 000	202 400
4	220 000	202 400	202 400
5	202 400	186 200	186 200
6 - 10	189 924	186 200	186 200
11 +	210 000	210 000	210 000

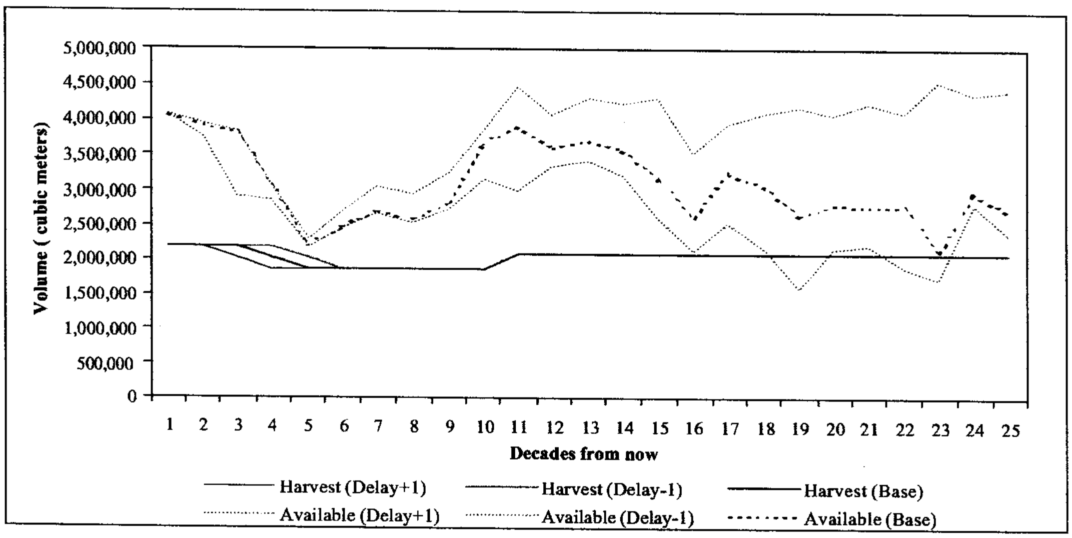

Figure 7.6. Net harvest levels – alter regeneration delay

7.7 Alter Maximum Disturbance Levels – IRM

In the Base Case, maximum disturbance levels for these zones are set at 33%; *i.e.* the amount of area in the net harvestable land base below green-up cannot exceed 33%. The sensitivity to this assumption was tested by arbitrarily adjusting maximum disturbance levels by +/- 5%.

As shown in Table 7.8 and Figure 7.7, the timber supply is insensitive to changes in this objective since the amount of available timber is able to absorb any downward pressure. Clearly, at these levels (+/- 5%), forest cover requirements within the IRM zone are not constraining timber supply.

Table 7.8. Net harvest levels – alter maximum disturbance levels

Decade	Annual Harvest Level (m^3 / year)		
	IRM -5%	Base Case	IRM +5%
1	220 000	220 000	220 000
2	220 000	220 000	220 000
3	220 000	220 000	220 000
4	202 400	202 400	202 400
5 - 10	186 200	186 200	186 200
11 +	210 000	210 000	210 000

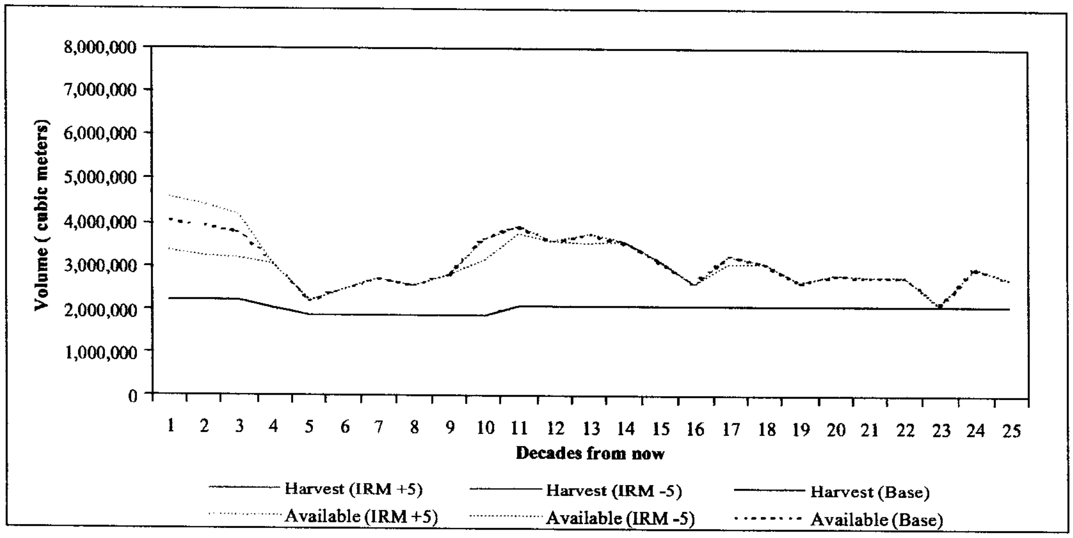

Figure 7.7. Net harvest levels – alter maximum disturbance levels

7.8 Alter Maximum Disturbance Levels – UWR

There are 12 black-tailed winter ranges within TFL 45. In some cases, ungulate winter ranges are designated as reserves with a 100% withdrawal from the timber harvesting land base. Seral stage forest cover requirements are assigned to the remaining ungulate winter ranges, *i.e.* no more than 20% of the area can be greater than 20 years of age at any one point in time. This sensitivity will test the impact on timber availability when increasing or decreasing the forest cover requirement within these zones by +/- 5%.

As shown in Figure 7.8 increasing the disturbance limits within the ungulate winter range zones provides no significant gain in timber availability, and consequently, Base Case harvest levels were not impacted. However, harvest levels in the short-term were unrealizable when decreasing the maximum amount of area below 20 years of age by 5% (Table 7.9) since less of the forest is allowed to be below the specified age. In this case, an alternative strategy to eliminate the decade 23 shortfall and maintain the existing short-term timber flow would be to reduce the long-term harvest level by approximately 2%.

Table 7.9. Net harvest levels – alter ungulate winter range disturbance levels

Decade	Annual Harvest Level (m^3 / year)		
	UWR -5%	Base Case	UWR +5%
1	220 000	220 000	220 000
2	220 000	220 000	220 000
3	202 400	220 000	220 000
4	186 200	202 400	202 400
5 - 10	186 200	186 200	186 200
11 +	205 800	210 000	210 000

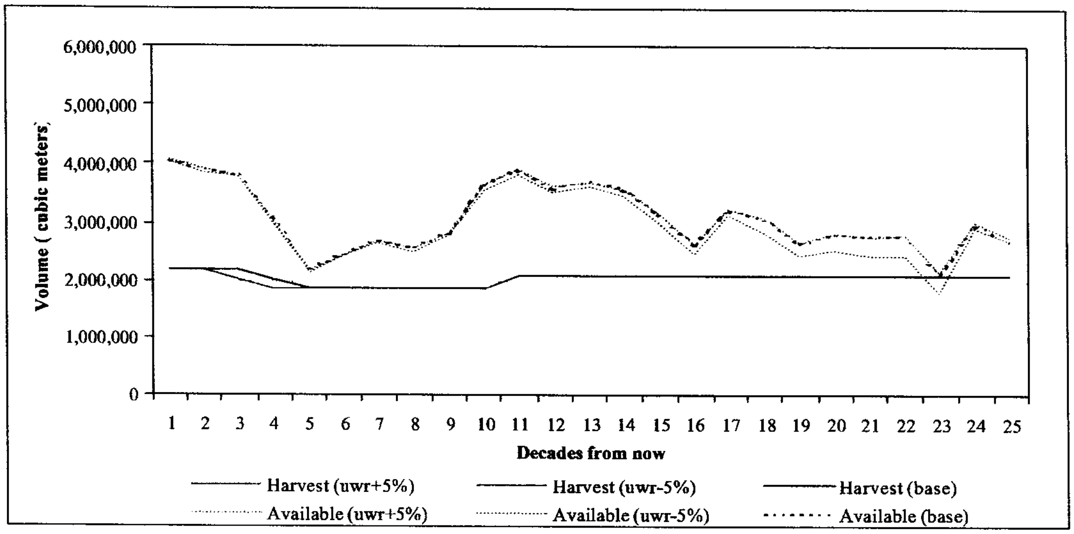

Figure 7.8. Net harvest levels – alter ungulate winter ranage disturbance levels

7.9 Alter Maximum Denudation Levels – VQO

In the Base Case, the VQO percent denudation ranges were determined based on the maximum percent denudation ratings for each VQO. This was based on a range of 1.0 – 5.0% for retention (R) polygons, 5.1 – 15.0% for partial retention (PR) polygons, and 15.1 – 25.0% for modification (M) polygons.

In this sensitivity analysis, the VQO maximum denudation percentages were altered to reflect the minimum percentage. Applying the minimum percentage had a severe impact on short, mid and long-term supply, due to a reduced availability in decades 5, 16 and 23 as shown in Table 7.10 and Figure 7.9. Consequently, short, mid and long-term harvest levels were unrealizable.

Table 7.10. Net harvest levels – alter denudation – VQO

Decade	Annual Harvest Level (m^3 / year)	
	VQO Min	Base Case
1	198 000	220 000
2	198 000	220 000
3	198 000	220 000
4	182 160	202 400
5 - 10	167 580	186 200
11 +	189 000	210 000

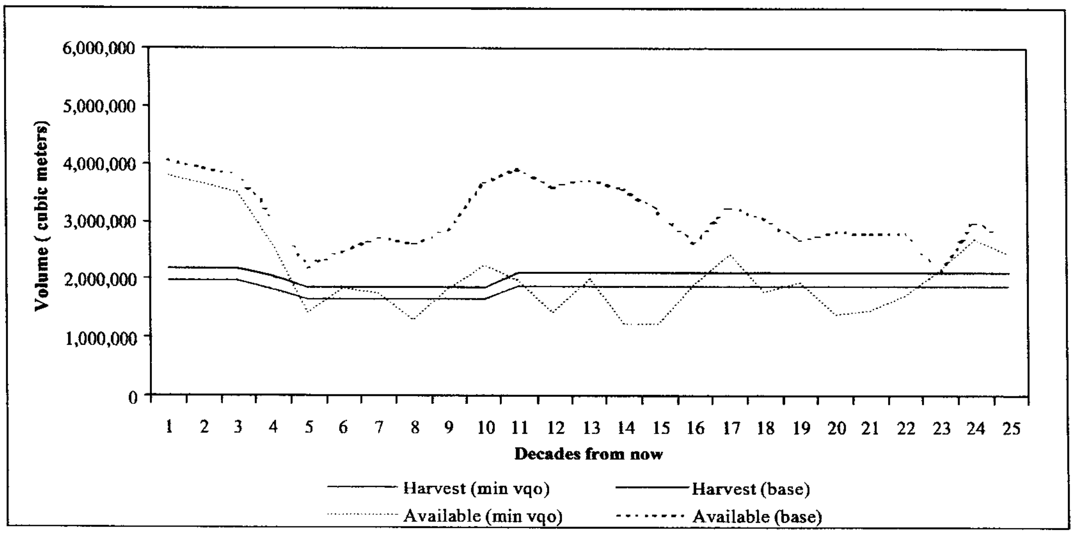

Figure 7.9. Net harvest levels – alter denudation levels – VQO

7.10 Alter Biodiversity Requirements

Landscape unit and biodiversity emphasis assignments for TFL 45 are still in the draft stage. As a result, only weighted-average (45/45/10) seral stage percentages were employed in the Base Case. In this scenario, all old-growth retention requirements were altered by +/- 5% to demonstrate the sensitivity associated with retaining old-growth to meet biodiversity objectives.

The results, as depicted in Table 7.11 and Figure 7.10, indicate moderate mid and long-term sensitivity to any further increases in this requirement. Consequently, initial harvest levels could only be maintained for 2 decades. Reducing the forest cover requirement by 5% had no significant impact on Base Case levels, therefore, timber supply is not constrained by the current Base Case seral stage requirements.

Table 7.11. Net harvest levels – alter biodiversity requirements

Decade	Annual Harvest Level (m^3 / year)		
	Bio –5%	Base Case	Bio +5%
1	220 000	220 000	220 000
2	220 000	220 000	220 000
3	220 000	220 000	202 400
4	206 448	202 400	186 200
5 - 10	189 924	186 200	186 200
11 +	210 000	210 000	205 800

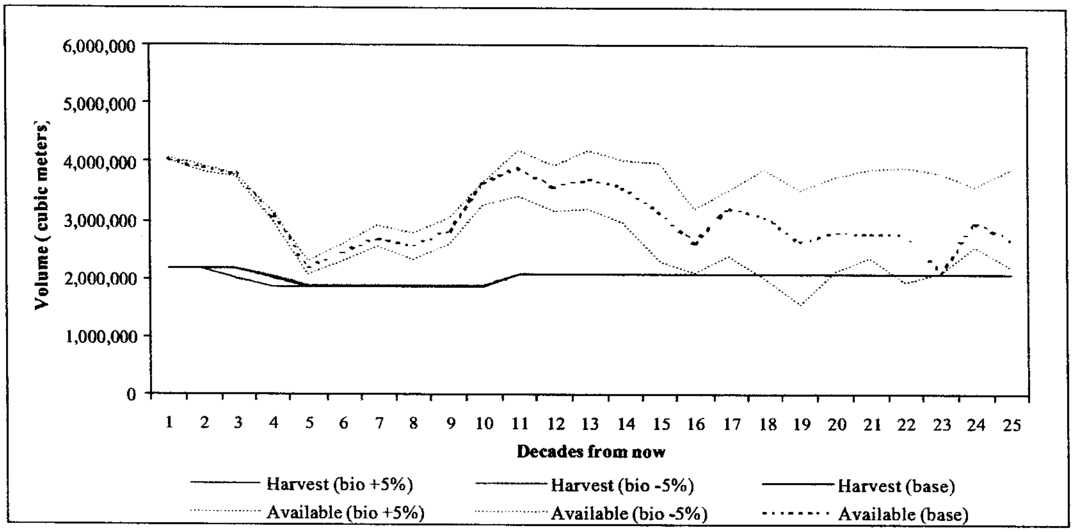

Figure 7.10. Net harvest levels – alter biodiversity requirements

7.11 Apply Mature + Old Seral Stage Requirements

In the Base Case, only old-growth seral stage requirements were employed. This analysis was designed to test the impact of incorporating mature+old seral stage requirements, in addition to the old-growth requirements.

As depicted in Table 7.12 and Figure 7.11, the results demonstrate a long-term negative impact (decade 23) on availability associated with this requirement. This impact on timber supply is based on the priorities set out at the beginning of this section, *i.e.* reductions in short and mid-term supplies are made before any reductions are made in long-term supply. In this case, however, an alternative strategy to eliminate the decade 23 shortfall and maintain the existing short-term timber flow would be to reduce the long-term harvest level by approximately 2%.

Table 7.12. Net harvest levels – apply mature+old seral stage requirements

Decade	Annual Harvest Level (m^3 / year)	
	Mature+Old	Base Case
1	220 000	220 000
2	220 000	220 000
3	202 400	220 000
4	186 200	202 400
5 - 10	186 200	186 200
11 +	210 000	210 000

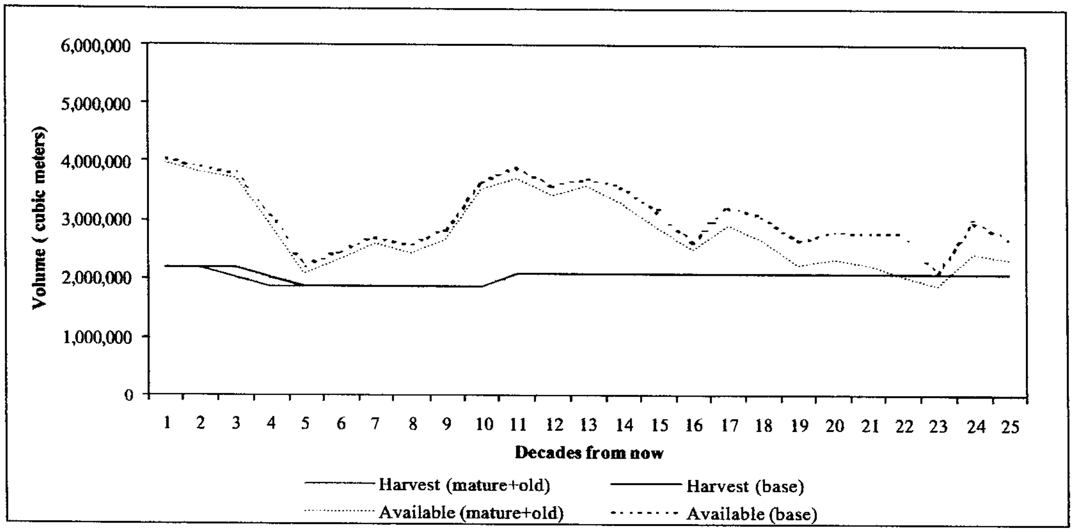

Figure 7.11. Net harvest levels – apply mature+old seral stage requirements

7.12 Summary of Sensitivity Issues

Table 7.13 provides a summary of the impacts of the sensitivity issues explored in this section. Impacts, represented as percentages, are only listed where the results differed from the Base Case by more than 0.5%. Impacts shown represent aggregate differences over the periods indicated, and are rounded to the nearest percentage value.

Table 7.13. Sensitivity analyses – summary of percentage impacts

		Harvest Interval (decades)		
		1-4	**5-10**	**11-25**
Base Case Net Harvest (total cubic meters) =		8 624 000	11 172 000	31 500 000
Issue Tested	**Sensitivity**	**Percentage Impact**		
Adjust THLB	+2 689 ha	+7	+7	+7
	-2 689 ha	-10	-10	-10
Include marginal operability	operability	+2	+4	0
Adjust existing VDYP yields	+10%	+2	+14	0
	-10%	-10	-10	-5
Adjust TIPSY yields	+10%	0	+5	+10
	-10%	0	-5	-10
Alter minimum harvest age	+10 years	-4	0	0
	-10 years	0	0	0
Alter regeneration delay	+1 year	-4	0	0
	- 1 year	+2	+1	0
Alter IRM disturbance %	+5%	0	0	0
	-5%	0	0	0
Alter UWR disturbance levels	+5%	0	0	0
	-5%	-4	0	0
Alter VQO disturbance levels	minimum	-10	-10	-10
Alter biodiversity requirements	+5%	-4	0	0
	-5%	0	+2	0
Apply incremental seral objectives	mature+old	-4	0	0

In summary, these sensitivity analyses demonstrated several factors that affect Base Case timber flow in the short-term. This reflects the amount of available timber in decades 5, 16 and 23, which is only 18%, 25%, and 1% above Base Case harvest levels (Figure 6.2). These points represent the limiting point in time controlling short-term harvest flow, and consequently, are sensitive to downward pressure.

8.0 Licensee Options

A series of licensee options have been explored as part of this analysis. These are summarized in Table 8.1. The results of these options are described in Sections 8.1 – 8.7 of this report.

Table 8.1. Licensee options

Option	Description	Section
1	Cruise adjusted volume project	8.1
2	Replace VQO buyback strategy with updated VLI	8.2
3	Alternate biodiversity a. priority biodiversity: retention of old-growth and WTP b. full biodiversity: retention of old-growth, seral stage distribution and WTP	8.3
4	Central Coast Land and Coastal Resource Management Plan (CCLCRMP) a. impact of land base loss due to removal of candidate protections areas (CPAs) b. impact of land base loss due to removal of CPAs and visual management within SMZs	8.4
5	Harvesting trends by forest district a. assess distribution of harvest as per the operable land base by forest district b. prioritize harvest in the north (Port McNeill Forest District) c. prioritize harvest in the south (Campbell River Forest District)	8.5
6	Harvesting trends by forest district excluding CPAs a. prioritize harvest in the north (Port McNeill Forest District) b. prioritize harvest in the south (Campbell River Forest District) c. prioritize harvest in south (Campbell River Forest District) with sustainable harvest flow	8.6
Summary	Summary of licensee option issues/impacts	8.7

8.1 Option 1 – Inventory Adjustment

A cruise adjusted volume project was conducted on approximately 950 inventory plots and 900 count plots from the 1989-1990 Fletcher Challenge inventory information on TFL 45. To date, this inventory plot data has not been audited. Consequently, the results can not be verified as unbiased. However, Interfor intends to explore the possibility of using VRI Phase II sampling over the term of this Management Plan to check the validity of the plot data. If found to be unbiased this data may be incorporated in future inventory estimates and timber supply analyses. Overall, when implementing the plot data, it was estimated that volumes in the existing older age classes (7 through 9) within the TFL were underestimated by approximately 7%.

In order to understand the timber supply consequences of this underestimation an exploratory option of standing volume was developed. The option included all management objectives defined in the Base Case with the exception of existing stand yields, which were adjusted to reflect an increase (7%) in the cruise volume.

In this option, incrementing existing mature stand volumes by 7% resulted in the short-term harvest level being maintained for 4 decades, 1 more than under the Base Case. As seen in Table 8.2 and Figure 8.1, timber availability in the long-term is also above Base Case levels resulting in a long-term harvest level increase of approximately 2%.

Table 8.2. Net harvest levels – inventory adjustment

Decade	Annual Harvest Level (m^3 / year)	
	Adjusted Inventory	Base Case
1 - 3	220 000	220 000
4	220 000	202 400
5	202 400	186 200
6 - 10	186 200	186 200
11 +	214 000	210 000

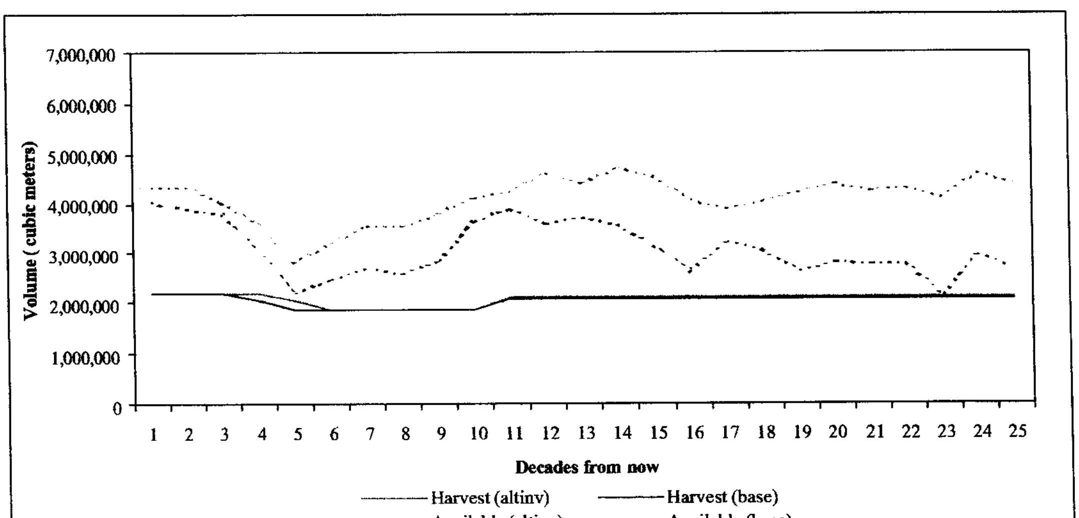

Figure 8.1. Net harvest levels – inventory adjustment

8.2 Option 2 – Alternate VQO

Under the Base Case option VQO information was determined through a full landscape inventory approved by the MoF in 1995, and subsequently modified under the VQO buyback strategy. In order to test the impacts related to the updated Visual Landscape Inventory (VLI) two scenarios will be tested, specifically:

- Updated VLI across the entire TFL; and
- Updated VLI within the Central Coast Land and Coastal Resource Management Plan (CCLCRMP) Special Management Zones (SMZ) only.

The 2000 update of the Visual Landscape Inventory (VLI) for Tree Farm Licence 45 is part of the requirements for managing Tree Farm Licences under the Forest Act. The inventory is required to be updated every five years. The update uses the methodology outlined in the Ministry of Forests, Forest Practices Branch publication entitled Visual Landscape Inventory, Procedures & Standards (May 1997). The purpose of the inventory is to:

- Standardize interpretation of landscape resources in British Columbia;
- Capture essential information regarding landscape characteristics; and
- Provide a measure of landscape sensitivity in order to guide landscape management in the working forest.

In addition, green-up heights within these VLI zones were based on slope classes and the associated weighted-average heights were modelled after Table 3 in the letter dated June 24, 1998, entitled "Managing Visual Resources to Mitigate Impacts on Timber Supply" from Larry Pedersen, Chief Forester.

Overall, timber availability responds negatively in the short, mid and long-term when implementing the updated VLI across the TFL. This is primarily attributable to the green-up height when testing this assumption which, on average, is 2 meters above Base Case levels. As a result, short term harvest levels were maintained for 2 decades, 1 less than the Base Case. Harvest levels in the long-term also decreased by 5% (Table 8.3 <alternate vqo **a**>, Figure 8.2 <alternate vqo **a**>).

Since most of the impact occurs late in the planning horizon an alternative strategy to maintain the existing short-term timber flow would be to reduce the mid and long-term harvest levels by approximately 3% (Table 8.3 <alternate vqo **b**>, Figure 8.2 <alternate vqo **b**>).

Conversely, when employing VLI objectives within the CCLCRMP SMZs only initial harvest levels could be maintained at Base Case levels. In the long-term, timber availability again dictated that the harvest level be reduced, albeit, only marginally (1%).

Table 8.3. Net harvest levels – alternate VQO

Decade	Annual Harvest Level (m^3 / year)			
	Alternate VQO a	**Alternate VQO b**	**Base Case**	**Alternate VQO-SMZ**
1	220 000	220 000	220 000	220 000
2	220 000	220 000	220 000	220 000
3	202 400	220 000	220 000	220 000
4	186 200	202 400	202 400	202 400
5 - 10	186 200	180 000	186 200	186 200
11 +	200 000	204 000	210 000	207 000

The results presented under this option directly reflect the amount of area within the visual landscape when testing these assumptions. In the first case, area under VLI accounts for 9 250 hectares (34%) of the timber harvesting land base. In the second case, however, area under VLI accounts for only 4 354 hectares (16%) of the timber harvesting land base, and predictably, equates to an increase in availability over the first case (Figure 8.2).

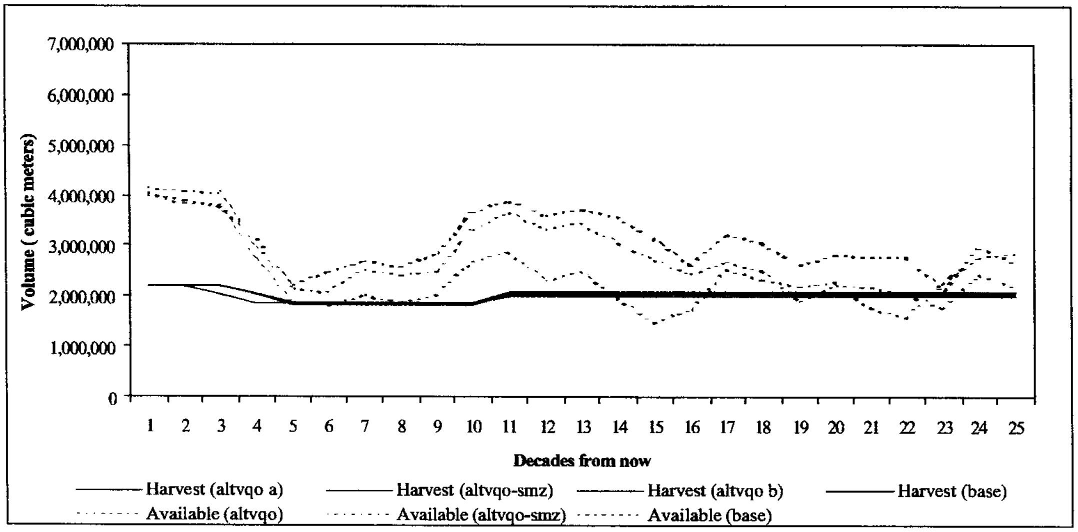

Figure 8.2. Net harvest levels – alternate VQO

8.3 Option 3 – Alternate Biodiversity

Under this option weighted-averaged seral stage distributions weighted 45% low, 45% intermediate and 10% high will be replaced with the draft biodiversity emphasis options as indicated on the Vancouver Forest Region Landscape Unit maps dated November 22, 1999 as proposed within the TFL. Two scenarios will be tested, specifically:

- One-third biodiversity (1/3 Low) including retention of old-growth and WTPs; and
- Three-thirds full biodiversity (3/3 Low) including WTPs, and seral stage distribution requirements in early+mature+old.

Overall, timber availability was considerably sensitive under each scenario illustrated above. When testing the 1/3 option harvest levels in the short and mid-term were maintained since availability in these terms generally paralleled that of the Base Case. However, since availability in the long-term was approximately 24% above Base Case levels the harvest level in the long-term was increased by 2% (Table 8.4, Figure 8.3).

Conversely, under the 3/3 option with full seral stage requirements short-term harvest levels could not be maintained. This reflects the lack of available timber in decade 5, which is unable to absorb the downward pressure when implementing these assumptions (Table 8.4, Figure 8.3).

Table 8.4. Net harvest levels – alternate biodiversity

Decade	Annual Harvest Level (m³ / year)		
	One Third	Base Case	Three Thirds
1	220 000	220 000	220 000
2	220 000	220 000	202 400
3	220 000	220 000	186 200
4	202 400	202 400	186 200
5 - 10	186 200	186 200	186 200
11 +	214 000	210 000	210 000

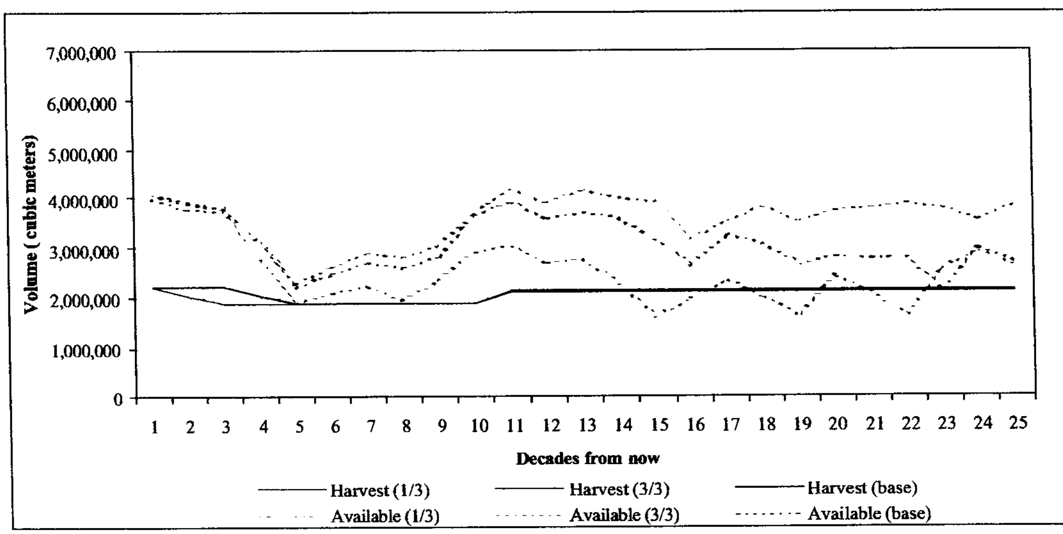

Figure 8.3. Net harvest levels – alternate biodiversity

8.4 Option 4 – Central Coast Land and Coastal Resource Management Plan

All areas within TFL 45 fall under the Central Coast Land and Coastal Resource Management Plan (CCLCRMP) area, the largest planning area in the Province. In the absence of the completion of the CCLCRMP higher level planning process, MP No. 4 is recognized as the principle document providing higher level planning objectives for TFL 45. For the purposes of this option, the draft CCLCRMP Candidate Protection Areas (CPAs) and SMZs will be employed. Two options will be tested to measure the impacts associated with the implementation of the CCLCRMP, specifically:

- The impact of excluding CPAs from the timber harvesting land base; and
- The impact of excluding CPAs from the timber harvesting land base and including SMZ visual quality objectives.

Predictably, the timber supply is sensitive to changes in the removal of the CPAs from the TFL. In fact, these areas account for an overall loss of approximately 800 hectares (3%) from the timber harvesting land base. Consequently, as seen in Table 8.5, harvest levels in the short, mid and long-term, were reduced proportionately.

When including the removal of CPAs and SMZ visual objectives timber availability was only slightly different than the CPA assessment (Figure 8.4). Nonetheless, mid and long-term timber availability was 2% below the CPA assessment. As a result, mid and long-term harvest levels had to be reduced, albeit only marginally, by an additional 1%.

Table 8.5. Net harvest levels – CCLCRMP

Decade	Annual Harvest Level (m^3 / year)		
	CPA	Base Case	CPA / SMZ
1	212 000	220 000	212 000
2	212 000	220 000	212 000
3	212 000	220 000	212 000
4	195 000	202 400	195 000
5 - 10	179 000	186 200	177 000
11 +	202 000	210 000	200 000

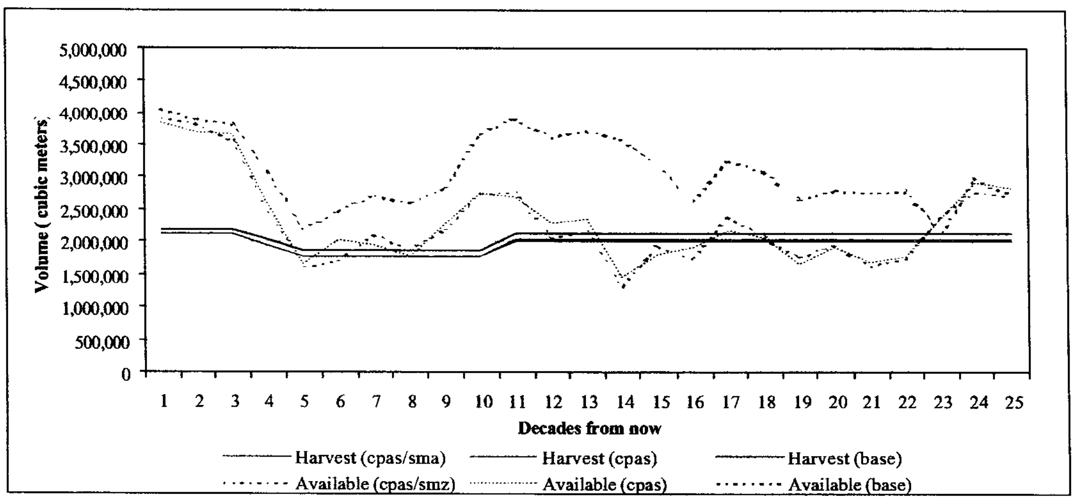

Figure 8.4. Net harvest levels – CCLCRMP

8.5 Option 5 – Harvesting Trends by Forest District

This option combines the management and input assumptions documented in the Base Case but explores the distribution of harvest across the TFL. The objective of this analysis is to maintain the harvest distribution in each partition for as long as possible and to determine at what rate the harvest is redistributed across the whole of TFL 45. Three options will be tested, specifically:

- Distribute harvest as per the operable land base by forest district;
- Prioritize harvest in the Port McNeill (north) Forest District; and
- Prioritize harvest in the Campbell River (south) Forest District.

The intent of the two latter options is to demonstrate to what extent the AAC is co-dependent on the old-growth in the northern (Port McNeill) portion of the TFL and the second growth in the southern (Campbell River) portion.

Timber flow is significantly impacted in the short, mid, and long-term when testing these assumptions. Overall, when prioritizing harvest within the forest districts as per the operable land base (70% (18 685 ha) Port McNeill, 30% (8 208 ha) Campbell River) Base Case harvest levels were unrealizable. Though harvest targets within the Port McNeill Forest District were attainable throughout the planning horizon those in the Campbell River Forest District were unsustainable, albeit, in decades 2 through 5 only. This clearly reflects a shortage of operable wood early in the planning horizon and illustrates the amount of second growth wood currently in the Campbell River Forest District, which accounts for 44% (3 620 ha) of the total operable area within the district.

When prioritizing harvest within the Port McNeill Forest District Base Case harvest levels were achievable for the first 3 decades. This reflects the amount of operable old-growth timber currently within the district, which accounts for 61% of the total operable area. Beyond this point however, Base Case harvest levels are unattainable since the Campbell River Forest District is unable to mitigate shortfalls, for example, in decade 5. Again, this reflects the amount, or lack of, operable wood early in the planning horizon within the Campbell River Forest District.

On the other hand, when prioritizing the harvest in the Campbell River Forest District Base Case harvest levels are achievable throughout the planning horizon as the Port McNeill Forest District is able to absorb any shortfalls incurred within the Campbell River Forest District. Once again, this reflects the surplus of operable old-growth timber within the Port McNeill Forest District. The results are presented in Table 8.6 and Figure 8.5.

Table 8.6. Net harvest levels – harvest trends

Decade	Achieved Annual Harvest Level (m^3 / year)									
		Thlb Division			Prioritize North (PM)			Prioritize South (CR)		
	Base Case	PM	CR	*Total*	PM	CR	*Total*	CR	PM	*Total*
1	220 000	154 000	66 000	*220 000*	220 000	0	*220 000*	74 030	145 970	*220 000*
2	220 000	154 000	46 657	*200 657*	220 000	0	*220 000*	37 507	182 493	*220 000*
3	220 000	154 000	45 568	*199 568*	220 000	0	*220 000*	47 732	172 268	*220 000*
4	202 400	141 680	33 653	*175 333*	127 832	74 600	*202 432*	31 137	171 263	*202 400*
5	186 200	130 340	33 388	*163 728*	60 127	89 290	*149 417*	38 685	147 515	*186 200*
6	186 200	130 340	55 900	*186 240*	133 927	52 300	*186 227*	65 339	120 861	*186 200*
7	186 200	130 340	55 900	*186 240*	137 968	48 200	*186 168*	92 602	93 598	*186 200*
8	186 200	130 340	55 900	*186 240*	116 967	69 200	*186 167*	74 201	111 999	*186 200*
9	186 200	130 340	55 900	*186 240*	172 976	13 200	*186 176*	59 631	126 569	*186 200*
10	186 200	130 340	55 900	*186 240*	167 013	19 200	*186 213*	49 236	136 964	*186 200*
11	210 000	147 000	63 000	*210 000*	71 811	138 200	*210 011*	55 325	154 675	*210 000*
12	210 000	147 000	63 000	*210 000*	103 105	97 444	*200 549*	61 892	148 108	*210 000*
13	210 000	147 000	63 000	*210 000*	177 852	32 150	*210 002*	80 586	129 414	*210 000*
14	210 000	147 000	63 000	*210 000*	95 013	114 900	*209 913*	65 627	144 373	*210 000*
15	210 000	147 000	63 000	*210 000*	120 083	82 867	*202 950*	71 255	138 745	*210 000*
16	210 000	147 000	63 000	*210 000*	158 966	51 000	*209 966*	41 844	168 156	*210 000*
17	210 000	147 000	63 000	*210 000*	142 367	67 600	*209 967*	63 971	146 029	*210 000*
18	210 000	147 000	63 000	*210 000*	87 487	103 357	*190 844*	64 739	145 261	*210 000*
19	210 000	147 000	63 000	*210 000*	158 378	51 600	*209 978*	82 613	127 387	*210 000*
20	210 000	147 000	63 000	*210 000*	121 973	76 960	*198 933*	58 804	151 196	*210 000*
21	210 000	147 000	63 000	*210 000*	115 457	76 205	*191 662*	66 897	143 103	*210 000*
22	210 000	147 000	63 000	*210 000*	163 505	46 500	*210 005*	59 383	150 617	*210 000*
23	210 000	147 000	63 000	*210 000*	141 135	61 127	*202 262*	52 358	157 642	*210 000*
24	210 000	147 000	63 000	*210 000*	183 871	26 100	*209 971*	65 687	144 313	*210 000*
25	210 000	147 000	63 000	*210 000*	120 786	89 200	*209 986*	83 848	126 152	*210 000*

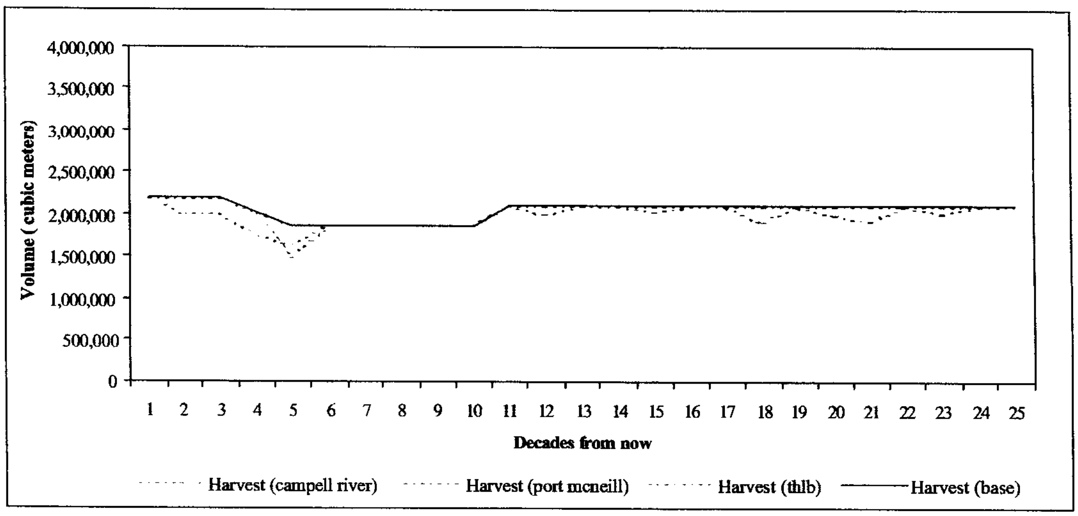

Figure 8.5. Net harvest levels – harvest trends

8.6 Option 6 – Harvesting Trends by Forest District Excluding Candidate Protection Areas

This option combines the management and input assumptions documented in Option 4 (Section 8.4) and Option 5 (Section 8.5) but explores the distribution of harvest across the TFL when excluding the CCLCRMP CPAs from the timber harvesting land base. The objective of this analysis is to maintain the harvest distribution in each partition for as long as possible and to determine at what rate the harvest is redistributed across the whole of TFL 45. Two options will be tested, specifically:

- Prioritize harvest in the Port McNeill (north) Forest District;
- Prioritize harvest in the Campbell River (south) Forest District; and
- Prioritize harvest in the Campbell River (south) Forest District and determine sustainable harvest level.

Predictably, timber availability responds negatively when testing this assumption. In fact, as depicted in Table 8.7 and Figure 8.6, the overall harvest in the short, mid, and long-term was 4% less when prioritizing the north and 6% less when prioritizing the south than those documented under Section 8.5.

Table 8.7. Net harvest levels – harvest trends with CCLCRMP CPAs

Decade	Base Case	Prioritize North (PM)			Prioritize South (PM)			Prioritize South (PM) - Flow		
		PM	CR	*Total*	CR	PM	*Total*	CR	PM	*Total*
1	220 000	220,000	0	*220,000*	71,977	148,023	*220,000*	71,977	140,023	*212,000*
2	220 000	220,000	0	*220,000*	34,760	185,239	*219,999*	34,760	177,240	*212,000*
3	220 000	220,000	0	*220,000*	46,924	173,076	*220,000*	46,924	165,076	*212,000*
4	202 400	73,655	118,456	*192,111*	30,993	171,407	*202,400*	30,993	164,007	*195,000*
5	186 200	60,159	57,187	*117,346*	39,644	145,933	*185,576*	39,644	139,356	*179,000*
6	186 200	135,042	51,158	*186,200*	65,442	120,757	*186,199*	65,442	113,558	*179,000*
7	186 200	118,206	67,994	*186,200*	91,440	94,759	*186,199*	91,440	87,560	*179,000*
8	186 200	139,030	47,170	*186,200*	72,632	104,621	*177,253*	72,632	106,368	*179,000*
9	186 200	175,590	10,610	*186,200*	57,611	128,588	*186,199*	57,611	121,389	*179,000*
10	186 200	122,520	63,680	*186,200*	49,225	136,975	*186,200*	49,225	129,775	*179,000*
11	210 000	72,583	122,773	*195,355*	55,207	154,792	*209,999*	55,207	146,793	*202,000*
12	210 000	102,367	98,312	*200,679*	61,225	139,923	*201,148*	61,225	140,775	*202,000*
13	210 000	179,273	30,727	*210,000*	80,358	129,642	*210,000*	80,358	121,642	*202,000*
14	210 000	64,597	120,346	*184,943*	64,818	80,958	*145,776*	64,818	137,182	*202,000*
15	210 000	147,047	32,345	*179,391*	70,271	98,817	*169,088*	70,271	131,729	*202,000*
16	210 000	149,398	60,602	*210,000*	41,975	141,151	*183,126*	41,975	160,025	*202,000*
17	210 000	115,098	75,868	*190,967*	60,748	149,252	*210,000*	60,748	141,252	*202,000*
18	210 000	107,568	95,986	*203,554*	65,682	144,318	*210,000*	65,682	136,318	*202,000*
19	210 000	120,125	38,810	*158,935*	79,635	95,905	*175,540*	79,635	122,365	*202,000*
20	210 000	111,464	95,327	*206,791*	55,792	134,745	*190,537*	55,792	146,208	*202,000*
21	210 000	131,174	37,917	*169,090*	63,834	96,394	*160,228*	63,834	138,166	*202,000*
22	210 000	155,606	54,394	*210,000*	64,326	115,875	*180,200*	64,326	137,674	*202,000*
23	210 000	169,064	40,936	*210,000*	54,170	155,830	*210,000*	54,170	147,830	*202,000*
24	210 000	138,059	71,941	*210,000*	64,313	145,686	*209,999*	64,313	137,687	*202,000*
25	210 000	102,735	97,760	*200,494*	82,033	127,967	*210,000*	82,033	119,967	*202,000*

These results primarily reflect the loss of approximately 800 hectares from the timber harvesting land base, 700 hectares in the north and 100 hectares in the south, when excluding CPAs. Moreover, while approximately 3% less than the Base Case, sustainable harvest levels duplicate those documented under Option 8.4 (CCLCRMP with CPA removals) even when prioritizing the harvest in the Campbell River Forest District. Given the loss of 700 hectares of timber harvesting land base from the north it is still able to mitigate any shortfalls in the south when prioritizing the TFL by forest district. Again, this reflects the amount of operable old-growth presently in the Port McNeill Forest District.

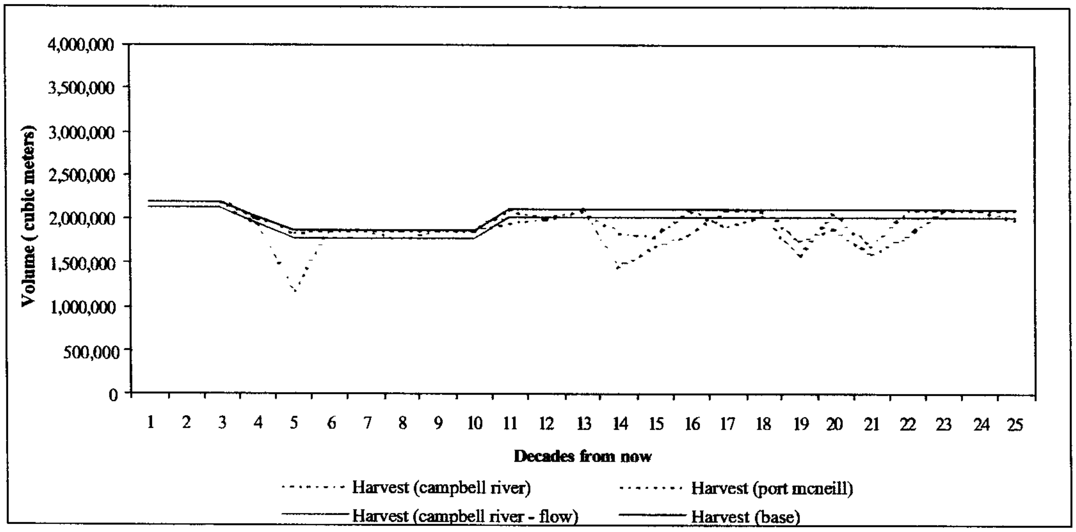

Figure 8.6. Net harvest levels – harvest trends with CPAs

8.7 Summary of Licensee Options

Table 8.8 provides a summary of the impacts of the options explored in this section. Impacts (%) are only listed where the results differed from the Base Case by more than 0.5%. Impacts shown represent aggregate differences over the periods indicated and are rounded to the nearest percentage value.

Table 8.8. Licensee options – summary of percentage impacts

	Harvest Interval (decades)		
	1-4	5-10	11-25
Base Case Net Harvest (total cubic meters) =	8,624,000	11,172,000	31,500,000
Option Tested	**Percentage Impact**		
Inventory adjustment	+2	+1	+2
Alternate VQO	-8	0	-5
Alternate biodiversity			
a. old + WTP	-4	0	0
b. early+mature+old+WTP	-8	0	0
CCLCRMP			
a. CPAs	-3	-3	-3
b. CPAs+SMZs	-3	-3	-4
Harvesting trends by forest district			
a. prioritize north	0	-3	-2
b. prioritize south	0	0	0
c. proportion land base	-8	-2	0
Harvesting trends by forest district excluding CPAs			
a. prioritize north	-1	-6	-7
b. prioritize south	0	-1	-9
c. prioritize south with sustainable harvest flow	-3	-3	-3

In summary, these options demonstrated several factors that affect Base Case timber flow in the short, mid, and long-term. The harvest flow policy does not allow for increases in harvest above the current AAC during the first 30 years. Therefore, there are no positive gains realized during this period.

Overall, the inclusion of draft biodiversity emphasis options, the implementation of the CCLCRMP and the replacement of the VQO buyback strategy with the updated VLI impacted Base Case timber availability negatively.

It is noteworthy, that, with the exception of significant land base withdrawals (CPAs), the existing AAC is still achievable for at least the first decade in all licensee options tested.

9.0 20-Year Spatial Feasibility Option

As laid out in the MoF guidelines for the preparation of the 20-year plan, the spatial plan sets out a hypothetical sequence of harvesting over a period of at least 20 years. The 20-year plan utilizes spatial constraints with little or no field information, to test achievement of a harvest level that conforms to current standards and practices as defined for the Base Case in the Timber Supply Analysis Information Package (April 2001, Version 4).

The TFL 45 20-Year Spatial Feasibility analysis has been prepared with these objectives in mind. It is not designed to be an operational plan, but a test of timber availability given the current structural characteristics and spatial distribution of components of the resource, and the structural and spatial management objectives associated with the Forest Practices Code.

A report (20-Year Spatial Feasibility Report, June 2001) detailing this analysis is submitted under separate cover.

10.0 Recommendations

Based on the outcome of these analyses, it is proposed that the AAC for TFL 45 be 220 000 cubic meters per year for the period January 1, 2002 to December 31, 2006. This harvest is maintainable for a period of 30 years. It is then reduced by 8% in decades 4 and 5 to achieve a mid-term harvest level of 186 200 cubic meters. Based on the application of MoF-approved yield curves, the long-term level rises to 210 000 cubic meters.

The proposed AAC is supported by four (4) critical factors:

1. The Base Case analysis demonstrates that this level is sustainable for three decades;
2. Mid-term reductions are reasonable given the productivity of the land base;
3. Long-term harvest is maintained within 9% of the productivity of the land base;
4. The 20-Year Spatial Feasibility analysis has demonstrated that the AAC is spatially attainable over the 20-year analysis period.